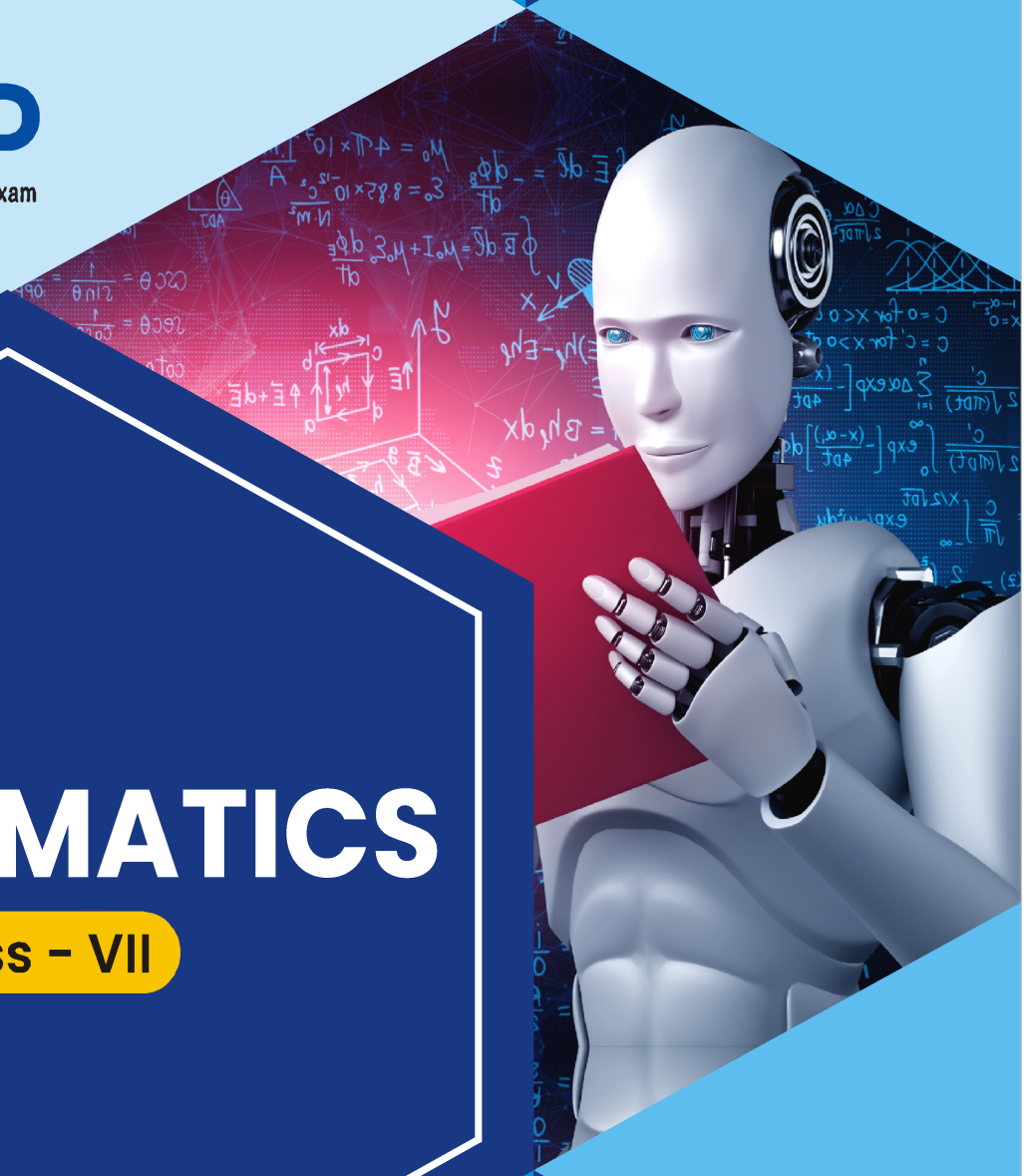
MATRIX OLYMPIAD

The Most Innovative Talent Recognition Exam



MATHEMATICS

Class - VII

MATRIX

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Few words for the Readers

Dear Reader,

"*Matrix Olympiad is established to encourage school students to go a step further than their regular studies, and get a chance and exposure to competition on a wide scale. It also helps students enhance their learning of basic cognitive skills and deeper knowledge of subjects like Science, Mathematics, English, Mental Ability, Social Studies.“Matrix Olympiad helps students nurture their minds for higher targets of tomorrow and enables them to study School for JEE, NEET, CLAT, NDA, Olympiads , NSEJS, NTSE , STSE etc.*"

The above thought has been our guiding principle while designing and collating the study material for **Matrix Olympiad** . And hence, we hope that this particular material will be helpful towards your preparation for **Matrix Olympiad**.

Our team at **MATRIX** has put in their best efforts for making this particular module interesting and relevant for you. Additional efforts have been made to ensure that the content is easy to understand and error free to the extent possible. However, there might remain some inadvertent errors in answer keys and theoretical portion and we would welcome your valuable feedback regarding the same.
If there are any suggestions for corrections, please write to us at **smd@matrixacademy.co.in** and we would be highly grateful.

Finally, we would like to end this message by a famous quote by Ernest Hemingway - "*There is no friend as loyal as a book*." So, please give your study material the time and attention it deserves, and it will surely help you reach newer heights in your fight with competition examinations.

With love and best wishes !
Team MATRIX

CONTENTS

LINES AND ANGLES (PARALLEL AND INTERSECTING LINES)

1

INTRODUCTION

In geometry, we have four simple ideas or imaginary things i.e. point, line, plane and space and everything else is built on these simple concepts.

1. POINT

We use a dot, like point P, to represent a point. A point is a location and it has absolutely no dimensions i.e. no length, no width and no depth.

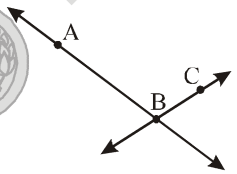
Line, Ray & Line Segment :

Line	Ray	Line segment
(i) A line $\overleftrightarrow{AB}$ is a represented by 	A ray $\overrightarrow{AB}$ is represented as 	A line segment is represented by $\overline{AB}$ 
(ii) A line has no end point	A ray has one end point	A line segment has two end points.
(iii) A line does not have a Definite length.	A ray does not have a definite length.	A line segment has a definite length.

2. TWO LINES CAN BE RELATED TO EACH OTHER IN FOUR DIFFERENT WAYS

2.1 INTERSECTING LINES

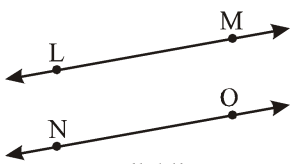
Lines that have just one point in common are called **Intersecting Lines**.



Intersecting lines

2.2 PARALLEL LINES

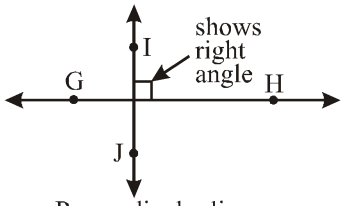
Lines that lie in the same plane but never intersect even if produced endlessly in both directions are called **Parallel Lines**.



Parallel lines

2.3 PERPENDICULAR LINES

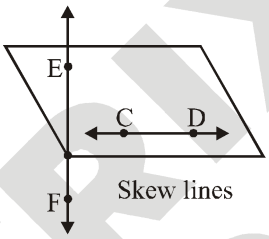
Two intersecting lines that form a right angle are called **Perpendicular Lines**.



Perpendicular lines

2.4 SKEW LINES

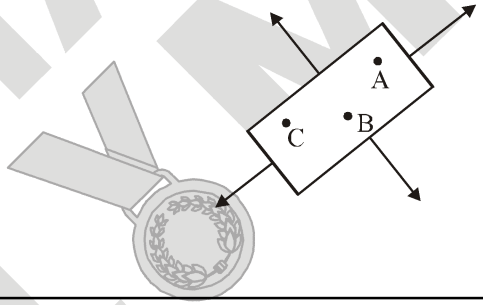
Lines that are not in the same plane and do not intersect are called **skew lines**.



Skew lines

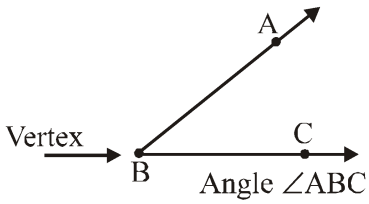
3. PLANE

The set of points all lying on one surface is called a plane. A wall, or surface of a table, floor etc. are all examples of a plane. A plane actually extends endlessly and the surface of a plane has no thickness. At least three points not on the same line are needed to define a plane.



4. ANGLE

Two rays that share a common end point form an angle. The common end point is called the vertex.

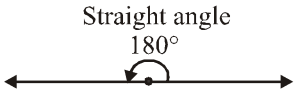


We measure the size of an angle in degrees using a protractor.

5. TYPES OF ANGLES

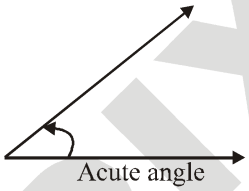
5.1 STRAIGHT ANGLE

An angle measuring 180° is called a straight angle.



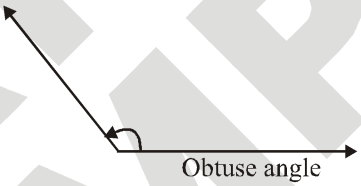
5.2 ACUTE ANGLE

An angle whose measure lies between 0° and 90° is called an acute angle.



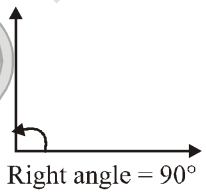
5.3 OBTUSE ANGLE

An angle whose measure lies between 90° and 180° is called an obtuse angle.



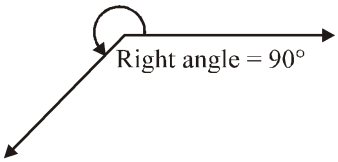
5.4 RIGHT ANGLE

An angle whose measure is equal to 90° is called a right angle.



5.5 REFLEX ANGLE

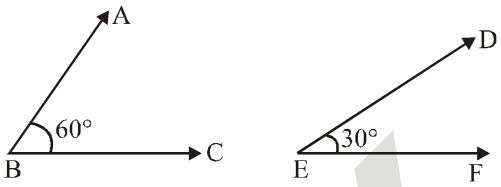
An angle whose measure lies between 180° and 360° is called a reflex angle.



6. MORE TYPES OF ANGLES

6.1 COMPLEMENTARY ANGLES

Two angles are called complementary angles if the sum of their degree measures equal to 90°. One of the complementary angles is called the complement of the other.

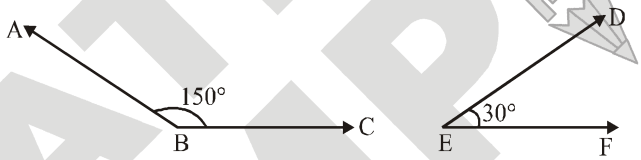


$\because$ $\angle ABC + \angle DEF = 60° + 30° = 90°$

$\therefore$ Angles ABC and DEF are complementary angles.

6.2 SUPPLEMENTARY ANGLES

Two angles are called supplementary angles, if the sum of their degree measures equal to 180°. One of the supplementary angles is called the supplement of the other.

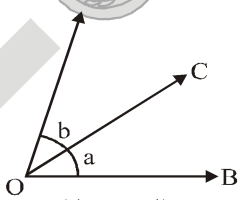


$\because$ $\angle ABC + \angle DEF = 150° + 30° = 180°$

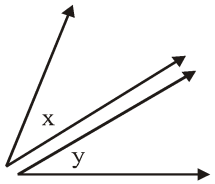
$\therefore$ Angles ABC and DEF are supplementary angles.

6.3 ADJACENT ANGLES

Two angles having a common vertex and a common side (ray) are called adjacent angles. In the figure given below a and b are adjacent angles having a common vertex O and a common ray OC.



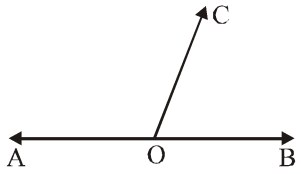
a and b are adjacent angles



x and y are not adjacent angles

6.4 LINEAR PAIR

Two adjacent angles form a linear pair if they are supplementary i.e. their sum is 180°.

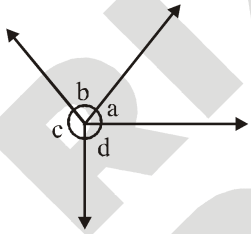


$\because$ $\angle AOB = 180°$ (a straight line)

$\therefore$ $\angle AOC$ and $\angle COB$ make a linear pair.

6.5 ANGLES AT POINT

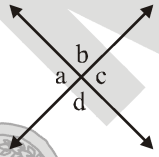
Sum of the angles around a point is 360°.



$\angle a + \angle b + \angle c + \angle d = 360°$

6.6 VERTICALLY OPPOSITE ANGLES

Vertically opposite angles are pairs of angles formed by two intersecting lines opposite to each other. They are always equal (or congruent).



$\angle a = \angle c$
$\angle b = \angle d$

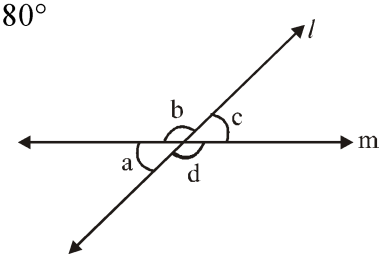
7. SOME IMPORTANT PROPERTIES

1. If two straight lines intersect then the adjacent angles are supplementary (i.e. form a linear pair).

For the two intersecting lines l and m,

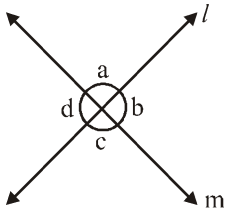
$\angle a + \angle b = 180°$, $\angle b + \angle c = 180°$

$\angle c + \angle d = 180°$, $\angle d + \angle a = 180°$



All these pairs of angles lie on a straight line and therefore form a straight angle.

2. If two straight lines intersect, then the vertically opposite angles are equal.



Proof :

$\because \angle a + \angle d = 180°$ (straight $\angle$)

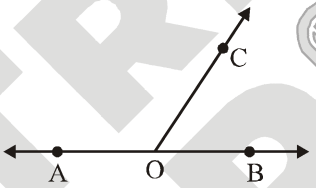
$\angle a + \angle b = 180°$ (straight $\angle$)

$\therefore \angle a + \angle d = \angle a + \angle b$

$\Rightarrow \angle d = \angle b$

Similarly, we can show that $\angle a = \angle c$.

3. If two angles having a common arm are supplementary then other two arms lie on a straight line.

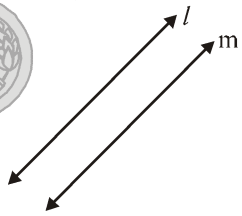


i.e. if $\angle AOC + \angle BOC = 180°$ then $\angle AOB$ is a straight angle and hence AOB is a straight line.

$\Rightarrow$ AO and OB lie on a straight line.

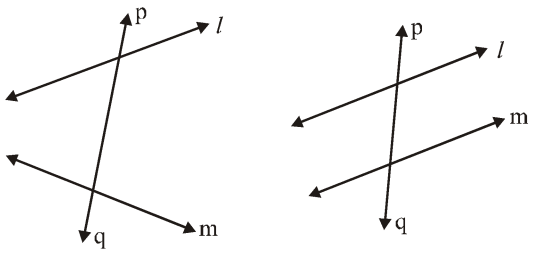
8. PARALLEL LINES

Lines in a plane which do not intersect are called parallel lines. A pair of parallel lines *l* and *m*, are always the same distance (perpendicular distance) apart.



9. TRANSVERSAL

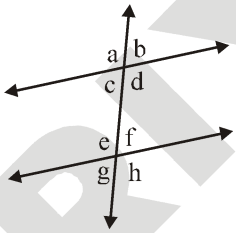
A line which intersects two or more given lines in distinct points is called a transversal to the given lines. In the given figures (a) and (b), line pq is transversal of lines *l* and m.



When two parallel lines are cut by a transversal, eight angles are formed, which may be classified as under

9.1 CORRESPONDING ANGLES

There are four pairs of corresponding angles. i.e. (∠a, ∠e) (∠c, ∠g) (∠b, ∠f) (∠d, ∠h) and they are equal.

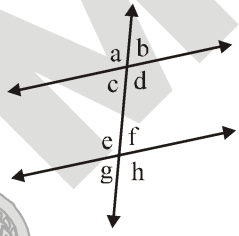


9.2 ALTERNATE ANGLES

(∠d, ∠e) and (∠c, ∠f) are alternate interior angles.

(∠a, ∠h) and (∠b, ∠g) are alternate exterior angles.

The alternate interior angles are also equal.



9.3 ALLIED ANGLES (CO-INTERIOR ANGLES)

Interior angles are on the same side of the transversal are called co-interior angles and these angles are always supplementary, i.e.,

∠c + ∠e = 180°, ∠d + ∠f = 180°

Theorem : If two parallel lines are intersected by a transversal, then

(A) Corresponding angles are equal

(B) Alternate Interior angles are equal

(C) Alternate exterior angles are equal

(D) Co-interior angles are supplementary.

Conversely : If two straight lines are intersected by a transversal such that :

(A) Corresponding angles are equal

Or

(B) Alternate angles are equal

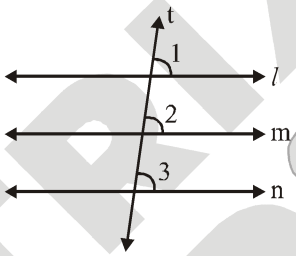
Or

(C) Co-interior angles are supplementary, then the two lines are parallel to each other.

Two lines parallel to the same line :

Two lines parallel to the same given line are parallel to each other.

Proof : Let l, m and n be three lines such that $l \parallel m$ and $l \parallel n$. Let t be the transversal cutting these lines.



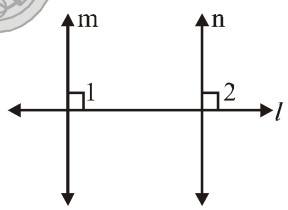
Since : $l \parallel m$, therefore, $\angle 1 = \angle 2$ (corresponding angles)
Also, $l \parallel n$, therefore, $\angle 1 = \angle 3$ (corresponding angles)
$\therefore \quad \angle 2 = \angle 3$ (both equal to the same $\angle 1$)

But these are corresponding angles

$\because$ m $\parallel$ n

Two lines perpendicular to the same line : Two lines in a plane, perpendicular to the same given line are parallel to each other.

Proof : Let m and n be two lines each perpendicular to a given line l



i.e. m $\perp l$ and n $\perp l$ $\Rightarrow \angle 1 = 90°$ and $\angle 2 = 90°$

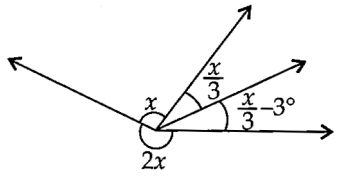
$\therefore \angle 1 = \angle 2$

But these are corresponding angles $\therefore$ m $\parallel$ n.

SOLVED EXAMPLES

SE. 1

Find the value of x



Ans. $x+\frac{x}{3}+\frac{x}{3}-3^\circ+2x=360^\circ$ (Complete angle)

$$\frac{3x+x+x-9^\circ+6x}{3}=360^\circ$$

$\Rightarrow 11x-9^\circ=360^\circ\times 3=1080^\circ$

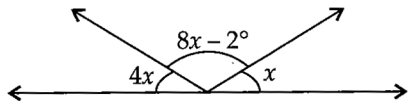
$\Rightarrow 11x=1080^\circ+9^\circ$

$\Rightarrow 11x=1089^\circ$

$$\Rightarrow x=\frac{1089^\circ}{11}=99^\circ$$

SE. 2

Find the value of x.



Ans. $4x+8x-2^\circ+x=180^\circ$ (Straight line)

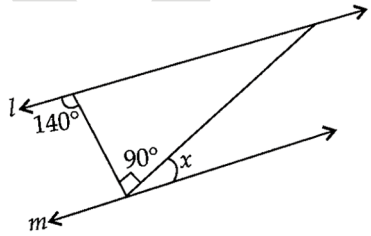
$\Rightarrow 13x-2^\circ=180^\circ$

$\Rightarrow 13x=182^\circ$

$$\Rightarrow x=\frac{182^\circ}{13}=14^\circ$$

SE. 3

Given *l* || *m* , find the measure of x.



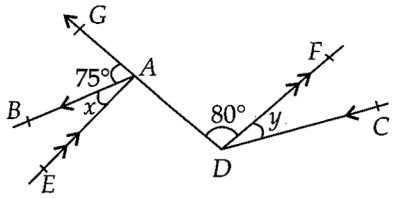
Ans. Since $l \parallel m$

$\therefore 140^\circ=90+x$ (Alternate interior angles)

$\Rightarrow 140^\circ-90^\circ=x \Rightarrow x=50^\circ$

SE. 4

In the given figure, AB || CD and EA || DF. If ∠GAB = 75°, ∠ADF = 80°, ∠EAB = x and ∠CDF = y. Find angle x and y ?



Ans. EA || DF and AD is transversal.

$\therefore \angle EAD=\angle ADF=80^\circ$

(Alternate interior angles)

Now, $\angle GAB+\angle EAB+\angle EAD=180^\circ$

$75^\circ+x+80^\circ=180^\circ$ (Straight line)

$x+155^\circ=180^\circ \Rightarrow x=180^\circ-155^\circ=25^\circ$

$\therefore \angle BAD=x+80^\circ=25^\circ+80^\circ=105^\circ$

Again AB || CD and AD is a transversal

$\therefore \angle ADC=\angle BAD$ (Alternate interior angles)

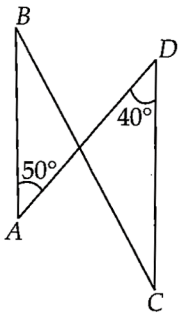
$\Rightarrow 80^\circ+y=105^\circ$

$y=105^\circ-80^\circ=25^\circ$

$\therefore x=25^\circ$ and $y=25^\circ$

SE. 5

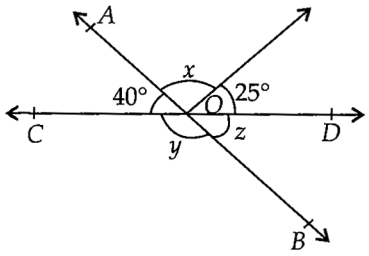
Is AB || CD?



Ans. Transversal AD cuts two lines AB and CD.
So, ∠BAD and ∠CDA is a pair of alternate angles.
But ∠BAD = 50°, ∠CDA = 40°
Thus, alternate angles are not equal.
∴ AB and CD are not parallel to each other.

SE. 6

Find the values of the angles x, y and z.



Ans. Since z and ∠AOC are vertically opposite angles.
∴ z = 40°
40° + x + 25° = 180° (Straight angle)
⇒ x + 65° = 180°
⇒ x = 180° – 65° = 115°
Also, y + z = 180° (Linear pair of angles)
⇒ y = 180° – 40° = 140°
∴ x = 115°, y = 140°, z = 40°

SE. 7

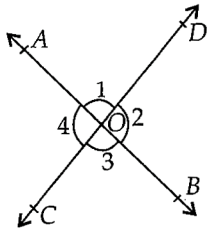
An angle is equal to four times its complement. Determine its measure

Ans. Let the measure of the required angle be x.
Required angle = 4 × complement of the angle
x = 4 × (90° – x)
⇒ x = 360° – 4x
⇒ x + 4x = 360°
⇒ 5x = 360°

$$\therefore \quad x = \frac{360^\circ}{5} = 72$$

SE. 8

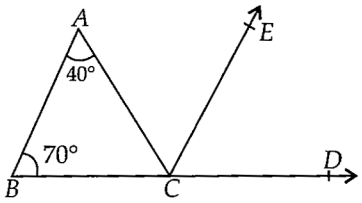
Line AB and CD intersect at O. If ∠3 = 70°. Find all other angles.



Ans. Since CD is a straight line and OB stands on it
∴ ∠2 and ∠3 form a linear pair of angles.
∠2 + ∠3 form a linear pair of angles.
⇒ ∠2 = 180° – 70° = 110°
Since, ∠1 = ∠3 (Vertically opposite angles)
∴ ∠1 = 70°
Also, ∠4 = ∠2 = 110° (Vertically opposite angles)
∴ ∠1 = 70°, ∠2 = 110°, ∠3 = 70° and ∠4 = 110°

SE. 9

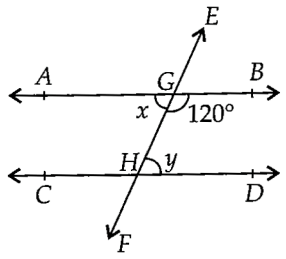
In the given figure, side BC of ΔABC has been produced to D. Line CE || BA. If ∠ABC = 70°, ∠BAC = 40°, find
(i) ∠ACE (ii) ∠ECD (iii) ∠ACD



Ans. (i) CE || BA and AC is a transversal.
∴ ∠BAC = ∠ACE (Alternate interior angles)
⇒ 40° = ∠ACE
Hence, ∠ACE = 40°
(ii) AB || EC and BD is a transversal, intersecting the parallel lines at B and C.
∠ABC = ∠ECD (Corresponding angles)
⇒ ∠ECD = 70°
(iii) ∠ACD = ∠ACE + ∠ECD
⇒ ∠ACD = 40° + 70° = 110°

SE. 10

AB || CD and EF is a transversal intersecting the parallel lines AB and CD and G and H respectively. Find x and y.



Ans. ∠AGH and ∠BGH form a linear pair of angles.

$\therefore x + 120^\circ = 180^\circ$

$\Rightarrow x = 180^\circ - 120^\circ = 60^\circ$

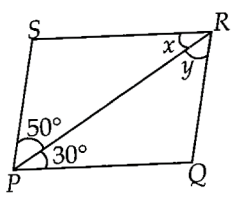
AB || CD, EF is a transversal.

$\Rightarrow \angle x = \angle y$ (Alternate interior angles)

$\Rightarrow x = y \Rightarrow y = 60^\circ$

SE. 11

PQ || SR and PS || QR. Find the values of x and y.



Ans. PQ || SR and RP is a transversal.

$\therefore \angle SRP = \angle RPQ$ (Alternate interior angles)

$\Rightarrow x = 30^\circ$

Now, SP || RQ and PR is a transversal.

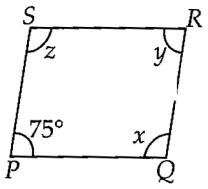
$\therefore \angle SPR = \angle PRQ$ (Alternate interior angles)

$\Rightarrow 50^\circ = y$

Hence, $x = 30^\circ$ and $y = 50^\circ$

SE. 12

Find the values of x, y, z. Given PQ || SR and PS || QR.



Ans. PQ || SR and SP is a transversal. Sum of interior angles on the same side of transversal is 180°.

$\therefore \angle RSP + \angle SPQ = 180^\circ$

$\therefore z + 75^\circ = 180^\circ$

$\Rightarrow z = 180^\circ - 75^\circ = 105^\circ$

Now, SP || RQ and SR is a transversal. Sum of interior angles on the same side of transversal is 180°

$\therefore \angle PSR + \angle SRQ = 180^\circ \Rightarrow z + y = 180^\circ$

$\Rightarrow y = 180^\circ - 105^\circ = 75^\circ$

Similarly, SR || PQ, RQ is a transversal.

$\therefore \angle SRQ + \angle RQP = 180^\circ$ [Co-interior angles]

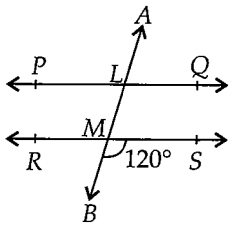
$\Rightarrow y + x = 180^\circ \Rightarrow 75^\circ + x = 180^\circ$

$x = 180^\circ - 75^\circ = 105^\circ$

$\therefore x = 105^\circ$, $y = 75^\circ$ and $z = 105^\circ$

SE. 13

In the given figure, PQ || RS and AB is transversal intersecting PQ and RS at L and M respectively. If ∠SMB = 120°, then find the values of ∠QLM, ∠LMS, ∠PLM.



Ans. PQ || RS and AB is a transversal.

(i) $\angle QLM = \angle SMB$ (Corresponding angle)

$\Rightarrow \angle QLM = 120^\circ$

(ii) $\angle BMS + \angle LMS = 180^\circ$ (Linear pair angles)

$\Rightarrow 120^\circ + \angle LMS = 180^\circ$

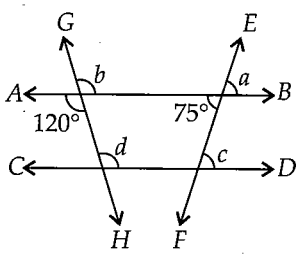
$\Rightarrow \angle LMS = 180^\circ - 120^\circ = 60^\circ$

(iii) $\angle PLM = \angle LMS$ (Alternate interior angles)

$\Rightarrow \angle PLM = 60^\circ$

SE. 14

In the given figure AB || CD and EF and GH are two transversals, find the values of a, b, c, d.



Ans. AB || CD and EF is a transversal.

$c = 75^\circ$ (Alternate interior angles)

Again $c = a$ (Corresponding angles)

$\therefore \ a = 75^\circ$

Now, AB || CD and GH is a transversal.

$\therefore \ d = 120^\circ$ (Alternate interior angles)

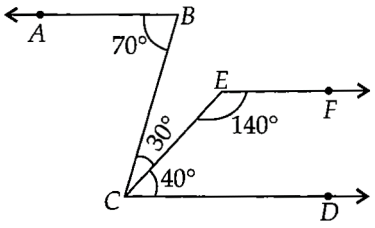
Again $b = d$ (Corresponding angles)

$\therefore \ b = 120^\circ$

$\therefore \ a = 75^\circ$, $b = 120^\circ$, $c = 75^\circ$ and $d = 120^\circ$

SE. 15

In the given figure, show that AB || EF.



Ans. $\angle ABC = 70^\circ$ (Given) --- (i)

$\angle BCD = \angle BCE + \angle ECD$

$\Rightarrow \angle BCD = 30^\circ + 40^\circ$

$\Rightarrow \angle BCD = 70^\circ$ --- (ii)

From (i) and (ii), we get

$\angle ABC = \angle BCD$

(Alternate interior angles are equal)

AB || CD

$\angle FEC + \angle ECD = 180^\circ$

(Sum of the interior angles made by the transversal on its same side is 180°.)

$\therefore$ EF || CD

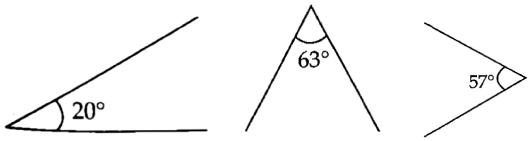
Since AB || CD and EF || CD

$\therefore$ AB || EF

Exercise 5.1

NS. 1

Find the complement of each of the following angles :



(i) (ii) (iii)

Ans. The sum of the measure of complementary angles is 90°

(i) Complement of 20° = 90° – 20° = 70°

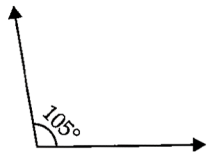
(ii) Complement of 63° = 90° – 63° = 27°

(iii) Complement of 57° = 90° – 57° = 33°

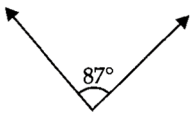
NS. 2

Find the supplement of each of the following angles

(i)



(ii)



(iii)

Ans. The sum of measure of supplementary angles is 180°.

(i) Supplement of 105° = 180° – 105° = 75°

(ii) Supplement of 87° = 180° – 87° = 93°

(iii) Supplement of 154° = 180° – 154° = 26°

NS. 3

Identify which of the following pairs of angles are complementary and which are supplementary.

(i) 65°, 115° (ii) 63°, 27°

(iii) 112°, 68° (iv) 130°, 50°

(v) 45°, 45° (vi) 80°, 10°

Ans. The sum of the measure of complementary angles is 90° and that of supplementary angles is 180°.

(i) Sum of the measure of angles = 65° + 115° = 180°.

∴ These angles are supplementary angles.

(ii) Sum of the measure of angles = 63° + 27° = 90°.

∴ These angles are complementary angles.

(iii) Sum of the measure of angles = 112° + 68° = 180°.

∴ These angles are supplementary angles.

(iv) Sum of the measure of angles = 130° + 50° = 180°.

∴ These angles are supplementary angles.

(v) Sum of the measure of angles = 45° + 45° = 90°.

∴ These angles are complementary angles.

(vi) Sum of the measure of angles = 80° + 10° = 90°.

∴ These angles are complementary angles.

NS. 4

Find the angle which is equal to its complement.

Ans. Let the angle be x.

Complement of this angle is also x.

The sum of the measure of a complementary angle pair is 90°.

$\therefore x + x = 90^\circ \Rightarrow 2x = 90^\circ \Rightarrow x = \frac{90^\circ}{2} = 45^\circ$

NS. 5

Find the angle which is equal to its supplement.

Ans. Let the angle be x.

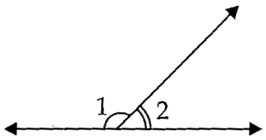
Supplement of this angle is also x.

The sum of the measure of a supplementary angle pair is 180°.

$\therefore x + x = 90^\circ \Rightarrow 2x = 90^\circ \Rightarrow x = 90^\circ$

NS. 6

In the given figure, ∠1 and ∠2 supplementary angles. If ∠1is decreased, what changes should take place in ∠2 so that both the angles still remain supplementary.



Ans. ∠1 and ∠2 are supplementary angles. If ∠1 is reduced, then ∠2 should be increased by the same measure so that this angle pair remains supplementary.

NS. 7

can two angles be supplementary if both of them are

(i) Acute? (ii) Obtuse? (iii) Right?

Ans. (i) No, Acute angle is always less than 90°. It can be observed that two angles, even of 89°, cannot add up to 180°. Therefore, two acute angles cannot be supplementary.

(ii) No. Obtuse angle is always greater than 90°. It can be observed that two angles, even of 91°, will always add up to more than 180°. Therefore, two obtuse angles cannot be supplementary.

(iii) Yes. Right angles are of 90° and 90° = 180°. Therefore, two right angles can be supplementary.

NS. 8

An angle is greater than 45°, Is its complemantry angle greater than 45° or equal to 45° or less than 45°?

Ans. Let A and B are two angles making a complementary angle pair and A is greater than 45°.

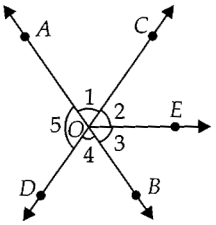
A + B = 90°.

$\Rightarrow$ B = 90° – A

Therefore, B will be less than 45°.

NS. 9

In the adjoining figure:



(i) Is ∠1 adjacent to ∠2?

(ii) Is ∠AOC adjacent to ∠AOE?

(iii) Do ∠COE and ∠EOD form a linear pair?

(iv) Are ∠BOD and ∠DOA supplementary?

(v) Is ∠1 vertically opposite to ∠4?

(vi) What is the vertically opposite angle of ∠5.

Ans. (i) Yes. Since they have a common vertex O and also a common arm OC. Also, their non-common arms, OA and OE, are on the opposite side of the common arm.

(ii) No. They have a common vertex O and also a common arm OA. But, their non-common arms, OC and OE, are on the same side of the common arms, OC and OE, are on the same side of the common arm. Therefore, these angles are not adjacent to each other.

(iii) Yes. Since they have a common vertex O and a common arm OE. Also, their non-common arms,OC and OD, are opposite rays.

(iv) Yes. Since ∠BOD and ∠DOA have a common vertex O and their non-common arms are opposite rays.

(v) Yes. Since these are formed due to the intersection of two straight lines (AB and CD).

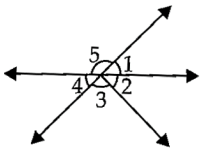
(vi) ∠COB is the vertically opposite angle of ∠5 as these are formed due to the intersection of two straight lines, AB and CD.

NS. 10

Indicate opposite angles as :

(i) Vertically opposite angles.

(ii) Linear pairs.

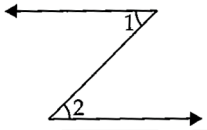


Ans. (i) $\angle 1$ and $\angle 4$, $\angle 5$ and $\angle 2$ and $\angle 3$ are vertically opposite angles as these are formed due to the intersection of two straight lines.

(ii) $\angle 1$ and $\angle 5$, $\angle 5$ and $\angle 4$ forming linear pair as these have a common vertex and also have non-common arms opposite to each other.

NS. 11

In the following figure, is $\angle 1$ adjacent to $\angle 2$? Give reasons.

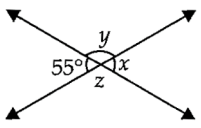


Sol. $\angle 1$ and $\angle 2$ are not adjacent angles because their vertex is not common.

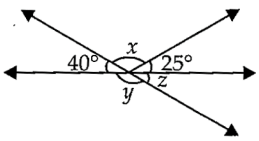
NS. 12

Find the value of the angle x, y and z in each of the following:

(i)



(ii)



Ans. (i) Since x and 55° are vertically opposite angles,

$\therefore$ x = 55°

x + y = 180°

y = 180° – 55° = 125°

y = z (vertically opposite angles)

$\therefore$ z = 125°

(ii) z = 40° (vertically opposite angles)

y + z = 180° (Linear pair)

$\Rightarrow$ y = 180° – 40° = 140°

40° + x + 25° = 180° (Angles on a straight line)

$\Rightarrow$ 65° + x = 180°

$\Rightarrow$ x = 180° – 65° = 115°

NS. 13

Fill in the blanks :

(i) If two angles are complementary, then the sum of their measure is _____.

(ii) If two angles are supplementary, then the sum of their measure is ____.

(iii) Two angles forming a linear pair are ____.

(iv) If two adjacent angles are supplementary, they form a ____.

(v) If two lines intersect at a point, then the vertically opposite angles are always ____.

(vi) If two lines intersect at a point, and if one pair of vertically opposite angles are acute angles, then the other pair of vertically angles are ____.

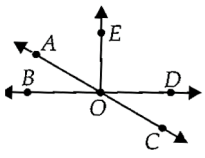
Ans. (i) 90° (ii) 180°

(iii) supplementary (iv) linear pair

(v) equal (vi) obtuse angles

NS. 14

In the adjoining figure, name the following pairs of angles.



(i) Obtuse vertically opposite angles

(ii) Adjacent complementary angles

(iii) Equal supplementary angles

(iv) Unequal supplementary angles

(v) Adjacent angles that do not form a linear pair.

Ans. (i) ∠AOD, ∠BOC

(ii) ∠EOA, ∠AOB

(iii) ∠EOB, ∠EOD

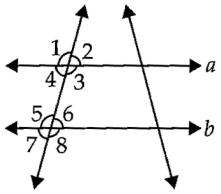
(iv) ∠EOA,∠EOC;∠AOB,∠BOC;∠AOD, ∠COD

(v) ∠AOB and ∠AOE; ∠AOE and ∠EOD; ∠DOC

Exercise 5.2

NS. 1

State the property that is used in each of the following statements?



(i) If a || b, then ∠1 = ∠5.

(ii) If ∠4 = ∠6, then a || b.

(iii) If ∠4 + ∠5 = 180°, then a || b.

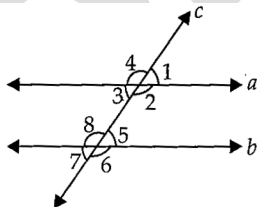
Ans. (i) Corresponding angles property

(ii) Alternate interior angles property

(iii) Interior angles on the same side of transversal are supplementary.

NS. 2

In the adjoining figure, identify



(i) the pairs of corresponding angles.

(ii) the pairs of alternate interior angles.

(iii) the pairs of interior angles on the same side of the transversal.

(iv) the vertically opposite angles.

Ans. (i) ∠1 and ∠5; ∠2 amd ∠6; ∠3 and ∠7; ∠4 and ∠8

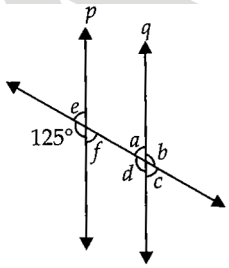
(ii) ∠2 and ∠8; ∠3 and ∠5

(iii) ∠2 and ∠5; ∠3 and ∠8

(iv) ∠1 and ∠3; ∠2 and ∠4 ; ∠5 and ∠7; ∠6 and ∠8

NS. 3

In the adjoining figure, p||q. Find the unknown angles.



Ans. ∠d = 125° (Corresponding angles)

∠e = 180° – 125° = 55° (Linear pair)

∠f = ∠e = 55° (Vertically opposite angles)

∠c = ∠f = 55° (Corresponding angles)

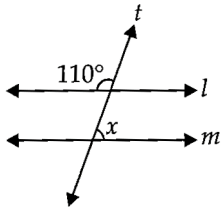
∠a = ∠e = 55° (Corresponding angles)

∠b = ∠d = 125° (Vertically opposite angles)

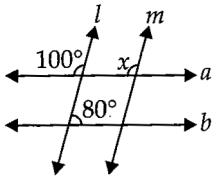
NS. 4

Find the value of x in each of the following figures if *l* || m.

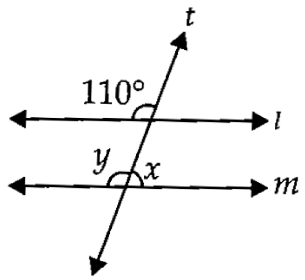
(i)



(ii)



Ans. (i)



y = 110° (Corresponding angles)

x + y = 180° (Linear pair)

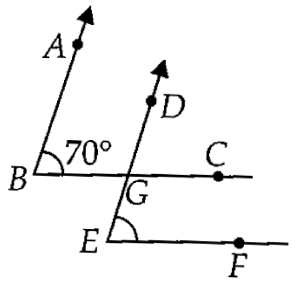
⇒ x = 180° – 110° = 70° (Corresponding angles)

(ii) x = 100° (Corresponding angles)

NS. 5

In the given figure, the arms of two angles are parallel. If ∠ABC = 70°, then find

(i) ∠DGC (ii) ∠DEF



Ans. (i) Consider that AB || DG and a transversal line BC is intersecting them.

∠DGC = ∠ABC (Corresponding angles)

⇒ ∠DGC = 70°

(ii) Consider that BC || EF and a transversal line DE is intersecting them.

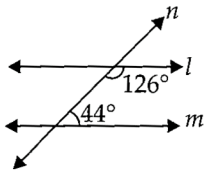
∠DEF = ∠DGC (Corresponding angles)

⇒ ∠DEF = 70°

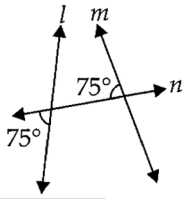
NS. 6

In the given figures below, decide whether *l* is parallel to m.

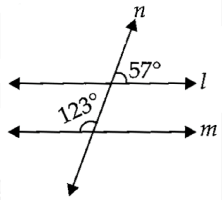
(i)



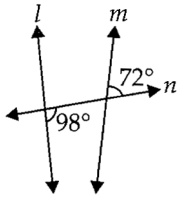
(ii)



(iii)

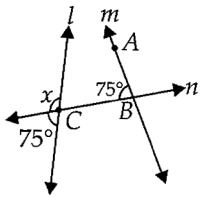


(iv)



Ans. (i) Consider two lines, *l* and *m* and a transversal line *n* which is intersecting them. Sum of the interior angles on the same side of transversal = 126° + 44° = 170°. As the sum of interior angles on the same side of transversal is not 180°, therefore , *l* is not parallel to *m*.

(ii)

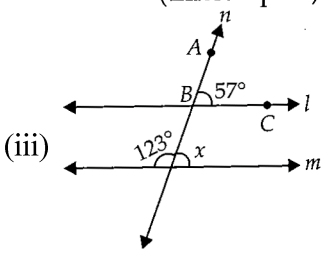


x + 75° = 180° (Linear pair on line *l*)

⇒ x = 180° – 75° = 105°

For *l* and *m* to be parallel to each other, corresponding angles (∠ABC and x) should be equal. Hence, lines *l* and *m* are not parallel to each other.

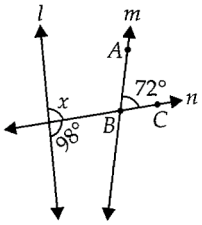
(Linear pair)

(iii) 

$x + 123^\circ = 180^\circ$ (Linear pair)

$\Rightarrow x = 180^\circ - 123^\circ = 57^\circ$

For l and m to be parallel to each other, corresponding angles ($\angle ABC$ and x) should be equal, Hence, $l \parallel m$.

(iv) 

$98^\circ + x = 180^\circ$ (Linear pair)

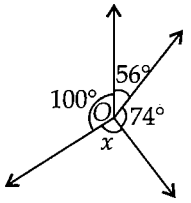
$\Rightarrow x = 82^\circ$

For l and m to be parallel to each other, corresponding angles ($\angle ABC$ and x) should be equal. However, here their measures are 72° and 82°. Hence, these lines are not parallel to each other.

Space for Notes :

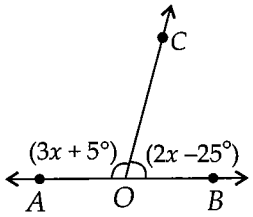
ONLY ONE CORRECT TYPE

1. In the given figure, the value of x is :



(A) 130° (B) 56°
(C) 100° (D) 74°

2. In the adjoining figure, the value of ∠AOC such that $\overline{AOB}$ is a line segment is



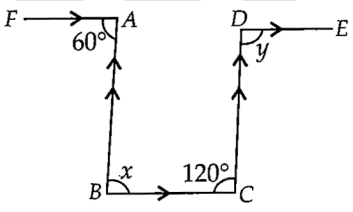
(A) 40° (B) 55°
(C) 125° (D) 180°

3. The supplement of an acute angle is ____ angle.
(A) Acute (B) Obtuse
(C) Right (D) Straight

4. In the figure, PQ is a

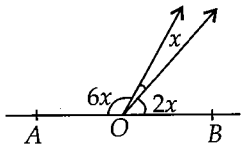
(A) Line (B) Ray
(C) Line segment (D) Ray or line

5. In the figure, find the value of x and y respectively.



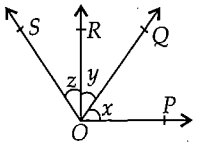
(A) 60°,120° (B) 70°, 110°
(C) 50°, 130° (D) 80°, 110°

6. In the figure, if AOB is a straight line, then find the value of x.



(A) 40° (B) 15°
(C) 20° (D) 50°

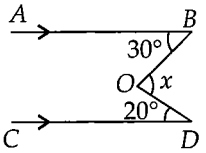
7. In the given figure, if ∠POR = 90° and OQ bisects ∠POS, then find the value of 2y + z.



(A) 60° (B) 45°
(C) 90° (D) 30°

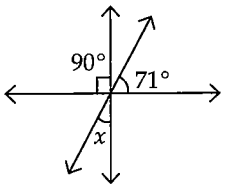
8. Find the two supplementary angles, if angle are in the ratio 7 : 11.
(A) 70°,120° (B) 60°, 120°
(C) 70°, 110° (D) 50°, 130°

9. In the following figure, find the value of x. If AB || CD.



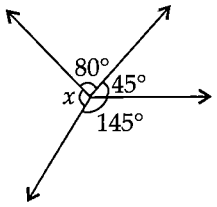
(A) 30° (B) 20°
(C) 10° (D) 50°

10. What is the value of x in the given figure?



(A) 71° (B) 90°
(C) 19° (D) 24°

11. Find the value of x in the figure given below.



(A) 90° (B) 45°
(C) 80° (D) 145°

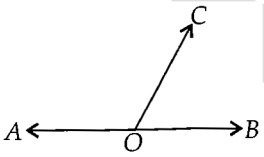
12. Two angles are complementary and equal, then find each of the angles.

(A) 90°, 90° (B) 45°, 45°
(C) 180°, 180° (D) 135°, 45°

13. If an angle is equal its own supplementary angle, then its measure is

(A) 30° (B) 45°
(C) 60° (D) 90°

14. Find ∠AOC, if ∠BOC = 60°.

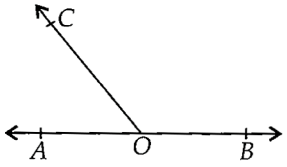


(A) 120° (B) 90°
(C) 60° (D) 45°

15. The supplement of an angle of 45° is

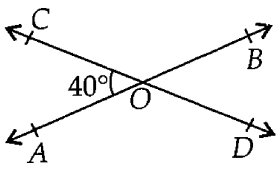
(A) 45° (B) 135°
(C) 155° (D) 90°

16. In the given figure, AOB is straight line and the ray OC stands on it.If ∠BOC = 130°, then find ∠AOC.



(A) 50° (B) 70°
(C) 20° (D) 160°

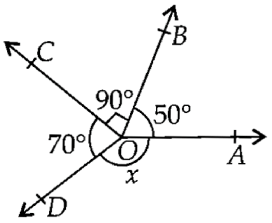
17. In the given figure, two straight lines AB and CD intesect at a point O.



If ∠AOC = 40°, then ∠BOD = ?

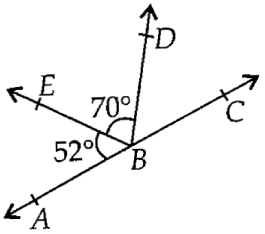
(A) 140° (B) 50°
(C) 40° (D) 160°

18. In the given figure, rays OA, OB, OC and OD are such that ∠AOB = 50°, ∠BOC = 90°,∠COD = 70° and ∠AOD = x. The value of x is



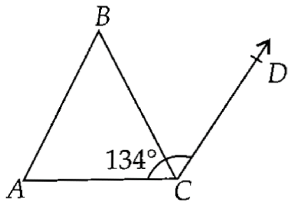
(A) 50° (B) 70°
(C) 150° (D) 90°

19. In the given figure, ABC is a straight line. Find ∠CBD.



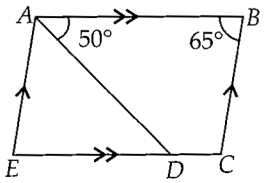
(A) 58° (B) 62°
(C) 73° (D) 25°

20. In the given figure, ΔABC is an equilateral triangle ∠ACD is 134°. Find ∠BCD



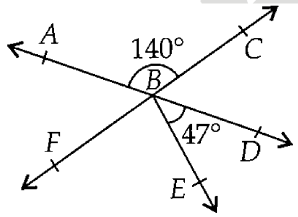
(A) 88° (B) 98°
(C) 74° (D) 64°

21. In the figure, ABCE is a parallelogram. Find ∠ADC.



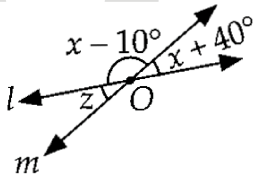
(A) 130° (B) 150°
(C) 50° (D) 115°

22. In the figure AD and CF are straight lines. Find ∠EBF



(A) 93° (B) 140°
(C) 47° (D) 107°

23. In the given figure, two lines *l* and *m* are intersect at O. Find the value of z.

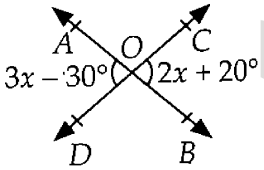


(A) 75° (B) 115°
(C) 65° (D) 105°

24. The difference in the measure of two complementary angles is 24°. Find the measure of the angles.

(A) 54°, 36° (B) 64°,26°
(C) 57°, 33° (D) 44°, 46°

25. In the given figure, two lines AB and CD intersect each other other at O. Find the value of x.

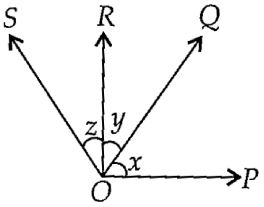


(A) 120° (B) 60°
(C) 50° (D) 70°

PARAGRAPH TYPE

PARAGRAPH # 1

Observe the following figure.



26. If x = 25°, y = 60°, then find ∠POR.

(A) 90° (B) 85°
(C) 45° (D) 95°

27. If ∠SOQ = 100°, ∠QOR = 55°, then find ∠SOR.

(A) 55° (B) 105°
(C) 45° (D) 60°

28. If $x = \frac{1}{3}$ of right angle, $y = \frac{2}{3}$ of right angle and $z = \frac{1}{2}$ of right angle , then ∠POS =

(A) 60° (B) 45°
(C) 90° (D) 135°

PARAGRAPH # 2

Two angles whose sum is 180° are called supplementary angles.

29. Two supplementary angles are in the ratio 5 : 13. Find the angles.

(A) 50°, 130° (B) 130°, 60°

(C) 90°, 90° (D) 70°, 110°

30. The angles are supplementary and the larger is 20° less than three times the smaller angle. Find the angles.

(A) 80°, 100° (B) 90°,90°

(C) 50°.130° (D) 140°,40°

31. The angles are supplementary and the smaller of the angles is half the larger. Find the angles.

(A) 110°, 70° (B) 60°,120°

(C) 80°.100° (D) 50°,130°

MATCH THE COLUMN TYPE

32. Match the following

Column I	Column II
(P) Two angles whose sum is 90° are called	(i) Adjacent Angles
(Q) Two angles whose sum is 180° are called	(ii) Complementary angles
(R) Two angles that are formed by two intersecting lines, which are not adjacent	(iii) Supplementary
(S) Two angles with a common vertex, a common arm and the other arms sides of the common arm of the opposite arm from	(iv) Vertcially opposite angles

(A) P → i, Q → ii, R → iii, S → iv

(B) P → iii, Q → i,R → iv, S → ii

(C) P → ii, Q → iii, R → iv, S → i

(D) P → iv, Q → ii,R → i, S → iii

33. Match the following

Column I	Column II
(P) If the measure of two supplement angles are (3x + 15°) and (2x +5°), then value of x is	(i) 62°
(Q) The complement angle of $\frac{2}{5}$ of 70° is	(ii) 32°
(R) Two complementary angles are in the ratio 7 : 8. The largest angle is	(iii) 48°
(S) The supplement angle of $\frac{3}{4}$ of 160° is	(iv) 60°

(A) P → ii, Q → i, R → iii, S → iv

(B) P → iii, Q → i, R → iv, S → ii

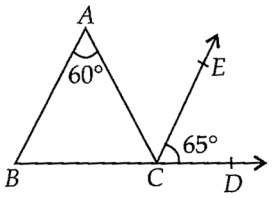
(C) P → ii, Q → iii, R → iv, S → i

(D) P → iv, Q → ii, R → i, S → iii

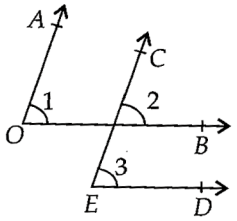
EXERCISE – II

VERY SHORT ANSWER TYPE

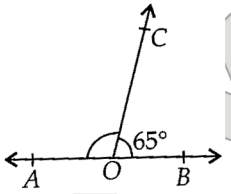
1. Find the angle which is its own complement.
2. Find the angle which is triple of its supplement.
3. In the adjoining figure, it is given that $\angle A = 60^\circ$, CE || BA and $\angle ECD = 65^\circ$. Find $\angle ACB$.



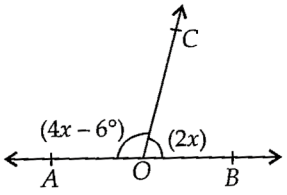
4. In the adjoining figure, it is given that OA || EC and OB || ED. Prove that $\angle AOB = \angle CED$.



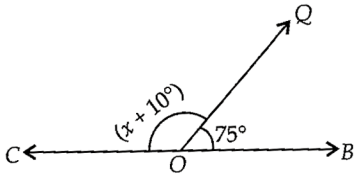
5. In the given figure, AB is a straight line and $\angle BOC = 65^\circ$, find the measure of $\angle AOC$.



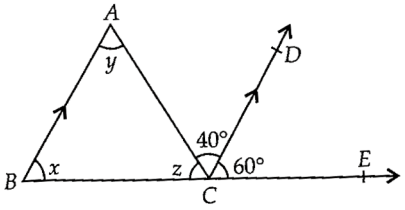
6. In the adjoining figure, what value of x will make AOB a straight line?



7. In the figure COB is a straight line. Find the value of x.

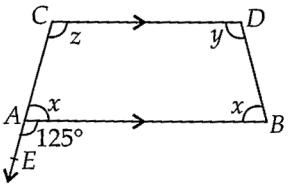


8. In the given figure, find x, y and z.



LONG ANSWER TYPE

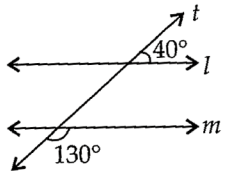
1. In the given figure, AB || CD and CA has been produced to E so that $\angle BAE = 125^\circ$.



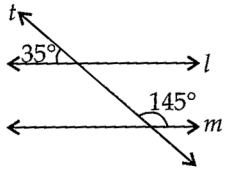
If $\angle BAC = x$, $\angle ABD = x$, $\angle BDC = y$ and $\angle ACD = z$, then find the values of x, y, z.

2. In each of the given figure, two lins *l* and *m* are cut by a transversal *t*. Find whether *l* || *m*.

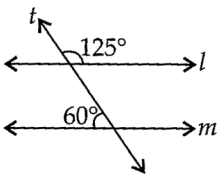
(i)



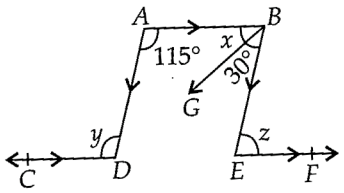
(ii)



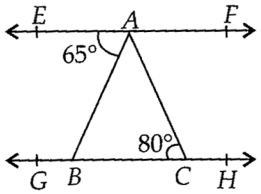
(iii)



3. In the given figure, AB || CD || EF and AD || BE. Find x, y and z



4. In the given figure, EF || GH.

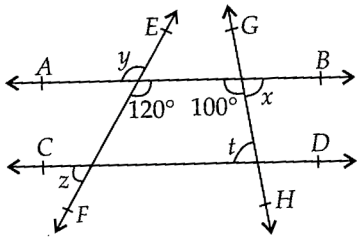


Determine :

(i) ∠ABC (ii) ∠ACH

(iii) ∠BAC (iv) ∠CAF.

5. In the following figure, AB || CD. Find the unknown angles.



TRUE / FALSE

1. Two obtuse angles cannot be complement of each other.
2. Interior angles on the same side of the transversal are supplementary if the lines are parallel.
3. The distance between two parallel lines is not always same.
4. Complementary angle of 45 is 45.
5. If two lines in a plane do not intersect then lines are parallel.

FILL IN THE BLANKS

1. Two lines are called _____ lines. If they have common point.
2. Three or more points said to be _____ if there is a line which contains all these points.
3. Three or more lines intersecting at the same point are called _____ lines.
4. Two angles are said to be _____ angle if sum sum of their measure is 90°.
5. Two angles are said to be _____ angle if the sum of their measure is 180°.

Answer Key

EXERCISE–I

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
A	C	B	C	A	C	C	C	D	C	A	B	D	A	B
16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
A	C	C	A	C	A	A	B	C	C	B	C	D	A	C
31	32	33												
B	C	A												

EXERCISE – II

VERY SHORT ANSWER TYPE

1. 45° **2.** 135° **3.** ∠ACB = 55° **5.** ∠AOC = 115°

6. $x = 31°$ **7.** 95° **8.** X = 60°, Y = 40°, 3 = 80°

LONG ANSWER TYPE

1. $x = 55°$, y = 125°, z = 125° **2.** (i) No (ii) Yes (iii) No **3.** x = 35°, y = 115° and z = 65°

4. (i) 65° (ii) 100° (iii) 35° (iv) 80° **5.** x = 80°, t = 80°, y = 120° and z = 60°

TRUE/FALSE

1. T **2.** T **3.** F **4.** T **5.** T

FILL IN THE BLANKS

1. intersecting line 2. collinear 3. concurrent lines 4. complementary

5. supplementary

SELF PROGRESS ASSESSMENT FRAMEWORK

(CHAPTER : LINES & ANGLES)

CONTENT	STATUS	DATE OF COMPLETION	SELF SIGNATURE
Theory			
In-Text Examples			
Solved Examples			
NCERT Exercises			
Exercise I			
Exercise II			
Short Note-1			
Revision - 1			
Revision - 2			
Revision - 3			
Remark			

NOTES :

1. In the status, put "completed" only when you have thoroughly worked through this particular section.
2. Always remember to put down the date of completion correctly. It will help you in future at the time of revision.

Space for Notes :

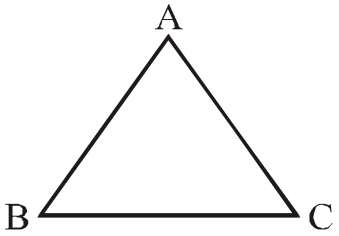
THE TRIANGLE AND ITS PROPERTIES (A TALE OF THREE INTERSECTING LINES)

2

INTRODUCTION

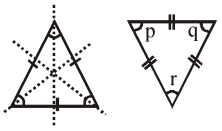
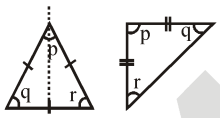
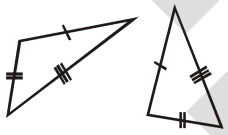
1. TRIANGLE

A triangle is the simplest polygon (closed figure) having three sides and three angles. The adjoining figure shows a triangle ABC usually written as ΔABC, with the three sides AB, BC and CA, the three angles ∠BAC, ∠ABC, ∠ACB and three vertices A, B and C. The three sides and three angles of a triangle are called its **elements** or **parts.**

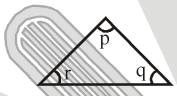
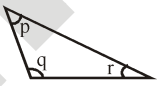
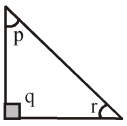


1.1 TYPES OF TRINAGLES

(A) ON THE BASES OF SIDES

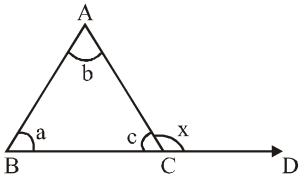
Name of triangles	Geometric properties
Equilateral triangle 	(i) All three sides are of equal length. (ii) It has three lines of symmetry. (iii) Every angle in the triangle is 60°. ∴ p = q = r = 60°
Isosceles triangle 	(i) Two sides are equal. (ii) It has one line of symmetry. (iii) The two angles opposite to the two equal sides are of the same size. ∴ q = r
Scalene triangle 	(i) All three sides are unequal. (ii) No lines of symmetry. (iii) All angles are unequal.

(B) ON THE BASES OF ANGLES

Name of triangles	Geometric properties
Acute angled triangle 	All interior angels are acute angles (less than 90°). ∴ p, q and r are less than 90°.
Obtuse angled triangle 	One of the interior angles is an obtuse angle (greater than 90°).
Right angled triangle 	One of the interior angle is a right angle. (equal to 90°)

1.2 EXTERIOR ANGLE AND INTERIOR OPPOSITE ANGLES

When any side of a triangle is extended beyond the vertex, it forms an exterior angle with the other side at the same vertex.



In the adjoining triangle ABC, BC is extended upto D. Thus it forms exterior angle ∠x with AC. ∠a and ∠b are called the interior opposite angles to the exterior angle ∠x.

2. THE ANGLES SUM PROPERTY OF A TRIANGLE

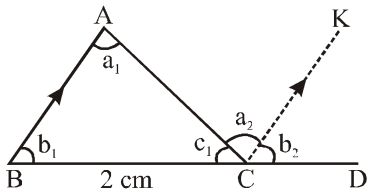
- **Theorem-1 :** The sum of the three angles of a triangle is 180°.

  Given : ABC is a triangle

  To prove that :

  $\angle BAC + \angle ABC + \angle ACB = 180°$

  Construction : Produce BC to D, and through C draw CK || BA.



$\angle a_1 = \angle a_2$ ($\because$ AB || KC; alternate angles)

$\angle b_1 = \angle b_2$ ($\because$ AB || KC; corresponding angles)

$\therefore \quad \angle a_1 + \angle b_1 = \angle a_2 + \angle b_2$

$\angle a_1 + \angle b_1 + \angle c_1 = \angle a_2 + \angle b_2 + \angle c_1$ (adding $\angle c$ both sides)

$\angle BAC + \angle ABC + \angle ACB = 180°$ ($\because$ BCD is a straight line)

- **Property : 1**

  An exterior angle of a triangle = sum of the interior opposite angles.

  As we can see in the figure of the first proof of the above theorem. $\angle ACD$ is the exterior angle of ΔABC at C.

  $\angle ACD = \angle a_2 + \angle b_2$

  But it is known that $\angle a_2 = \angle a_1$ and $\angle b_2 = \angle b_1$,

  $\therefore \angle ACD = \angle a_1 + \angle b_1$

  $\Rightarrow$ exterior angle = sum of the interior opposite angles.

- **Property : 2**

  An exterior angle is always greater than either of the two interior opposite angles.

  Since the exterior angle is equal to sum of the interior opposite angles, it follows that it is greater than either of the interior opposite angles.

  $\angle ACD = a_1 + b_1 \Rightarrow \angle ACD > a_1$ and $\angle ACD > b_1$

3. SOME PROPERTIES OF AN ISOSCELES TRIANGLE AND AN EQUILATERAL TRIANGLE

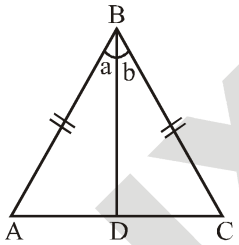
- **Property : 1**

Given : If two sides of a triangle are equal, then the angles opposite those sides are equal.

Proof : Isosceles ΔABC is given and AB = BC.

We wish to prove that ∠A = ∠C.

Construction : We begin by drawing the bisector of ∠B, namely BD.



AB = BC (Given)

∠a = ∠b (Construction)

BD = BD (Common)

∴ ΔABD ≅ ΔCBD (SAS congruency)

∴ ∠A = ∠C

(Corresponding parts of congruent triangles (CPCT) are equal)

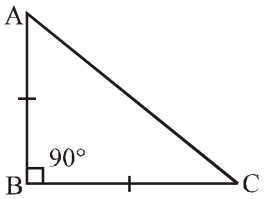
- **Property : 2**

If two angles of a triangle are equal the sides opposite those angles are also equal.

- **Property : 3**

The angles of an isosceles right angled triangle are 45°, 45° and 90°.

Proof : ΔABC is right angled isosceles triangle with AB = BC and ∠B = 90°.



AB = BC ⇒ ∠C = ∠A (Angles opposite equal sides are equal)

∠A + ∠B + ∠C = 180° (Angle sum property)

⇒ ∠A + 90° + ∠C = 180° ⇒ ∠A + ∠C = 180° – 90° ⇒ ∠A + ∠C = 90°

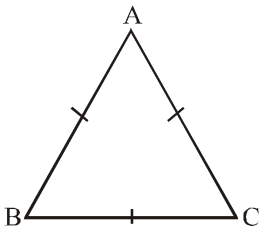
But it is given that ∠A = ∠C

∴ ∠A = ∠C = 45°

- **Property : 4**

In an equilateral triangle all the three angles are equal and each angle is equal to 60°.

Proof : ΔABC is an equilateral triangle with AB = BC = CA



AB = AC ⇒ ∠C = ∠B ...(i)

AB = BC ⇒ ∠C = ∠A ...(ii)

& BC = CA ⇒ ∠A = ∠B ...(iii)

(∵ Angles opposite equal sides are equal)

From (i) and (ii) it follows ∠A = ∠B = ∠C.

Also ∠A + ∠B + ∠C = 180° (Angle sum property of a Δ)

∴ From ∠A = ∠B = ∠C it follows that ∠A = ∠B = ∠C = 60°.

- **Property : 5**

If all the three angles of a triangle are equal, it is an equilateral triangle.

Ex. In the triangle ABC, ∠A : ∠B : ∠C = 1 : 2 : 3. Find the angles of the triangle.

Sol. Let ∠A = x, ∠B = 2x and ∠C = 3x.

By the angle sum property of a triangle.

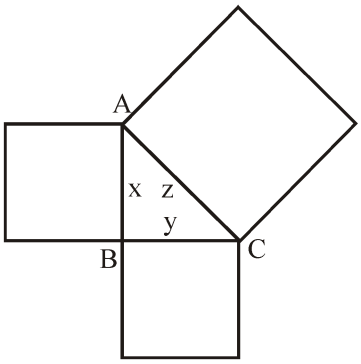
∠A + ∠B + ∠C = 180° ⇒ x + 2x + 3x = 180°

$\Rightarrow 6x = 180° \Rightarrow x = \frac{180°}{6} = 30°$

∴ ∠A = x = 30°, ∠B = 2x = 2 × 30° = 60 and ∠C = 3x = 3 × 30 = 90°

4. PYTHAGORAS THEOREM

Theorem states that, 'In any right-angled triangle the square on the hypotenuse is equal to the sum of the squares on the other two sides of the triangle. The side opposite to the right angle is the hypotenuse. In $\Delta ABC, \sqrt{B} = 90°$, AC the hypotenuse . If two sides of a right angle are represented by x and y and hypotenuse is represented by z, then $x^2 + y^2 = z^2$.



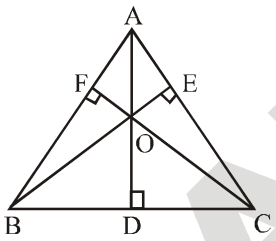
5. IMPORTANT DEFINATIONS

- **Concurrent lines in a triangle**

  If a number of straight lines intersect at one common point, they are called concurrent lines.

- **Altitude**

  In a triangle, the perpendicular drawn from a vertex to its opposite side is called an altitude.



In the above figure, AD, BE and CF are the three altitudes of ΔABC.

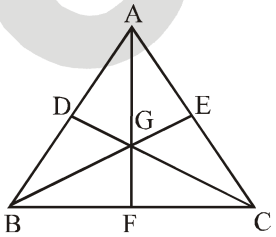
The three altitudes of a triangle always meet at a single common point called the orthocenter, denoted by 'O' which can lie inside or outside the triangle.

In a right angled triangle it lies at the vertex containing the right angle.

In an isosceles triangle it lies on the altitude drawn to the base.

- **Median**

  The straight line joining any vertex to the midpoint of the opposite side of a triangle is known as a median. In the figure below, AF, BE and CD are the medians of ΔABC.

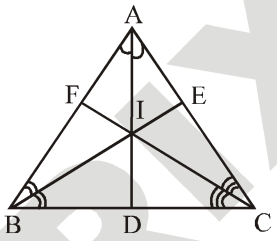


The three medians meet at a common point called the centroid of the triangle and is denoted by G. Centroid is the centre of gravity of all the triangles. Centroid divides each median in the ratio of 2 :1.

A median divides a triangle into two triangles of equal area.

- **Angular bisectors**

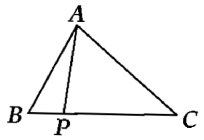
  The line segments which bisect the angles of a triangle are called the angular bisectors. The line segments which bisect the angles of a triangle internally are called the internal bisectors. In the figure below, AD, BE and CF are the angular bisectors of ΔABC.



SOLVED EXAMPLES

SE. 1

In the given figure, P is a point on the side BC of ΔABC. Prove that (AB + BC + AC) > 2AP.



Ans. We know that in triangle, the sum of any two sides is greater than the third side,

In ΔABP; AB + BP > AP ...(i)

In ΔAPC; PC + AC > AP ...(ii)

Now, adding (i) and (ii), we get

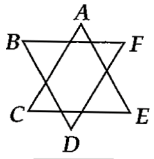
AB + BP + PC + AC > AP + AP

⇒ AB + BC + AC > 2AP

SE. 2

The adjoining figure has been obtained by using two triangles, Prove that

∠A + ∠B + ∠C + ∠D + ∠E + ∠F = 360°.



Ans. We know that the sum of the angles of a triangle is 180°.

In ΔACE; ∠A + ∠C + ∠E = 180° ...(i)

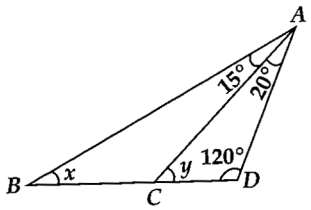
In ΔBDF; ∠B + ∠D + ∠F = 180° ...(ii)

On adding (i) and (ii), we get

∠A + ∠B + ∠C + ∠D + ∠E + ∠F = 360°

SE. 3

Find the values of the unknown variable in the figure given below.



Ans. In ΔACD,

y + 120° + 20° = 180° (Angle sum property)

⇒ y + 140° = 180°

⇒ y = 180° – 140° = 40°

For ΔABC, y is an exterior angle

∴ x + 15° = y (Exterior angle property)

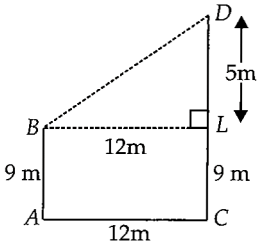
⇒ x + 15° = 40°

⇒ x = 40° – 15° = 25°

SE. 4

Two poles of height 9 m and 14 m stand upright on a plane ground. If the distance between their feet is 12 m, find the distance between their tops.

Ans.



Let AB and CD be the given poles such that AB = 9m, CD = 14 m and AC = 12 m.

Join BD.

From B, draw BL ⊥ CD.

∴ DL = (CD – CL) = (CD – AB) = (14 – 9)m = 5 m

BL = AC = 12 m

Now, in right ΔBLD, by Pythagoras theorem, we have

$BD^2 = BL^2 + DL^2$

$= (12)^2 + (5)^2 = 144 + 25 = 169 = (13)^2$

$\Rightarrow$ BD = 13 m.

Hence, the distance between their tops is 13m.

SE. 5

The lengths of the sides of two triangles are given below. Which of them is right angled?

(i) a = 7 cm, b = 24 cm and c = 25 cm

(ii) a = 8 cm, b = 5 cm and c = 10 cm

Ans. (i) Here a = 7 cm, b = 24 cm and c = 25 cm.

The largest side is c = 25 cm.

Now, $a^2 + b^2 = (7)^2 + (24)^2 = 49 + 576 = 625 = (25)^2 = c^2$

$\Rightarrow a^2 + b^2 = c^2$

Hence, given triangle is right angled [by the converse of Pythagoras theorem].

(ii) Here a = 8 cm, b = 5 cm and c = 10 cm.

The largest side is c = 10 cm

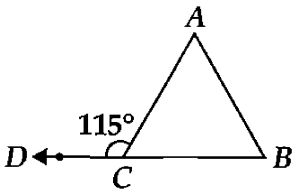
Now, $a^2 + b^2 = (8)^2 + (5)^2 = 64 + 25 = 89 \neq (10)^2$

Now, $a^2 + b^2 \neq c^2$

Hence, given triangle is not right angled.

SE. 6

Exterior angle ACD = 115° and ∠ABC and ∠BAC are in the ratio 2 : 3. Find all the angles of the triangle.



Ans. Let ∠ABC = 2x and ∠BAC = 3x.

∠ACD = ∠ABC + ∠BAC (Exterior angle property)

$\Rightarrow$ 115° = 2x + 3x $\Rightarrow$ 5x = 115° $\Rightarrow$ $x = \frac{115^\circ}{5} = 23^\circ$

$\Rightarrow$ ∠ABC = 2x = 2 × 23° = 46°

$\Rightarrow$ ∠BAC = 3x = 3 × 23° = 69°

Also, ∠ACB + ∠ACD = 180° (Linear pair)

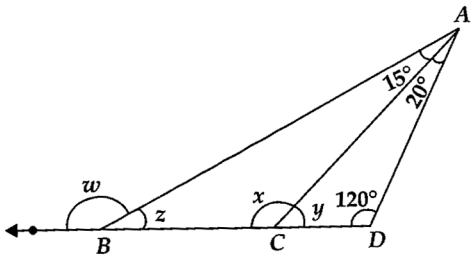
$\Rightarrow$ ∠ACB + 115° = 180°

$\Rightarrow$ ∠ACB = 180° – 115° = 65°

Thus, ∠ACB = 65°, ∠ABC = 46° and ∠BAC = 69°

SE. 7

Find the values of the unknown variables in the given figure.



Ans. In ΔACD,

20° + 120° + y = 180° (Angle sum property)

$\Rightarrow$ y = 180° – 120° – 20° = 40°

Also, x = 20° + 120° [Exterior angle property]

= 140°

In ΔABC,

15° + x + z = 180° (Angle sum property)

$\Rightarrow$ z = 180° – x – 15° = 180° – 140° – 15° = 25°

Now, w + z = 180° (Linear pair)

$\Rightarrow$ w = 180° – z = 180° – 25° = 155°

Hence, x = 140°, y = 40°, z = 25° and w = 155°

SE. 8

Check, whether the given dimensions represent the sides of a triangle or not.

(i) 5cm, 7 cm and 9 cm

(ii) 1.8 cm, 2.8 cm and 4.8 cm

Ans. (i) 5 cm + 7 cm = 12 cm > 9 cm

5 cm + 9 cm = 14 cm > 7 cm

7 cm + 9 cm = 16 cm > 5 cm

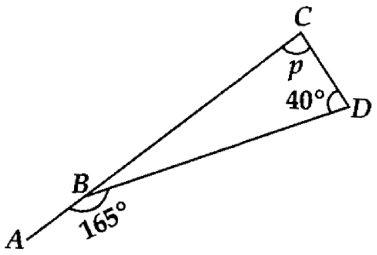
Hence, 5 cm, 7 cm and 9 cm represent the sides of a triangle.

(ii) 1.8 cm + 2.8 cm = 4.6 cm < 4.8 cm

Hence, 1.8 cm, 2.8 cm and 4.8 cm do not represent the sides of triangle.

SE. 9

Calculate the value of p in the figure, given that ABC is a straight line.



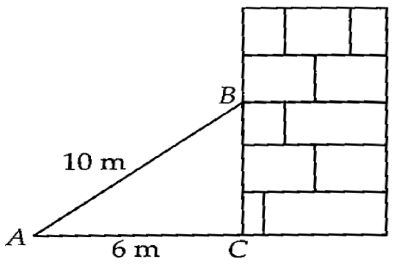
Ans. $40° + p = 165°$ (Exterior angle property)

So, $p = 165° - 40° = 125°$

SE. 10

A 10 m long ladder is placed against a wall of a building. How high against the wall does the ladder reach? (If the distance between ladder foot and building is 6m).

Ans.



Let AB represent the ladder.

ΔABC is right-angled triangle.

So, by Pythagoras theorem

$AB^2 = BC^2 + AC^2$

$\Rightarrow (10)^2 = BC^2 + (6)^2$

$\Rightarrow 100 = BC^2 + 36$

$\Rightarrow 100 - 36 = BC^2$

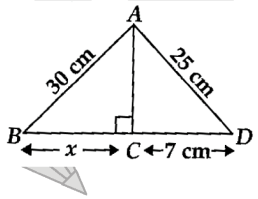
$\Rightarrow 64 = BC^2$

$\therefore BC = 8$ m

Thus, the ladder reaches a height of 8 m against the wall.

SE. 11

In the given figure, find x.



Ans. In ΔADC,

$AD^2 = AC^2 + CD^2$ (Pythagoras Theorem)

$\Rightarrow (25)^2 = AC^2 + (7)^2 \Rightarrow 625 = AC^2 + 49$

$\Rightarrow AC^2 = 625 - 49 = 576 = (24)^2$

$\therefore$ In ΔABC,

$AB^2 = AC^2 + BC^2$ (Pythagoras Theorem)

$\Rightarrow (30)^2 = (24)^2 + x^2$

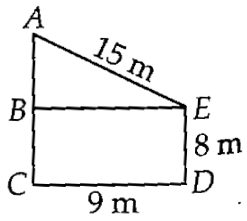
$\Rightarrow x^2 = 900 - 576 = 324 = (18)^2$

$\therefore x = 18$ cm

SE. 12

An 8 m high pole is 9 m away from a building. If the distance between the top of the pole and the top of the building is 15 m, then find the height of the building.

Ans. Let AC be the height of the building. ED be the height of the pole, AE be the distance between their tops and CD be the distance between the foot of the pole and foot of the building. From E, draw perpendicular EB on AC.



EB ⊥ AC,

AE = 15 m

BE = CD = 9 m

In the right-angled ΔABE,

$AE^2 = AB^2 + BE^2$

$\Rightarrow 15^2 = AB^2 + 9^2$

$\Rightarrow 225 = AB^2 + 81$

$\Rightarrow AB^2 = 225 - 81 = 144 = (12)^2$

$\therefore AB = 12$ m

Since, AC = AB + BC

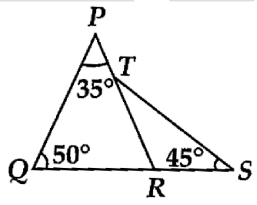
and BC = ED = 8 m

$\therefore$ AC = 12 + 8 = 20 m

Hence, height of building is 20 m.

SE. 13

In the given figure, find ∠PTS.



Ans. For ΔPQR, ∠PRS is an exterior angle.

$\therefore \angle PRS = \angle PQR + \angle QPR = 50^\circ + 35^\circ = 85^\circ$

For ΔRST, ∠PTS is an exterior angle

$\therefore \angle PTS = \angle SRT + \angle RST$

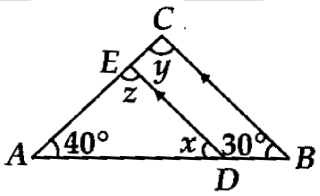
$\Rightarrow \angle PTS = 85^\circ + 45^\circ = 130^\circ$

$(\angle SRT = \angle PRS = 85^\circ)$

SE. 14

In figure, D and E are the points on sides AB and AC of ΔABC such that DE || BC. If ∠A = 40° and ∠B = 30°, find :

(i) x (ii) y (iii) z



Ans. (i) ∠ADE = ∠ABC

(Corresponding angles as DE || BC)

$\Rightarrow x = 30^\circ$ $(\because \angle ABC = 30^\circ)$

(ii) In ΔABC, we have

$\angle A + \angle B + \angle C = 180^\circ$

(Given : $\angle A = 40^\circ$ and $\angle B = 30^\circ$)

$\Rightarrow 70^\circ + y = 180^\circ$

$\Rightarrow y = 180^\circ - 70^\circ = 110^\circ$

(iii) In ΔADE, we have,

$x + 40^\circ + z = 180^\circ$ (Angle sum property)

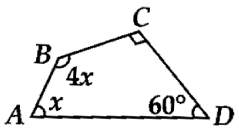
$\Rightarrow 30^\circ + 40^\circ + z = 180^\circ$

$\Rightarrow 70^\circ + z = 180^\circ$

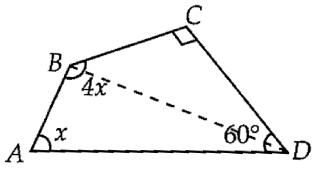
$\Rightarrow z = 180^\circ - 70^\circ = 110^\circ$

SE. 15

Find the value of x for the figure.



Ans.



Join BD,.

In ΔABD ; $\angle ABD + \angle ADB + \angle BAD = 180^\circ$ .....(i)

[Angle sum property]

In ΔBCD; $\angle BCD + \angle CBD + \angle BDC = 180^\circ$ .....(ii)

[Angle sum property]

Adding (i) and (ii), we get

$\angle BAD + \angle ABD + \angle CBD + \angle BCD + \angle ADB + \angle BDC = 180^\circ + 180^\circ$

$\Rightarrow \angle BAD + \angle ABC + \angle BCD + \angle ADC = 360^\circ$

$\Rightarrow x + 4x + 90^\circ + 60^\circ = 360^\circ$

$\Rightarrow 5x + 150^\circ = 360^\circ \Rightarrow 5x = 360^\circ - 150^\circ = 210^\circ$

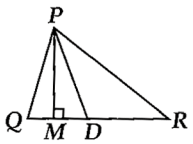
$\Rightarrow x = 42^\circ$

Space for Notes :

EXERCISE - 6.1

NS. 1

In ΔPQR, D is the mid-point of $\overline{QR}$.



$\overline{PM}$ is _____.

PD is _____.

Is QM = MR?

Ans. (i) PM is an Altitude

(ii) PD is a Median

(iii) No, QM ≠ MR

NS. 2

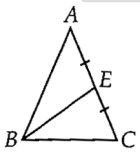
Draw rough sketches for the following:

(a) In ΔABC, BE is a median.

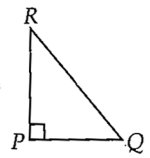
(b) In ΔPQR, PQ and PRare altitudes of the triangle.

(c) In ΔXYZ, YL is an altitude in the exterior of the triangle.

Ans. **(a)**



(b)

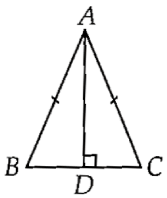


(c)

NS. 3

Verify by drawing a diagram, if the median and altitude of an isosceles triangle can be same.

Ans. Draw a line segment AD perpendicular to BC. It can be observed that the length of BD and DC is also same. Therefore, AD is also a median of this triangle.

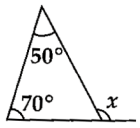


EXERCISE - 2.2

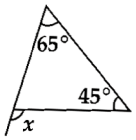
NS. 1

Find the value of the unkown exterior angle x in the following diagrams :

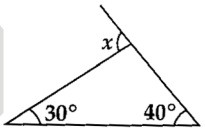
(i)



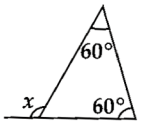
(ii)



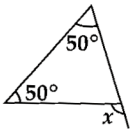
(iii)



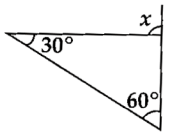
(iv)



(v)



(vi)



Ans. (i) x = 50° + 70° = 120° (Exterior angle property)

(ii) x = 65° + 45° = 110° (Exterior angle property)

(iii) x = 40° + 30° = 70° (Exterior angle property)

(iv) x = 60° + 60° = 120° (Exterior angle property)

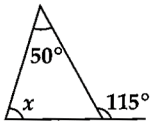
(v) x = 50° + 50° = 100° (Exterior angle property)

(vi) x = 30° + 60° = 90° (Exterior angle property)

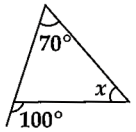
NS. 2

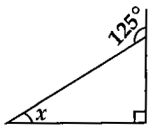
Find the value of the unknown interior angle x in the following figures:

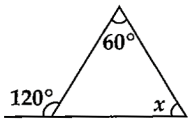
(i)

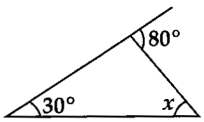


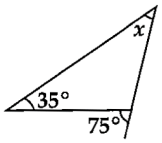
(ii)



(iii) 

(iv) 

(v) 

(vi) 

Ans. (i) $x + 50^\circ = 115^\circ$ (Exterior angle property)

$\Rightarrow x = 115^\circ - 50^\circ = 65^\circ$

(ii) $70^\circ + x = 100^\circ$ (Exterior angle property)

$\Rightarrow x = 100^\circ - 70^\circ = 30^\circ$

(iii) $x + 90^\circ = 125^\circ$ (Exterior angle property)

$\Rightarrow x = 125^\circ - 90^\circ = 35^\circ$

(iv) $x + 60^\circ = 120^\circ$ (Exterior angle property)

$\Rightarrow x = 120^\circ - 60^\circ = 60^\circ$

(v) $x + 30^\circ = 80^\circ$ (Exterior angle property)

$\Rightarrow x = 80^\circ - 30^\circ = 50^\circ$

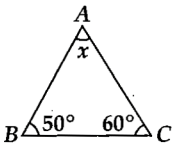
(vi) $x + 35^\circ = 75^\circ$

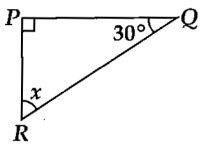
$\Rightarrow x = 75^\circ - 35^\circ = 40^\circ$

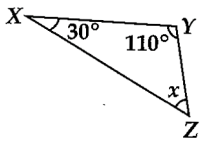
EXERCISE - 6.3

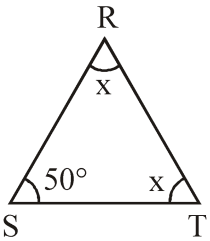
NS. 1

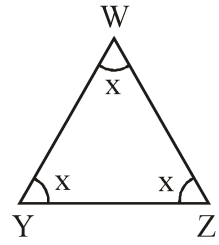
Find the value of the unknown x in the following diagrams:

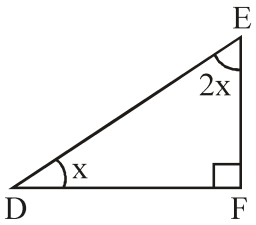
(i) 

(ii) 

(iii) 

(iv) 

(v) 

(vi) 

Ans. The sum of all interior angles of a triangle is 180°. By using this property,these problems can be solved as follows :

(i) $x + 50^\circ + 60^\circ = 180^\circ \Rightarrow x + 110^\circ = 180^\circ$

$\Rightarrow x = 180^\circ - 110^\circ = 70^\circ$

(ii) $x + 90^\circ + 30^\circ = 180^\circ \Rightarrow x + 120^\circ = 180^\circ$

$\Rightarrow x = 180^\circ - 120^\circ = 60^\circ$

(iii) $x + 30^\circ + 110^\circ = 180^\circ \Rightarrow x + 140^\circ = 180^\circ$

$\Rightarrow x = 180^\circ - 140^\circ = 40^\circ$

(iv) $50^\circ + x + x = 180^\circ \Rightarrow 2x = 180^\circ - 50^\circ = 130^\circ$

$\Rightarrow x = \frac{130^\circ}{2} = 65^\circ$

(v) $x + x + x = 180^\circ \Rightarrow 3x = 180^\circ$

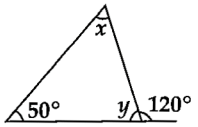
$x = \frac{180^\circ}{3} = 60^\circ$

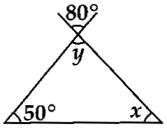
(vi) $x + 2x + 90^\circ = 180^\circ \Rightarrow 3x = 180^\circ - 90^\circ = 90^\circ$

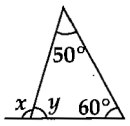
$\Rightarrow x = \frac{90^\circ}{3} = 30^\circ$

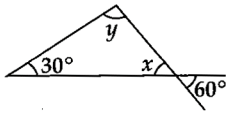
NS. 2

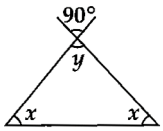
Find the values of the unknowns x and y in the following diagrams:

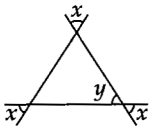
(i) 

(ii) 

(iii) 

(iv) 

(v) 

(vi) 

Ans. (i) $y + 120^\circ = 180^\circ$ (Linear pair)

$\Rightarrow y = 180^\circ - 120^\circ = 60^\circ$

Now, $x + y + 50^\circ = 180^\circ$

(Angle sum property)

$\Rightarrow x + 60^\circ + 50^\circ = 180^\circ$

$\Rightarrow x + 180^\circ - 60^\circ - 50^\circ = 70^\circ$

(ii) $y = 80^\circ$ (Vertically opposite angles)

$80^\circ + 50^\circ + x = 180^\circ$ (Angle sum property)

$x = 180^\circ - 130^\circ$

$x = 50^\circ$

(iii) $y + 50^\circ + 60^\circ = 180^\circ$ (Angle sum property)

$\Rightarrow y = 180^\circ - 60^\circ - 50^\circ = 70^\circ$

Now, $x + y = 180^\circ$ (Linear pair)

$\Rightarrow x = 180^\circ - y = 180^\circ - 70^\circ = 110^\circ$

(iv) $x = 60^\circ$ (Vertically opposite angles)

Now, $30^\circ + x + y = 180^\circ$ (Angles sum property)

$\Rightarrow 30^\circ + 60^\circ + y = 180^\circ \Rightarrow y = 180^\circ - 30^\circ - 60^\circ = 90^\circ$

(v) $y = 90^\circ$ (Vertically opposite angles)

Now, $x + x + y = 180^\circ$ (Angles property)

$\Rightarrow 2x + 90^\circ = 180^\circ \Rightarrow 2x = 180^\circ - 90^\circ = 90^\circ$

$\Rightarrow x = \frac{90^\circ}{2} = 45^\circ$

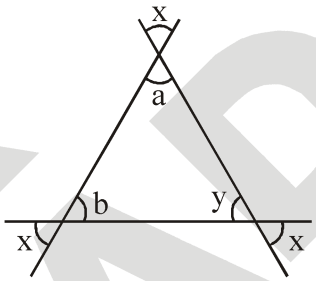
(vi) $y = x$ (Vertically opposite angles)

$a = x$ (Vertically opposite angles)

$b = x$ (Vertically opposite angles)

Now, $a + b + y = 180^\circ$

(Angles sum property)



$\Rightarrow x + x + x = 180^\circ$

(Vertically opposite property)

$\Rightarrow 3x = 180^\circ \Rightarrow x = \frac{180^\circ}{3} = 60^\circ$

Hence, $y = x = 60^\circ$

EXERCISE - 6.4

NS. 1

Is it possible to have a triangle with the following sides ?

(i) 2 cm, 3 cm, 5 cm (ii) 3 cm, 6 cm, 7 cm

(iii) 6 cm, 3cm, 2 cm

Ans. In a triangle ,the sum of the lengths of either two sides is always greater than the third side,

(i) Given that, the sides of the triangle are 2 cm, 3 cm, 5 cm.

It can be observed that,

2 + 3 = 5 cm

However, 5 cm = 5 cm

Hence, this triangle is not possible.

(ii) Given that, the sides of the triangle are 3 cm, 6 cm, 7 cm.

Here, 3 + 6 = 9 cm > 7 cm

6 + 7 = 13 cm > 3 cm

3 + 7 = 10 cm > 6 cm

Hence, this triangle is possible.

(iii) Given that , the sides of the triangle are 6 cm, 3 cm, 2 cm.

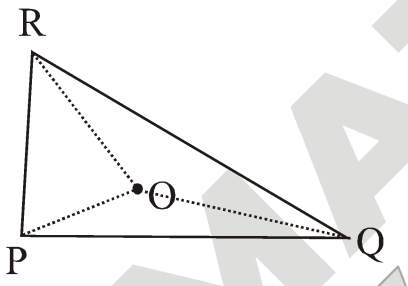
Here, 6 + 3 = 9 cm > 2 cm

However, 3 + 2 = 5cm < 6 cm

Hence, this triangle is not possible.

NS. 2

Take any point O in the interior of a triangle PQR is.



(i) OP + OQ > PQ?

(ii) OQ + OR > QR?

(iii) OR + OP > RP?

Ans. If O is a point in the interior of a given triangle, then three triangles ΔOPQ, ΔOQR and ΔORP can be constructed. In a triangle, the sum of the lengths of the either two sides is always greater than the third side.

(i) Yes, as OPQ is a triangle with sides OP, OQ and PQ.

∴ OP + OQ > PQ

(ii) Yes, as OQR is a triangle with sides OR, OQ and QR.

∴ OQ + OR > QR

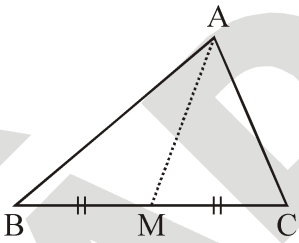
(iii) Yes, as ΔORP is a triangle with sides OR, OP and PR.

∴ OR + OP > PR

NS. 3

AM is median of a triangle ABC.

Is AB + BC + CA > 2AM?



(Consider the sides of ΔABM and ΔAMC.)

Ans. In a triangle, the sum of the lengths of either two sides is always greater than the third side.

In ΔABM,

AB + BM > AM

Similarly, in ΔACM,

AC + CM > AM

Adding (i) and (ii)

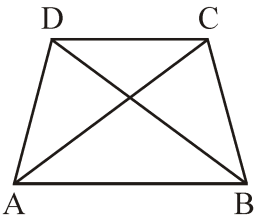
AB + BM + MC + AC > AM + AM

AB + BC + AC > 2AM

Yes, the given expression is true

NS. 4

ABCD is a quadrilateral. Is AB + BC + CD + DA > AC + BD?



Ans. In a triangle, the sum of the lengths of either two sides is always greater than the third side.

In ΔABC; AB + BC > CA ...(i)

In ΔBCD; BC + CD > BD ...(ii)

In ΔADC; AD + CD > CA ...(iii)

In ΔABD; AB + AD > BD ...(iv)

Adding (i), (ii), (iii) and (iv), we obtain

AB + BC + BC + CD + CD + DA + AB + AD > AC + BD + AC + BD

⇒ 2AB + 2BC + 2CD + 2DA > 2AC + 2BD

⇒ 2(AB + BC + CD + DA) > 2(AC + BD)

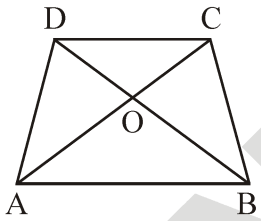
⇒ (AB + BC + CD + DA) > (AC + BD)

Yes, the given expression is true.

NS. 5

ABCD is a quadrilateral.

Is AB + BC + CD + DA < 2(AC + BD)?



Ans. In a triangle, the sum of the lengths of either two sides is always greater than third side.

In ΔOAB ; OA + OB > AB .....(i)

In ΔOBC ; OB + OC > BC .....(ii)

In ΔOCD ; OC + OD > CD .....(iii)

In ΔODA ; OD + OA > DA .....(iv)

Adding (i), (ii), (iii) and (iv), we obtain

OA + OB + OB + OC + OC + OD + OD + OA > AB + BC + CD + DA

⇒ 2OA + 2OB + 2OC + 2OD > AB + BC + CD + DA

⇒ 2(OA + OC) + 2(OB + OD) > AB + BC + CD + DA

⇒ 2(AC) + 2(BD) > AB + BC + CD + DA

⇒ 2(AC + BD) > AB + BC + CD + DA

Yes, the given expression is true.

NS. 6

The lengths of two sides of a triangle are 12 cm and 15 cm. Between what two measures should the length of the third side fall?

Ans. Lengths of two sides of a triangle are 12 cm and 15 cm.

In a triangle, the sum of the lengths of either two side is always greater than the third side.

Let the side be x.

∴ x + 12 > 15 ⇒ x > 3

x + 15 > 12 ⇒ x > – 3 but side length never be –ve and 12 + 15 > x ⇒ 27 > x

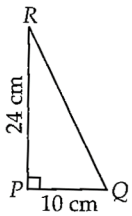
Hence, third side can measure between 3 and 27.

EXERCISE - 6.5

NS. 1

PQR is a triangle, right-angled at P. If PQ = 10 cm and PR = 24 cm, find QR.

Ans.



By applying Pythagoras theorem in ΔPQR,

$(PQ)^2 + (PR)^2 = (QR)^2$

$\Rightarrow (10)^2 + (24)^2 = QR^2$

$\Rightarrow (QR)^2 = 100 + 576 = 676 = (26)^2$

∴ QR = 26 cm

NS. 2

ABC is a triangle, right-angled at C. If AB = 25 cm and AC = 7 cm, find BC.

Ans. By applying Pythagoras theorem in ΔABC,

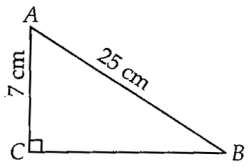
$(AC)^2 + (BC)^2 = (AB)^2$

$\Rightarrow (BC)^2 = (AB)^2 - (AC)^2$

$= (25)^2 - (7)^2$

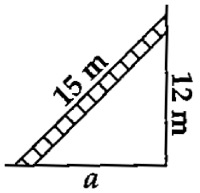
$= 625 - 49 = 576 = (24)^2$

$\therefore BC = 24$ cm



NS. 3

A 15 m long ladder reached a window 12 m high from the ground on placing it against a wall at a distance a .Find the distance of the foot of the ladder from the wall.



Ans. By applying Pythagoras theorem,

$(15)^2 = (12)^2 + a^2 \Rightarrow 225 = 144 + a^2$

$\Rightarrow a^2 = 225 - 144 = 81 = 9^2 \Rightarrow a = 9$ m

Therefore, the distance of the foot of the ladder from the wall is 9 m.

NS. 4

Which of the following can be the sides of a right triangle?

(i) 2.5 cm, 6.5 cm, 6 cm

(ii) 2 cm, 2 cm, 5 cm

(iii) 1.5 cm, 2 cm, 2.5 cm

In the case of right-angled triangles, identify the right angles.

Ans. (i) 2.5 cm, 6.5 cm, 6 cm

$\therefore (2.5)^2 = 6.25$, $(6.5)^2 = 42.25$ and $(6)^2 = 36$

It can be observed that,

$36 + 6.25 = 42.25 \Rightarrow (6)^2 + (2.5)^2 = (6.5)^2$

The square of the length of one side is the sum of the squares of the lengths of the remaining two sides. Hence, these sides are a right-angled triangle.

(ii) 2cm , 2 cm, 5 cm

$2^2 = 4$, $2^2 = 4$, $5^2 = 25$

$4 + 4 = 8 \neq 25$

The square of the length of one side is not equal the sum of the squares of the lengths of the remaining two sides. Hence, these sides are not of a right-angled triangle.

(iii) 1.5 cm, 2 cm, 2.5 cm

$\therefore (1.5)^2 = 2.25$, $(2)^2 = 4$ and $(2.5)^2 = 6.25$

Here, $2.25 + 4 = 6.25$

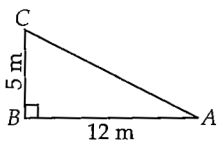
$\Rightarrow (1.15)^2 + (2)^2 = (2.5)^2$

The square of the lenght of one side is the sum of the squares of the lengths of the remaining two sides, Hence, these are the sides of a right-angled triangle. Right angle will be opposite of the side of measure 2.5 cm.

NS. 5

A tree is broken at a height of 5 m from the ground and its top touches the ground at a distance of 12 m from the base of the tree. Find the original height of the tree.

Ans.



In the given figure, BC represents the unbroken part of the tree. Point C represents the point where the tree broke and CA represents the broken part of the tree. Triangle ABC, thus formed, is right-angled at B.

Applying Pythagoras theorem in ΔABC,

$AC^2 = BC^2 + AB^2 = (5)^2 + (12)^2$

$= 25 + 144 = 169 = (13)^2$

$\therefore$ AC = 13 m

Thus, original height of the tree

= AC + CB = 13 m + 5 m = 18 m

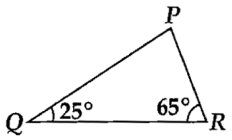
NS. 6

Angles Q and R of a ΔPQR are 25° and 65°. Write which of the following is true:

(i) $PQ^2 + QR^2 = RP^2$

(ii) $PQ^2 + RP^2 = QR^2$

(iii) $RP^2 + QR^2 = PQ^2$



Ans. The sum of the measures of all interior angles of a triangle is 180°.

$\angle P + \angle Q + \angle R = 180°$

$\Rightarrow 25° + 65° + \angle P = 180°$

$\Rightarrow 90° + \angle P = 180°$

$\Rightarrow \angle P = 180° - 90° = 90°$

Therefore, ΔPQR is right-angled at point P.Hence,

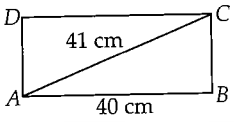
$(PR)^2 + (PQ)^2 = (QR)^2$

$\therefore$ (ii) is true.

NS. 7

Find the perimeter of the rectangle whose lengths is 40 cm and a diagonal is 41 cm.

Ans.



In ΔABC,

$(AC)^2 = (AB)^2 + (BC)^2$

$\Rightarrow (41)^2 = (40)^2 + (BC)^2$

$\Rightarrow (BC)^2 = 1681 - 1600 = 81 = 9^2$

$\therefore$ BC = 9 cm

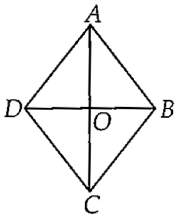
$\therefore$ Perimeter of rectangle = 2(40 + 9)

= 2(49) = 98 cm

NS. 8

The diagonals of a rhombus measure 16 cm and 30 cm. Find its perimeter.

Ans. We know the diagonals of a rhombus bisect each other at right angle.



Let diagonals bisects at O.

$\therefore$ $AO = OC = \frac{16}{2} = 8$ cm

and $BO = OD = \frac{30}{2} = 15$ cm

Now, ΔAOB is right-angled triangle.

$\therefore (AO)^2 + (OB)^2 = (AB)^2$

$\Rightarrow (AB)^2 = 8^2 + (15)^2 = 64 + 225 = 289 = (17)^2$

$\therefore$ AB = 17 cm

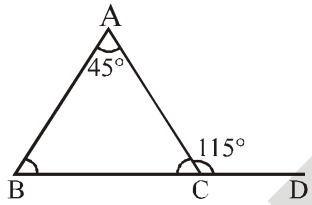
Hence, perimeter of rhombus = 4 × (17) = 68 cm

EXERCISE – I

ONLY ONE CORRECT TYPE

1. A triangle whose lengths of sides are 5 cm, 12 cm and 13 cm. The triangle is :
   (A) obtuse - angled triangle
   (B) Acute - angled triangle
   (C) Right angled triangle
   (D) Triangle is not formed

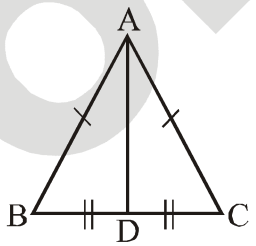
2. Side BC of a triangle ABC has been produced to point D., If angle ACD = 115° and angle A = 45°, then angle C is :



   (A) 65° (B) 80°
   (C) 100° (D) 60°

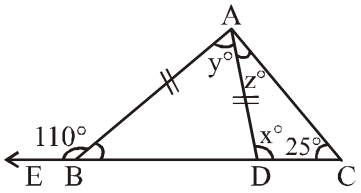
3. In a ΔABC, If AB + BC = 10 cm, BC + CA = 12 cm, CA + AB = 16 cm, then the perimeter of the triangle is :
   (A) 19 cm (B) 17 cm
   (C) 28 cm (D) None of these

4. In the following figure, If AB = AC and BD = DC, then ∠ADC =



   (A) 60° (B) 120°
   (C) 90° (D) 45°

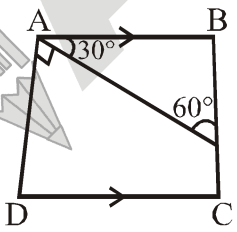
5. In the given figure, find ∠z =



   (A) 40° (B) 110°
   (C) 45° (D) 90°

6. In a ΔABC
   (A) AB – BC > CA (B) AB + BC < CA
   (C) AB – BC = CA (D) AB + BC > CA

7. AB || DC, then ∠ADC is equal to :



   (A) 90° (B) 45°
   (C) 60° (D) 75°

8. The triangle formed by BC = 7.2 cm, AC = 6 cm and ∠C = 120° is :
   (A) An acute angled triangle
   (B) An obtuse angled triangle
   (C) A right angled triangle
   (D) No triangle is formed

9. The top of a broken tree touches the gorund at a distance of 15 m from its base. If the tree is broken at a height of 8 m from the ground, then the actual height of the tree is :
   (A) 20 m (B) 25 m
   (C) 30 m (D) 17 m

10. ABC is an isosceles triangle with AB = AC and AD is altitude, then :
(A) $\angle B > \angle C$ (B) $\angle B < \angle C$
(C) $\angle B = \angle C$ (D) $\angle B \leq \angle C$

11. If two triangles are formed by dividing a square into half, what is the measure of each angle ?
(A) 50°, 50°, 80° (B) 90°, 45°, 45°
(C) 65°, 65°, 5° (D) 60°, 60°, 60°

12. If two sides of an isosceles triangles are 3 cm and 8 cm, then the length of the third side is :
(A) 3 cm (B) 8 cm
(C) 3 cm or 8 cm (D) 5 cm

13. The three angles of a triangle are in the ratio 1 : 2 : 1, then the greatest angle is :
(A) 45° (B) 90°
(C) 60° (D) 120°

14. Which of the following cannot be side of a triangle ?
(A) 2.5 cm, 6.5 cm, 6 cm
(B) 3 cm, 4 cm, 5 cm
(C) 2 cm, 3 cm, 5 cm
(D) 1.5 cm, 2 cm, 2.5 cm

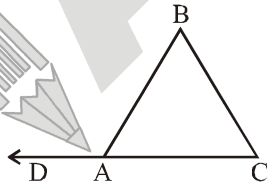
15. If the two legs of a right angled triangle are equal and the square of the hypotenuse is 100 cm^2, then the length of each leg is :
(A) 10 cm (B) $5\sqrt{2}$ cm
(C) $10\sqrt{2}$ cm (D) $13\sqrt{2}$ cm

16. One of the exterior angle of a triangle is 70°, Interior opposite angles are in the ratio 2 : 5. The angles are :
(A) 20°, 50°, 110° (B) 70°, 20°, 90°
(C) 45°, 45°, 90° (D) 60°, 60°, 60°

17. Two chimneys 18 m and 13 m high stand upright on a ground. If their feet is 12 m apart, then the distance between their tops is :
(A) 5 m (B) 31 m
(C) 13 m (D) 18 m

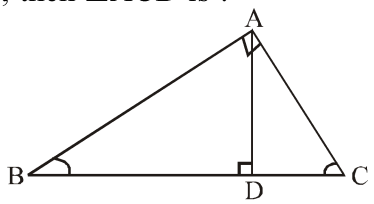
18. Two angles of a triangle are 60°, then the triangle is :
(A) Right angled triangle
(B) Scalene triangle
(C) Obtuse angled triangle
(D) Equilateral triangle

19. In the figure, the measure of angle BAD is twice the measure of angle BAC.



What is the measure of angle BAC ?
(A) 120° (B) 45°
(C) 60° (D) 90°

20. In ΔABC, $\angle BAC = 90°$ and $AD \perp BC$. If $\angle BAD = 40°$, then $\angle ACD$ is :



(A) 40° (B) 50°
(C) 140° (D) 60°

21. The lengths of two sides of a triangles are 6 cm and 8 cm. Between which two numbers can length of the third side fall ?
(A) 1 to 12 (B) 2 to 14
(C) 3 to 16 (D) 1 to 15

22. In ΔABC, If AB = BC and $\angle B = 80^\circ$ then $\angle C$

(A) 50° (B) 100°

(C) 130° (D) 60°

23. If the area of a triangle with base x is equal to the area of a square with side x, then the altitude of the triangle is :

(A) $\frac{x}{2}$ (B) x

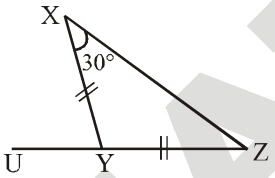
(C) 2x (D) 3x

24. In a ΔPQR, PQ = PR and $\angle Q$ is twice that of $\angle P$. Then $\angle Q$ =

(A) 72° (B) 36°

(C) 144° (D) 108°

25. The value of $\angle XYU$ in the given figure is :



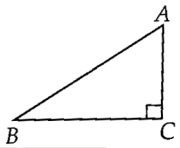
(A) 30° (B) 120°

(C) 90° (D) 60°

PARAGRAPH TYPE

PASSAGE # 1

In a right Δ ABC in which $\angle C = 90^\circ$ we have $AB^2 = BC^2 + AC^2$



26. The hypotenuse of a right angled triangle is 17 cm. If one of the remaining two sides is 8 cm, find the length of the other side.

(A) 10 cm (B) 15 cm

(C) 13 cm (D) 7 cm

27. The lengths of the sides of two triangles are given below. Which of the following is a right angled triangle?

(i) a = 12 cm, b = 35 cm and c = 37 cm

(ii) a = 13 cm, b = 5 cm and c = 15 cm

(A) only (i)

(B) only (ii)

(C) both (i) and (ii)

(D) None of these

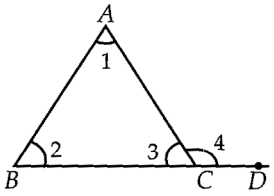
28. A man goes 15 m due east and then 8 m due north. How far is he from his initial position?

(A) 17 m (B) 19 m

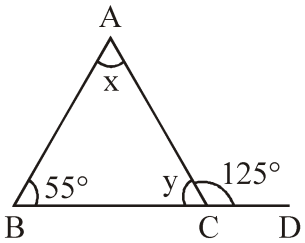
(C) 21 m (D) 23 m

PASSAGE # 2

If a side of a triangle is produced then the exterior angle so formed is equal to the sum of the two interior opposite angles, i.e.,



29. In the given figure, find the values of x and y respectively.



(A) 75°, 50° (B) 95°, 45°

(C) 70°, 55° (D) 90°, 45°

30. One side of a triangle is produced and the exterior angle so formed is 120°. If the interior opposite angles are in the ratio 3 : 5, find the measure of each angle of the triangle.

(A) 45°, 75°, 60° (B) 40°, 70°, 70°

(C) 45°, 70°, 65° (D) 40°, 75°, 65°

31. If the side of a triangle are produced in order, then the sum of the exterior angles so formed is :

(A) 180° (B) 270°

(C) 90° (D) 360°

MATCH THE COLUMNS

32. Match the following measure of triangle.

Column I	Column II
(P) 2 sides of equal length	(i) Right Angled Triangle
(Q) 1Right Angle	(ii) Obtused Angled Triangle
(R) 1 Right angle with two sides of equal length	(iii) Isosceles Triangles
(S) 1 Obtuse Angle	(iv) Isosceles Right Angled

(A) (P) → (i), (Q) → (iv), (R) → (ii), (S) → (iii)

(B) (P) → (iii), (Q) → (i), (R) → (iv), (S) → (ii)

(C) (P) → (iii), (Q) → (ii), (R) → (iv), (S) → (i)

(D) (P) → (iii), (Q) → (i), (R) → (iv), (S) → (ii)

33.

Column I	Column II
(P) The line segment joining the vertices of a triangle to the mid point of opposite side is called	(i) Altitude
(Q) The longest side in right angled triangle is	(ii) Centroid
(R) The intersection point of medians in a triangle is called	(iii) Hypotenuse
(S) The line segment which makes an angle of 90° on the opposite side from a vertex is called	(iv) Median

(A) (P) → (i), (Q) → (iii), (R) → (iv), (S) → (ii)

(B) (P) → (iii), (Q) → (ii), (R) → (i), (S) → (iv)

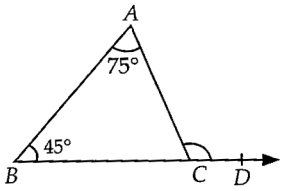
(C) (P) → (iv), (Q) → (iii), (R) → (ii), (S) → (i)

(D) (P) → (ii), (Q) → (iv), (R) → (iii), (S) → (i)

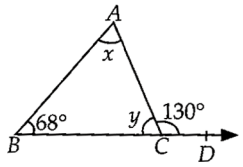
EXERCISE – II

VERY SHORT ANSWER TYPE

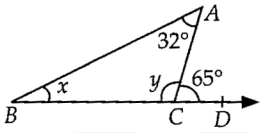
1. In a ΔABC, ∠A = 65°, ∠B = 35°, find the measure of ∠C.
2. In the given figure, find ∠ACD.



3. In the given figure, find the value of x and y.



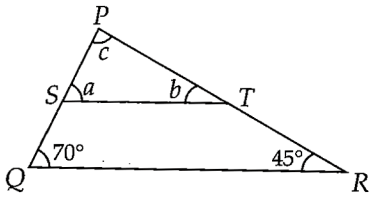
4. In the given figure, find the value of x and y.



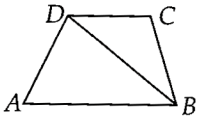
5. It is possible to draw a triangle whose sides are 5 cm, 8 cm, 9 cm?
6. What is the measure of each angle of an equilateral triangle?
7. In a ΔXYZ, if ∠X = 90°and ∠Z = 48°, find ∠Y.
8. In a ΔABC, right angled at B, if AB = 3 cm, BC = 4 cm, then find CA.
9. How many lines of symmetry are there in an equilateral triangle?
10. In ΔABC, Find ∠A + ∠B, if the exterior angle of ∠C is 135°.

SHORT ANSWER TYPE

1. Find the angles of a ΔABC which are in the ratio 11 : 13 : 12.
2. In ΔPQR, QR || ST, find the value of a, b and c.



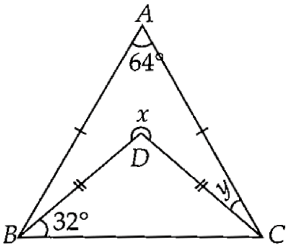
3. The given figure is formed up of two triangles. Find ∠ABD + ∠DBC + ∠BCD + ∠CDB + ∠BDA + ∠DAB.



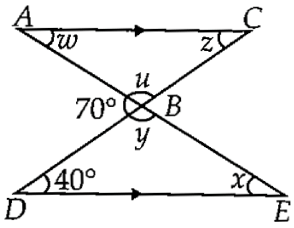
4. Three squares have area 25cm^2 , 16cm^2 and 9cm^2, will the squares exactly surround the edges of a right angled triangle?
5. The angles of a triangle are in the ratio 3 : 5 : 10. Find the measure of each angle.

LONG ANSWER TYPE

1. One of the exterior angles of a triangle is 80° and the interior opposite angles are in the ratio 5 : 3. Find all the angles of the triangle.
2. Find x and y respectively.



3. In the given figure given below, find the angles x, y, z. u and w.



4. Find the perimeter of the rectangle whose length is 40 cm and one diagonal is 41 cm.
5. In a ΔPQR, if 6 ∠R = 4∠Q = 3∠P. then find ∠P, ∠Q, ∠R.

TRUE FALSE TYPE

1. Sum of the two angles of a triangle is always greater than the third angle.
2. The sum of the measures of three angles of a triangle is greater than 180º.
3. It is possible to have a right angle in equilateral triangle.
4. It is possible to have a triangle in which two angles are acute.
5. It is possible to have a triangle in which all angles are greater than 60º.

NUMERICAL TYPE

1. If ΔABC ≅ ΔPQR and AB = x + 7 & PQ = 3x – 1 then the value of x is
2. The ratio of corresponding sides of two congruent triangles is
3. If the equal angles of an isosceles triangle is 80° then the vertical angle is
4. What will be the angle of triangle if two of its angles are 100° & 70° ?
5. What will be the sum of digits of sum of interior angle of a triangle ?

FILL IN THE BLANKS

1. The diagonals of _____divides it into four equal triangles.
2. There are _____ lines of symmetry in triangles.
3. The triangle in which all sides are unequal is called_____
4. The sum of either two sides is_____than third side.
5. If one angle of a triangle is obtuse then other two angles are_____.

Answer Key

EXERCISE–I

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
C	A	A	C	C	D	C	B	B	C	B	B	B	C	B
16	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**
A	C	D	C	A	B	A	C	A	D	B	A	A	C	A
31	**32**	**33**												
D	D	C												

EXERCISE – II

VERY SHORT ANSWER TYPE

1. 80° **2.** 120° **3.** x = 62°, y = 50° **4.** x = 33°, y = 115° **5.** Yes

6. 60° **7.** 42° **8.** 5 cm **9.** 3 **10.** 135°

SHORT ANSWER TYPE

1. 55°, 65°, 60° **2.** a = 70°, b = 45°, c = 65° **3.** 360° **4.** Yes

5.30°, 50°, 100°

LONG ANSWER TYPE

1. 30°, 50°, 100° **2.** x = 244°, y = 26°

3. x = 30°, y = 110°, z = 40°, μ = 110°, w = 30° **4.** 98 cm

5. ∠P = 80°, ∠Q = 60°,∠R = 40°

NUMERICAL TYPE

1. x = 4 2. 1 3. 20° 4.10° 5. 9

TRUE / FALSE

1. F 2. F 3. F 4. T 5. F

FILL IN THE BLANKS

1. Square 2. Three 3. Scalene triangle 4. Greater 5. Acute angles

SELF PROGRESS ASSESSMENT FRAMEWORK

(CHAPTER : THE TRIANGLE AND ITS PROPERTIES)

CONTENT	STATUS	DATE OF COMPLETION	SELF SIGNATURE
Theory			
In-Text Examples			
Solved Examples			
NCERT Exercises			
Exercise I			
Exercise II			
Short Note-1			
Revision - 1			
Revision - 2			
Revision - 3			
Remark			

NOTES :

1. In the status, put "completed" only when you have thoroughly worked through this particular section.
2. Always remember to put down the date of completion correctly. It will help you in future at the time of revision.

Space for Notes :

FRACTIONS AND DECIMALS (A PEEK BEYOND THE POINT)

3

1. FRACTIONS

A fraction is a number of the form $\frac{a}{b}$, where a and b are integers and b ≠ 0. The parts of a fraction are

numerator $\rightarrow a$
denominator $\rightarrow b$ ← fraction bar

2. TYPE OF FRACTIONS

2.1 LIKE FRACTIONS

Fractions having same denominator are called like fractions.

For example : $\frac{2}{9}, \frac{4}{9}, \frac{5}{9}$ and $\frac{8}{9}$ are like fractions.

2.2 UNLIKE FRACTION

Fraction with different denominators are called unlike fractions.

For example: $\frac{1}{2}, \frac{3}{4}, \frac{5}{6}$ and are unlike fractions

2.3 PROPER FRACTION

A fraction whose numerator is less than its denominator, but not equal to zero is called a proper fraction.

For example : $\frac{1}{2}, \frac{3}{4}, \frac{2}{7}, \frac{11}{20}$ etc.

2.4 IMPROPER FRACTION

A fraction whose numerator is equal to or greater than its denominator is called and improper fraction.

For example : $\frac{7}{8}, \frac{8}{5}, \frac{215}{15}, \frac{63}{15}$ etc.

2.5 MIXED FRACTION

A number which consists of two parts (i) a natural number (ii) a proper fraction is called a mixed fraction.

For example : $2\frac{5}{13}, 1\frac{7}{8}, 18\frac{9}{17}$ etc, where 2,1,18 are natural numbers and $\frac{5}{13}, \frac{7}{8}$ and $\frac{9}{17}$ are proper fractions.

$$2\frac{5}{13} = 2 + \frac{5}{13}, 1\frac{7}{8} = 1 + \frac{7}{8} \text{ and } 18\frac{9}{17} = 18 + \frac{9}{17}$$

2.6 EQUIVALENT FRACTION

The fractions with equal ratios are called equivalent fractions.

For example : $\frac{2}{3}=\frac{4}{6}=\frac{6}{9}=\frac{8}{12}=\frac{10}{15}=\frac{12}{18}=\frac{20}{30}=\frac{26}{39}$

Note :

1. If we multiply the numerator and the denominator by the same non-zero number, the value of the fraction remains unchanged.
2. If we divide the numerator and the denominator by the same non zero number, the value of the fractions remains unchanged.

2.7 RECIPROCAL FRACTION

The reciprocal fraction of a number k be $\frac{1}{k}$ i.e., the product of a reciprocal number with the number itself is unity (i.e., 1) hence the reciprocal of 6 is $\frac{1}{6}$, the reciprocal of $\frac{1}{8}$ is 8, the reciprocal of $\frac{3}{5}$ is $\frac{5}{3}$.

2.8 COMPOUND FRACTION

The fraction of a fraction is called its compound fraction for examples $\frac{1}{3}$ of $\frac{1}{2}$

$\left(\text{i.e.,}\frac{1}{3}\times\frac{1}{2}=\frac{1}{6}\right)$ is the compound fraction.

2.9 COMPLEX FRACTION

If the numerator or denominator or both of a fraction are again fractions then it is called a complex fraction.

For example : $\frac{2/3}{7/8},\frac{7/5}{2},\frac{3/7}{8/9},\frac{2}{3/7}$ etc.

Remember: $\frac{a/b}{c/d}=\frac{a}{b}\times\frac{d}{c}$

$$\frac{a/b}{c}=\frac{a}{b\times c}\quad\Rightarrow\quad\frac{a}{b/c}=\frac{a\times c}{b}$$

3. CONVERSION OF DECIMAL NUMBERS INTO DECIMAL FRACTION

Write the number of zeros as the number of digits in the decimal number preceded by 1, below the actual number without decimal point is

$23.6 = \frac{236}{10}$, $4.579 = \frac{4579}{1000}$

$75.89 = \frac{7589}{100}$, $0.018870 = \frac{18870}{1000000} = \frac{1887}{100000}$

4. CONVERSION OF DECIMAL FRACTIONS INTO DECIMAL NUMBERS

Count the number of zeros in the denominator and then count the same number of digits in the numerator starting from the unit digit of the numerator moving to the left and then place the decimal point at:

$\frac{2375}{10} = 237.5$, $\frac{2375}{100} = 23.75$, $\frac{2375}{1000} = 2.375$,

$\frac{2375}{100000} = 0.02375$, $\frac{2375}{1000000} = 0.002375$ etc.

SOLVED EXAMPLES

SE. 1

What number should be added to $\frac{5}{11}$ to get $\frac{7}{11}$?

Ans. Sum of fractions $= \frac{7}{11}$

One of the fraction $= \frac{5}{11}$

Other fraction $= \frac{7}{11} - \frac{5}{11} = \frac{2}{11}$

SE. 2

A piece of wire is of length $8\frac{1}{4}$ m. It is cut into two pieces. The length of one piece is $4\frac{3}{4}$ m. What is the length of the other piece?

Ans. Total length of wire $= 8\frac{1}{4}\text{ m} = \frac{33}{4}\text{ m}$

Length of one piece $= 4\frac{3}{4}\text{ m}$

Length of one piece $= 4\frac{3}{4}\text{ m} = \frac{19}{4}\text{ m}$

Length of other piece $= \frac{14}{4}$

SE. 3

The sides of a triangle are $\frac{7}{2}$ cm, $\frac{11}{4}$ cm and $\frac{16}{5}$ cm. Find its perimeter.

Ans. Perimeter of triangle = Sum of all sides

$= \frac{7}{2} + \frac{11}{4} + \frac{16}{5}\text{ cm}$

$= \frac{70}{20} + \frac{55}{20} + \frac{64}{20} = \frac{189}{20}\text{ cm}$

[L.C.M (2, 4, 5) = 20]

$= 9\frac{9}{20}\text{ cm}$

SE. 4

Find :

(i) $\frac{1}{4}$ of a rupee

(ii) $\frac{3}{4}$ of a day

(iii) $\frac{7}{25}$ of a kg

(iv) $\frac{2}{3}$ of an hour

Ans. (i) $\frac{1}{4}$ of a rupee $= \frac{1}{4}$ of 100 paise

$= \frac{1}{4} \times 100$ paise $= 25$ paise

(ii) $\frac{3}{4}$ of a day $= \frac{3}{4}$ of 24 hours

$= \frac{3}{4} \times 24 = 18$ hours

(iii) $\frac{7}{25}$ of a kg $= \frac{7}{25}$ of 1000 gm

$= \frac{7}{25} \times 1000$ gm $= 280$ gm

(iv) $\frac{2}{3}$ of an hour $= \frac{2}{3}$ of 60 mins

$= \frac{2}{3} \times 60$ mins $= 40$ mins

SE. 5

Which is greater : $\frac{3}{4}$ of 36 or $\frac{4}{5}$ of 35?

Ans. $\frac{3}{4}$ of $36 = \frac{3}{4} \times 36 = 27$ and $\frac{4}{5}$ of 35

$= \frac{4}{5} \times 35 = 28$

Since, $28 > 27 \Rightarrow \frac{4}{5}$ of $35 > \frac{3}{4}$ of 36

SE. 6

Vineeta reads a book for $1\frac{4}{5}$ hours everyday. She reads the entire book in 10 days. How many hours in all were required by her to read the book?

Ans. In one day, she reads for $1\frac{4}{5}$ hours $= \frac{9}{5}$ hours in 10 days, she read for $\frac{9}{5} \times 10 = 18$ hours

So, 18 hours were required by her to read the book.

SE. 7

The steel needed for the construction of a bridge is 640 tonnes. If the contractor has already purchased 0.65 part of the steel, how many more tonnes of steel to be purchased for completion of the bridge?

Ans. Total quantity of steel required = 640 tonnes

This quantity is the total one and whole part required for construction of bridge. Out of this, the part of the purchased = 0.65

Balance that still needs to be purchased

= 1 – 0.65 = 0.35 part

Hence, quantity of steel to be purchased

= 0.35 × 640 = 224 tonnes

SE. 8

Vinay covers $7\frac{1}{2}$ km in one hour. How much distance will he cover in $2\frac{4}{5}$ hours?

Ans. $7\frac{1}{2}$ km $= \frac{15}{2}$ km and $2\frac{4}{5}$ hours $= \frac{14}{5}$ hours

Distance covered in one hour $= \frac{15}{2}$ km

So, distance covered in $\frac{14}{5}$ hours $= \frac{15}{2} \times \frac{14}{5}$ km

= 21 km

Thus, Vinay will cover 21 km in $2\frac{4}{5}$ hours.

SE. 9

If the cost of 17 m of cloth is ₹ $77\frac{5}{7}$. Find its cost per metre.

Ans. Cost of 17 m of cloth = ₹ $77\frac{5}{7}$ = ₹ $\frac{544}{7}$

Cost of 1m of cloth = ₹ $\frac{544}{7} \div 17 = \frac{544}{7} \times \frac{1}{17}$

= ₹ $\frac{32}{7}$ = ₹ $4\frac{4}{7}$

Hence, the cost of cloth is ₹ $4\frac{4}{7}$ per metre.

SE. 10

Find 3.705 × 10000.

Ans. Number of zeroes in 10000 = 4.

Move decimal point 4 places to the right in 3.705

$\therefore$ 3.705 × 10000 = 37050

SE. 11

A film show casted 3.75 hours. Out of this, 0.23 hours were spent on advertisement and trailers. What was the actual duration of the film?

Ans. The duration of a film show = 3.75 hours.

Time spent on advertisement and trailers = 0.23 hour

Actual duration film = 3.75 – 0.23 = 3.52 hours

SE. 12

Cost of one book is ₹ 34.75. Find the cost of 25 such books.

Ans. Cost of 1 book = ₹ 34.75

Cost of 25 books = ₹ (25 × 34.75)

First we multiply 25 × 3475, we get 86875 and places decimal point after 2 digit from right

∴ ₹ 34.75 × 25 = ₹ 868.75

Hence, cost as 25 such books = ₹ 868.75

SE. 13

Find the area of square whose side is 6.25 m.

Ans. Area of square = Side × Side

Side of square = 6.25 m

∴ Area of square = 6.25 × 6.25 m^2

To multiply 6.25 m and 6.25 m, first multiply 625 by 625 = 390625 and place decimal point after four digits from the right.

6.25 × 6.25 = 39.0625 m^2

∴ Area of square = 39.0625 m^2

SE. 14

Samson carries a bag weighing 5.5 kg. How many grams is it?

Ans. 1 kg = 1000 gm

∴ 5.5 kg = 5.5 × 1000 gm = 5500 gm

(By shifting decimal by 1 places to the right)

SE. 15

If 2.54 cm make an inch, how many inches will 60.96 cm make?

Ans. 2.54 cm = 1 inch

$\therefore$ 1 cm = $\frac{1}{2.54}$ inch

$\Rightarrow$ 60.96 cm = $\frac{60.96}{2.54}$ inch

$\therefore \frac{60.96}{2.54} = \frac{60.96}{2.54} \times \frac{100}{100} = 24$

$\Rightarrow$ 60.96 cm = 24 inches

SE. 16

The cost of a book is 25.75. How many books can be purchased for ₹ 2472?

Ans. The number of books can be purchased

$= 2472 \div 25.75 = 2472 \times \frac{1}{25.75} = \frac{247200}{2575} = 96$

SE. 17

A tank is filled with $149\frac{1}{2}$ litres of water. How many buckets with capacity of $6\frac{1}{2}$ litres each can be filled from the tank?

Ans. Volume of water in tank = 149.5 litres

Volume of bucket = 6.5 litres

Number of buckets = $149.5 \div 6.5 = 149.5 \times \frac{1}{6.5}$

$= \frac{1495}{65} = 23$

EXERCISE - 2.1

NS. 1

Solve :

(i) $2-\frac{3}{5}$ **(ii)** $4+\frac{7}{8}$

(iii) $\frac{3}{5}+\frac{2}{7}$ **(iv)** $\frac{9}{11}-\frac{4}{15}$

(v) $\frac{7}{10}+\frac{2}{5}+\frac{3}{2}$ **(vi)** $2\frac{2}{3}+3\frac{1}{2}$

(vii) $8\frac{1}{2}-3\frac{5}{8}$

Ans. (i) $2-\frac{3}{5}=\frac{2\times5}{5}-\frac{3}{5}=\frac{10-3}{5}=\frac{7}{5}$

(ii) $4+\frac{7}{8}=\frac{4\times8}{8}+\frac{7}{8}=\frac{32+7}{8}=\frac{39}{8}=4\frac{7}{8}$

(iii) $\frac{3}{5}+\frac{2}{7}=\frac{3\times7}{5\times7}+\frac{2\times5}{7\times5}=\frac{21+10}{35}=\frac{31}{35}$

(iv) $\frac{9}{11}-\frac{4}{15}=\frac{9\times15}{11\times15}-\frac{4\times11}{15\times11}=\frac{135-44}{165}=\frac{91}{165}$

(v) $\frac{7}{10}+\frac{2}{5}+\frac{3}{2}=\frac{7}{10}+\frac{2\times2}{5\times2}+\frac{3\times5}{2\times5}=\frac{7+4+15}{10}$

$=\frac{26}{10}=\frac{13}{5}=2\frac{3}{5}$

(vi) $2\frac{2}{3}+3\frac{1}{2}=\frac{8}{3}+\frac{7}{2}=\frac{8\times2}{3\times2}+\frac{7\times3}{2\times3}$

$=\frac{16+21}{6}=\frac{37}{6}=6\frac{1}{6}$

(vii) $8\frac{1}{2}-3\frac{5}{8}=\frac{17}{2}-\frac{29}{8}=\frac{17\times4}{2\times4}-\frac{29}{8}$

$=\frac{68}{8}-\frac{29}{8}=\frac{39}{8}=4\frac{7}{8}$

NS. 2

Arrange the following in descending order :

(i) $\frac{2}{9},\frac{2}{3},\frac{8}{21}$ **(ii)** $\frac{1}{5},\frac{3}{7},\frac{7}{10}$

Ans. **(i)** $\frac{2}{9},\frac{2}{3},\frac{8}{21}$

Changing them to like fractions, we obtain

$\frac{2}{9}=\frac{2\times7}{9\times7}=\frac{14}{63};\frac{2}{3}=\frac{2\times21}{3\times21}=\frac{42}{63};\frac{8}{21}=\frac{8\times3}{21\times3}=\frac{24}{63}$

[L.C.M (3, 9, 21) = 3 × 3 × 7 = 63]

Since, 42 > 24 > 14,

$\therefore\ \frac{2}{3}>\frac{8}{21}>\frac{2}{9}$

(ii) $\frac{1}{5},\frac{3}{7},\frac{7}{10}$

Changing them to like fractions, we obtain

$\frac{1}{5}=\frac{1\times14}{5\times14}=\frac{14}{70};\frac{3}{7}=\frac{3\times10}{7\times10}=\frac{30}{70};\frac{7}{10}=\frac{7\times7}{10\times7}=\frac{49}{70}$

[L.C.M (5, 7, 10) = 2 × 5 × 7 = 70]

As 49 > 30 > 14,

$\therefore\ \frac{7}{10}>\frac{3}{7}>\frac{1}{5}$

NS. 3

In a "magic square", the sum of the numbers in each row, in each column and along the diagonals is the same. Is this a magic square?

$\frac{4}{11}$	$\frac{9}{11}$	$\frac{2}{11}$
$\frac{3}{11}$	$\frac{5}{11}$	$\frac{7}{11}$
$\frac{8}{11}$	$\frac{1}{11}$	$\frac{6}{11}$

(Along the first row $\frac{4}{11}+\frac{9}{11}+\frac{2}{11}=\frac{15}{11}$)

Ans. Sum along the first row $=\frac{4}{11}+\frac{9}{11}+\frac{2}{11}=\frac{15}{11}$

Sum along the second row $=\frac{3}{11}+\frac{5}{11}+\frac{7}{11}=\frac{15}{11}$

Sum along the third row $=\frac{8}{11}+\frac{1}{11}+\frac{6}{11}=\frac{15}{11}$

Sum along the first column $=\frac{4}{11}+\frac{3}{11}+\frac{8}{11}=\frac{15}{11}$

Sum along the second column

$=\frac{9}{11}+\frac{5}{11}+\frac{1}{11}=\frac{15}{11}$

Sum along with the third column

$=\frac{2}{11}+\frac{7}{11}+\frac{6}{11}=\frac{15}{11}$

Sum along the first diagonal $=\frac{4}{11}+\frac{5}{11}+\frac{6}{11}=\frac{15}{11}$

Sum along the second diagonal

$=\frac{2}{11}+\frac{5}{11}+\frac{8}{11}=\frac{15}{11}$

Since, the sum of the numbers in each row, in each column, and along the diagonals is the same. Hence, it is a magic square.

NS. 4

A rectangular sheet of paper is $12\frac{1}{2}$ cm along and $10\frac{2}{3}$ cm wide. Find its perimeter.

Ans. Length $=12\frac{1}{2}\text{cm}=\frac{25}{2}\text{cm}$ and Breadth

$=10\frac{2}{3}\text{cm}=\frac{32}{3}\text{cm}$

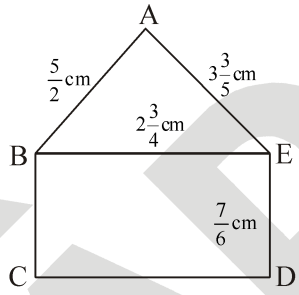
Perimeter = 2 × (Length + Breadth)

$=2\times\left(\frac{25}{2}+\frac{32}{3}\right)=2\times\left(\frac{25\times3}{2\times3}+\frac{32\times2}{3\times2}\right)$

$=2\times\left(\frac{75+64}{6}\right)=2\times\frac{139}{6}=\frac{139}{3}\text{cm}$

NS. 5

Find the perimeters of (i) ΔABE (ii) the rectangle BCDE in this figure. Whose perimeter is greater?



Ans. (i) Perimeter of ΔABE = AB + BE + EA

$=\left(\frac{5}{2}+2\frac{3}{4}+3\frac{3}{5}\right)=\left(\frac{5}{2}+\frac{11}{4}+\frac{18}{5}\right)$

$=\left(\frac{5\times10}{2\times10}+\frac{11\times5}{4\times5}+\frac{18\times4}{5\times4}\right)$

$=\frac{50+55+72}{20}=\frac{177}{20}=8\frac{17}{2}\text{cm}$

(ii) Perimeter of □ BCDE $=2\left[\frac{11}{4}+\frac{7}{6}\right]$

$2\left[\frac{11\times3}{4\times3}+\frac{7\times2}{6\times2}\right]=2\left[\frac{33+14}{12}\right]$

$=2\times\frac{47}{12}=\frac{47}{6}=7\frac{5}{6}\text{cm}$

Perimeter of ΔABE $=\frac{177}{20}$cm and perimeter of

□ BCDE $=\frac{47}{6}$cm

Changing them to like fractions, we obtains

$\frac{177}{20}=\frac{177\times3}{20\times3}=\frac{531}{60};\frac{47}{6}=\frac{47\times10}{6\times10}=\frac{470}{60}$

As 531 > 470, $\therefore\frac{177}{20}>\frac{47}{6}$

Thus, perimeter (ΔABE) > perimeter (□BCDE)

NS. 6

Salil wants to put a picture in a frame. The picture is $7\frac{3}{5}$ cm wide. To fit in the frame the picture cannot be more than $7\frac{3}{10}$ cm wide. How much should the picture be trimmed ?

Ans. Width of picture $= 7\frac{3}{5} = \frac{38}{5}$ cm

Required width $= 7\frac{3}{10} = \frac{73}{10}$ cm

The picture should be trimmed by $= \left(\frac{38}{5} - \frac{73}{10}\right)$

$= \left(\frac{38\times 2}{5\times 2} - \frac{73}{10}\right) = \frac{76-73}{10} = \frac{3}{10}$ cm

NS. 7

Ritu ate $\frac{3}{5}$ part of an apple and the remaining apple was eaten by her brother Somu. How much part of the apple did Somu eat? Who had the larger share? By how much?

Ans. Part of an apple eaten by Ritu $= \frac{3}{5}$

Part of an apple eaten by Somu = 1 – Part of an apple eaten by Ritu $= 1 - \frac{3}{5} = \frac{2}{5}$

Therefore, Somu ate $\frac{2}{5}$ part of the apple.

Since 3 > 2, Ritu had the larger share.

Difference between the 2 shares $= \frac{3}{5} - \frac{2}{5} = \frac{1}{5}$

Therefore, Ritu's share is larger than Somu's share by $\frac{1}{5}$.

NS. 8

Michael finished colouring a picture in $\frac{7}{12}$ hour. Vaibhav finished colouring the same picture in $\frac{3}{4}$ hour. Who worked longer? By what fraction was it longer?

Ans. Time taken by Michael $= \frac{7}{12}$ hour

Time taken by Vaibhav $= \frac{3}{4}$ hour

Converting these fractions into like fractions,

we obtain $\frac{3}{4} = \frac{3\times 3}{4\times 3} = \frac{9}{12}$ and $\frac{7}{12} = \frac{7\times 1}{12\times 1} = \frac{7}{12}$

Since 9 > 7, Vaibhav worked longer.

Difference $= \frac{9}{12} - \frac{7}{12} = \frac{1}{6}$ hour

EXERCISE - 2.2

NS. 1

Which of the drawings (a) to (d) show.

(i) $2\times\frac{1}{5}$ **(ii)** $2\times\frac{1}{2}$

(iii) $3\times\frac{2}{3}$ **(iv)** $3\times\frac{1}{4}$

(A) 

(B) 

(C) 

(D) 

Ans. (i) $2\times\frac{1}{5}$ represents addition of 2 figures, each representing 1 shaded part of 5 equal parts.

Hence, $2\times\frac{1}{5}$ is represented by (d).

(ii) $2\times\frac{1}{2}$ represents addition of 2 figures, each representing 1 shaded part out of 2 equal parts.

Hence, $2\times\frac{1}{2}$ is represented by (b).

(iii) $3\times\frac{2}{3}$ represents addition of 3 figures, each representing 2 shaded parts out of 3 equal parts.

Hence, $3\times\frac{2}{3}$ is represented by (a).

(iv) $3\times\frac{1}{4}$ represents addition of 3 figures, each representing 1 shaded out of 4 equals parts.

Hence, $3\times\frac{1}{4}$ is represented by (c).

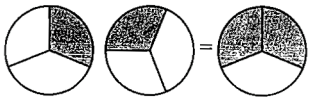
NS. 2

Some pictures (a) to (c) are given below. Tell which of them show:

(i) $3\times\frac{1}{5}=\frac{3}{5}$ **(ii)** $2\times\frac{1}{3}=\frac{2}{3}$

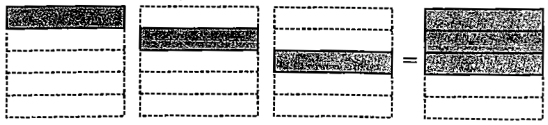
(iii) $3\times\frac{3}{4}=2\frac{1}{4}$

(A)



(B)

(C)



Ans. (i) $3\times\frac{1}{5}$ represents the addition of 3 figures, each representing 1 shaded part out of 5 equal parts and $\frac{3}{5}$ represents 3 shaded parts out of 5 equal parts.

Hence, $3\times\frac{1}{5}=\frac{3}{5}$ is represented by (c).

(ii) $2\times\frac{1}{3}$ represents the addition of 2 figures, each representing 1 shaded part out of 3 equal parts and $\frac{2}{3}$ represents 2 shaded parts out of 3 equal parts.

Hence, $2\times\frac{1}{3}=\frac{2}{3}$ is represented by (a).

(iii) $3\times\frac{3}{4}$ represents the addition of 3 figures, each representing 3 shade parts out of 4 equal parts and $2\frac{1}{4}$ represents 2 fully shaded figures and one figure having 1 part is shaded out of 4 equal parts/

Hence, $3\times\frac{3}{4}=2\frac{1}{4}$ is represented by (b).

NS. 3

Multiply and reduce to lowest form and convert into a mixed fraction:

(i) $7\times\frac{3}{5}$ **(ii)** $4\times\frac{1}{3}$

(iii) $2\times\frac{6}{7}$ **(iv)** $5\times\frac{2}{9}$

(v) $\frac{2}{3}\times4$ **(vi)** $\frac{5}{2}\times6$

(vii) $11\times\frac{4}{7}$ **(viii)** $20\times\frac{4}{5}$

(ix) $13\times\frac{1}{3}$ **(x)** $15\times\frac{3}{5}$

Ans. (i) $7\times\frac{3}{5}=\frac{21}{5}=4\frac{1}{5}$

(ii) $4\times\frac{1}{3}=\frac{4}{3}=1\frac{1}{3}$ (iii) $2\times\frac{6}{7}=\frac{12}{7}=1\frac{5}{7}$

(iv) $5\times\frac{2}{9}=\frac{10}{9}=1\frac{1}{9}$ (v) $\frac{2}{3}\times4=\frac{8}{3}=2\frac{2}{3}$

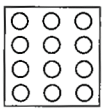
(vi) $\frac{5}{2}\times6=15$ (vii) $11\times\frac{4}{7}=\frac{44}{7}=6\frac{2}{7}$

(viii) $20\times\frac{4}{5}=16$ (ix) $13\times\frac{1}{3}=\frac{13}{3}=4\frac{1}{3}$

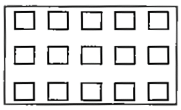
(x) $15\times\frac{3}{5}=9$

NS. 4

Shade: (i) $\frac{1}{2}$ of the circles in box (a); (ii) $\frac{2}{3}$ of the triangles in box (b); (iii) $\frac{3}{5}$ of the squares in box (c).

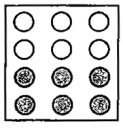
(A) 

(B) 

(C) 

Ans. (i) There are 12 circles in the given box.

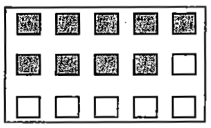
To shade $\frac{1}{2}$ of the circles in it i.e., $12\times\frac{1}{2}=6$, we will shade any 6 circles of it.



(ii) There are 9 triangles in the given box. To shade $\frac{2}{3}$ of the triangles in it i.e., $9\times\frac{2}{3}=6$, we shade any 6 triangles of it.

(iii) There are 15 squares in the given box.

To shade $\frac{3}{5}$ of the squares in it i.e., $\frac{3}{5}\times15=9$, we will shade any 9 squares of it.



NS. 5

Find :

(a) $\frac{1}{2}$ of (i) 24 (ii) 46 (b) $\frac{2}{3}$ of (i) 18 (ii) 27

(c) $\frac{3}{4}$ of (i) 16 (ii) 36 (d) $\frac{4}{5}$ of (i) 20 (ii) 35

Ans. **(a)** (i) $\frac{1}{2}\times24=12$ (ii) $\frac{1}{2}\times46=23$

(b) (i) $\frac{2}{3}\times18=12$ (ii) $\frac{2}{3}\times27=18$

(c) (i) $\frac{3}{4}\times16=12$ (ii) $\frac{3}{4}\times36=27$

(d) (i) $\frac{4}{5}\times20=16$ (ii) $\frac{4}{5}\times35=28$

NS. 6

Multiply and express as a mixed fraction :

(a) $3\times5\frac{1}{5}$ **(b)** $5\times6\frac{3}{4}$ **(c)** $7\times2\frac{1}{4}$

(d) $4\times6\frac{1}{3}$ **(e)** $3\frac{1}{4}\times6$ **(f)** $3\frac{2}{5}\times8$

Ans. **(a)** $3\times5\frac{1}{5}=3\times\frac{26}{5}=\frac{78}{5}=15\frac{3}{5}$

(b) $5\times6\frac{3}{4}=5\times\frac{27}{4}=\frac{135}{4}=33\frac{3}{4}$

(c) $7\times2\frac{1}{4}=7\times\frac{9}{4}=\frac{63}{4}=15\frac{3}{4}$

(d) $4\times6\frac{1}{3}=4\times\frac{19}{3}=\frac{76}{3}=25\frac{1}{3}$

(e) $3\frac{1}{4}\times 6=\frac{13}{4}\times 6=\frac{39}{2}=19\frac{1}{2}$

(f) $3\frac{2}{5}\times 8=\frac{17}{5}\times 8=\frac{136}{5}=27\frac{1}{5}$

NS. 7

Find : (a) $\frac{1}{2}$ of (i) $2\frac{3}{4}$ (ii) $4\frac{2}{9}$

(b) $\frac{5}{8}$ of (i) $3\frac{5}{6}$ (ii) $9\frac{2}{3}$

Ans. (a) (i) $\frac{1}{2}\times 2\frac{3}{4}=\frac{1}{2}\times\frac{11}{4}=\frac{11}{8}=1\frac{3}{8}$

(ii) $\frac{1}{2}\times 4\frac{2}{9}=\frac{1}{2}\times\frac{38}{9}=\frac{19}{9}=2\frac{1}{9}$

(b) (i) $\frac{5}{8}\times 3\frac{5}{6}=\frac{5}{8}\times\frac{23}{6}=\frac{115}{48}=2\frac{19}{48}$

(ii) $\frac{5}{8}\times 9\frac{2}{3}=\frac{5}{8}\times\frac{29}{3}=\frac{145}{24}=6\frac{1}{24}$

NS. 8

Vidhya and Pratap went for a picnic. Their mother gave them a water bottle that contained 5 litres of water. Vidya consumed $\frac{2}{5}$ of the water.

Pratap consumed the remaining water.

(i) How much water did Vidya drink?

(ii) What fraction of the total quantity of water did Pratap drink?

Ans. **(i)** Water consumed by Vidya = $\frac{2}{5}$ of 5 litres

$=\frac{2}{5}\times 5=2$ litres.

(ii) Water consumed by Pratap $=1-\frac{2}{5}=\frac{3}{5}$ of the total water.

EXERCISE - 2.3

NS. 1

Find :

(i) $\frac{1}{4}$ of

(a) $\frac{1}{4}$ (b) $\frac{3}{5}$ (c) $\frac{4}{3}$

(ii) $\frac{1}{7}$ of

(a) $\frac{2}{9}$ (b) $\frac{6}{5}$ (c) $\frac{3}{10}$

Ans. (i) (a) $\frac{1}{4}\times\frac{1}{4}=\frac{1}{16}$ (b) $\frac{1}{4}\times\frac{3}{5}=\frac{3}{20}$

(c) $\frac{1}{4}\times\frac{4}{3}=\frac{1}{3}$

(ii) (a) $\frac{1}{7}\times\frac{2}{9}=\frac{2}{63}$ (b) $\frac{1}{7}\times\frac{6}{5}=\frac{6}{35}$

(c) $\frac{1}{7}\times\frac{3}{10}=\frac{3}{70}$

NS. 2

Multiply and reduce to lowest form (if possible):

(i) $\frac{2}{3}\times 2\frac{2}{3}$ **(ii)** $\frac{2}{7}\times\frac{7}{9}$ **(iii)** $\frac{3}{8}\times\frac{6}{4}$

(iv) $\frac{9}{5}\times\frac{3}{5}$ **(v)** $\frac{1}{3}\times\frac{15}{8}$ **(vi)** $\frac{11}{2}\times\frac{3}{10}$

(vii) $\frac{4}{5}\times\frac{12}{7}$

Ans. **(i)** $\frac{2}{3}\times 2\frac{2}{3}=\frac{2}{3}\times\frac{8}{3}=\frac{16}{9}=1\frac{7}{9}$

(ii) $\frac{2}{7}\times\frac{7}{9}=\frac{2}{9}$

(iii) $\frac{3}{8}\times\frac{6}{4}=\frac{9}{16}$

(iv) $\frac{9}{5}\times\frac{3}{5}=\frac{27}{25}=1\frac{2}{25}$

(v) $\frac{1}{3}\times\frac{15}{8}=\frac{5}{8}$

(vi) $\frac{11}{2}\times\frac{3}{10}=\frac{33}{20}=1\frac{13}{20}$

(vii) $\frac{4}{5}\times\frac{12}{7}=\frac{48}{35}=1\frac{13}{35}$

NS. 3

Multiply the following fractions:

(i) $\frac{2}{3}\times5\frac{1}{4}$ (ii) $6\frac{2}{5}\times\frac{7}{9}$ (iii) $\frac{3}{2}\times5\frac{1}{3}$

(iv) $\frac{5}{6}\times2\frac{3}{7}$ (v) $3\frac{2}{5}\times\frac{4}{7}$ (vi) $2\frac{3}{5}\times3$

(vii) $3\frac{4}{7}\times\frac{3}{5}$

Ans. (i) $\frac{2}{3}\times5\frac{1}{4}=\frac{2}{3}\times\frac{21}{4}=\frac{7}{2}=3\frac{1}{2}$

(ii) $6\frac{2}{5}\times\frac{7}{9}=\frac{32}{5}\times\frac{7}{9}=\frac{224}{45}=4\frac{44}{45}$

(iii) $\frac{3}{2}\times5\frac{1}{3}=\frac{3}{2}\times\frac{16}{3}=8$

(iv) $\frac{5}{6}\times2\frac{3}{7}=\frac{5}{6}\times\frac{17}{7}=\frac{85}{42}=2\frac{1}{42}$

(v) $3\frac{2}{5}\times\frac{4}{7}=\frac{17}{5}\times\frac{4}{7}=\frac{68}{35}=1\frac{33}{35}$

(vi) $2\frac{3}{5}\times3=\frac{13}{5}\times3=\frac{39}{5}=7\frac{4}{5}$

(vii) $3\frac{4}{7}\times\frac{3}{5}=\frac{25}{7}\times\frac{3}{7}=\frac{15}{7}=2\frac{1}{7}$

NS. 4

Which is greater :

(i) $\frac{2}{7}$ **of** $\frac{3}{4}$ **or** $\frac{3}{5}$ **of** $\frac{5}{8}$

(ii) $\frac{1}{2}$ **of** $\frac{6}{7}$ **or** $\frac{2}{3}$ **of** $\frac{3}{7}$

Ans. (i) $\frac{2}{7}\times\frac{3}{4}=\frac{3}{14};\frac{3}{5}\times\frac{5}{8}=\frac{3}{8}$

Converting these fractions into like fractions,

$\frac{3}{14}\times\frac{3\times4}{14\times4}=\frac{12}{56};\frac{3}{8}=\frac{3\times7}{8\times7}=\frac{21}{56}$

Since $\frac{21}{56}>\frac{12}{56}$, $\therefore\frac{3}{8}>\frac{3}{14}$

Thus, $\frac{3}{5}$ of $\frac{5}{8}$ is greater.

(ii) $\frac{1}{2}\times\frac{6}{7}=\frac{3}{7};\frac{2}{3}\times\frac{3}{7}=\frac{2}{7}$

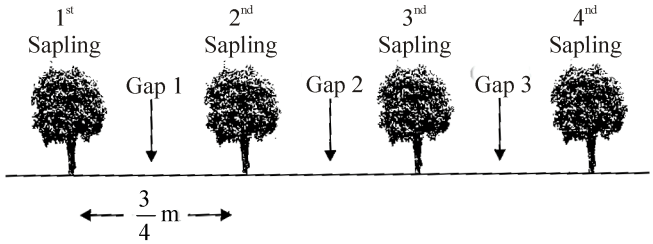
Since $3>2$. $\therefore\frac{3}{7}>\frac{2}{7}$

Thus $\frac{1}{2}$ of $\frac{6}{7}$ is greater.

NS. 5

Saili plants 4 saplings, in a row, her garden, The distance between two adjacent saplings is $\frac{3}{4}$ m. Find the distance between the first and the last sapling.

Ans.



From the figure, it can be observed that gap between 1st and last sapling = 3 × Length of 1 gap

Therefore, distance between first and last sapling

$=3\times\frac{3}{4}=\frac{9}{4}=2\frac{1}{4}$m

NS. 6

Sandeep reads a book for $1\frac{3}{4}$ hours everday. He reads the entire book in 6 days. How many hours in all were required by her to read the book?

Ans. Number of hours, Sandeep reads the book per day $= 1\frac{3}{4} = \frac{7}{4}$ hours

Number of day = 6

Total number of hours required by him to read the book $= \frac{7}{4} \times 6 = \frac{21}{2} = 10\frac{1}{2}$

NS. 7

A car runs 16 km using 1 litre of petrol. How much distance will it cover using $2\frac{3}{4}$ litres of petrol?

Ans. A car can run per litre of petrol = 16 km

Quantitiy of petrol $= 2\frac{3}{4}$ litres $= \frac{11}{4}$ litres

So, a car can run for $\frac{11}{4}$ litres of petrol $= \frac{11}{4} \times 16$

= 44 km

NS. 8

(a) (i) Provide the number in the box $\square$, such that $\frac{2}{3} \times \square = \frac{10}{30}$

(ii) The simplest form of the number obtained in $\square$ is _____.

(b) (i) Provide the number in the box $\square$, such that $\frac{3}{5} \times \square = \frac{24}{75}$

(ii) The simplets form of the number obtained in $\square$ is _____.

Ans. **(a)** (i) As $\frac{2}{3} \times \frac{5}{10} = \frac{10}{30}$, therefore, the number in the box $\square$ **is** $\frac{5}{10}$.

Hence, the simplest form of $\frac{5}{10}$ is $\frac{1}{2}$.

(b) (i) As $\frac{3}{5} \times \frac{8}{15} = \frac{24}{75}$, therefore, the number in the box $\square$ **is** $\frac{8}{15}$,

(ii) As $\frac{8}{15}$ cannot be further simplified, therefore, its simplest form is $\frac{8}{15}$.

EXERCISE - 2.4

NS. 1

Find :

(i) $12 \div \frac{3}{4}$ **(ii)** $14 \div \frac{5}{6}$ **(iii)** $8 \div \frac{7}{3}$

(iv) $4 \div \frac{8}{3}$ **(v)** $3 \div 2\frac{1}{3}$ **(vi)** $5 \div 3\frac{4}{7}$

Ans. **(i)** $12 \div \frac{3}{4} = 12 \times \frac{4}{3} = 16$

(ii) $14 \div \frac{5}{6} = 14 \times \frac{6}{5} = \frac{84}{5}$

(iii) $8 \div \frac{7}{3} = 8 \times \frac{3}{7} = \frac{24}{7}$

(iv) $4 \div \frac{8}{3} = 4 \times \frac{3}{8} = \frac{3}{2}$

(v) $3 \div 2\frac{1}{3} = 3 \div \frac{7}{3} = 3 \times \frac{3}{7} = \frac{9}{7}$

(vi) $5 \div 3\frac{4}{7} = 5 \div \frac{25}{7} = 5 \times \frac{7}{25} = \frac{7}{5}$

NS. 2

Find the reciprocal of each of the following fractions. Classify the reciprocals as proper fractions, improper fractions and whole numbers.

(i) $\frac{3}{7}$ (ii) $\frac{5}{8}$ (iii) $\frac{9}{7}$

(iv) $\frac{6}{5}$ (v) $\frac{12}{7}$ (vi) $\frac{1}{8}$

(vii) $\frac{1}{11}$

Ans. (i) $\frac{3}{7}$; Reciprocal = $\frac{7}{3}$. It is an improper fraction.

(ii) $\frac{5}{8}$; Reciprocal = $\frac{8}{5}$. It is an improper fraction.

(iii) $\frac{9}{7}$; Reciprocal = $\frac{7}{9}$. It is a proper fraction.

(iv) $\frac{6}{5}$; Reciprocal = $\frac{5}{6}$. It is a proper fraction.

(v) $\frac{12}{7}$; Reciprocal = $\frac{7}{12}$. It is a proper fraction.

(vi) $\frac{1}{8}$ Reciprocal = $\frac{8}{1}$. It is a whole number.

(vii) $\frac{1}{11}$; Reciprocal = $\frac{11}{1}$. It is a whole fraction.

NS. 3

Find :

(i) $\frac{7}{3}\div 2$ (ii) $\frac{4}{9}\div 5$ (iii) $\frac{6}{13}\div 7$

(iv) $4\frac{1}{3}\div 3$ (v) $3\frac{1}{2}\div 4$ (vi) $4\frac{3}{7}\div 7$

Ans. (i) $\frac{7}{3}\div 2=\frac{7}{3}\times\frac{1}{2}=\frac{7}{6}$

(ii) $\frac{4}{9}\div 5=\frac{4}{9}\times\frac{1}{5}=\frac{4}{45}$

(iii) $\frac{6}{13}\div 7=\frac{6}{13}\times\frac{1}{7}=\frac{6}{91}$

(iv) $4\frac{1}{3}\div 3=\frac{13}{3}\div 3=\frac{13}{3}\times\frac{1}{3}=\frac{13}{9}$

(v) $3\frac{1}{2}\div 4=\frac{7}{2}\div 4=\frac{7}{2}\times\frac{1}{4}=\frac{7}{8}$

(vi) $4\frac{3}{7}\div 7=\frac{31}{7}\times\frac{1}{7}=\frac{31}{49}$

NS. 4

Find :

(i) $\frac{2}{5}\div\frac{1}{2}$ (ii) $\frac{4}{9}\div\frac{2}{3}$ (iii) $\frac{3}{7}\div\frac{8}{7}$

(iv) $2\frac{1}{3}\div\frac{3}{5}$ (v) $3\frac{1}{2}\div\frac{8}{3}$ (vi) $\frac{2}{5}\div 1\frac{1}{2}$

(vii) $3\frac{1}{5}\div 1\frac{2}{3}$ (viii) $2\frac{1}{5}\div 1\frac{1}{5}$

Ans. (i) $\frac{2}{5}\div\frac{1}{2}=\frac{2}{5}\times 2=\frac{4}{5}$ (ii) $\frac{4}{9}\div\frac{2}{3}=\frac{4}{9}\times\frac{3}{2}=\frac{2}{3}$

(iii) $\frac{3}{7}\div\frac{8}{7}=\frac{3}{7}\times\frac{7}{8}=\frac{3}{8}$

(iv) $2\frac{1}{3}\div\frac{3}{5}=\frac{7}{3}\div\frac{3}{5}=\frac{7}{3}\times\frac{5}{3}=\frac{35}{9}$

(v) $3\frac{1}{2}\div\frac{8}{3}=\frac{7}{2}\div\frac{8}{3}=\frac{7}{2}\times\frac{3}{8}=\frac{21}{16}$

(vi) $\frac{2}{5}\div 1\frac{1}{2}=\frac{2}{5}\div\frac{3}{2}=\frac{2}{5}\times\frac{2}{3}=\frac{4}{15}$

(vii) $3\frac{1}{5}\div 1\frac{2}{3}=\frac{16}{5}\div\frac{5}{3}=\frac{16}{5}\times\frac{3}{5}=\frac{48}{25}$

(viii) $2\frac{1}{5}\div 1\frac{1}{5}=\frac{11}{5}\div\frac{6}{5}=\frac{11}{5}\times\frac{5}{6}=\frac{11}{6}$

EXERCISE - 2.5

NS. 1

Which is greater?

(i) 0.5 or 0.05 **(ii) 0.7 or 0.5**

(iii) 7 or 0.7 **(iv) 1.37 or 1.49**

(v) 2.03 or 2.30 **(vi) 0.8 or 0.88**

Ans. **(i)** 0.5 or 0.05

Converting these decimal numbers into equivalenrt fractions :

$$0.5 = \frac{5}{10} = \frac{5\times10}{10\times10} = \frac{50}{100} \text{ and } 0.05 = \frac{5}{100}$$

As $50 > 5 \Rightarrow 0.5 > 0.05$

(ii) 0.7 or 0.5

Converting these decimal numbers into equivalent fractions :

$$0.7 = \frac{7}{10} \text{ and } 0.5 = \frac{5}{10}$$

As $7 > 5 \Rightarrow 0.7 > 0.5$

(iii) 7 or 0.7

Converting these decimal numbers into equivalent fraction :

$$7 = \frac{7}{1} = \frac{7\times10}{1\times10} = \frac{70}{10} \text{ and } 0.7 = \frac{7}{10}$$

As $70 > 7 \Rightarrow 7 > 0.7$

(iv) 1.37 or 1.49

Converting these decimal numbers into equivalent fractions :

$$1.37 = \frac{137}{100} \text{ and } 1.49 = \frac{149}{100}$$

As $137 < 149 \Rightarrow 1.37 < 1.49$

(v) 2.03 or 2.30

Converting these decimal numbers into equivalent fractions :

$$2.03 = \frac{203}{100} \text{ and } 2.30 = \frac{230}{100}$$

As $230 > 203 \Rightarrow 2.30 > 2.03$

(vi) 0.8 or 0.88

Converting these decimal numbers into equivalent fractions :

$$0.8 = \frac{8}{10} = \frac{8\times10}{10\times10} = \frac{80}{100} \text{ and } 0.88 = \frac{88}{100}$$

As $80 < 88 \Rightarrow 0.8 < 0.88$

NS. 2

Express as rupees using decimals :

(i) 7 paise

(ii) 7 rupees 7 paise

(iii) 77 rupees 77 paise

(iv) 50 paise

(v) 235 paise

Ans. There are 100 paise in 1 rupee. Therefore, if we went to convert paise into rupees, we have to divide paise by 100.

(i) 7 paise = ₹ $\frac{7}{100}$ = ₹ 0.07

(ii) 7 rupees 7 paise = ₹ 7 + ₹ $\frac{7}{100}$ = ₹ 7.07

(iii) 77 rupees 77 paise = ₹ 77 + ₹ $\frac{77}{100}$ = ₹ 77.77

(iv) 50 paise = ₹ $\frac{50}{100}$ = ₹ 0.50

(v) 235 paise = ₹ $\frac{235}{100}$ = ₹ 2.35

NS. 3

(i) Express 5 cm in metre and kilometre,

(ii) Express 35 mm in cm, m and km.

Ans. **(i)** 5 cm; $5 \text{ cm} = \frac{5}{100} \text{ m} = 0.05 \text{ m}$;

$5 \text{ cm} = \frac{5}{100000} \text{km} = 0.00005 \text{ km}$

(ii) 35 mm; $35 \text{ mm} = \frac{35}{10} \text{cm} = 3.5 \text{ cm}$

$35 \text{ mm} = \frac{35}{1000} \text{m} = 0.035 \text{ m}$;

$35 \text{ mm} = \frac{35}{1000000} \text{km} = 0.000035 \text{ km}$

NS. 4

Express in kg :

(i) 200 g **(ii) 3470 g** **(iii) 4 kg 8 g**

Ans. **(i)** $200 \text{ g} = \frac{200}{1000} \text{kg} = 0.2 \text{ kg}$

(ii) $3470 \text{ g} = \frac{3470}{1000} \text{kg} = 3.470 \text{ kg}$

(iii) $4 \text{ kg } 8 \text{ g} = 4 \text{ kg} + \frac{8}{1000} \text{kg} = 4.008 \text{ kg}$

NS. 5

Write the following decimal numbers in the expanded form :

(i) 20.03 **(ii) 2.03** **(iii) 200.03**

(iv) 2.034

Ans. **(i)** $20.03 = 2 \times 10 + 0 \times 1 + 0 \times \frac{1}{10} + 3 \times \frac{1}{100}$

(ii) $2.03 = 2 \times 1 + 0 \times \frac{1}{10} + 3 \times \frac{1}{100}$

(iii) $200.03 = 2 \times 100 + 0 \times 10 + 0 \times 1 + 0 \times \frac{1}{10} + 3 \times \frac{1}{100}$

(iv) $2.034 = 2 \times 1 + 0 \times \frac{1}{10} + 3 \times \frac{1}{100} + 4 \times \frac{1}{1000}$

NS. 6

Write the place value of 2 in the following decimal numbers:

(i) 2.56

(ii) 21.37

(iii) 10.25

(iv) 9.42

(v) 63.352

Ans. **(i)** 2.56; Ones

(ii) 21.37; Tens

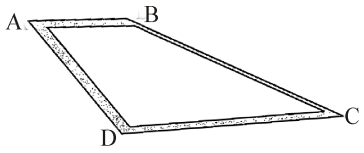
(iii) 10.25; Tenth

(iv) 9.42; Hundredth

(v) 63.352; Thousandth

NS. 7

Dinesh went from place A to place B and from there to place C. A is 7.5 km from B and B is 12.7 km from C. Ayub went from place A to place D and from there to place C. D is 9.3 km from A and C is 11.8 km from D.Who travelled more and by how much?



Ans. Distance travelled by Dinesh = AB + BC

= (7.5 + 12.7) km = 20.2 km.

Distance travelled by Ayub = AD + DC

= (9.3 + 11.8) km = 21.1 km.

Difference = (21.1 – 20.2) km = 0.9 km

Hence, Ayub travelled 0.9 km more than Dinesh.

NS. 8

Shyama bought 5 kg 300 g apples and 3 kg 250 g mangoes. Sarala bought 4 kg 800 g oranges and 4 kg 150 g bananas. Who bought more fruits ?

Ans. Total fruits bought by Shyama

= 5 kg 300 g + 3 kg 250 g = 8 kg 550 g

$= \left(8 + \frac{550}{1000}\right)$ kg = 8.550 kg

Total fruits bought by Sarala

= 4 kg 800 g + 4 kg 150 g = 8 kg 950 g

$= \left(8 + \frac{950}{1000}\right)$ kg = 8.950 kg

Hence, Sarala bought more fruits.

NS. 9

How much less is 28 km than 42.6 km ?

Ans. 42.6 – 28.0 = 14.6 km

Hence, 28 km is 14.6 km less than 42.6 km.

EXERCISE - 2.6

NS. 1

Find :

(i) 0.2 × 6 **(ii) 8 × 4.6**

(iii) 2.71 × 5 **(iv) 20.1 × 4**

(v) 0.05 × 7 **(vi) 211.02 × 4**

(vii) 2 × 0.86

Ans. **(i)** $0.2 \times 6 = \frac{2}{10} \times 6 = \frac{12}{10} = 1.2$

(ii) $8 \times 4.6 = 8 \times \frac{46}{10} = \frac{368}{10} = 36.8$

(iii) $2.71 \times 5 = \frac{271}{100} \times 5 = \frac{1355}{100} = 13.55$

(iv) $20.1 \times 4 = \frac{201}{10} \times 4 = \frac{804}{10} = 80.4$

(v) $0.05 \times 7 = \frac{5}{100} \times 7 = \frac{35}{100} = 0.35$

(vi) $211.02 \times 4 = \frac{21102}{100} \times 4 = \frac{84408}{100} = 844.08$

(vii) $2 \times 0.86 = 2 \times \frac{86}{100} = \frac{172}{100} = 1.72$

NS. 2

Find the area of rectangle whose length is 5.7 cm and breadth is 3 cm.

Ans. Length = 5.7 cm and Breadth = 3 cm

Area = Length × Breadth = 5.7 × 3 = 17.1 cm^2

NS. 3

Find :

(i) 1.3 × 10 **(ii) 36.8 × 10**

(iii) 153.7 × 10 **(iv) 168.07 × 10**

(v) 31.1 × 100 **(vi) 156.1 × 100**

(vii) 3.62 × 100 **(viii) 43.07 × 100**

(ix) 0.5 × 10 **(x) 0.08 × 10**

(xi) 0.9 × 100 **(xii) 0.03 × 1000**

Ans. We know that when a decimal number is multiplied by 10, 100, 1000, the decimal point in the product is shifted to the right by as many places as there are zeroes. Therefore, these products can be calculated as

(i) 1.3 × 10 = 13

(ii) 36.8 × 10 = 368

(iii) 153.7 × 10 = 1537

(iv) 168.07 × 10 = 1680.7

(v) 31.1 × 100 = 3110

(vi) 156.1 × 100 = 15610

(vii) 3.62 × 100 = 362

(viii) 43.07 × 100 = 4307

(ix) $0.5 \times 10 = 5$

(x) $0.08 \times 10 = 0.8$

(xi) $0.9 \times 100 = 90$

(xii) $0.03 \times 1000 = 30$

NS. 4

A two- wheeler covers a distance of 55.3 km in one litre of petrol. How much distance will its cover in 10 litres of petrol?

Ans. Distance covered in 1 litre of petrol = 55.3 km

Distance covered in 10 litres of petrol = 10×55.3 = 553 km

NS. 5

Find :

(i) 2.5×0.3 **(ii) 0.1×51.7**

(iii) 0.2×316.8 **(iv) 1.3×3.1**

(v) 0.5×0.05 **(vi) 11.2×0.15**

(vii) 1.07×0.02 **(viii) 10.05×1.05**

(ix) 101. 01 × 0.01 **(x) 100.01 × 1.1**

Ans. **(i)** $2.5 \times 0.3 = \frac{25}{10} \times \frac{3}{10} = \frac{75}{100} = 0.75$

(ii) $0.1 \times = 51.7 = \frac{1}{10} \times \frac{517}{10} = \frac{517}{100} = 5.17$

(iii) $0.2 \times 316.8 = \frac{2}{10} \times \frac{3168}{10} = \frac{6336}{100} = 63.36$

(iv) $1.3 \times 3.1 = \frac{13}{10} \times \frac{31}{10} = \frac{403}{100} = 4.03$

(v) $0.5 \times 0.05 = \frac{5}{10} \times \frac{5}{100} = \frac{25}{1000} = 0.025$

(vi) $11.2 \times 0.15 = \frac{112}{10} \times \frac{15}{100} = \frac{1680}{1000} = 1.68$

(vii) $1.07 \times 0.02 = \frac{107}{100} \times \frac{2}{100} = \frac{214}{10000} = 0.0214$

(viii) $10.05 \times 1.05 = \frac{1005}{100} \times \frac{105}{100} = \frac{105525}{10000}$

$= 10.5525$

(ix) $101.01 \times 0.01 =$

$\frac{10101}{100} \times \frac{1}{100} = \frac{10101}{10000} = 1.0101$

(x) $100.01 \times 1.1 = \frac{10001}{100} \times \frac{11}{10} = \frac{1100011}{1000}$

$= 1100.011$

EXERCISE - 2.7

NS. 1

Find :

(i) $0.4 \div 2$ **(ii) $0.35 \div 5$**

(iii) $2.48 \div 4$ **(iv) $65.4 \div 6$**

(v) $651.2 \div 4$ **(vi) $14.49 \div 7$**

(vii) $3.96 \div 4$ **(viii) $0.80 \div 5$**

Ans. **(i)** $0.4 \div 2 = \frac{4}{10} \div 2 = \frac{4}{10} \times \frac{1}{2} = \frac{2}{10} = 0.2$

(ii) $0.35 \div 5 = \frac{35}{100} \div 5 = \frac{35}{100} \times \frac{1}{5} = \frac{7}{100} = 0.07$

(iii) $2.48 \div 4 = \frac{248}{100} \div 4 = \frac{248}{100} \times \frac{1}{4} = \frac{62}{100} = 0.62$

(iv) $65.4 \div 6 = \frac{654}{10} \div 6 = \frac{654}{10} \times \frac{1}{6} = \frac{109}{10} = 10.9$

(v) $651.2 \div 4 = \frac{6512}{10} \div 4 = \frac{6512}{10} \times \frac{1}{4}$

$= \frac{1628}{10} = 162.8$

(vi) $14.49 \div 7 = \frac{1449}{100} \div 7 = \frac{1449}{100} \times \frac{1}{7} = \frac{207}{100} = 2.07$

(vii) $3.96 \div 4 = \frac{396}{100} \div 4 = \frac{396}{100} \times \frac{1}{4} = \frac{99}{100} = 0.99$

(viii) $0.80 \div 5 = \frac{80}{100} \div 5 = \frac{80}{100} \times \frac{1}{5} = \frac{16}{100} = 0.16$

NS. 2

Find :

(i) 4.8 ÷ 10 **(ii) 52.5 ÷ 10**

(iii) 0.7 ÷ 10 **(iv)** 33.1 ÷ 10

(v) 272.23 ÷ 10 **(vi) 0.56 ÷ 10**

(vii) 3.97 ÷ 10

Ans. We know that when a decimal number is divided by a multiple of 10(i.e., 10, 100 , 1000, etc.), the decimal point will be shifted to the left by as many places as there are zeroes.

(i) 4.8 ÷ 10 = 0.48

(ii) 52.5 ÷ 10 = 5.25

(iii) 0.7 ÷ 10 = 0.07

(iv) 33.1 ÷ 10 = 3.31

(v) 272.23 ÷ 10 = 27.223

(vi) 0.56 ÷ 10 = 0.056

(vii) 3.97 ÷ 10 = 0.397

NS. 3

Find :

(i) 2.7 ÷ 100 **(ii) 0.3 ÷ 100**

(iii) 0.78 ÷ 100 **(iv) 432.6 ÷ 100**

(v) 23.6 ÷ 100 **(vi) 98.53 ÷ 100**

Ans. We know that when a decimal number is divided by a multiple of 10(i.e., 10, 100, 1000, etc.), the decimal point will be shifted to the left by as many places as there are zeroes.

(i) 2.7 ÷ 100 = 0.027

(ii) 0.3 ÷ 100 = 0.003

(iii) 0.78 ÷ 100 = 0.0078

(iv) 432.6 ÷ 100 = 4.326

(v) 23.6 ÷ 100 = 0.236

(vi) 98.53 ÷ 100 = 0.9853

NS. 4

Find :

(i) 7.9 ÷ 1000 **(ii) 26.3 ÷ 1000**

(iii) 38.53 ÷ 1000 **(iv) 128.9 ÷ 1000**

(v) 0.5 ÷ 1000

Ans. We know that when a decimal number is divided by a multiple of 10(i.e., 10, 100, 1000, etc.), the decimal point will be shifted to the left by as many places as there are zeroes.

(i) 7.9 ÷ 1000 = 0.0079

(ii) 26.3 ÷ 1000 = 0.0263

(iii) 38.53 ÷ 1000 = 0.03853

(iv) 128.9 ÷ 1000 = 0.1289

(v) 0.5 ÷ 1000 = 0.0005

NS. 5

Find :

(i) 7 ÷ 3.5 **(ii) 36 ÷ 0.2**

(iii) 3.25 ÷ 0.5 **(iv) 30.94 ÷ 0.7**

(v) 0.5 ÷ 0.25 **(vi) 7.75 ÷ 0.25**

(vii) 76.5 ÷ 0.15 **(viii) 37.8 ÷ 1.4**

(ix) 2.73 ÷ 1.3

Ans. **(i)** $7 \div 3.5 = 7 \div \frac{35}{10} = 7 \times \frac{10}{35} = 2$

(ii) $36 \div 0.2 = 36 \div \frac{2}{10} = 36 \times \frac{10}{2} = 180$

(iii) $3.25 \div 0.5 = \frac{325}{100} \div \frac{5}{10} = \frac{325}{100} \times \frac{10}{5} = \frac{65}{10} = 6.5$

(iv) $30.94 \div 0.7 = \frac{3094}{100} \div \frac{7}{10} = \frac{3094}{100} \times \frac{10}{7}$

$= \frac{442}{10} = 44.2$

(v) $0.5 \div 0.25 = \frac{5}{10} \div \frac{25}{100} = \frac{5}{10} \times \frac{100}{25} = 2$

(vi) $7.75 \div 0.25 = \frac{775}{100} \div \frac{25}{100} = \frac{775}{100} \times \frac{100}{25} = 31$

(vii) $76.5 \div 0.15 = \frac{765}{10} \div \frac{15}{100} = \frac{765}{10} \times \frac{100}{15} = 510$

(viii) $37.8 \div 1.4 = \frac{378}{10} \div \frac{14}{10} = \frac{378}{10} \times \frac{10}{14} = 27$

(ix) $2.73 \div 1.3 = \frac{273}{100} \div \frac{13}{10} = \frac{273}{100} \times \frac{10}{13} = 2.1$

NS. 6

A vehicle covers a distance of 43.2 km in 2.4 litres of petrol. How much distance will it cover in one litre of petrol ?

Ans. Distance covered in 2.4 litres of petrol = 43.2 km

$\therefore$ Distance covered in 1 litre of petrol

$= 43.2 \div 2.4 = \frac{432}{100} \div \frac{24}{10} = \frac{432}{10} \times \frac{10}{24} = 18$ km

Space for Notes :

EXERCISE – I

ONLY ONE CORRECT TYPE

1. Which among the following is mixed as well as proper fraction.

(A) $2\frac{3}{4}$

(B) $\frac{12}{35}$

(C) Does not exist

(D) None of these

2. If $\frac{5}{10}=\frac{m-2}{30}$, then the value of m is :

(A) 15 (B) 17

(C) 20 (D) 7

3. If $\frac{10}{x}+\frac{6}{x}+\frac{8}{x}=2$, then the value of x is :

(A) 16 (B) 12

(C) 6 (D) 3

4. The result obtained after subtracting the sum of $9\frac{3}{4}$ and $5\frac{5}{6}$ from the sum of $11\frac{2}{5}$ and $7\frac{1}{3}$ is :

(A) $4\frac{3}{20}$ (B) $3\frac{3}{20}$

(C) $3\frac{5}{20}$ (D) $3\frac{7}{20}$

5. If $\frac{4}{7}+\frac{2}{7}=\frac{y}{21}$, then the value of y is :

(A) 18 (B) 6

(C) 20 (D) 2

6. If $2\frac{1}{2}+3\frac{1}{2}+4\frac{1}{2}=x$, then $x-5\frac{1}{2}=$

(A) 6 (B) 5

(C) 4 (D) 8

7. $\left(\frac{1}{4}\text{ of }2\frac{2}{7}\right)$ when multiplied by $6\frac{3}{10}\times2\frac{1}{7}\times\frac{35}{9}$ gives x, and $y=\frac{5}{6}$, then $\frac{x}{y}$ is :

(A) $2^2\times3^2$

(B) $2^3\times3^2$

(C) $2^2\times3^3$

(D) 2×3^4

8. If $1+1\div\left\{1+1\div\left(1+\frac{1}{3}\right)\right\}$ is simplified, then the answer is :

(A) $1\frac{2}{7}$ (B) $1\frac{3}{4}$

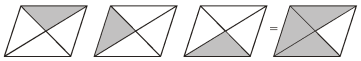
(C) $1\frac{4}{7}$ (D) $1\frac{5}{7}$

9. If $\frac{c}{d}=1\div\frac{3}{4}$, then $\frac{5}{6}+\frac{c}{d}$ is :

(A) $\frac{13}{3}$ (B) $\frac{13}{2}$

(C) $\frac{13}{6}$ (D) $\frac{13}{4}$

10. The figure



represents :

(A) $3\times\frac{2}{3}=2$ (B) $4\times\frac{1}{3}=\frac{4}{3}$

(C) $3\times\frac{1}{4}=\frac{3}{4}$ (D) $3\times\frac{5}{12}=1\frac{1}{4}$

11. Evaluate the expression

$6\frac{1}{4}\times0.25+0.75-0.3125$.

(A) 5.9675 (B) 4.2968

(C) 2.1250 (D) 0.0306

12. The value of $\left(1+\frac{1}{1\times 2}+\frac{1}{1\times 2\times 4}\right)$ up to 3 places of decimal is :

(A) 1.641 (B) 1.293

(C) 0.641 (D) 1.625

13. The expression of $\frac{1}{15}+\left(\frac{4}{15}+\frac{1}{3}\right)$ is equivalent to

(A) $\frac{1}{9}$ (B) 9

(C) $\frac{1}{5}$ (D) $\frac{2}{3}$

14. $0.4 \times 0.4 \times 0.4$ is equal to

(A) 6.4 (B) 0.64

(C) 0.064 (D) 0.0064

15. The cost of 7.5 kg of rice is ₹ 262.5. Find the cost of 1 kg of rice.

(A) 35 (B) 30

(C) 36.5 (D) 23

16. Simplify : $2\frac{2}{17}\times 7\frac{2}{9}\times 1\frac{33}{52}$

(A) 62 (B) 25

(C) 33 (D) 27

17. $\frac{2}{8}$ of day = _____ hours.

(A) 3 (B) 5

(C) 6 (D) 7

18. Which of the following fractions have numerator 5.

(A) $\frac{2}{5}$ (B) $\frac{5}{7}$

(C) $1\frac{5}{7}$ (D) $7\frac{1}{5}$

19. Which part contains the fraction in ascending order ?

(A) $\frac{16}{19},\frac{19}{21},\frac{11}{14}$ (B) $\frac{11}{14},\frac{19}{21},\frac{16}{19}$

(C) Both (D) None of these

20. Solve : $0.64 \times 0.64 + 0.64 \times 0.72 + 0.36 \times 0.36$.

(A) 1 (B) 0.8962

(C) 0.9682 (D) 0.5392

21. Value of $\frac{25.75}{100}$ = _____.

(A) 0.2575 (B) 257.5

(C) 2.575 (D) None of these

22. $2.2 \times 0.2 \times 0.001$ Is _____.

(A) 0.00044 (B) 4.4

(C) 4.2 (D) None of these

23. The result of adding the difference of 3.003 and 2.05 to their sum is _____.

(A) 60.06 (B) 600.6

(C) 6.006 (D) 0.6060

24. Find the average of :

0.3, 3, 0.03 and 0.002.

(A) 83.3 (B) 833

(C) 0.803 (D) 0.833

25. Value of $\frac{1.8}{0.4\times 0.3}$

(A) $\frac{0.3}{0.2}$ (B) $\frac{0.4}{0.2}$

(C) $\frac{6}{0.3}$ (D) None of these

PARAGRAPH TYPE

PARAGRAPH # 1

For addition and subtraction of like fractions, the numerators are added and the denominator remains the same. For adding or subtracting unlike fractions, change them into equivalent like fractions and then add or subtract.

26. Find the sum $3\frac{4}{5}+2\frac{3}{10}+1\frac{1}{15}$

(A) $\frac{42}{9}$ (B) $8\frac{1}{3}$

(C) $1\frac{1}{3}$ (D) $7\frac{1}{6}$

27. Simplify : $8\frac{5}{6}-3\frac{3}{8}+1\frac{7}{12}$

(A) $7\frac{1}{24}$ (B) $8\frac{1}{9}$

(C) $6\frac{8}{11}$ (D) $4\frac{1}{53}$

28. The cost of a pen is ₹ $16\frac{3}{5}$ and that of a pencil is ₹ $4\frac{3}{4}$. Which costs more and by how much?

(A) pen, ₹ $\frac{81}{4}$ (B) pencil, ₹ $7\frac{3}{9}$

(C) pen, ₹ $11\frac{17}{20}$ (D) pencil, ₹ $6\frac{1}{9}$

PARAGRAPH # 2

Product of two fractions $\frac{a}{b}$ and $\frac{c}{d}$ = $\frac{a}{b}\times\frac{c}{d}=\frac{a\times c}{b\times d}$

Division of two fractions $\frac{a}{b}\times\frac{c}{d}=\frac{a}{b}\div\frac{c}{d}=\frac{a}{b}\times\frac{d}{c}$

29. Find $\frac{7}{8}$ of a day.

(A) 20 hours (B) 21 hours

(C) $\frac{7}{8}$ hours (D) 1 hour

30. Sapna earns ₹ 12000 per month. She spends $\frac{7}{8}$ of her income and deposits rest of the money in a bank. How much money does she deposit in the bank each month.

(A) ₹ 10,500 (B) ₹ 11,000

(C) ₹ 1500 (D) ₹ 5000

31. At a charity show, the price of each ticket was ₹ $10\frac{1}{2}$. The total amount collected by a boy was ₹ $283\frac{1}{2}$. How many tickets were sold by him?

(A) 21 (B) 27

(C) 4 (D) 19

MATCH THE COLUMN TYPE

32. Simplify and match the following :

Column I	Column II
(P) $4\frac{3}{10}-1\frac{2}{5}+8\frac{1}{9}$	(i) 6.83
(Q) $0.25+9.81\times6.4+4\frac{1}{9}$	(ii) – 90.31
(R) $6\frac{1}{3}-4\frac{7}{9}\times0.8+4.32$	(iii) 67.145
(S) $2\frac{7}{12}+\frac{5}{9}-0.9345\times100$	(iv) 11.01

(A) (P) → (i), (Q) → (ii), (R) → (iii), (S) → (iv)

(B) (P) → (iii), (Q) → (i), (R) → (iv), (S) → (ii)

(C) (P) → (ii), (Q) → (iii), (R) → (iv), (S) → (i)

(D) (P) → (iv), (Q) → (iii), (R) → (i), (S) → (ii)

33. | **Column-I** | **Column-II**

(P) Suman studies for $5\frac{2}{3}$ hrs daily. She devotes $2\frac{4}{5}$ hrs of her time for Science and Maths. The time she devotes for other subjects (in hours) is — (i) 775

(Q) A piece of wire is of length $12\frac{3}{4}$ m. If it is cut into two pieces in such a way that the length of one piece is $5\frac{1}{4}$ then the length of the other piece (in metres) is — (ii) $2\frac{13}{15}$

(R) The area of rectangular part which is $41\frac{2}{3}$ m long and $18\frac{3}{5}$ m broad (in m^2) is — (iii) 64

(S) The cost of $6\frac{1}{4}$ kg of apples is ₹ 400. At what rate per kg (in ₹) are the apples being sold? — (iv) $7\frac{1}{2}$

(A) (P) → (i), (Q) → (ii), (R) → (iii), (S) → (iv)

(B) (P) → (iii), (Q) → (i), (R) → (iv), (S) → (ii)

(C) (P) → (iii), (Q) → (iv), (R) → (i), (S) → (ii)

(D) (P) → (ii), (Q) → (iv), (R) → (i), (S) → (iii)

Space for Notes :

EXERCISE – II

VERY SHORT ANSWER TYPE

1. Simplify : $3\frac{1}{5}+2\frac{1}{10}-1\frac{1}{2}-\frac{1}{4}$
2. Sameera purchased 3.5 kg apples and 4.75 kg oranges. What is the total weight of fruits purchased by her?
3. If cost of 7 kg of rice is ₹ 140.70, then what is the cost of 1 kg rice?
4. Simplify : $\frac{14}{25}\times\frac{35}{51}\times\frac{34}{49}$
5. The side of an equilateral triangle is 3.5 cm. Find its perimeter.
6. A carton contains 16 boxes of nails and each box weights 4.75 kg. How much would a carton of nails weigh?
7. A book consists of 216 pages . During last week Vikas read $\frac{3}{4}$ of the book. How many pages did he read?
8. Divide the sum of $3\frac{1}{4}$ and 3 by $2\frac{3}{5}$.
9. Find reciprocal of :

   (i) 5 (ii) $\frac{1}{3}$

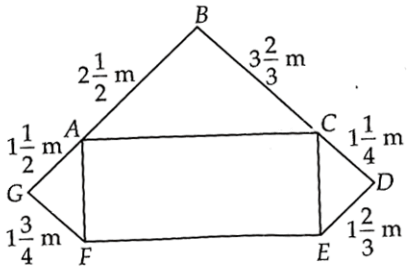
   (iii) $\frac{7}{9}$ (iv) $4\frac{1}{5}$
10. Find the average of 4.2, 3.8 and 7.6.

SHORT ANSWER TYPE

1. The sum of two numbers is $13\frac{1}{4}$. If one number is $5\frac{3}{4}$, find the other.
2. Product of two decimals is 13.25. If one of them is 5.75, find the other decimal.
3. Renu spends $\frac{4}{5}$ of ther income on household expenses. Her monthly income is ₹ 15000. How much does she saves every month?
4. Divide 36 by $6\frac{2}{3}$ and subtract the quotient from $7\frac{3}{5}$.
5. Tom studies for $5\frac{1}{4}$ hours daily. He devotes $2\frac{3}{4}$ hours of his time for English and Mathematics . How much time does he devote for other subjects?

LONG ANSWER TYPE

1. The perimeter of the given figure is 18 m and the area of rectangular part ACEF is $8\frac{1}{2}$ m^2. Find the length and breadth of the rectangular part.



2. A social service group buys 43.7 kg of rice at ₹ 12 per kg and distributes it equally amongst 152 poor people. What is the cost of the quantity of rice that each person gets?
3. A grocer buys 5.5 kg of sugar at ₹ 14.38 per kg. He then mixes all the sugar and repacks it in 250 g packets. How many packets of sugar does the grocer have and what is the price of each packet ?

4. Find the reciprocal of the sum of $1\frac{7}{9}$ and $1\frac{9}{7}$.

5. A mat is divided into 9 colourful blocks. if $\frac{1}{3}$ of the mat is red in colour, $\frac{1}{3}$ of the mat is blue and $\frac{1}{3}$ of the mat is yellow, find the number of blocks of each colour.

TRUE / FALSE TYPE

1. Reciprocal of an improper fraction is an improper fraction.
2. $2\frac{2}{5} \div 2\frac{1}{5} = 2$
3. $0.04 \div 0.2 = 0.2$
4. $0.2 \times 0.3 = 0.6$
5. $16\frac{3}{4} \times 6\frac{2}{5} = 107\frac{3}{10}$

FILL IN THE BLANKS

1. $93.5 \times 100 =$ _____.
2. $4.7 \div 1000 =$ _____.
3. The lowest form of the product $2\frac{3}{7} \times \frac{7}{9}$ is _____.
4. $\frac{4}{5}$ of 45 is _____.
5. $2.001 \div 0.003 =$ _____.

NUMERICAL PROBLEMS

1. Michael purchased a notebook for ₹ 23.75, a pencil for ₹ 3.75 and a pen for ₹15.90. He gave a 50 rupee note to the shopkeeper. The amount he got back is ₹ _____,
2. The value of $\frac{3}{4} \div \frac{5}{36}$ is
3. By what number should $2\frac{3}{5}$ be multiplied to get $5\frac{1}{5}$
4. The value of $2.08 \div (0.26)$ is
5. The value of $1.02 + 0.17$ is

Answer Key

EXERCISE–I														
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
C	B	B	B	A	B	A	C	C	C	C	D	D	C	A
16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
B	C	B	B	A	A	A	C	D	D	D	A	C	B	C
31	32	33												
B	D	D												

EXERCISE II

VERY SHORT ANSWER TYPE

1. $3\frac{11}{20}$ **2.** 8.25 kg **3.** Rs. 20.10 **4.** $\frac{4}{15}$ **5.** 10.5 cm **6.** 76 kg

7. 162 **8.** $\frac{125}{52}$ **9.**(i) $\frac{1}{5}$ (ii) 3 (iii) $1\frac{2}{7}$ (iv) $\frac{5}{21}$ **10.** 5.2

SHORT ANSWER TYPE

1. $7\frac{1}{2}$ 2. 2.304 3. Rs. 3000 4. $2\frac{1}{5}$ 5. $2\frac{1}{2}$ hours

LONG ANSWER TYPE

1. $1\frac{1}{2}$ m 2. Rs. 3.45 3. Rs. 3.595 4. $\frac{63}{256}$ 5. 3

TRUE/ FALSE

1. F 2. F 3. T 4. F 5. F

FILL IN THE BLANKS

1. 9350 2. 0.0047 3. $\frac{17}{9}$ 4. 36

5. 667

INTEGER ANSWER TYPE

2. 6.60 3. 5.4 4. 2 5. 8 6. 1.19

SELF PROGRESS ASSESSMENT FRAMEWORK

(CHAPTER : FRACTIONS AND DECIMALS)

CONTENT	STATUS	DATE OF COMPLETION	SELF SIGNATURE
Theory			
In-Text Examples			
Solved Examples			
NCERT Exercises			
Exercise I			
Exercise II			
Short Note-1			
Revision - 1			
Revision - 2			
Revision - 3			
Remark			

NOTES :

1. In the status, put "completed" only when you have thoroughly worked through this particular section.
2. Always remember to put down the date of completion correctly. It will help you in future at the time of revision.

Space for Notes :

RATIONAL NUMBERS (WORKING WITH FRACTIONS)

4

1. VARIOUS TYPES OF NUMBERS

1.1 NATURAL NUMBERS

The numbers 1, 2, 3, ... are used for counting objects and therefore are called 'counting numbers'. They are also called natural numbers. Natural numbers are infinite. The sum of natural numbers is always a natural number and the product of natural number is also a natural number.

1.2 WHOLE NUMBERS

If we include '0' in the collection of natural numbers, 'we get 0, 1, 2, 3, ... These are called whole numbers. Whole numbers are infinite. The sum of whole numbers is a whole number and the product of whole numbers is also a whole number. If we subtract any whole number from the same number then the difference is 0, which is also a whole number.

1.3 INTEGERS

Using the concept of opposite numbers, we get directed numbers. Natural numbers, the number 0, and all opposites of natural numbers are together known as integers. Thus ... –3, –2, –1, 0, 1, 2, 3, ... are integers. Out of these 1, 2, 3, ... are positive integers and –1, –2, –3, ... are negative integers. 0 is neither positive nor negative. The product of two integers is an integer. The difference on subtracting one integer from another is also an integer. Is the quotient on dividing one integer by another also an integer.

Let us study the following examples.

(i) $8 \div 2 = \frac{8}{2} = 4$ (ii) $0 \div 5 = \frac{0}{5} = 0$ (iii) $15 \div (-3) = \frac{15}{-3} = -5$

(iv) $(-4) \div (-4) = \frac{-4}{-4} = 1$ (v) $7 \div 3 = \frac{7}{3}$ (vi) $4 \div (-5) = \frac{4}{-5} = \frac{-4}{5}$

(vii) $1 \div 7 = \frac{1}{7}$ (viii) $2 \div (-8) = \frac{2}{-8} = \frac{-1}{4}$

We observe that in examples (i) to (iv), there is no remainder and the quotient is an integer. But in each of the examples (v) to (viii) , there is a remainder at the end . In other words, we do not obtain '0' as the remainder in these examples if we take any of the integers as the quotient. Therefore, no integer can be the quotient here. This leads us to conclude that the collection of integers is not sufficient to express every possible quotient. In order to express every possible quotient we have to expand the number system. Let us know consider how it is done.

2. RATIONAL NUMBERS

Rational numbers are expressed in the form of p/q, where p and q are integer and $q \neq 0$, and p and q do not have common factors.

Thus, $Q = \left\{\frac{p}{q}, q \in Z \text{ and } q \neq 0\right\}$, **Ex.** $Q = \left\{\frac{-5}{2}, \frac{-1}{2}, \frac{-1}{3}, 0, \frac{1}{3}, \frac{1}{2}, \frac{5}{2} \ldots\right\}$

Let us now see which of the numbers can be said rational numbers.

1. All the integers are rational numbers, because every integer can be expressed in the form $\frac{p}{q}$. For example, the integers, 4, 0, –23 can be expressed in the form $\frac{p}{q}$ as follows :

$4 = \frac{4}{1} = \frac{8}{2} = \ldots., \; 0 = \frac{0}{1} = \frac{0}{2} = \ldots, \; -23 = \frac{-23}{1} = \frac{-92}{4} = \ldots$

2. All the fractions are rational numbers

It follows from the meaning of the rational number that (i) the proper fraction $\frac{2}{3}$ is a rational number, (ii) the improper fraction $\frac{3}{2}$ is also a rational number, (iii) the mixed fraction $1\frac{2}{3}$ can be expressed as $\frac{5}{3}$ which is an improper fraction and hence $1\frac{2}{3}$ is also a rational number. Opposites $\frac{2}{3}, \frac{3}{2}$ and $1\frac{2}{3}$ are $-1\frac{2}{3}$. They are rational numbers.

Clearly

(i) Every natural number is a rational number.

(ii) Every whole number is a rational number

(iii) Every integer is a rational number

(iv) Every fraction is a rational number

2.1 EXISTENCE OF A RATIONAL NUMBER

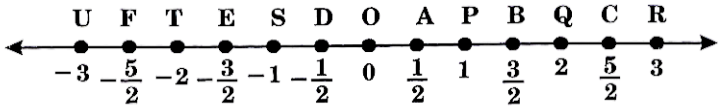
Between any two given rational numbers, we can always find many rational numbers.

If $\frac{a}{b}$ and $\frac{c}{d}$ are two rational numbers, then $\frac{1}{2}\left(\frac{a}{b} + \frac{c}{d}\right)$ is a rational number which lies between $\frac{a}{b}$ and $\frac{c}{d}$.

2.2 REPRESENTING RATIONAL NUMBERS ON A NUMBER LINE

In the previous standard, we have learnt to represent integers on a number line. Let us now learn to represent rational numbers other than integers on a number line.

To represent rational numbers with the denominator 2 on a number line : Observe the following number line.



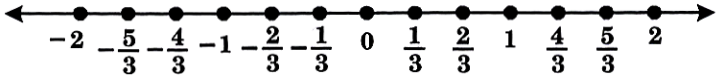
In the figure above, points O, P, Q, R correspond to the integers 0, 1, 2, 3 and points S, T, U correspond to the integers –1, –2, –3. Points A, B, C divide each unit distance to the right side of the origin 0 into two equal parts and so do the points D, E, F to the left of 0.

Hence, distance $OA = \frac{1}{2}$ units, distance $OB = 1\frac{1}{2} = \frac{3}{2}$ units and so on. Therefore, the points D, E, F correspond to the number $-\frac{1}{2}, -\frac{3}{2}, -\frac{5}{2}$ respectively.

We can write the integers 1, 2, 3, ... in the form of rationals with 2 in the denominator.

such as $\frac{2}{2}, \frac{4}{2}, \frac{6}{2}$, ... Similarly, we can write the integers –1, –2, –3, ... as $-\frac{2}{2}, -\frac{4}{2}, \frac{6}{2}, \cdots$ with 2 as the denominator.

If we divide each unit distance into 3 equal parts, we can represent on a number line all the rational numbers which have 3 in the denominator. Observe the following number line.



To represent any rational number on a number line, it is convenient to first divide each unit distance into as many equal parts as the integer in the denominator. The given rational will then correspond to the indicating as many parts from the origin as the integer in the numerator. If the given number is negative, the point should be fixed to the left of the origin and if the number is positive, the point should be fixed to the right of the origin.

3. COMPARISON OF TWO RATIONAL NUMBERS

In earlier classes we have learnt the way to write fractions in an order and to compare one fraction with the other. We also know that the integers have an order relation. In the same way, rational numbers also have an order relation. Therefore there are two ways to compare rational numbers.

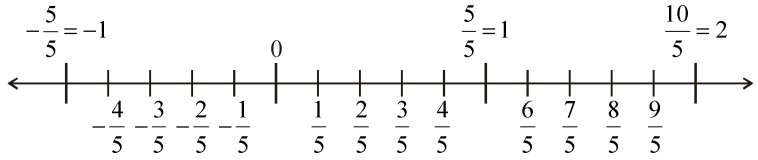
(1) Using the number line

(2) Using the arithmetical process

3.1 USING THE NUMBER LINE

One can compare rational numbers by using a number line easily. We arrange the rational numbers on the number lines in ascending order from left to right. For instance.

(i) the rational numbers having 5 as denomintor can be represented on the number lines as shown below.



From the first example it is clear that $\frac{7}{5} > \frac{5}{5}$ since $\frac{7}{5}$ is to the right of $\frac{5}{5}$.

From the two rational numbers represented on the number line, the number on the left is smaller than the number to its right. Thus,

$-\frac{6}{5} < \frac{4}{5}, \frac{3}{5} < \frac{9}{5}$, $\quad -\frac{8}{5} < \frac{2}{5}, -\frac{3}{5} > -\frac{7}{5}$ etc.

We observe from the above examples that :–

A positive rational number is always greater than a negative rational number ; zero is greater than each one of the negative rational numbers and less than each one of the positive rational numbers.

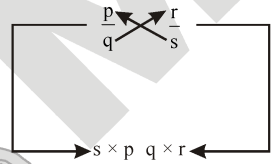
3.2 USING THE ARITHMETICAL PROCESS

(i) Express each rational number with a positive denominator.

(ii) Find LCM of the positive denominators.

(iii) Express each of the given rational numbers with LCM as the common denominator.

(iv) The number having greater numerator is greater.



To compare two rational numbers $\frac{p}{q}$ and $\frac{r}{s}$, we compare the products s × p and q × r and define their inequality as under :

(1) $\frac{p}{q} > \frac{r}{s}$, if s × p > q × r $\qquad$ (2) $\frac{p}{q} < \frac{r}{s}$, s × p < q × r

4. PROPERTIES OF RATIONAL NUMBERS

(i) Addition on rational numbers satisfies the closure property, the commutative law and the associative law.

(ii) Zero is the identity element for the addition of rational numbers.

(iii) Every rational number $\frac{p}{q}$ has the additive inverse $\frac{-p}{q}$.

(iv) Multiplication on rational numbers satisfies the closure property, the commutative law, the associative law and the distributive law over addition.

(v) Every non-zero rational number $\frac{p}{q}$ has its multiplicative inverse $\frac{q}{p}$.

5. PYTHAGOREAN TRIPLETES

Theorem states that, 'In any right-angled triangle the square on the hypotenuse is equal to the sum of the squares on the other two sides of the triangle. The side opposite to the right angle is the hypotenuse. In $\Delta ABC, \sqrt{B} = 90^{\circ}, AC$ the hypotenuse . If two sides of a right angle are represented by x and y and hypotenuse is represented by z, then $x^2 + y^2 = z^2$.

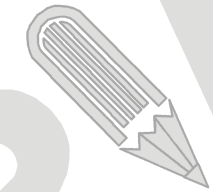
Ex : 1. $(3)^2 + (4)^2 = (5)^2$

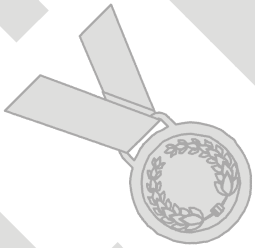
2. $(24)^2 + (10)^2 = (26)^2$

3. $(6)^2 + (8)^2 = (10)^2$

4. $(5)^2 + (12)^2 = (13)^2$

Such triplets are known as Pythagorean Tripletes.





SOLVED EXAMPLES

SE. 1

Find four rational numbers equivalent to each of the rational numbers.

(i) $\frac{-2}{3}$ (ii) $\frac{7}{-9}$

Ans. (i) $\frac{-2}{3}=\frac{-2\times2}{3\times2}=\frac{-2\times3}{3\times3}=\frac{-2\times4}{3\times4}=\frac{-2\times5}{3\times5}$,

i.e., $\frac{-2}{3}=\frac{-4}{6}=\frac{-6}{9}=\frac{-8}{12}=\frac{-10}{15}$

Hence, the four rational numbers equivalent of $\frac{-2}{3}$ are $\frac{-4}{6},\frac{-6}{9},\frac{-8}{12}$ and $\frac{-10}{15}$.

(ii) $\frac{7}{-9}=\frac{7\times2}{-9\times2}=\frac{7\times3}{-9\times3}=\frac{7\times4}{-9\times4}=\frac{7\times5}{-9\times5}$,

i.e, $\frac{7}{-9}=\frac{14}{-18},\frac{21}{-27},\frac{28}{-36}$, and $\frac{35}{-45}$

SE. 2

Express :

(i) $\frac{-40}{56}$ as a rational number with numerator = 5.

(ii) $\frac{-45}{-70}$ with numerator – 9.

Ans. (i) Think by what number should we divide –40 to get 5. Clearly, the number is –8.

So, $\frac{-40}{56}=\frac{-40\div(-8)}{56\div(-8)}=\frac{5}{-7}$

(ii) Think by what number should we divide –45 to get –9. Clearly, the number is 5.

So, $\frac{-45}{-70}=\frac{-45\div5}{-70\div5}=\frac{-9}{-14}$

SE. 3

Write the following rational numbers in their standard form

(i) $\frac{9}{15}$ (ii) $\frac{-8}{2}$ (iii) $\frac{-3}{-7}$

(iv) $-8\frac{2}{11}$ (v) 0.2

Ans. (i) $\frac{9}{15}=\frac{9\div3}{15\div3}=\frac{3}{5}$ (ii) $\frac{-8}{2}=-4$

(iii) $\frac{-3}{-7}=\frac{3}{7}$ (iv) $-8\frac{2}{11}=\frac{-90}{11}$

(v) $0.2=\frac{2}{10}=\frac{1}{5}$

SE. 4

Arrange the rational numbers $\frac{-3}{7}=\frac{5}{-14},-\frac{7}{12}$ in ascending order.

Ans. First we write each rational number with positive denominator. The number thus written are $\frac{-3}{7},\frac{5}{14},\frac{-7}{12}$

LCM of 7, 14 and 12 = 7 × 2 × 6 = 84.

$\frac{-3}{7}=\frac{-3\times12}{7\times12}=\frac{-36}{84},\frac{-5}{14}=\frac{-5\times6}{14\times6}=\frac{-30}{84}$

$\frac{-7}{12}=\frac{-7\times7}{12\times7}=\frac{-49}{84}$

Since – 49 < –36 < – 30, therefore,

$\frac{-49}{84}<\frac{-36}{84}<\frac{-30}{84}$

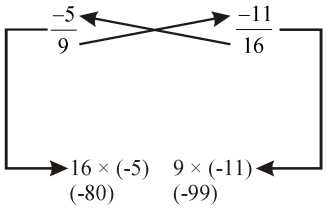
$\therefore\frac{-7}{12}<\frac{-3}{7}<\frac{-5}{14}$, i.e, $\frac{-7}{12}<\frac{-3}{7}$ and $\frac{-5}{14}$ are ascending order.

SE. 5

Compare $\frac{-5}{9}$ and $\frac{11}{-16}$

Ans. First re-write $\frac{11}{-16}$ in standard form as $\frac{-11}{16}$

Now,



Since $-80 > -99$, so $\frac{-5}{9} > \frac{11}{-16}$

SE. 6

Add $\frac{7}{-18}+\frac{5}{-12}+\frac{-9}{-16}$

Ans. First write the given rational numbers with positive denominators.

$\frac{7}{-18}=\frac{7\times(-1)}{-18\times(-1)}=\frac{-7}{18}$, $\frac{5}{-12}=\frac{5\times(-1)}{-12\times(-1)}=\frac{-5}{12}$,

$\frac{-9}{-16}=\frac{9\times(-1)}{-16\times(-1)}=\frac{9}{16}$

Now, LCM of

18, 12, 16 is $2\times2\times3\times3\times4=144$.

and $\frac{-7}{18}=\frac{-7\times8}{18\times8}=\frac{-56}{144}$, $\frac{-5}{12}=\frac{5\times12}{12\times12}=\frac{-60}{144}$,

$\frac{9}{16}=\frac{9\times9}{16\times9}=\frac{81}{144}$

$\therefore \frac{-7}{18}+\frac{-5}{12}+\frac{-9}{16}=\frac{-56}{144}+\frac{-60}{144}+\frac{81}{144}=\frac{-56-60+81}{144}=\frac{-35}{144}$

You could shorten the working by performing the addition as under :

$\frac{-7}{18}+\frac{-5}{12}+\frac{-9}{16}=\frac{-7\times8}{18\times8}+\frac{-5\times12}{12\times12}+\frac{9\times9}{16\times9}$ step-1

$=\frac{-56-60+81}{144}=\frac{-35}{144}$ step-2

You can shorten your work further by writting step 2 directly as under :

$\frac{-7}{18}+\frac{-5}{12}+\frac{-9}{16}=\frac{(-7\times8)+(-5\times12)+(9\times9)}{144}$

$=\frac{-56-60+81}{144}=\frac{-35}{144}$

SE. 7

Subtract $\frac{11}{-15}$ from $\frac{-13}{20}$.

Ans. $\frac{11}{-15}=\frac{11\times(-1)}{-15\times(-1)}=\frac{-11}{15}$

$\therefore \frac{-13}{20}-\frac{11}{-15}=\frac{-13}{20}-\frac{-11}{15}=\frac{-13}{20}+\left(-\left(\frac{11}{15}\right)\right)$

$=\frac{-13}{20}+\frac{11}{15}=\frac{-13\times3+11\times4}{60}$

$=\frac{-39+44}{60}=\frac{5}{60}=\frac{1}{12}$

SE. 8

The sum of two rational numbers –8. If one of the rational numbers is $\frac{-17}{9}$, find the other.

Ans. Sum of the given numbers = –8 , given number is $\frac{-17}{9}$

$\therefore$ The other number = (sum – given number)

$=-8-\left(-\frac{17}{9}\right)$

$=\frac{-8}{1}+\frac{17}{9}=\frac{-8\times9+17\times1}{9}=\frac{-72+17}{9}=\frac{-55}{9}$

SE. 9

Simplify : $\frac{8}{-15}+\frac{7}{20}+\frac{11}{35}+\frac{1}{5}$

Ans. $\frac{-8}{15}+\frac{7}{20}+\frac{11}{35}+\frac{1}{5}$

The L.C.M. of 15, 20, 35 and 5 is 420

$$= \frac{-8\times 28+7\times 21+11\times 12+1\times 84}{420}$$

$$= \frac{-224+147+132+84}{420} = \frac{-224+363}{463} = \frac{139}{420}$$

SE. 10

Simplify : (i) $\left(\frac{25}{8}\times\frac{2}{5}\right)-\left(\frac{3}{5}\times\frac{-10}{9}\right)$

(ii) $\left(\frac{-5}{9}\times\frac{72}{-125}\right)-\left(\frac{11}{17}\times\frac{34}{55}\right)+\left(\frac{28}{-13}\times\frac{-52}{21}\right)$

Ans. (i) $\left(\frac{25}{8}\times\frac{2}{5}\right)-\left(\frac{3}{5}\times\frac{-10}{9}\right)$

$$= \frac{{}^{5}\cancel{25}\times{}^{1}\cancel{2}}{{}_{4}\cancel{8}\times{}_{1}\cancel{5}} - \frac{{}^{1}\cancel{3}\times{}^{2}\cancel{-10}}{{}_{1}\cancel{5}\times{}_{3}\cancel{9}} = \frac{5\times 1}{4\times 1} - \frac{1\times -2}{1\times 3} = \frac{5}{4} - \frac{-2}{3}$$

$$= \frac{5\times 3-(-2)\times 4}{12} - \frac{15+8}{12} = \frac{23}{12}$$

(ii) $\left(\frac{-5}{9}\times\frac{72}{-125}\right)-\left(\frac{11}{17}\times\frac{34}{55}\right)+\left(\frac{28}{-13}\times-\frac{52}{21}\right)$

$$= \frac{{}^{1}\cancel{5}\times\cancel{72}^{8}}{{}_{1}\cancel{9}\times\cancel{125}_{25}} - \frac{{}^{1}\cancel{11}\times\cancel{34}^{2}}{{}_{1}\cancel{17}\times\cancel{55}_{5}} + \frac{{}^{4}\cancel{28}\times\cancel{-52}^{-4}}{{}_{-1}\cancel{-13}\times\cancel{21}_{3}}$$

$$= \frac{1\times 8}{1\times 25} - \frac{1\times 2}{1\times 5} + \frac{4\times 4}{1\times 3} = \frac{8}{25} - \frac{2}{5} + \frac{16}{3}$$

$$= \frac{8\times 3-2\times 15+16\times 25}{75} = \frac{24-30+400}{75}$$

$$= \frac{424-30}{75} = \frac{394}{75}$$

SE. 11

Find two rational numbers between $\frac{2}{3}$ and $\frac{7}{10}$

Ans. A rational number between $\frac{2}{3}$ and $\frac{7}{10}$ is

$$\frac{1}{2}\left(\frac{2}{3}+\frac{7}{10}\right) = \frac{1}{2}\left(\frac{20+21}{30}\right) = \frac{1}{2}\times\frac{41}{30} = \frac{41}{60}$$

A rational number between $\frac{2}{3}$ and $\frac{41}{60}$ is

$$\frac{1}{2}\left(\frac{2}{3}+\frac{41}{60}\right) = \frac{1}{2}\left(\frac{40+41}{60}\right) = \frac{1}{2}\times\frac{81}{60} = \frac{81}{120}$$

$$\therefore \frac{2}{3} < \frac{81}{120} < \frac{41}{60} < \frac{7}{10}$$

(Two rational numbers between $\frac{2}{3}$ and $\frac{7}{10}$ are $\frac{81}{120}$ and $\frac{41}{60}$).

SE. 12

Insert three rational numbers between $\frac{1}{3}$ and $\frac{4}{5}$

Ans. A rational number between $\frac{1}{3}$ and $\frac{4}{5}$ is

$$\frac{1}{2}\left(\frac{1}{3}+\frac{4}{5}\right) = \frac{1}{2}\left(\frac{5+12}{15}\right) = \frac{1}{2}\times\frac{17}{15} = \frac{17}{30}$$

$$\therefore \frac{1}{3} < \frac{17}{30} < \frac{4}{5}$$

A rational number between $\frac{1}{3}$ and $\frac{17}{30}$ is

$$\frac{1}{2}\left(\frac{1}{3}+\frac{17}{30}\right) = \frac{1}{2}\left(\frac{10+17}{30}\right) = \frac{1}{2}\times\frac{27}{30} = \frac{27}{60}$$

$$\therefore \frac{1}{3} < \frac{27}{60} < \frac{17}{30} < \frac{4}{5}$$

A rational number between $\frac{17}{30}$ and $\frac{4}{5}$ is

$$\frac{1}{2}\left(\frac{17}{30}+\frac{4}{5}\right) = \frac{1}{2}\left(\frac{17+24}{30}\right) = \frac{1}{2}\times\frac{41}{30} = \frac{41}{60}$$

$$\therefore \frac{1}{3} < \frac{27}{60} < \frac{17}{30} < \frac{41}{60} < \frac{4}{5}$$

$\frac{27}{60}, \frac{17}{30}, \frac{41}{60}$ are three rational numbers which lie between $\frac{1}{3}$ and $\frac{4}{5}$.

EXERCISE 9.1

NS. 1

List five rational numbers between :

(i) –1 and 0 (ii) –2 and –1

(iii) $\frac{-4}{5}$ and $\frac{-2}{3}$ (iv) $\frac{-1}{2}$ and $\frac{2}{3}$

Ans. (i) We know that

$$-1=\frac{-1}{1}=\frac{-1\times6}{1\times6}=\frac{-6}{6}$$

and , $0=\frac{0}{1}=\frac{0\times6}{1\times6}=\frac{0}{6}$

we know that integers between –6 and 0 are :

$-6<-5<-4<-3<-2<-1<0$

$$\Rightarrow \frac{-6}{6}<\frac{-5}{6}<\frac{-4}{6}<\frac{-3}{6}<\frac{-2}{6}<\frac{-1}{6}<\frac{0}{6}$$

Hence, 5 rational numbers between –1 and 0 are.

$\frac{-5}{6},\frac{-4}{6},\frac{-3}{6},\frac{-2}{6}$ and $\frac{-1}{6}$ i.e. $\frac{-5}{6},\frac{-2}{3},\frac{-1}{2},\frac{-1}{3}$ and $\frac{-1}{6}$

(ii) We know that

$$-2=\frac{-2}{1}=\frac{-2\times6}{1\times6}=\frac{-12}{6}$$

and $-1=\frac{-1}{1}=\frac{-1\times6}{1\times6}=\frac{-6}{6}$

Now, integers between –12 and –6 are

$-12<-11<-10<-9<-8<-7<-6$

$$\Rightarrow \frac{-12}{6}<\frac{-11}{6}<\frac{-10}{6}<\frac{-9}{6}<\frac{-8}{6}<\frac{-7}{6}<\frac{-6}{6}$$

Hence, 5 rational numbers between –2 and –1 are :

$\frac{-11}{6},\frac{-10}{6},\frac{-9}{6},\frac{-8}{6}$ and $\frac{-7}{6}$

i.e., $\frac{-11}{6},\frac{-5}{3},\frac{-3}{2},\frac{-4}{3}$ and $\frac{-7}{6}$

(iii) $\frac{-4}{5}=\frac{-4\times3}{5\times3}=\frac{-12}{15}=\frac{-12\times3}{15\times3}=\frac{-36}{45}$

and $-\frac{2}{3}=-\frac{2\times5}{3\times5}=\frac{-10}{15}=\frac{-10\times3}{15\times3}=\frac{-30}{45}$

We know that integers between –36 and–30 are:

$-36<-35<-34<-33<-32<-31<-30$

$\Rightarrow \frac{-36}{45}<\frac{-35}{45}<\frac{-34}{45}<\frac{-33}{45}<\frac{-32}{45}<\frac{-31}{45}$ and $\frac{-30}{45}$

Hence, 5 rational numbers between $\frac{-4}{5}$ and $\frac{-2}{3}$ are $\frac{-35}{45},\frac{-34}{45},\frac{-33}{45},\frac{-32}{45}$ and $\frac{-31}{45}$

i.e., $\frac{-7}{9},\frac{-34}{45},\frac{-11}{15},\frac{-32}{45}$ and $\frac{-31}{45}$

(iv) $\frac{-1}{2}=\frac{-1\times3}{2\times3}=\frac{-3}{6}$ and $\frac{2}{3}=\frac{2\times2}{3\times2}=\frac{4}{6}$

We know that integers between –3 and 4 are

$-3<-2<-1<0<1<2<3<4$

$$\Rightarrow \frac{-3}{6}<\frac{-2}{6}<\frac{-1}{6}<\frac{0}{6}<\frac{1}{6}<\frac{2}{6}<\frac{3}{6}<\frac{4}{6}$$

Hence, 5 rational numbers between $\frac{-1}{2}$ and $\frac{2}{3}$ are

$\frac{-2}{6},\frac{-1}{6},\frac{0}{6},\frac{1}{6}$ and $\frac{2}{6}$ i.e., $\frac{-1}{3},\frac{-1}{6},\frac{0}{6},\frac{1}{6}$ and $\frac{1}{3}$.

NS. 2

Write four more rational numbers in each of the following patterns :

(i) $\frac{-3}{5},\frac{-6}{10},\frac{-9}{15},\frac{-12}{20},\ldots$

(ii) $\frac{-1}{4},\frac{-2}{8},\frac{-3}{12},\ldots$

(iii) $\frac{-1}{6}, \frac{2}{-12}, \frac{3}{-18}, \frac{4}{-24}, \ldots$

(iv) $\frac{2}{-3}, \frac{4}{-6}, \frac{6}{-9}, \ldots$

Ans. (i) $\frac{-3}{5}, \frac{-6}{10}, \frac{-9}{15}, \frac{-12}{20}, \ldots\ldots$

Now $\frac{-3}{5} = \frac{(-3)\times 1}{(5)\times 1}$

$\frac{-6}{10} = \frac{(-3)\times 2}{5\times 2}$

$\frac{-9}{15} = \frac{(-3)\times 3}{5\times 3}$

$\frac{-12}{20} = \frac{(-3)\times 4}{5\times 4}$

Next four rational numbers would be :

$\frac{(-3)\times 5}{5\times 5} = \frac{-15}{25}$

$\frac{(-3)\times 6}{5\times 6} = \frac{-18}{30}$

$\frac{(-3)\times 7}{5\times 7} = \frac{-21}{35}$

$\frac{(-3)\times 8}{5\times 8} = \frac{-24}{40}$

Hence, the next four rational number are

$\frac{-15}{25}, \frac{-18}{30}, \frac{-21}{35}$ and $\frac{-24}{40}$.

(ii) $\frac{-1}{4}, \frac{-2}{8}, \frac{-3}{12}, \ldots$

$\frac{-1}{4} = \frac{(-1)\times 1}{4\times 1}$

$\frac{-2}{8} = \frac{(-1)\times 2}{4\times 2}$

$\frac{-3}{12} = \frac{(-1)\times 3}{4\times 3}$

Next four rational numbers would be :

$\frac{(-1)\times 4}{4\times 4} = \frac{-4}{16}$

$\frac{(-1)\times 5}{4\times 5} = \frac{-5}{20}$

$\frac{(-1)\times 6}{4\times 6} = \frac{-6}{24}$

$\frac{(-1)\times 7}{4\times 7} = \frac{-7}{28}$

Hence the next four rational number are

$\frac{-4}{16}, \frac{-5}{20}, \frac{-6}{24}$ and $\frac{-7}{28}$.

(iii) $\frac{-1}{6}, \frac{2}{-12}, \frac{3}{-18}, \frac{4}{-24}, \ldots$

$\frac{-1}{6} = \frac{1}{-6} = \frac{1\times 1}{(-6)\times 1}$

$\frac{2}{-12} = \frac{1\times 2}{(-6)\times 2} = \frac{1\times 3}{(-6)\times 3}$

$\frac{4}{-24} = \frac{1\times 4}{(-6)\times 4}$

Next four rational numbers would be :

$\frac{1\times 5}{(-6)\times 5} = \frac{5}{-30}$

$\frac{1\times 6}{(-6)\times 6} = \frac{6}{-36}$

$\frac{1\times 7}{(-6)\times 7} = \frac{7}{-42}$

$\frac{1\times 8}{(-6)\times 8} = \frac{8}{-48}$

Hence, the next four rational numbers are

$\frac{5}{-30}, \frac{6}{-36}, \frac{7}{-42}$ and $\frac{8}{-48}$.

(iv) $\frac{2}{-3}, \frac{4}{-6}, \frac{6}{-9}, \ldots$

$\frac{2}{-3} = \frac{2\times1}{(-3)\times1}$

$\frac{4}{-6} = \frac{2\times2}{(-3)\times2}$

$\frac{6}{-9} = \frac{2\times3}{(-3)\times3}$

Next four rational numbers are.

$\frac{2\times4}{(-3)\times4} = \frac{8}{12}$

$\frac{2\times5}{(-3)\times5} = \frac{10}{-15}$

$\frac{2\times6}{(-3)\times6} = \frac{12}{-18}$

$\frac{2\times7}{(-3)\times7} = \frac{14}{-21}$

NS. 3

Give four rational numbers equivalent to :

(i) $\frac{-2}{7}$ (ii) $\frac{5}{-3}$ (iii) $\frac{4}{9}$

Ans. (i) We have

$\frac{-2\times2}{7\times2} = \frac{-4}{14}, \frac{-2\times3}{7\times3} = \frac{-6}{21}$

$\frac{-2\times4}{7\times4} = \frac{-8}{28}$ and $\frac{-2\times5}{7\times5} = \frac{-10}{35}$

Hence, the four rational numbers equivalent to $\frac{-2}{7}$ are $\frac{-4}{14}, \frac{-6}{21}, \frac{-8}{28}$ and $\frac{-10}{35}$

(ii) $\frac{5}{-3}$

Four rational numbers are

$\frac{5\times2}{-3\times2}, \frac{5\times3}{-3\times3}, \frac{5\times4}{-3\times4}, \frac{5\times5}{-3\times5}$

i.e., $\frac{10}{-6}, \frac{15}{-9}, \frac{20}{-12}, \frac{25}{-15}$

(iii) We have

$\frac{4\times2}{9\times2} = \frac{8}{18}, \frac{4\times3}{9\times3} = \frac{12}{27}$

$\frac{4\times4}{9\times4} = \frac{16}{36}$ and $\frac{4\times5}{9\times5} = \frac{20}{45}$

Hence, the four rational numbers equivalent to $\frac{4}{9}$ are $\frac{8}{18}, \frac{12}{27}, \frac{16}{36}$ and $\frac{20}{45}$.

NS. 4

Draw the number line and represent the following rational numbers on it :

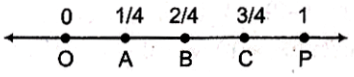
(i) $\frac{3}{4}$ (ii) $\frac{-5}{8}$

(iii) $\frac{-7}{4}$ (iv) $\frac{7}{8}$

Ans. (i) To represent the rational number $\frac{3}{4}$ on the number line, draw a number line. Choose a point O on it to represent the rational number zero. Choose a point P to the right O to represent 1. Then divide OP, into 4 equal parts such that

OA = AB = BC = CP

The point C represents $\frac{3}{4}$.

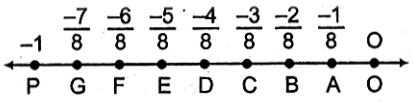


(ii) To represent $\frac{-5}{8}$ on a number line, draw a number line, take a point O on it to represent the rational number zero.

Now take point P to the left of O to represent –1.

Now, divide OA into 8 equals parts such that

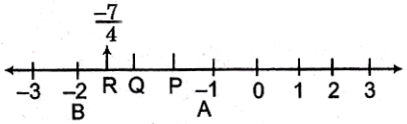
OA = AB = BC = CD = DE = EF= FG = GP



On the number line E represents $\frac{-5}{8}$.

(iii) To represent $\frac{-7}{4}$ on a number line, draw a number line.

Take a point O in it to represent the rational number zero.



$\frac{-7}{4} = 1 + \frac{-3}{4}$

$-2 < \frac{-7}{4} < -1$

Hence divide AB into 4 equal parts such that AP = PQ = QR = RB

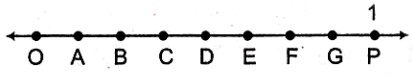
Point R represents $\left(-1 + \frac{-3}{4} = \frac{-7}{4}\right)$

(iv) To represent $\frac{7}{8}$ on a number line, draw a number line.

Take one point O on it to represent the rational number zero. Now take any point p to the right of O. Such that OP = 1

Now, divide OP into eight equal parts such

OA = AB = BC = CD = DE = EF = FG = GP

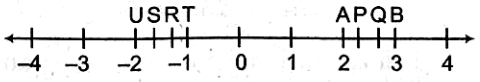


Since, OA is $\frac{1}{8}$ part6 of OP.

Hence, point G represents $\frac{7}{8}$

NS. 5

The points P, Q, R, S, T, U, A and B on the number line are such that, TR = RS = SU and AP = PQ = QB.Name the rational numbers represented by P, Q, R and S.



Ans. Since, AP = PQ = QB

∴ Distance between 2 and 3 is divided into 3 equal parts. It is clear from the number line.

P represent the rational number

$= 2 + \frac{1}{3} = \frac{7}{3}$

Q represents the rational number

$= 2 + \frac{2}{3} = \frac{8}{3}$

R represents the rational number $-\left(1 + \frac{1}{3}\right)$

$= -1\frac{1}{3} = \frac{-4}{3}$

S represents the rational number

$-\left(1 + \frac{2}{3}\right) = -\frac{5}{3}$

NS. 6

Which of the following pairs represent the same rational number?

(i) $\frac{-7}{21}$ and $\frac{3}{9}$ (ii) $\frac{-16}{20}$ and $\frac{20}{-25}$

(iii) $\frac{-2}{-3}$ and $\frac{2}{3}$ (iv) $\frac{-3}{5}$ and $\frac{-12}{20}$

(v) $\frac{8}{-5}$ and $\frac{-24}{15}$ (vi) $\frac{1}{3}$ and $\frac{-1}{9}$

(vii) $\frac{-5}{-9}$ and $\frac{5}{-9}$

Ans. (i) We represent these rational numbers in standard form as :

$$\frac{-7}{21}=\frac{-7\div 7}{21\div 7}=\frac{-1}{3} \text{ and } \frac{3}{9}=\frac{3\div 3}{9\div 3}=\frac{1}{3}$$

These rational numbers are not equal.

$$\therefore \frac{-7}{21}\neq\frac{3}{9}$$

(ii) We represent these rational numbers in standrad form as :

$$\frac{-16}{20}=\frac{-16\div 4}{20\div 4}=\frac{-4}{5} \text{ and } \frac{20}{-25}=\frac{20\div(-5)}{(-25)\div(-5)}=\frac{-4}{5}$$

Hence, rational numbers $\frac{-16}{20}$ and $\frac{20}{-25}$ represent the same rational number.

(iii) We represent these rational numbers in standard form as :

$$\frac{-2}{-3}=\frac{(-2)\div(-1)}{(-3)\div(-1)}=\frac{2}{3} \text{ and } \frac{2}{3}=\frac{2}{3}$$

Hence, rational numbers $\frac{-2}{-3}$ and $\frac{2}{3}$ represent the same rational number.

(iv) We represent these rational numbers in standard form as :

$$\frac{-3}{5}=\frac{-3}{5} \text{ and } \frac{-12}{20}=\frac{(-12)\div 4}{(20)\div 4}=\frac{-3}{5}$$

Hence, these rational numbers represent the rational number.

(v) We represent these rational numbers in standard form as :

$$\frac{-24}{15}=\frac{(-24)\div 3}{15\div 3}=\frac{-8}{3}$$

$$\text{and } \frac{8}{-5}=\frac{8\times(-1)}{(-5)\times(-1)}=\frac{-8}{5}$$

Hence, these rational numbers represent the same rational number.

(vi) We represent these rational numbers in standard form as :

$$\frac{1}{3}=\frac{1}{3} \text{ and } \frac{-1}{9}=\frac{-1}{9}$$

These rational numbers do not represent the same rational number.

(vii) We represent these rational numbers in standard form as :

$$\frac{-5}{-9}=\frac{(-5)\div(-1)}{(-9)\div(-1)}=\frac{5}{9} \text{ and } \frac{5}{-9}=\frac{-5}{9}$$

Hence these rational number do not represent the same rational number.

NS. 7

Rewrite the following rational numbers in the simplest form :

(i) $\frac{-8}{6}$ (ii) $\frac{25}{45}$

(iii) $\frac{-44}{72}$ (iv) $\frac{-8}{10}$

Ans. (i) HCF of 8 and 6 = 2

Now, $\frac{-8}{6}=\frac{(-8)\div 2}{6\div 2}=\frac{-4}{3}$

Hence, the simplest form of $\frac{-8}{6}$ is $\frac{-4}{3}$.

(ii) HCF of 25 and 45 = 5

Now, $\frac{25}{45}=\frac{25\div 5}{45\div 5}=\frac{5}{9}$

Hence, the simplest form of $\frac{25}{45}$ is $\frac{5}{9}$

(iii) HCF of 44 and 72 = 4

Now, $\frac{-44}{72}=\frac{(-44)\div 4}{72\div 4}=\frac{-11}{18}$

Hence, the simplest form of $\frac{-44}{72}$ is $\frac{-11}{18}$.

(iv) HCF of 8 and 10 = 2

Now, $\frac{-8}{10}=\frac{(-8)\div 2}{10\div 2}=\frac{-4}{5}$

Hence, the simplest form of $\frac{-8}{10}$ is $\frac{-4}{5}$.

NS. 8

Fill in the boxes with the correct symbol out of >, < and =.

(i) $\frac{-5}{7} \square \frac{2}{3}$ (ii) $\frac{-4}{5} \square \frac{-5}{7}$

(iii) $\frac{-7}{8} \square \frac{14}{-16}$ (iv) $\frac{-8}{5} \square \frac{-7}{4}$

(v) $\frac{1}{-3} \square \frac{-1}{4}$ (vi) $\frac{5}{-11} \square \frac{-5}{11}$

(vii) $0 \square \frac{-7}{6}$

Ans. (i) We know that the negative rational number is smaller than the positive rational number.

Hence, $\frac{-5}{7} \boxed{<} \frac{2}{3}$

(ii) LCM of denominator 5 and 7 is 35.

$\therefore \frac{-4}{5} = \frac{-4\times7}{5\times7} = \frac{-28}{35}$ and $\frac{-5}{7} = \frac{-5\times5}{7\times5} = \frac{-25}{35}$

Comparing the numerators.

Since, $-28 < -25$

So, $\frac{-28}{35} < \frac{-25}{35}$

Hence, $\frac{-4}{5} \boxed{<} \frac{-5}{7}$

(iii) LCM of 8 and 16 is 16.

$\therefore \frac{-7}{8} = \frac{-7\times2}{8\times2} = \frac{-14}{16}$ and $\frac{-14}{16} = \frac{-14}{16}$

Comparing the numerators.

Since, $-14 = -14$

So, $\frac{-14}{16} = \frac{-14}{16}$

$\Rightarrow \frac{-7}{8} \boxed{=} \frac{-14}{16}$

(iv) LCM of 5 and 4 is 20.

Here, $\frac{-8}{5} = \frac{-8\times4}{5\times4} = \frac{-32}{20}$ and

$\frac{-7}{4} = \frac{-7\times5}{4\times5} = \frac{-35}{20}$

As $-32 > -35$, therefore $\frac{-8}{5} \boxed{>} \frac{-7}{4}$

(v) Here, $\frac{1}{-3} = \frac{1\times(-1)}{(-3)\times(-1)} = \frac{-1}{3}$

Now, LCM of 3 and 4 is 12.

$\frac{-1}{3} = \frac{-1\times4}{3\times4} = \frac{-4}{12}$ and $\frac{-1}{4} = \frac{-1\times3}{4\times3} = \frac{-3}{12}$

comparing the numerators.

Since, $-4 < -3$

So, $\frac{-4}{12} < \frac{-3}{12}$

$\Rightarrow \frac{1}{-3} \boxed{<} \frac{-1}{4}$

(vi) Comparing the numerators

Since, $-5 = -5$

So, $\frac{-5}{11} = \frac{-5}{11}$

Hence, $\frac{5}{-11} \boxed{=} \frac{-5}{11}$

(vii) Since, 0 is greater than every negative number.

$\therefore 0 \boxed{>} \frac{-7}{6}$

NS. 9

Which is greater in each of the following :

(i) $\frac{2}{3}, \frac{5}{2}$ (ii) $\frac{-5}{6}, \frac{-4}{3}$

(iii) $\frac{-3}{4}, \frac{2}{-3}$ (iv) $\frac{-1}{4}, \frac{1}{4}$

(v) $-3\frac{2}{7}, -3\frac{4}{5}$

Ans. (i) LCM of 3 and 2 is 6

$\therefore \frac{2}{3} = \frac{2\times2}{3\times2} = \frac{4}{6}$ and $\frac{5}{2} = \frac{5\times3}{2\times3} = \frac{15}{6}$

Comparing the numerators.

Since, $15 > 4$ So $\frac{15}{6} > \frac{4}{6}$

$\Rightarrow \frac{5}{2} > \frac{2}{3}$

Thus, $\frac{5}{2}$ is a greater rational number.

(ii) LCM of 6 and 3 is 6.

$\therefore \frac{-5}{6} = \frac{-5}{6}$ and $\frac{-4}{3} = \frac{-4\times 2}{3\times 2} = \frac{-8}{6}$

Comparing the numerators.

Since, $-5 > -8$

$\Rightarrow \frac{-5}{6} > \frac{-8}{6}$

$\Rightarrow \frac{-5}{6} > \frac{-4}{3}$

Hence, $\frac{-5}{6}$ is greater rational number.

(iv) We know that every positive rational number is greater than every negative rational number.

$\therefore \frac{1}{4} > \frac{-1}{4}$

Hence, $\frac{1}{4}$ is a greater rational number.

(v) LCM of 7 and 5 = 35

$-3\frac{2}{7} = \frac{-23}{7} = \frac{23\times 5}{7\times 5} = \frac{-115}{35}$ and

$-3\frac{4}{5} = \frac{-19}{5} = \frac{-19\times 7}{5\times 7} = \frac{-133}{35}$

comparing the numerators.

$-115 > -133$

$\Rightarrow \frac{-115}{36} > \frac{-133}{35}$

$\Rightarrow -3\frac{2}{7} > -3\frac{4}{5}$

Hence, $-3\frac{2}{7}$ is a greater rational number.

NS. 10

Write the following rational numbers in ascending order:

(i) $\frac{-3}{5}, \frac{-2}{5}, \frac{-1}{5}$ (ii) $\frac{-1}{3}, \frac{-2}{9}, \frac{-4}{3}$

(iii) $\frac{-3}{7}, \frac{-3}{2}, \frac{-3}{4}$

Ans. In the given rational numbers each denominator is equal and positive

Since, $-3 < -2 < -1$

$\frac{-3}{5} < \frac{-2}{5} < \frac{-1}{5}$

Thus, the required ascending order is $\frac{-3}{5}, \frac{-2}{5}, \frac{-1}{5}$

(ii) Denominators of the given rational numbers are positive.

LCM of 3, 9 and 3 = 9.

Now, $\frac{-1}{3} = \frac{-1\times 3}{3\times 3} = \frac{-3}{9}$

and $\frac{-2}{9} = \frac{-2}{9}$

and $\frac{-4}{3} = \frac{-4\times 3}{3\times 3} = \frac{-12}{9}$

Since, $-12 < -3 < -2$

$\therefore \frac{-12}{9} < \frac{-3}{9} < \frac{-2}{9}$

$\Rightarrow \frac{-4}{3} < \frac{-1}{3} < \frac{-2}{9}$

Thus, the required ascending order is $\frac{-4}{3}, \frac{-1}{3}, \frac{-2}{9}$.

(iii) Denominators of the given rationals number are positive

LCM of 7, 2 and 4 = 28

Now, $\frac{-3}{7} = \frac{-3\times 4}{7\times 4} = -\frac{12}{28}$

and $\frac{-3}{2} = \frac{-3\times 14}{2\times 14} = -\frac{42}{28}$

and $\frac{-3}{4}=\frac{-3\times7}{4\times7}=-\frac{-21}{28}$

Since, $-42<-21<-12$

$\therefore \frac{-42}{28}<\frac{-21}{28}<\frac{-12}{28}$

$\Rightarrow \frac{-3}{2}<\frac{-3}{4}<\frac{-3}{7}$

Thus the required ascending order is

$\frac{-3}{2},\frac{-3}{4},\frac{-3}{7}$

EXERCISE 9.2

NS. 1

Find the sum :

(i) $\frac{5}{4}+\left(\frac{-11}{4}\right)$ (ii) $\frac{5}{3}+\frac{3}{5}$

(iii) $\frac{-9}{10}+\frac{22}{15}$ (iv) $\frac{-3}{-11}+\frac{5}{9}$

(v) $\frac{-8}{19}+\frac{(-2)}{57}$ (vii) $\frac{-2}{3}+0$

(vii) $-2\frac{1}{3}+4\frac{3}{5}$

Ans. (i) $\frac{5}{4}+\left(\frac{-11}{4}\right)=\frac{5+(-11)}{4}$

$=\frac{5-11}{4}=\frac{-6}{4}=\frac{-3}{2}$

(ii) $\frac{5}{3}+\frac{3}{5}=\frac{5\times5+3\times3}{15}$

(LCM of 3 and 5 = 15)

$=\frac{25+9}{15}=\frac{34}{15}$

(iii) $\frac{-9}{10}+\frac{22}{15}=\frac{-9\times3+22\times2}{30}=\frac{-27+44}{30}=\frac{17}{30}$

(LCM of 10 and 15 = 30)

(iv) $\frac{-3}{-11}+\frac{5}{9}=\frac{3}{11}+\frac{5}{9}$

$=\frac{3\times9+5\times11}{99}=\frac{27+55}{99}=\frac{82}{99}$

(LCM of 11 and 9 =99)

(v) $\frac{-8}{19}+\frac{-2}{57}=\frac{-8\times3+(-2)\times1}{57}$

(LCM of 19 and 57 = 57)

$=\frac{-24-2}{57}=\frac{-26}{57}$

(vi) $\frac{-2}{3}+0=\frac{-2}{3}$

(vii) $-2\frac{1}{3}+4\frac{3}{5}=\frac{-7}{3}+\frac{23}{5}$

$=\frac{-7\times5+23\times3}{15}$

(LCM of 3 and 5 = 15)

$=\frac{-35+69}{15}=\frac{34}{15}$

NS. 2

Find :

(i) $\frac{7}{24}-\frac{17}{36}$ (ii) $\frac{5}{63}-\left(\frac{-6}{21}\right)$

(iii) $\frac{-6}{13}-\left(\frac{-7}{15}\right)$ (iv) $\frac{-3}{8}-\frac{7}{11}$

(v) $-2\frac{1}{9}-6$

Ans. (i) $\frac{7}{24}-\frac{17}{36}=\frac{7\times3-17\times2}{72}$

(LCM 24 and 36 is 72)

$=\frac{21-34}{72}=\frac{-13}{72}$

(ii) $\frac{5}{63}-\left(\frac{-6}{21}\right)=\frac{5}{63}+\frac{6}{21}=\frac{5}{63}+\frac{2}{7}$

$=\frac{5\times1+2\times9}{63}=\frac{5+18}{63}=\frac{23}{63}$

(LCM of 21 and 63 = 63)

(iii) $\frac{-6}{13}-\left(\frac{-7}{15}\right)=\frac{-6}{13}+\frac{7}{15}$

$=\frac{-6\times15+7\times13}{195}$

(LCM of 13 and 15 = 195)

$=\frac{-90+91}{195}=\frac{1}{195}$

(iv) $\frac{-3}{8}-\frac{7}{11}=\frac{-3\times11-7\times8}{88}=\frac{-33-56}{88}=\frac{-89}{88}$

(v) $-2\frac{1}{9}-6=\frac{-19}{9}-\frac{6}{1}=\frac{-19\times1-6\times9}{9}$

(LCM of 9 and 1 = 9)

$=\frac{-19-54}{9}=\frac{-73}{9}$

NS. 3

Find the product :

(i) $\frac{9}{2}\times\left(\frac{-7}{4}\right)$ (ii) $\frac{3}{10}\times(-9)$

(iii) $\frac{-6}{5}\times\frac{9}{11}$ (iv) $\frac{3}{7}\times\left(\frac{-2}{5}\right)$

(v) $\frac{3}{11}\times\frac{2}{5}$ (vi) $\frac{3}{-5}\times\frac{-5}{3}$

Ans. (i) $\frac{9}{2}\times\left(\frac{-7}{4}\right)=\frac{9\times(-7)}{2\times4}=\frac{-63}{8}$

(ii) $\frac{3}{10}\times(-9)=\frac{3\times(-9)}{10}=\frac{-27}{10}$

(iii) $\frac{-6}{5}\times\frac{9}{11}=\frac{(-6)\times9}{5\times11}=\frac{-54}{55}$

(iv) $\frac{3}{7}\times\left(\frac{-2}{5}\right)=\frac{3\times(-2)}{7\times5}=\frac{-6}{35}$

(v) $\frac{3}{11}\times\frac{2}{5}=\frac{3\times2}{11\times5}=\frac{6}{55}$

(vi) $\frac{3}{-5}\times\frac{-5}{3}=\frac{3\times(-5)}{(-5)\times3}=\frac{-15}{-15}=1$

NS. 4

Find the value of :

(i) $(-4)\div\frac{2}{3}$ (ii) $\frac{-3}{5}\div2$

(iii) $\frac{-4}{5}\div(-3)$ (iv) $\frac{-1}{8}\div\frac{3}{4}$

(v) $\frac{-2}{13}\div\frac{1}{7}$ (vi) $\frac{-7}{12}\div\left(\frac{-2}{13}\right)$

(vii) $\frac{3}{13}\div\left(\frac{-4}{65}\right)$

Ans. (i) $-4\div\frac{2}{3}=-4\times\frac{3}{2}=\frac{-4\times3}{2}$

$=\frac{-12}{2}=-6$

(ii) $\frac{-3}{5}\div2=\frac{-3}{5}\times\frac{1}{2}=\frac{-3\times1}{5\times2}=\frac{-3}{10}$

(iii) $\frac{-4}{5}\div(-3)=\frac{-4}{5}\times\frac{1}{-3}$

$=\frac{-4\times1}{5\times(-3)}=\frac{-4}{-15}=\frac{4}{15}$

(iv) $\frac{-1}{8}\div\frac{3}{4}=\frac{-1}{8}\times\frac{4}{3}$

$=\frac{-1\times4}{8\times3}=\frac{-4}{24}=\frac{-1}{6}$

(v) $\frac{-2}{13}\div\frac{1}{7}=\frac{-2}{13}\times\frac{7}{1}=\frac{-2\times7}{13\times1}=\frac{-14}{13}$

(vi) $\frac{-7}{12}\div\left(\frac{-2}{13}\right)=\frac{-7}{12}\times\frac{13}{-2}$

$=\frac{-7\times13}{12\times(-2)}$

$=\frac{-91}{-24}=\frac{91}{24}$

(vii) $\frac{3}{13}\div\left(\frac{-4}{65}\right)=\frac{3}{13}\times\frac{65}{-4}=\frac{3\times65}{13\times(-4)}$

$\frac{3\times5}{1\times(-4)}=\frac{15}{-4}=\frac{-15}{4}$

EXERCISE – I

ONLY ONE CORRECT TYPE

1. Every integer is a _____ number.

(A) whole (B) natural

(C) rational (D) positive

2. Every _____ number is smaller than 0.

(A) positive (B) rational

(C) natural (D) negative

3. $\frac{-8}{9} \square \frac{-5}{9}$ (Fill the box).

(A) > (B) <

(C) = (D) none of these

4. The sum of $-\frac{1}{8}$ and $-\frac{1}{8}$ is _____.

(A) $\frac{1}{4}$ (B) $-\frac{1}{4}$

(C) 0 (D) 1

5. $\frac{-1}{-5} =$ _____

(A) $\frac{1}{5}$ (B) $\frac{-1}{5}$

(C) 0 (D) 1

6. $\frac{-3}{5} = \frac{x}{-15}$, then x will be

(A) 9 (B) –9

(C) –3 (D) 3

7. $\frac{1}{9} - \frac{1}{3} =$ _____

(A) $-\frac{2}{3}$ (B) $\frac{2}{3}$

(C) $-\frac{2}{9}$ (D) $\frac{1}{3}$

8. $-\left(\frac{1}{2}+\frac{1}{2}\right) =$ _____

(A) $-\frac{2}{3}$ (B) $\frac{2}{3}$

(C) $-\frac{2}{9}$ (D) None of these

9. The multiplicative inverse of $\frac{1}{8}$ is _____.

(A) –8 (B) 8

(C) $-\frac{1}{8}$ (D) 1

10. $\frac{1}{8} \times (-8) =$ _____

(A) –1 (B) 1

(C) 8 (D) –8

11. $\frac{2}{3} \div \left(\frac{3}{2}\right) =$ _____

(A) –1 (B) 1

(C) $\frac{4}{9}$ (D) $\frac{-4}{3}$

12. The multiplicative inverse of $\frac{a}{b}$ is :

(A) $\frac{b}{a}$ (B) $-\frac{a}{b}$

(C) $-\frac{b}{a}$ (D) 1

13. $-\frac{2}{3} \times 4$ is equal to :

(A) $\frac{8}{3}$ (B) $\frac{-8}{3}$

(C) $\frac{-2}{12}$ (D) $\frac{-6}{8}$

14. $\frac{-7}{8}+\frac{5}{8}$ is equal to :

(A) $\frac{3}{8}$ (B) $\frac{12}{8}$

(C) $\frac{2}{8}$ (D) $\frac{-2}{8}$

15. The additive inverse of $-\frac{4}{5}$ is :

(A) $\frac{4}{5}$ (B) $\frac{-5}{4}$

(C) $\frac{5}{4}$ (D) None of these

16. The difference between $\frac{5}{7}$ and $\frac{3}{7}$ is

(A) $\frac{15}{56}$ (B) $\frac{18}{56}$

(C) $\frac{19}{56}$ (D) None of these

17. If $\frac{-36}{6}\times\frac{p}{1}=1$, then p is :

(A) –6 (B) $-\frac{1}{6}$

(C) $-\frac{1}{36}$ (D) – 1

18. $\frac{-2}{9}+(-4)$ is equal to :

(A) $-\frac{6}{9}$ (B) $\frac{2}{9}$

(C) $\frac{-38}{9}$ (D) $\frac{34}{9}$

19. $\frac{3}{4}-\frac{4}{5}$ is not equal to

(A) $-\frac{4}{5}+\frac{3}{4}$ (B) $-\frac{1}{20}$

(C) $\frac{4}{5}-\frac{3}{4}$ (D) $-\frac{4}{5}-\left(-\frac{3}{4}\right)$

20. Divide the sum of $\frac{-12}{5}$ and $\frac{-18}{15}$ by their difference.

(A) 3 (B) –9

(C) –7 (D) 5

EXERCISE – II

VERY SHORT ANSWER TYPE

1. Verify the following statements and state the property:

(i) $\frac{1}{7}\left(\frac{2}{81}+\frac{1}{9}\right)=\frac{1}{7}\times\frac{2}{81}+\frac{1}{7}\times\frac{1}{9}$

(ii) $\frac{2}{3}\left(\frac{1}{4}+\frac{-7}{8}\right)=\frac{2}{3}\times\frac{1}{4}+\frac{2}{3}\times\left(\frac{-7}{8}\right)$

(iii) $\left(\frac{-5}{6}\right)\left(\frac{7}{9}+\frac{10}{81}\right)=\left(\frac{-5}{6}\right)\times\frac{7}{9}+\left(\frac{-5}{6}\right)\times\frac{10}{81}$

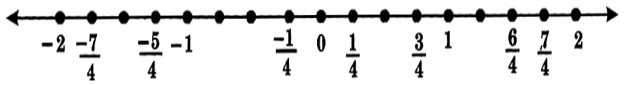
(iv) $\frac{16}{179}\times\frac{-180}{17}=\frac{-180}{17}\times\frac{16}{179}$

2. Reduce the following to their lowest terms :

(i) $\frac{65}{-78}$ (ii) $\frac{-64}{128}$ (iii) $\frac{26}{143}$

(iv) $\frac{-18}{-24}$ (v) $\frac{-36}{84}$ (vi) $\frac{-5}{-20}$

3. Observe the following number line and answer the questions given below:



(i) Which of the two numbers $-\frac{5}{4}$ and $-\frac{7}{4}$ is smaller? Why?

(ii) Arrange $-2, -\frac{1}{4}, \frac{7}{4}, 1, 0$ in the ascending order.

(iii) Which of the two numbers $\frac{3}{4}$ and 0 is greater? Why?

4. Which of the following pairs of rational numbers are not equal?

(i) $\frac{3}{5}$ and $\frac{-3}{-5}$ (ii) $\frac{-15}{35}$ and $\frac{-21}{49}$

(iii) $\frac{27}{-36}$ and $\frac{24}{-30}$ (iv) $\frac{-8}{24}$ and $\frac{7}{-21}$

5. Draw the number line and represent the following rational numbers:

(i) $\frac{3}{5}$ (ii) $\frac{-2}{5}$ (iii) $\frac{4}{7}$

(iv) $\frac{-1}{6}$ (v) $\frac{5}{6}$

6. Compare the given rational numbers using the number line:

(i) $-\frac{1}{3}, \frac{-2}{3}, \frac{1}{3}, \frac{2}{3}$ (ii) $-\frac{1}{5}, \frac{-2}{5}, \frac{3}{5}, \frac{-4}{5}, \frac{4}{5}$

(iii) $-\frac{1}{9}, \frac{2}{9}, \frac{5}{9}, \frac{-4}{9}, \frac{-6}{9}$

7. Write the additive inverses of the following rational numbers:

(i) –3 (ii) $\frac{-17}{8}$

(iii) $\frac{1}{3}$ (iv) $\frac{-4}{7}$

8. Write the multiplicative inverses of the following:

(i) $\frac{-7}{3}$ (ii) $\frac{17}{-50}$ (iii) $\frac{3}{85}$ (iv) $\frac{-2}{57}$

9. The additive inverse of $\left(\frac{22}{4}\times\frac{2}{5}\right)-\left(\frac{-1}{5}\times\frac{-10}{3}\right)$ is

10. Give reciprocal of $\frac{-28}{40}$ in standard form.

FILL IN THE BLANKS

1. If $\frac{x}{6}=\frac{-35}{42}$, then x = ...
2. The sum of $\left(\frac{-1}{2}\right)$ and .... is zero.
3. On a number line, $\frac{-3}{4}$ is to the ... of zero.
4. The sum of $\frac{15}{8}$ and $\frac{-7}{8}$ is....
5. On a number line $\frac{5}{3}$ is to the .... of the zero.

TRUE / FALSE TYPE

1. The reciprocal of the negative rational number is always negative.
2. $\frac{5}{0}$ is a rational number.
3. If $\frac{p}{q}$ and $\frac{r}{s}$ are equivalent fractions, then pq = rs.
4. $\frac{p}{q}$ will be a positive rational number if p and q have like signs
5. A fraction is a positive fraction if p and q have like signs.

INTEGER VALUE TYPE

1. Product of digits of numerator of subtraction of $\left(\frac{12}{5}\text{and}\frac{13}{7}\right)$.
2. If $2\frac{3}{4}-\frac{5}{8}+\frac{-5}{12}+1\frac{1}{6}$ is k, then find k.
3. Divide $\frac{3}{5}$ by $\frac{4}{9}$ and multiply the result by $\frac{-2}{9}+\frac{1}{3}$, we get $\frac{k}{20}$. Find k.
4. The product of $2\frac{3}{4}$ and $-5\frac{6}{7}$ is $\frac{-451}{7k}$. Find k.
5. $\frac{28}{48}$ and $\frac{-k}{-12}$ are equivalent rational numbers. Find (k + 1).
6. If $\frac{x}{3}=\frac{65}{54}$, then find the denominator of x.
7. If the reciprocal of $\frac{4}{5}$ is $\frac{k}{m}$ then, k + m will be.
8. The reciprocal of $\left(\frac{1}{2}\times 12\right)+\left(\frac{1}{3}\div\frac{1}{9}\right)$ is 3k. Find the numerator of k.
9. If $\frac{3}{8}$ can be expressed as the equivalent fraction $\frac{24}{k}$. Then find k.
10. If $\frac{x}{-5}=\frac{28}{7}$, then find the denominator of x.

Answer Key

EXERCISE–I														
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
C	D	B	B	A	A	C	D	B	A	C	A	B	D	A
16	17	18	19	20										
D	B	C	C	A										

EXERCISE – II

VERY SHORT ANSWER TYPE

2. $\frac{5}{-6}, \frac{-1}{2}, \frac{2}{11}, \frac{3}{4}, \frac{-3}{7}, \frac{1}{4}$

3. (i) $\frac{-7}{4}$, because $\frac{-7}{4}$ is on the left of $\frac{-5}{4}$ (ii) $-2 < \frac{-1}{4} < 0 < 1 < \frac{7}{4}$,

(iii) $\frac{3}{4}$, because $\frac{3}{4}$ is on the right of 0. **4.** (iii)

7. (i) 3 (ii) $\frac{17}{8}$ (iii) $\frac{-1}{3}$ (iv) $\frac{4}{7}$

8. (i) $\frac{-3}{7}$ (ii) $\frac{-50}{17}$ (iii) $\frac{85}{3}$ (iv) $\frac{-57}{2}$

9. $\frac{-23}{15}$ **10.** $\frac{-10}{7}$

FILL IN THE BLANKS

1. –5 **2.** $\frac{1}{2}$ **3. LEFT** **4. 1** **5.RIGHT**

TRUE/FALSE TYPE

1. T **2.** F **3.** F **4.** T **5.** T

INTEGER VALUE TYPE

1. 9 **2.** 2.875 **3.** 3 **4.** 4 **5** 8

6. 18 **7.** 9 **8.** 1 **9.** 64 **10.** 1

SELF PROGRESS ASSESSMENT FRAMEWORK

(CHAPTER : RATIONAL NUMBERS)

CONTENT	STATUS	DATE OF COMPLETION	SELF SIGNATURE
Theory			
In-Text Examples			
Solved Examples			
NCERT Exercises			
Exercise I			
Exercise II			
Short Note-1			
Revision - 1			
Revision - 2			
Revision - 3			
Remark			

NOTES :

1. In the status, put "completed" only when you have thoroughly worked through this particular section.
2. Always remember to put down the date of completion correctly. It will help you in future at the time of revision.

Space for Notes :

ALGEBRAIC EXPRESSIONS (EXPRESSION USING LETTER NUMBERS)

5

INTRODUCTION

Algebra is that branch of Mathematics in which letters represent any value which we can assign according to our requirement. These letters are generally of two types : constants and variables (or literal numbers).

1. CONSTANT

A number having a fixed numerical value is called a constant.

Example : 7, $\frac{8}{3}$, 4, 16.5 etc

1.1 VARIABLE

A number which can take various numerical values is known as variable.

Example : a, b, c, x, y, z etc.

2. TERMS

Different parts of an algebraic expression which are connected by the symbol + or – are called the terms of the algebraic expression.

Ex. $3x^2 + 5x$

Both are terms

2.1 COEFFICIENT OF A TERM

Consider the term $8x^2$. In this case, 8 is called the numerical coefficient and x^2 is said to be the literal coefficient.

In case of 9xy, we have the numerical coefficient as 9 and the literal coefficient as xy.

2.2 LIKE TERMS

Terms having the same literal coefficients are called like terms.

Ex. $15x^2$, $-19x^2$ and $35x^2$ are all like terms.

2.3 UNLIKE TERMS

Terms having different literal coefficients are called unlike terms.

Ex. $5x^2$, $-10x$ and $15x^3$ are unlike terms.

3. VARIOUS DEFINITIONS & CONCEPTS

3.1 LITERALS

The letters which are used to represent numbers are called literal numbers or literals. In 2xy, x & y are the literals.

Literal numbers obey all the rules (and signs) of addition, subtraction, multiplication and division of numbers along with the properties of these operations.

$a \times b = ab$, $2 \times a = 2a$, $1 \times a = a$,

$x \times 3 = 3x$ and $a \times a \times a \times ..... \times 10$ times $= a^{10}$.

In a^{10}, 10 is called the index or exponent and a is called the base.

3.2 ALGEBRAIC EXPRESSION

A combination of constants and variables connected by the signs of fundamental operations of addition, subtraction, multiplication and division is called algebraic expression.

3.3 TYPES OF ALGEBRAIC EXPRESSION

An algebraic expression is called a monomial, a binomial, a trinomial, a quadrinomial according as it contains one term, two terms, three terms and four terms respectively.

(i) Monomial : 5, 4x, $7x^2y^3$, –4xyz, $2mn^2p^3$ are all monomials.

(ii) Binomial : $a + 5$, $4 - 3a$, $p^2 - 8qr$, $n^3 - 3$, $2x^2 + xyz^2$ are all binomials.

Note that 2 + 5 is not a binomial, because 2 + 5 = 7, which is a monomial.

(iii) Trinomial : $2x - 5y + 8$, $p^2 + q^2 + 4r^2$, $11 + abc + a^3$ are all trinomials.

Note that 3 + 6x + 6 is not a trinomial, because 3 + 6x + 6 = 6x + 9 which is a binomial.

(iv) Quadrinomials : $p^3 + q^4 + r^5 + 3pqr$, $a^2 - b^2 - c^2 - 7$, mn + np + pq + pqr are all quadrinomials.

3.4 COEFFICIENT

In a term of an algebraic expression any of the factors with the sign of the term is called the coefficient of the product of the factors.

Consider the term – 5ab in the binomial – 5ab + 7. The coefficient of a in the term – 5ab is – 5b, the coefficient of b is – 5a and the coefficient of ab is – 5.

3.5 LIKE TERMS

The terms having the same literal coefficients are called like or similar terms.

(i) In the algebraic expression $12a^2 - 15b^2 + b^2 - 17a^2 + 8ab + 9$, we have, $12a^2$ and $-17a^2$ as like terms. Also, $-15b^2$ and b^2 are like terms.

3.6 ADDITION OR SUBTRACTION OF LIKE TERMS

The sum of difference of several like terms is another like term whose coefficient is the sum or difference of those like terms.

Ex : Add $7x^2 + 3y^2$ to $2y^2 + 3x^2$

$= 7x^2 + 3y^2 + 2y^2 + 3x^2$

$= 10x^2 + 5y^2$

3.7 UNLIKE TERMS

The terms not having same literal coefficients are called unlike or dissimilar terms.

In the algebraic expression $3p^2q + 5pq^2 - 7pq$, $5pq^2$ and $-7pq$ all terms are unlike terms.

SOLVED EXAMPLES

SE. 1

Simplify : $4k - 2 + 3k^2 - 5k + 6$

Ans. $4k - 2 + 3k^2 - 5k + 6$

$= 3k^2 + (4 - 5)K + (-2 + 6)$

$= 3k^2 - k + 4$

SE. 2

Find the value of $\frac{4c^2}{6} - 25$, when c = 9.

Ans. Putting c = 9 in $\frac{4c^2}{6} - 25$,

we get $\frac{4}{6} \times (9)^2 - 25 = \frac{2}{3} \times 81 - 25$

$= 2 \times 27 - 25 = 54 - 25 = 29$

SE. 3

Find the value of $3a + 2bc - 3d^3$; given that a = 5, b = 4, c = 3 and d = 2.

Ans. Putting a = 5, b = 4, c = 3 and d = 2 in $3a + 2bc - 3d^3$, we get

$= 3 \times 5 + 2 \times 4 \times 3 - 3 \times (2)^3$

$= 15 + 24 - 3 \times 8$

$= 15 + 24 - 24 = 15$

SE. 4

The length of a rectangle is three times its breadth. If the perimeter of the rectangle is 96 metres, then find the length and breadth of the rectangle.

Ans. Let the breadth of the rectangle be x m.

$\therefore$ Length of the rectangle = 3x m

Given that, perimeter of the rectangle = 96 m

$\therefore \ 2 \times (x + 3x) = 96$

$\Rightarrow 2 \times 4x = 96$

$\Rightarrow 8x = 96$

$\Rightarrow x = \frac{96}{8} = 12$

$\therefore$ Breadth of the rectangle = 12 m

Length of the rectangle = $3 \times 12 = 36$ m

SE. 5

Subtract the sum of $10m - 8n + 6p^2$ and $-7m - 4n + 12p^2$ from the sum $2m - 4n + 6p^2$ and $m - 8n + 12p^2$.

Ans. Sum of $10m - 8n + 6p^2$ and $-7m - 4n + 12p^2$

$= 10m - 8n + 6p^2 - 7m - 4n + 12p^2$

$= (10 - 7)m + (-8 - 4)n + (6 + 12)p^2$

$= 3m - 12n + 18p^2$

Now , sum of $2m - 4n + 6p^2$ and $m - 8n + 12p^2$

$= 2m - 4n + 6p^2 + m - 8n + 12p^2$

$= (2 + 1)m + (-4 - 8)n + (6 + 12)p^2$

$= 3m - 12n + 18p^2$.

$\therefore$ Required difference

$= 3m - 12n + 18p^2 - (3m - 12n + 18p^2)$

$= 3m - 12n + 18p^2 - 3m + 12n - 18p^2$

$= (3 - 3)m + (-12 + 12)n + (18 - 18)p^2$

$= 0$

SE. 6

If $A = 3a - 2b$, $B = -2a + 3b$ and $C = -a - b$, Then find A + B + C.

Ans. $A = 3a - 2b$, $B = -2a + 3b$, $C = -a - b$

Now, $A + B + C = 3a - 2b - 2a + 3b - a - b$

$= (3 - 2 - 1)a + (-2 + 3 - 1)b$

$= (3 - 3)a + (3 - 3)b = 0$

SE. 7

What should be added to $x^2 + xy + y^2$ to obtain $4x^2 + 8xy$?

Ans. $4x^2 + 8xy - (x^2 + xy + y^2)$

$= 4x^2 + 8xy - x^2 - xy - y^2$

$= (4 - 1)x^2 + (8 - 1)xy - y^2$

$= 3x^2 + 7xy - y^2$

$\therefore 3x^2 + 7xy - y^2$ is added to $x^2 + xy + y^2$ to obtain $4x^2 + 8xy$.

SE. 8

Subtract the sum of $7x^2 - 4y^2$ and $4x^2 + 3xy - 4y^2$ from the sum $5x^2 - 3xy - y^2$ and $x^2 + 2xy - 2y^2$.

Ans. Sum of $7x^2 - 4y^2$ and $4x^2 + 3xy - 4y^2$ is

$= 7x^2 - 4y^2 + 4x^2 + 3xy - 4y^2$

$= (7 + 4)x^2 + (- 4 - 4)y^2 + 3xy$

$= 11x^2 - 8y^2 + 3xy$

Sum of $5x^2 - 3xy - y^2$ and $x^2 + 2xy - 2y^2$

$= 5x^2 - 3xy - y^2 + x^2 + 2xy - 2y^2$

$= (5 + 1)x^2 + (- 3 + 2)xy + (- 1 - 2)y^2$

$= 6x^2 - xy - 3y^2$

$\therefore$ Required difference $= 6x^2 - xy - 3y^2 - (11x^2 - 8y^2 + 3xy)$

$= 6x^2 - xy - 3y^2 - 11x^2 + 8y^2 - 3xy$

$= (6 - 11)x^2 + (- 1 - 3)xy + (- 3 + 8)y^2$

$= -5x^2 + 5y^2 - 4xy$

SE. 9

Find the sum of the expressions :

$x + xy^2 + y + ax^2$; $2ax^2 - 2y + 3x$ and $-5xy^2 - ax^2 - 2y$; $- 5x + 3y - 2ax^2$

Ans. Sum of given expressions

$= [x + xy^2 + y + ax^2 + 2ax^2 - 2y + 3x] + [- 5xy^2 - ax^2 - 2y - 5x + 3y - 2ax^2]$

$= [4x + 3ax^2 - y + xy^2] + [-5xy^2 - 3ax^2 - 5x + y]$

$= 4x + 3ax^2 - y + xy^2 - 5xy^2 - 3ax^2 - 5x + y$

$= (4 - 5)x + (3a - 3a)x^2 + (-1 + 1)y + (1 - 5)xy^2$

$= - x - 4xy^2$

SE. 10

Identify like terms in the following:

(i) $-x^2y$, $- 4y^2x$, $7y^2$, $2x^2y$, $3y$, $-4y^2$, $- 100y$, $12xy$, $10xy^2 - 6y^2x^2$, $4yx$, $11x^2y^2$

(ii) $4ab$, $7a$, $8b$, $-3a^2b^2$, $-4ba$, $- 50b$, $- 75$, $15b^2a^2$, $-7a^2$, 45, $150a$, $70ba$, $10a^2b$, $-15ab^2$, $3ba^2$, $-21a^2$, $7b^2a$

Ans. Like terms are :

(i) $-x^2y$ and $2x^2y$; $- 4y^2x$ and $10xy^2$; $7y^2$ and $- 4y^2$; $3y$ and $- 100y$; $12xy$ and $4xy$; $- 6y^2x^2$ and $11x^2y^2$

(ii) $4ab$, $-4ba$ and $70ba$; $7a$ and $150a$; $8b$ and $- 50b$; $- 3a^2b^2$ and $15b^2a^2$; $- 75$ and 45; $- 7a^2$ and $- 21a^2$; $10a^2b$ and $3ba^2$; $- 15ab^2$ and $7b^2a$

SE. 11

Classify into monomials, binomials and trinomials:

(i) $3x - 5y$ (ii) x^2

(iii) $a + b - ab$ (iv) 50

(v) $2x^2 + y^2 - xy$

Ans. Monomials : x^2, 50

Binomials : $3x - 5y$

Trinomials : $a + b - ab$, $2x^2 + y^2 - xy$

SE. 12

The length of a rectangle is 6 m more than its breadth. The perimeter of the rectangle is 60m. Find the length and breadth of the rectangle.

Ans. Let breadth of the rectangle be x m

$\therefore$ Length of rectangle $= (x + 6)$m

Perimeter $= 60$ m

$\therefore$ 2(length + breadth) $= 60$

$\Rightarrow 2(x + 6 + x) = 60 \quad \Rightarrow 4x + 12 = 60$

$\Rightarrow 4x = 60 - 12 = 48 \quad \Rightarrow x = \frac{48}{4} = 12$

$\therefore$ Breadth of rectangle = 12 m

Length of rectangle = (12 + 6)m = 18 m

SE. 13

The perimeter of a rectangle is 36m. Its length is 2 m greater than its breadth . Find its length and breadth.

Ans. Let breadth of rectangle be x m

$\therefore$ Length = (x + 2)m

Perimeter = 36 m

$\therefore 2(x + 2 + x) = 36$

$\Rightarrow 2(2x + 2) = 36 \quad \Rightarrow 4x + 4 = 36$

$\Rightarrow 4x = 36 - 4 = 32 \Rightarrow x = \frac{32}{4} = 8$

$\therefore$ Breadth of rectangle = 8m

Length of rectangle = (8 + 2)m = 10 m

SE. 14

Write each of the following statements in equation:

(i) A number x increased by 5 equals 12.

(ii) Thrice a number x decreased by 5 is equal to 27.

(iii) 20 decreased by a number x is equal to 15.

Ans. (i) A number x increased by 5

$\therefore x + 5 = 12$

(ii) Thrice of number x = 3x

Thrice of number x decreased by 5

$\therefore 3x - 5 = 27$

(iii) 20 decreased by a number x

$\therefore x - 20 = 15$

SE. 15

Subtract $5x^2 - 3xy + 2y^2$ from $7x^2 - 5xy - 8y^2$.

Ans. Required difference

$= 7x^2 - 5xy - 8y^2 - (5x^2 - 3xy + 2y^2)$

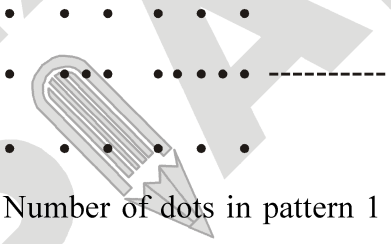
$= 7x^2 - 5xy - 8y^2 - 5x^2 + 3xy - 2y^2$

$= (7 - 5)x^2 + (-5 + 3)xy + (-8 - 2)y^2$

$= 2x^2 - 2xy - 10y^2$

SE. 16

Find the number of dots in the pattern 143 of the following pattern.



Ans. Number of dots in pattern 1 = 3 = 4 × 1 – 1

Number of dots in pattern 2 = 7 = 4 × 2 – 1

Number of dots in pattern 3 = 11= 4 × 3 – 1

and so on

$\therefore$ Number of dots in pattern n = 4 × n – 1

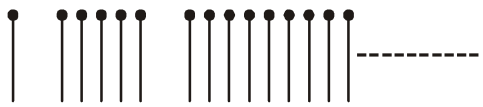
Hence, number of dots in pattern

143 = 4 × 143 – 1

= 572 – 1 = 571

SE. 17

How many match sticks will be required to make the 54^{th} pattern ?



Ans. Number of match sticks in pattern 1

= 1 = 4 × 1 – 3

Number of match sticks in pattern 2

$= 5 = 4 \times 2 - 3$

Number of match stick in pattern 3

$= 9 = 4 \times 3 - 3$ and so on

$\therefore$ Number of match sticks in pattrn n

$= 4 \times n - 3$

Hence, number of match sticks in 54th pattern

$= 4 \times 54 - 3 = 216 - 3 = 213$

SE. 18

When $a = 2, b = -1, c = 0$, find the value of expression $2a^2b + 2ab^2 + 2abc$.

Ans. Putting $a = 2, b = -1, c = 0$

in $2a^2b + 2ab^2 + 2abc$, we get

$2 \times (2)^2 \times (-1) + 2 \times (2) \times (-1)^2 + 2 \times (2) \times (-1) \times 0$

$= 2 \times 4 \times (-1) + 2 \times 2 + 0$

$= -8 + 4 = -4$

SE. 19

Find the value of $16a^2 + 24a + 9$. [$a = 9$]

Ans. Substituting $a = 9$ in $16a^2 + 24a + 9$, we get

$16 \times (9)^2 + 24 \times 9 + 9$

$= 16 \times 81 + 216 + 9$

$= 1296 + 225 = 1521$

Space for Notes :

Exercise 11.1

NS. 1

Get the algebraic expressions in the following cases using variables, constants and arithmetic operations.

(i) Subtraction of z from y.

(ii) One-half of the sum of numbers x and y.

(iii) The number z multiplied by itself.

(iv) One-fourth of the product of numbers p and q.

(v) Numbers x and y both squared and added.

(vi) Number 5 added to three times the product of numbers m and n.

(vii) Product of numbers y and z subtracted from 10.

(viii) Sum of numbers a and b subtracted from their product.

Ans. (i) $y - z$

(ii) $\frac{1}{2}(x+y)$ (iii) z^2

(iv) $\frac{1}{4}(pq)$ (v) $x^2 + y^2$

(vi) $5 + 3(mn)$ (vii) $10 - yz$

(viii) $ab - (a + b)$

NS. 2

(i) Identify the terms and their factors in the following expressions show the terms and factors by tree diagrams.

(a) $x - 3$ (b) $1 + x + x^2$

(c) $y - y^3$ (d) $5xy^2 + 7x^2y$

(e) $-ab + 2b^2 - 3a^2$

(ii) Identify terms and factors in the expressions given below:

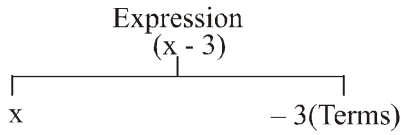
(A) $-4x + 5$ (B) $-4x^2 + 5y^2$

(C) $5y + 3y^2$ (D) $xy + 2x^2y^2$

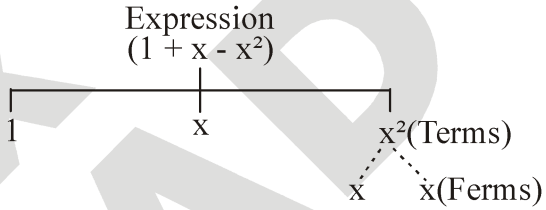
(E) $pq + q$ (F) $1.2ab - 2.4b + 3.6a$

(G) $\frac{3}{4}x + \frac{1}{4}$ (H) $0.1p^2 + 0.2q^2$

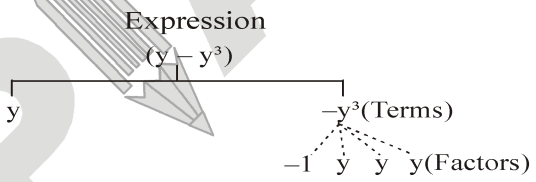
Ans. (i) (A)



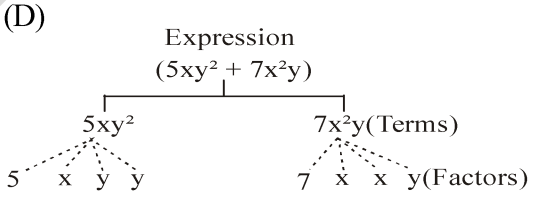
(B)



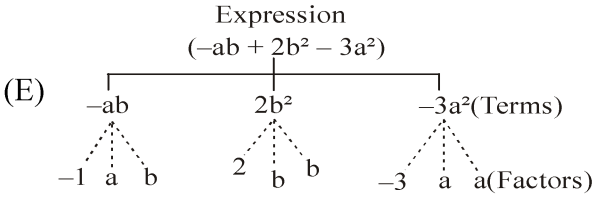
(C)



(D)



(E)



(ii)

	Expression	Terms	Factors
(a)	$-4x + 5$	$-4x$ 5	$-4, x$ 5
(b)	$-4x^2 + 5y^2$	$-4x^2$ $5y^2$	$-4, x, x$ $5, y, y$
(c)	$5y + 3y^2$	$5y$ $3y^2$	$5, y$ $3, y, y$
(d)	$xy + 2x^2y^2$	xy $2x^2y^2$	x, y $2, x, x, y, y$
(e)	$pq + q$	pq q	p, q q
(f)	$1.2ab - 2.4b + 3.6a$	$1.2ab$ $-2.4b$ $3.6a$	$1.2, a, b$ $-2.4, b$ $3.6, a$
(g)	$x\ \frac{3}{4}\ + \frac{1}{4}$	$\frac{3}{4}x$ $\frac{1}{4}$	$\frac{3}{4}, x$ $\frac{1}{4}$
(h)	$0.1p^2 + 0.2q^2$	$0.1p^2$ $0.2q^2$	$0.1, p, p$ $0.2, q, q$

NS. 3

Identify the numerical coefficients of terms (other than constants) in the following expressions:

(i) $5 - 3t^2$ (ii) $1 + t + t^2 + t^3$

(iii) $x + 2xy + 3y$ (iv) $100m + 1000n$

(v) $-p^2q^2 + 7pq$ (vi) $1.2a + 0.8b$

(vii) $3.14\ r^2$ (viii) $2(l + b)$

(ix) $0.1y + 0.01y^2$

Ans.

	Expression	Terms(excluding constants)	Coefficients
(i)	$5 - 3t^2$	$-3t^2$	-3
(ii)	$1 + t + t^2 + t^3$	t t^2 t^3	1 1 1
(iii)	$x + 2xy + 3y$	x $2xy$ $3y$	1 2 3
(iv)	$100m + 1000n$	$100m$ $1000n$	100 1000
(v)	$-p^2q^2 + 7pq$	$-p^2q^2$ $7pq$	-1 7
(vi)	$1.2a + 0.8b$	$1.2a$ $0.8b$	1.2 0.8
(vii)	$3.14r^2$	$3.14r^2$	3.14
(viii)	$2(l + b)$	$2l$ $2b$	2 2
(ix)	$0.1y + 0.01y^2$	$0.1y$ $0.01y^2$	0.1 0.01

NS. 4

(A) Identify terms which contains x and give the coefficient of x.

(i) $y^2x + y$ (ii) $13y^2 - 8xy$

(iii) $x + y + 2$ (iv) $5 + z + zx$

(v) $1 + x + xy$ (iv) $12xy^2 + 25$

(vii) $7x + xy^2$

(B) Identify terms which contains y^2 and give the coefficient of y^2.

(i) $8 - xy^2$

(ii) $5y^2 + 7x$

(iii) $2x^2y - 15xy^2 + 7y^2$

Ans. (A)

	Expression	Terms with x	Coefficient of x
(i)	$y^2x + y$	y^2x	y^2
(ii)	$13y^2 - 8xy$	$-8xy$	$-8y$
(iii)	$x + y + 2$	x	1
(iv)	$5 + z + zx$	zx	z
(v)	$1 + x + xy$	x xy	1 y
(vi)	$12xy^2 + 25$	$12xy^2$	$12y^2$
(vii)	$7x + xy^2$	$7x$ xy^2	7 y^2

(B)

	Expression	Terms with y^2	Coefficient of y^2
(i)	$8 - xy^2$	$-xy^2$	$-x$
(ii)	$5y^2 - 7x$	$5y^2$	5
(iii)	$2x^2y + 7y^2 - 15xy^2$	$7y^2$ $-15xy^2$	7 $-15x$

NS. 5

Classify into monomials, binomials and trinomials.

(i) $4y - 7z$ (ii) y^2

(iii) $x + y - xy$ (iv) 100

(v) $ab - a - b$ (vi) $5 - 3t$

(vii) $4p^2q - 4pq^2$ (viii) 7mn

(ix) $z^2 - 3z + 8$ (x) $a^2 + b^2$

(xi) $z^2 + z$ (xii) $1 + x + x^2$

Ans. The monomials, binomials and trinomials have 1, 2 and 3 unlike terms in it respectively.

(i) $4y - 7z$ Binomial

(ii) y^2 Monomial

(iii) $x + y - xy$ Trinomial

(iv) 100 Monomial

(v) $ab - a - b$ Trinomial

(vi) $5 - 3t$ Binomial

(vii) $4p^2q - 4pq^2$ Binomial

(viii) 7mn Monomial

(ix) $z^2 - 3z + 8$ Trinomial

(x) $a^2 + b^2$ Binomial

(xi) $z^2 + z$ Binomial

(xii) $1 + x + x^2$ Trinomial

NS. 6

State whether a given pair of terms is of like or unlike terms.

(i) 1, 100 (ii) $-7x, \frac{5}{2}x$

(iii) $-29x, -29y$ (vi) $14xy, 42yz$

(v) $4m^2p, 4mp^2$ (vi) $12xz, 12x^2z^2$

Ans. The terms which have same algebraic factors are called like terms. However, when terms have different algebraic factors, these are called unlike terms.

(i) 1,100 Like terms

(ii) $-7x, \frac{5}{2}x$ Like terms

(iii) $-29, -29y$ Unlike terms

(iv) $14xy, 42yx$ Like terms

(v) $4m^2p, 4mp^2$ Unlike terms

(vi) $12xz, 12x^2z^2$ Unlike terms

NS. 7

Identify like terms in the following :

(A) $-xy^2, -4yx^2, 8x^2, 2xy^2, 7y, -11x^2, -100x, -11yx, 20x^2y, -6x^2, y, 2xy, 3x$

(B) $10pq, 7p, 8q, -p^2q^2, -7qp, -100q, -23, 12q^2p^2, -5p^2, 41, 2405p, 78qp, 13p^2q, qp^2, 701p^2$

Ans. (A) $-xy^2$ and $2xy^2$; $-4yx^2$ and $20x^2y$; $8x^2$, $-11x^2$ and $-6x^2$; 7y and y; $-100x$ and $3x$; $-11yx$ and $2xy$

(B) 10pq, –7qp and 78qp; 7p and 2405p; 8q and –100q; $-p^2q^2$ and $12q^2p^2$; – 23 and 41; $-5p^2$ and $701p^2$; $13p^2q$ and qp^2

Exercise 11.2

NS. 1

Simplify by combining like terms;

(i) 21b – 32 + 7b – 20b

(ii) $-z^2 + 13z^2 - 5z + 7z^3 - 15z$

(iii) $p - (p - q) - q - (q - p)$

(iv) $3a - 2b - ab - (a - b + ab) + 3ab + b - a$

(v) $5x^2y - 5x^2 + 3yx^2 - 3y^2 + x^2 - y^2 + 8xy^2 - 3y^2$

(vi) $(3y^2 + 5y - 4) - (8y - y^2 - 4)$

Ans. (i) 21b – 32 + 7b – 20b

$= 21b + 7b - 20b - 32$

$= (21 + 7 - 20)b - 32$

$= 8b - 32$

(ii) $-z^2 + 13z^2 - 5z + 7z^3 - 15z$

$= 7z^3 + (-1 + 13)z^2 + (-5 - 15)z$

$= 7z^3 + 12z^2 - 20z$

(iii) $p - (p - q) - q - (q - p)$

$= p - p + q - q - q + p$

$= p - q$

(iv) $3a - 2b - ab - (a - b + ab) + 3ab + b - a$

$= 3a - 2b - ab - a + b - ab + 3ab + b - a$

$= (3 - 1 - 1)a + (-2 + 1 + 1)b +$

$(-1 - 1 + 3)ab$

$= a + ab$

(v) $5x^2y - 5x^2 + 3yx^2 - 3y^2 + x^2 - y^2 + 8xy^2 - 3y^2$

$= (5 + 3)x^2y + (-5 + 1)x^2 + (-3 - 1 - 3)y^2 + 8xy^2$

$= 8x^2y - 4x^2 - 7y^2 + 8xy^2$

(vi) $(3y^2 + 5y - 4) - (8y - y^2 - 4)$

$= 3y^2 + 5y - 4 - 8y + y^2 + 4$

$= (3 + 1)y^2 + (5 - 8)y + 4 - 4$

$= 4y^2 - 3y$

NS. 2

Add : (i) 3mn, –5mn, 8mn, –4mn

(ii) t – 8tz, 3tz – z, z – t

(iii) –7mn + 5, 12mn + 2, 9mn – 8, –2mn – 3

(iv) a + b – 3, b – a + 3, a – b + 3

(v) 14x + 10y – 12xy – 13, 18 – 7x – 10y + 8xy, 4xy

(vi) 5m – 7n, 3n – 4m + 2, 2m – 3mn – 5

(vii) $4x^2y, -3xy^2, -5xy^2, 5x^2y$

(viii) $3p^2q^2 - 4pq + 5, -10p^2q^2, 15 + 9pq + 7p^2q^2$

(ix) ab – 4a, 4b – ab, 4a – 4b

(x) $x^2 - y^2 - 1, y^2 - 1 - x^2, 1 - x^2 - y^2$

Ans. (i) 3mn + (–5mn) + 8mn + (–4mn)

$= (3 - 5 + 8 - 4)mn = 2mn$

(ii) (t – 8tz) + (3tz – z) + (z – t)

$= t - 8tz + 3tz - z + z - t$

$= (1 - 1)t + (-8 + 3)tz + (-1 + 1)z$

$= -5tz$

(iii) (–7mn + 5) + (12mn + 2) + (9mn – 8) + (–2mn – 3)

$= -7mn + 5 + 12mn + 2 + 9mn - 8 - 2mn - 3$

$= (-7 + 12 + 9 - 2)mn + (5 + 2 - 8 - 3)$

$= 12mn - 4$

(iv) (a + b – 3) + (b – a + 3) + (a – b + 3)

$= a + b - 3 + b - a + 3 + a - b + 3$

$= (1 - 1 + 1)a + (1 + 1 - 1)b - 3 + 3 + 3$

$= a + b + 3$

(v) (14x + 10y – 12xy – 13) + (18 – 7x – 10y + 8xy) + 4xy

$= 14x + 10y - 12xy - 13 + 18 - 7x - 10y + 8xy + 4xy$

$= (14 - 7)x + (10 - 10)y +$

$(-12 + 8 + 4)xy - 13 + 18$

$= 7x + 5$

(vi) (5m – 7n) + (3n – 4m + 2) + (2m – 3mn – 5)

$= 5m - 7n + 3n - 4m + 2 + 2n - 3mn - 5$

$= (5 - 4 + 2)m + (-7 + 3)n$

$= -3mn + 2 - 5$

$= 3m - 4n - 3mn - 3$

(vii) $(4x^2y) + (-3xy^2) + (-5xy^2) + (5x^2y)$

$= 4x^2y - 3xy^2 - 5xy^2 + 5x^2y$

$= (4 + 5)x^2y + (-3 - 5)xy^2$

$= 9x^2y - 8xy^2$

(viii) $(3p^2q^2 - 4pq + 5) + (-10p^2q^2)$

$+ (15 + 9pq + 7p^2q^2)$

$= 3p^2q^2 - 4pq + 5 - 10p^2q^2 + 15$

$+ 9pq + 7p^2q^2$

$= (3 - 10 + 7)\ p^2q^2 + (-4 + 9)pq$

$+ 5 + 15$

$= 5\ pq + 20$

(ix) $(ab - 4a) + (4b - ab) + (4a - 4b)$

$= ab - 4a + 4b - ab + 4a - 4b$

$= (1 - 1)ab + (-4 + 4)a + (4 - 4)b = 0$

(x) $(x^2 - y^2 - 1) + (y^2 - 1 - x^2) + (1 - x^2 - y^2)$

$= x^2 - y^2 - 1 + y^2 - 1 - x^2 + 1 - x^2 - y^2$

$= (1 - 1 - 1)x^2 + (-1 + 1 - 1)y^2$

$+ (-1 - 1 + 1)$

$= -x^2 - y^2 - 1$

NS. 3

Subtract :

(i) $-5y^2$ from y^2 (ii) $6xy$ from $-12xy$

(iii) $(a - b)$ from $(a + b)$

(iv) $a(b - 5)$ from $b(5 - a)$

(v) $-m^2 + 5mn$ from $4m^2 - 3mn + 8$

(vi) $-x^2 + 10x - 5$ from $5x - 10$

(vii) $5a^2 - 7ab + 5b^2$ from $3ab - 2a^2 - 2b^2$

(viii) $4pq - 5q^2 - 3p^2$ from $5p^2 + 3q^2 - pq$

Ans. (i) $y^2 - (-5y^2) = y^2 + 5y^2 = 6y^2$

(ii) $-12xy - (6xy) = -12xy - 6xy = -18xy$

(iii) $(a + b) - (a - b)$

$= a + b - a + b = 2b$

(iv) $b(5 - a) - a(b - 5)$

$= 5b - ab - ab + 5a$

$= 5a + 5b - 2ab$

(v) $(4m^2 - 3mn + 8) - (-m^2 + 5mn)$

$= 4m^2 - 3mn + 8 + m^2 - 5mn$

$= (4 + 1)m^2 + (-3 - 5)mn + 8$

$= 5m^2 - 8mn + 8$

(vi) $(5x - 10) - (-x^2 + 10x - 5)$

$= 5x - 10 + x^2 - 10x + 5$

$= x^2 + (5 - 10)x - 10 + 5$

$= x^2 - 5x - 5$

(vii) $(3ab - 2a^2 - 2b^2) - (5a^2 - 7ab + 5b^2)$

$= 3ab - 2a^2 - 2b^2 - 5a^2 + 7ab - 5b^2$

$= (3 + 7)ab + (-2 - 5)a^2 + (-2 - 5)b^2$

$= 10ab - 7a^2 - 7b^2$

(viii) $(5p^2 + 3q^2 - pq) - (4pq - 5q^2 - 3p^2)$

$= 5p^2 + 3q^2 - pq - 4pq + 5q^2 + 3p^2$

$= (5 + 3)p^2 + (3 + 5)q^2 + (-1 - 4)pq$

$= 8p^2 + 8q^2 - 5pq$

NS. 4

(A) What should be added to $x^2 + xy + y^2$ to obtain $2x^2 + 3xy$?

(B) What should be subtracted from $2a + 8b + 10$ to get $-3a + 7b + 16$?

Ans. (a) Let a be the required term.

$\therefore a + (x^2 + y^2 + xy) = 2x^2 + 3xy$

$\Rightarrow a = 2x^2 + 3xy - (x^2 + y^2 + xy)$

$= 2x^2 + 3xy - x^2 - y^2 - xy$

$= (2 - 1)x^2 - y^2 + (3 - 1)\ xy$

$= x^2 - y^2 + 2xy$

(B) Let p be the required term.

$\therefore (2a + 8b + 10) - p = -3a + 7b + 16$

$\Rightarrow p = 2a + 8b + 10 - (-3a + 7b + 16)$

$= 2a + 8b + 10 + 3a - 7b - 16$

$= (2 + 3)a + (8 - 7)b + 10 - 16$

$= 5a + b - 6$

NS. 5

What should be taken away from $3x^2 - 4y^2 + 5xy + 20$ to obtain $-x^2 - y^2 + 6xy + 20$?

Ans. Required term

$= (3x^2 - 4y^2 + 5xy + 20) - (-x^2 - y^2 + 6xy + 20)$

$= 3x^2 - 4y^2 + 5xy + 20 + x^2 + y^2 - 6xy - 20$

$= (3 + 1)x^2 + (-4 + 1)y^2 + (5 - 6)xy + 20 - 20$

$= 4x^2 - 3y^2 - xy$

NS. 6

(A) From the sum of $3x - y + 11$ and $-y - 11$, subtract $3x - y - 11$.

(B) From the sum of $4 + 3x$ and $5 - 4x + 2x^2$, subtract the sum of $3x^2 - 5x$ and $-x^2 + 2x + 5$.

Ans. (A) Sum of $3x - y + 11$ and $-y - 11$

$= (3x - y + 11) + (-y - 11)$

$= 3x - y + 11 - y - 11$

$= 3x + (-1 - 1)y + 11 - 11$

$= 3x - 2y$

Now, required difference

$= (3x - 2y) - (3x - y - 11)$

$= 3x - 2y - 3x + y + 11$

$= (3 - 3)x + (-2 + 1)y + 11$

$= -y + 11$

(b) Sum of $4 + 3x$ and $5 - 4x + 2x^2$

$= (4 + 3x) + (5 - 4x + 2x^2)$

$= 4 + 3x + 5 - 4x + 2x^2$

$= (3 - 4)x + 2x^2 + 4 + 5$

$= -x + 2x^2 + 9$

Now, sum of $3x^2 - 5x$ and $-x^2 + 2x + 5$

$= (3x^2 - 5x) + (-x^2 + 2x + 5)$

$= 3x^2 - 5x - x^2 + 2x + 5$

$= (3 - 1)x^2 + (-5 + 2)x + 5$

$= 2x^2 - 3x + 5$

Required difference

$= (-x + 2x^2 + 9) - (2x^2 - 3x + 5)$

$= -x + 2x^2 + 9 - 2x^2 + 3x - 5$

$= (-1 + 3)x + (2 - 2)x^2 + 9 - 5$

$= 2x + 4$

Exercise 11.3

NS. 1

If $m = 2$, find the value of :

(i) $m - 2$ (ii) $3m - 5$

(iii) $9 - 5m$ (iv) $3m^2 - 2m - 7$

(v) $\frac{5m}{2} - 4$

Ans. (i) $m - 2 = 2 - 2 = 0$

(ii) $3m - 5 = (3 \times 2) - 5 = 6 - 5 = 1$

(iii) $9 - 5m = 9 - (5 \times 2) = 9 - 10 = -1$

(iv) $3m^2 - 2m - 7$

$= 3 \times (2 \times 2) - (2 \times 2) - 7 = 12 - 4 - 7 = 1$

(v) $\frac{5m}{2} - 4 = \left(\frac{5 \times 2}{2}\right) - 4 = 5 - 4 = 1$

NS. 2

If $p = -2$, find the value of :

(i) $4p + 7$ (ii) $-3p^2 + 4p + 7$

(iii) $-2p^3 - 3p^2 + 4p + 7$

Ans. (i) $4p + 7 = 4 \times (-2) + 7$

$= -8 + 7 = -1$

(ii) $-3p^2 + 4p + 7$

$= -3 \times (-2) \times (-2) + 4 \times (-2) + 7$

$= -12 - 8 + 7 = -13$

(iii) $-2p^3 - 3p^2 + 4p + 7$

$= -2 \times (-2) \times (-2) \times (-2) - 3 \times (-2) \times (-2)$

$+ 4 \times (-2) + 7$

$= 16 - 12 - 8 + 7 = 3$

NS. 3

Find the value of the following expressions, when x = – 1:

(i) 2x –7

(ii) –x + 2

(iii) $x^2 + 2x + 1$

(iv) $2x^2 – x – 2$

Ans. (i) 2x – 7 = 2 × (–1) –7

= – 2 –7 = – 9

(ii) –x + 2 = –(–1) + 2

= 1 + 2 = 3

(iii) $x^2 + 2x + 1$

= (–1) × (–1) + 2 ×(–1) + 1

= 1 – 2 + 1 = 0

(iv) $2x^2 – x – 2$

= 2 × (–1) × (–1) – (–1) –2

= 2 + 1 – 2 = 1

NS. 4

If a = 2, b = –2, then find the value of :

(i) $a^2 + b^2$

(ii) $a^2 + ab + b^2$

(iii) $a^2 – b^2$

Ans. (i) $a^2 + b^2 = (2)^2 + (–2)^2$

= 2 × 2 + (–2) × (–2)

= 4 + 4 = 8

(ii) $a^2 + ab + b^2$

= (2 × 2) + 2 × (–2) + (–2) × (–2)

= 4 – 4 + 4 = 4

(iii) $a^2 – b^2$

= 2 × 2 – (–2) ×(–2) = 4 – 4 = 0

NS. 5

When a = 0, b = –1, find the value of the given expressions :

(i) 2a + 2b

(ii) $2a^2 + b^2 + 1$

(iii) $2a^2b + 2ab^2 + ab$

(iv) $a^2 + ab + 2$

Ans. (i) 2a + 2b = 2 ×(0) + 2 × (–1) = 0 – 2 = – 2

(ii) $2a^2 + b^2 + 1$

= 2 × 0 × 0 + (–1) × (–1) + 1

= 0 + 1 + 1 = 2

(iii) $2a^2b + 2ab^2 + ab$

= 2 × 0 × 0 × (–1) + 2 × 0 × (–1) × (–1) + 0 × (–1)

= 0 + 0 + 0 = 0

(iv) $a^2 + ab + 2$

= (0) × (0) + 0 × (–1) + 2

= 0 + 0 + 2 = 2

NS. 6

Simplify the expressions and find the value, if x is equal to 2

(i) x + 7 + 4 (x – 5)

(ii) 3(x + 2) + 5x –7

(iii) 6x + 5(x – 2)

(iv) 4(2x – 1)+3x + 11

Ans. (i) x + 7 + 4(x –5)

= x + 7 + 4x –20

= (1 + 4)x + 7 – 20

= 5x –13

Putting x = 2, In 5x –13

= (5 ×2) –13

= 10 –13 = –3

(ii) 3 (x + 2) + 5x –7

= 3x + 6 + 5x –7

= (3 + 5)x + 6 – 7

= 8x – 1

Putting x = 2, 8x – 1

= (8 × 2) – 1

= 16 – 1 = 15

(iii) 6x + 5(x – 2)

= 6x + 5x –10

= (6 + 5)x – 10

= 11x – 10

Putting x = 2, 11x – 10

= (11 × 2) – 10

= 22 – 10 = 12

(iv) $4(2x - 1) + 3x + 11$
$= 8x - 4 + 3x + 11$
$= (8 + 3)x + 11 - 4$
$= 11x + 7$
Putting $x = 2$, $11x + 7$
$= (11 \times 2) + 7$
$= 22 + 7 = 29$

NS. 7

Simplify these expressions and find their values if $x = 3$, $a = -1$, $b = -2$.
(i) $3x - 5 - x + 9$
(ii) $2 - 8x + 4x + 4$
(iii) $3a + 5 - 8a + 1$
(iv) $10 - 3b - 4 - 5b$
(v) $2a - 2b - 4 - 5 + a$

Ans. (i) $3x - 5 - x + 9 = (3 - 1)x - 5 + 9$
$= 2x + 4$
$= (2 \times 3) + 4$ [x = 3]
$= 6 + 4 = 10$
(ii) $2 - 8x + 4x + 4 = 2 + 4 + (-8 + 4)x$
$= 6 - 4x = 6 - (4 \times 3)$
$= 6 - 12 = -6$ [x=3]
(iii) $3a + 5 - 8a + 1$
$= (3 - 8)a + 5 + 1$
$= -5a + 6$
$= -5 \times (-1) + 6$ [a = –1]
$= 5 + 6 = 11$
(iv) $10 - 3b - 4 - 5b = 10 - 4 + (-3 - 5)b$
$= 6 - 8b = 6 - 8 \times (-2)$ [b = –2]
$= 6 + 16 = 22$
(v) $2a - 2b - 4 - 5 + a = (2 + 1)a - 2b - 4 - 5$
$= 3a - 2b - 9$
$= 3 \times (-1) - 2 \times (-2) - 9$ [a = –1, b= –2]
$= -3 + 4 - 9 = -8$

NS. 8

(i) If $z = 10$, find the value of $z^3 - 3(z - 10)$.
(ii) If $p = -10$, find the value of $p^2 - 2p - 100$.

Ans. (i) For $z = 10$, $z^3 - 3(z - 10)$
$= z^3 - 3z + 30$
$= (10 \times 10 \times 10) - (3 \times 10) + 30$
$= 1000 - 30 + 30 = 1000$
(ii) For $p = -10$,
$p^2 - 2p - 100$
$= (-10) \times (-10) - 2 \times (-10) - 100$
$= 100 + 20 - 100 = 20$

NS. 9

What should be the value of a if the value of $2x^2 + x - a$ equals to 5, when $x = 0$?

Ans. When $x = 0$; $2x^2 + x - a = 5$,
$\therefore (2 \times 0 \times 0) + 0 - a = 5$
$\Rightarrow 0 - a = 5 \Rightarrow a = -5$

NS. 10

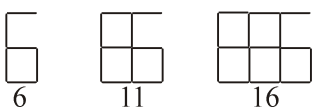
Simplify the expression $2(a^2 + ab) + 3 - ab$ and find its value when $a = 5$ and $b = -3$.

Ans. $2(a^2 + ab) + 3 - ab$
$= 2a^2 + 2ab + 3 - ab$
$= 2a^2 + (2 - 1)ab + 3$
$= 2a^2 + ab + 3$
$= 2 \times (5 \times 5) + 5 \times (-3) + 3$ [$\therefore a = 5, b = -3$]
$= 50 - 15 + 3 = 38$

Exercise 11.4

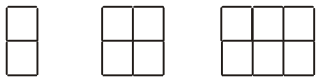
NS. 1

Observe the patterns of digits made from line segments of equal length. You will find such segmented digits on the display of electronic watches or calculators.

(A) 
6 11 16 21... (5n + 1)...

(B) 

4 7 10 13... (3n + 1)...

(C) 

7 12 17 22... (5n + 2)...

If the number of digits formed is taken to be n, the number of segments required to form n digits is given by the algebraic expression appearing on the right of each pattern. How many segments are required to from 5, 10, 100 digits of the kind 

Ans. (A) It is given that the number of segments required to form n digits of the kind  is (5n + 1).

Number of segments required to form 5 digits = (5 × 5 + 1) = 25 + 1 = 26

Number of segments required to form 10 digits = (5 × 10 + 1) = 50 + 1 = 51

Number of segments required to form 100 digits = (5 × 100 + 1) = 500 + 1 = 501

(B) It is given that the number of segments required to form n digits of the given kind is (3n + 1).

Number of segments required to form 5 digits = (3 × 5 + 1) = 15 + 1 = 16

Number of segments required to form 10 digits = (3 × 10 + 1) = 30 + 1 = 31

Number or segments required to form 100 digits = (3 × 100 + 1) = 300 + 1 = 301

(C) It is given that the number of segments required to form n digits of the given kind is (5n + 2).

Number of segments required to form 5 digits = (5 × 5 + 2) = 25 + 2 = 27

Number of segments required to form 10 digits = (5 × 10 + 2) = 50 + 2 = 52

Number of segments required to form 100 digits = (5 × 100 +2) = 500 + 2 = 502

NS. 2

Use the given algebraic expression to complete the table of number patterns.

S.No.	Expression	Terms									
		1st	2nd	3rd	4th	5th	...	10th	...	100th	...
1.	2n – 1	1	3	5	7	9	-	19	-	-	-
2.	3n + 2	5	8	11	14	-	-	-	-	-	-
3.	4n + 1	5	9	13	17	-	-	-	-	-	-
4.	7n + 20	27	34	41	48	-	-	-	-	-	-
5.	$n^2 + 1$	2	5	10	17	-	-	-	-	10,001	-

Ans. Number pattern for expression 2n – 1 put n = 1, 2, 3, ...and so on , we get

1, 3, 5, 7, 9, 11, 13, 15, 17, (19), ... (199)

$2 \times 10 - 1$ $2 \times 100 - 1$

Now, 5th term, 10th and 100th term of the pattern for expression 3n + 2 are (3 × 5 + 2, 3 ×10 + 2 and 3 × 100 + 2) or 17, 32 and 302 respectively.

For expression 4n + 1, 5th term, 10th and 100th term of the pattern are 4 × 5 + 1 = 21, 4 × 10 + 1 = 41 and 4 ×100 + 1 = 401 respectively.

For expression 7n + 20, 10th and 100th term of the pattern are 7 × 5 + 20 = 55, 7 × 10 + 20 = 90 and 7 × 100 + 20 = 720 respectively.

For expression $n^2 + 1$, 10th and 100th term of the pattern are $5^2 + 1 = 26$, $10^2 + 1 = 101$ and $100^2 + 1 = 10001$ respectively.

EXERCISE – I

ONLY ONE CORRECT TYPE

1. Latika is 6m years old. She is thrice as old as her sister. What will be their total age after six years ?

(A) (8m + 12) years (B) (8m + 6) years

(C) (6m + 6) years (D) (5m + 10) years

2. Simplify : $4k - 2 + 3k^2 - 5k + 6$

(A) $k^2 + k + 4$ (B) $3k^2 - K + 4$

(C) $3k^2 - 9K + 4$ (D) $3k^2 - 9K - 4$

3. Find the value of $\frac{4c^2}{6} - 25$ when c = 12.

(A) 24 (B) 71 (C) 29 (D) 35

4. Kiran spent Rs. 6x on a book, Rs. 6 on food and had Rs. 18 left. What was the sum of money she had at first ? Express your answer in terms of x.

(A) Rs.(6x + 18) (B) Rs.(6x + 24)

(C) Rs. 64x (D) Rs. 24x

5. Beena bought m pencils at n paise each. How much change did she get back, if she paid Rs. 20 ?

(A) Rs. $(20 - \frac{mn}{100})$ (B) Rs.(2 – m – n)

(C) Rs.(200 – m –n) (D) Rs. $(200 - \frac{mn}{100})$

6. The sum of $3p^2q^2 - 5pq + 4$ and $7 + 7pq - 2p^2q^2$ is equal to

(A) $p^2q^2 - 2pq + 1$

(B) $-p^2q^2 + 2pq + 11$

(C) $-p^2q^2 - 2pq + 11$

(D) $p^2q^2 + 2pq + 11$

7. Subtracting 3xy + 5yz – 7zx from 5xy – 2zx + 10 xyz, we get

(A) 2xy – 5yz + 5zx + 10xyz

(B) 2xy + 5yz – 5zx + 10xyz

(C) 2xy – 5yz – 5zx – 10xyz

(D) 2xy + 5yz + 5zx – 10xyz

8. If the sides of a triangle are 3p, 4p – 2 and 5p + 1. Find the perimeter of the triangle.

(A) 9p – 3 (B) 7p – 1

(C) 12p – 1 (D) 8p – 3

9. What should be added to $-6y^2 + 3x$ to get $-3y^2 + 5x$?

(A) $3y^2 + 4x$ (B) $3y^2 + 2x$

(C) $2x^2 + 3y$ (D) $4x^2 + 2y$

10. If there are x rows of chairs and each row contains 3x chairs. Determine the total number of chairs.

(A) $3x^2$ (B) $2x^3$

(C) x^2 (D) x^3

11. Subtract :

$\frac{3}{2}x^2y + \frac{4}{5}y - \frac{1}{3}x^2yz$ from $\frac{12}{5}x^2yz - \frac{3}{5}xyz + \frac{2}{3}x^2y$

(A) $\frac{41}{15}x^2yz - \frac{5}{6}x^2y - \frac{3}{5}xyz - \frac{4}{5}y$

(B) $\frac{5}{6}x^2yz - \frac{3}{5}x^2y + \frac{41}{15}x^2yz - \frac{4}{5}y$

(C) $\frac{4}{5}x^2yz - \frac{5}{6}x^2y - \frac{3}{4}xyz + \frac{4}{7}y$

(D) $\frac{41}{15}x^2yz + \frac{5}{6}x^2y + \frac{4}{5}xyz + \frac{3}{5}y$

12. Add the following algebraic expressions and then find value at y = 1

$\frac{2y}{3}-\frac{5y^2}{3}+\frac{5y^3}{2}, -\frac{4}{3}+\frac{2y^2}{3}-\frac{y}{2}$

(A) $\frac{1}{3}$ (B) $\frac{-3}{7}$

(C) $\frac{3}{2}$ (D) $\frac{4}{3}$

13. The score of Ishita in Mathematics is 25 more than the two third of her score in Science. If she scored x marks in Science, determine her score in Mathematics.

(A) $\frac{3}{2}x+25$ (B) $\frac{2}{3}+25x$

(C) $\frac{2}{3}x+25$ (D) $\frac{3}{2}+25x$

14. Simplify :

$a^3b - a^2b^3 + 4a^2b^3 - 2a^3b^2 - a^3b + 2a^3b^2$

(A) $3a^2b^3$ (B) $-3a^3b$

(C) $-3a^3b^2$ (D) 0

15. How much larger is $13x^2 - 7y^2$ than $6x^2 - 9y^2$?

(A) $7x^2 - 2y^2$ (B) $7x^2 + 2y^2$

(C) $6x^2 - 3y^2$ (D) $6x^2 + 3y^2$

16. A pipe is (7x – 3) metres long. A length of (5x – 7) metres is cut for use. How much pipe (in meters) is left ?

(A) 2x + 4 (B) –2x +7

(C) 3x +2 (D) 2x + 1

17. The length of rectangle is 7x – 3y and its breadth is 3x + 4y. The perimeter of the rectangle is

(A) 13x + 5y (B) 17x – 2y

(C) 20x + 2y (D) 10x + y

18. Tanmay had Rs. 56. He spent Rs. x on transport and Rs. 2y on lunch. He used the remaining amount to buy 3 similar books. What was the cost of each book ?

(A) Rs.(56 –x + 2y)

(B) Rs. (56 – x – 2y)

(C) Rs. $\frac{(56-x+y)}{3}$

(D) Rs. $\frac{(56-x-2y)}{3}$

19. Rohan spends Rs. x daily and saves Rs. y per week What is his income after 3 weeks ?

(A) Rs. (21x + 3y) (B) Rs.(3x + 9y)

(C) Rs.(21x + 9y) (D) Rs. (7x + 3y)

20. Ahmed starts from Delhi at 8 A.M. to jaipur. It his car is ruuning at the speed or x km/hr and at 1p.m., he observes that he is 20 km away from Jaipur. Find the distance between Delhi and Jaipur.

(A) (4x + 20) km (B) (4x + 25) km

(C) (5x + 25) km (D) (5x + 20) km

21. Subtract the sum of $(8m + 7n + 6p^2)$ and $(-3m - 4n - p^2)$ from the sum of $(2m + 4n - 3p^2)$ and $(- m - n - p^2)$.

(A) $-4m - 9p^2$ (B) $4m - 6n + 9p^2$

(C) $-4m + 6n - 9p^2$ (D) $4m - 9p^2$

22. The perimeter of a triangle is (7x – 15)cm. The two sides are (3x – 3) cm and (2x + 2) cm . Find the third side.

(A) 3x – 13 (B) 2x – 14

(C) 2x – 15 (D) 3x – 15

23. Distance covered by a man 3 times around a square park having side $3x - 2a + 5$ is

(A) $9x - 6a + 15$

(B) $12x - 4a + 20$

(C) $36x - 24a + 60$

(D) None of these

24. Somya bought 2 toy cars for Rs. $(4x + 3y)$ each and 1 book for Rs. $(7x - 3y)$. What is the total money spent by her ?

(A) $11x + 6y$ (B) $15x + 3y$

(C) $3x - 6y$ (D) $3x + 6y$

25. Sameeksha had Rs.$(58x^2 + 6x - 3)$ with her. She spent Rs.$(19x^2 - 2x - 1)$ out of it. What amount (in Rs.) is left with her ?

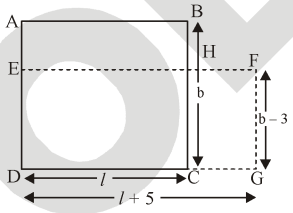
(A) $45x^2 + 4x - 2$ (B) $39x^2 + 8x - 2$

(C) $77x^2 + 4x - 4$ (D) $39x^2 + 4x - 2$

PARAGRAPH TYPE

PARAGRAPH # 1

We have a rectangle of length l and breadth b. The length of the rectangle is increased by 5 units, i.e., $(l + 5)$ units and breadth is decreased by 3 units, i.e., $(b - 3)$ units.



From above answer the following questions :

26. What is the perimeter of rectangle DEHC ?

(A) $3l + 2b + 6$ (B) $2l + 2b - 6$

(C) $3l - 2b - 6$ (D) $2l - 3b - 15$

27. If length of rectangle DEFG is 2 times its breadth then find the perimeter of the rectangle DEFG.

(A) $6b + 16$ (B) $2b + 18$

(C) $6b - 18$ (D) $6l + 16$

28. What is the perimeter of rectangle DEFG ?

(A) $2l + 2b + 4$ (B) $2l + 2b$

(C) $2l + 4b - 2$ (D) $2b + 4l + 2$

PARAGRAPH # 2

If $a * b$ means a is added in b,

$a \$ b$ means b is subtracted from a

$a \# b$ means a is multiplied by b.

$a \& b$ means a is divided by b,

Then answer the following questions :

29. If $a = x^2 + x + 1$ and $b = 2x^2 - 4x + 6y$, then find $a * b + 2b$

(A) $11x^2 - 7y + 19x - 1$

(B) $7x^2 - 11x + 7y + 18$

(C) $18x^2 - 7x + 11y + 1$

(D) $7x^2 - 11x + 18y + 1$

30. If $a = \frac{x}{2} + \frac{3y}{4}$ and $b = \frac{-x}{2} + \frac{6y}{4}$, then find $a \$ b * a$.

(A) $\frac{1}{2}x$ (B) $\frac{3}{2}x$

(C) $\frac{3}{4}y$ (D) $\frac{3}{8}y$

31. If $a = 4x - 7xy + 3y + 12$ and $b = 12x - 9xy + 6y - 3$, then find $a \$ b \# 3$.

(A) $-32x + 20xy - 15y + 21$

(B) $32x + 4xy - y - 12$

(C) $-32x - xy + 13$

(D) $-3xy + x + 12$

MATCH THE COLUMN TYPE

In this section each question has two matching lists. Choices for the correct combination of elements from List – I and List – II are given as options (A), (B), (C) and (D) out of which one is correct.

32. Match the following:

List – I	**List – II**
(P) Add $x^5 + 8x^3 - 7x^2 + 12$ and $-3x^3 + 10x^2 + 8$	(i) $-x^3 - 3x^2 + 3x + 2$
(Q) Subtract $2x^2y + 4x^2y^2 + 3xy^2$ from $5x^2y + 7xy^2$	(ii) $-x^3 + x^2 + 3x - 6$
(R) Subtract $2x^3 + 2x^2 - 4x - 4$ from $x^3 - x^2 - x - 2$	(iii) $x^5 + 5x^3 + 3x^2 + 20$
(S) Add $x^3 - x^2 - x - 2$ add $2x^2 - 2x^3 + 4x - 4$	(iv) $3x^2y + 4xy^2 - 4x^2y^2$

(A) (P) → (iii), (Q) → (ii), (R) → (i), (S) → (iv)

(B) (P) → (iii), (Q) → (iv), (R) → (i), (S) → (ii)

(C) (P) → (ii), (Q) → (iv), (R) → (iii), (S) → (i)

(D) (P) → (ii), (Q) → (iii), (R) → (iv), (S) → (i)

33. Match the value of given expressions.

List – I	**List – II**
(P) $(x^2 + 5)(x^3 + 3) + 5$ at $x = 2$	(i) 0
(Q) $2x^3 + 2x^2 - 4x - 4$ at $x = -2$	(ii) 104
(R) $\left(\frac{-10}{3}xy^3\right) \times \left(\frac{6}{5}x^3y\right)$ at $x = 5, y = 3$	(iii) 13
(S) $x^3 - x^2 - x - 2$ at $x = 3$	(iv) -4

(A) (P) → (iii), (Q) → (ii), (R) → (iv), (S) → (i)

(B) (P) → (ii), (Q) → (iii), (R) → (i), (S) → (iv)

(C) (P) → (ii), (Q) → (iv), (R) → (i), (S) → (iii)

(D) (P) → (iii), (Q) → (i), (R) → (iv), (S) → (ii)

EXERCISE – II

VERY SHORT ANSWER TYPE

1. Find the coefficient of xy in the expression $2x^2y + 4xy - 3yx$.
2. Are the terms $\frac{2}{5}x^2y, -\frac{3}{2}x^2y$ and $\frac{10}{7}x^2y$ like terms ?
3. How many terms are there in a binomial ?
4. Is $7x^2 - 9x - 3(-3x^2 - 3x + 2)$ a monomial or a binomial ?
5. What is the difference between binomial and monomial ?
6. What is the coefficient of $x^2 \times (-3x^2)$?
7. What is the constant term in the sum of $(5x^2 - 7x + 4)$ and $(7x - 8)$?
8. If a = 2, b = – 1, then find the value of $a^2 + b^2 + 2ab$.
9. If $A = 3x^2 + 2x - 7$ and $B = 7x^3 - 3x + 4$, then find the value of 2A + 3B.
10. The length and breadth of a rectangle are $6x^2 - 2$ and $5x + 2$ respectively. Find its perimeter.

SHORT ANSWER TYPE

1. Simplify : $3(4x^2 - 5x) + 4(3x^2 + 5x)$ and find the value for (i) x = 3, (ii) $x = \frac{1}{2}$
2. Subtract $4(-ac + 4bc + c^2)$ from $3(a^2 + ab + ac) - 5(ab - b^2 + bc)$.
3. Solve:
$$\frac{4}{3}m^2 - \frac{3}{4}n^2 + 2mn - \left(\frac{16}{9}m^2 + \frac{9}{16}n^2 + 2mn\right)$$
4. Subtract $4p^2q + pq^2 - 3pq + 7q - 8p - 10$ from $5p^2q - 2pq^2 + 5pq - 11q - 3p + 28$.
5. Simplify : $4(a^3 + a^2 + a) - (5a + 3)$ and find its value for (i) a = 0, (ii) a= 1.

LONG ANSWER TYPE

1. Find the sum of $\frac{7}{2}s^2t + st^2$ and $\frac{7}{2}st^2 + s^2t$. Verify the result for $s = \frac{1}{2}$ and t = 5.
2. Add the following algebraic expressions and then find its value for y = 1.
$$2, \frac{2y}{3} - \frac{5y^2}{3} + \frac{5y^3}{2}, -\frac{4}{3} + \frac{2y^2}{3} - \frac{y}{2}, \frac{5y^3}{3} + 3y^2 + 3y + \frac{6}{5}$$
3. Simplify : $9x^4 + (2x^3 - 5x^4) - 5x^3 - (x^4 - 3x^2)$ and find its value for x = – 2
4. Simplify :$(2x + 3y) - (3x + 4y) + (7x + 3y) + (x + 2y)$ and find value for x = 2, y = 1.
5. Find the sum of $24(x^2 - 2x^3)$ and $-3(xy^2 + y^3)$ and evaluate their sum at $x = \frac{1}{2}$ and y = 2.

TRUE FALSE

1. $1 + \frac{x}{2} + x^3$ is a polynomial.
2. $(3a - b + 3) - (a + b)$ is a binomial.
3. A trinomial can be a polynomial.
4. A polynomial with more than two terms is a trinomial.
5. The total number of planets of sum can be denoted by the variable n.

FILL IN THE BLANKS

1. $-5a^2b$ and $-5b^2a$ are _____ terms.
2. $3a^2b$ and $-7ba^2$ are _____ terms.
3. In the expression $2\pi r$, the algebraic variable is _____.
4. Number of terms in a monomial is _____.
5. The coefficient of y^2 in $-63x^3y^2z$ is _____.

NUMERICAL PROBLEMS

1. Find the value of expression $(4x - 3y)(4x + 3y + 5) - 4x + 12y$ when $x = 2$ and $y = 3$.
2. Find the value of $\left(\frac{-8}{5}a^2b^2c^3\right) \times \left(\frac{-3}{4}ab^2c\right)$ at $a = \frac{1}{5}$, $b = -1$ and $c = 5$.
3. Find the value of expression $6x^3 \times (2x^2 - 1)$ at $x = 2$.
4. How many terms are there in $3x - \frac{4}{5}xy^2 - \frac{1}{5}xy^2 - \frac{2}{3}y$?
5. Find the coefficient of x, if $(2x^2 - 5x + 7)$ is subtracted from $(3x^2 + 4x - 6)$.
6. If the sum of $(8x^2 - 6x + 9)$ and $(-10x^2 - 8x - 9)$ is subtracted from -3, then find the coefficient of x.
7. Find the constant term on subtracting $-17x^2 + (3x - 7)$ from $2x^2 + (3x - 4x^2)$.
8. Find the value of $a^2 + ab^2 + a^2b + b^2$ at $a = -1$ and $b = 2$.
9. The value of $\left(\frac{-7}{5}x^2y\right) \times \left(\frac{3}{2}xy^2\right) \times \left(\frac{-6}{5}x^3y^3\right)$ at $x = 2$, $y = 1$ is $\frac{63}{25}k$, Then find k.
10. Find the sum of the values of the expression $2x^2 - 2x + 2$ when $x = -1$ and $x = 1$.

Space for Notes :

Answer Key

EXERCISE–I

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
A	B	B	B	A	D	A	C	B	A	A	A	C	A	B
16	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**
A	C	D	A	D	A	B	C	B	B	B	C	A	D	B
31	**32**	**33**												
A	B	C												

EXERCISE – II

VERY SHORT ANSWER TYPE

1. xy is 1. **2.** Yes **3.** two terms **4.** It is a binomial **5.** One term.

6. –3 **7.** –4 **8.** 1 **9.** $21x^3 + 6x^2 - 5x - 2$ **10.** $12x^2 + 10x$

SHORT ANSWER TYPE

1. $24x^2 + 5x$ **(i)** 231 **(ii)** $\frac{17}{2}$ **2.** $3a^2 + 5b^2 - 4c^2 - 2ab + 7ac - 21bc$

3. $-\frac{4}{9}m^2 - \frac{21}{16}n^2$ **4.** $p^2q - 3pq^2 + 8pq - 18q + 5p + 38$

5. (i) –3 **(ii)** 4

TRUE FALSE

1. T 2. F 3. T 4. F 5. F

FILL IN THE BLANKS

1. unlike 2. like 3. r 4. one 5. $-63x^3z$

LONG ANSWER TYPE

1. $\frac{495}{8}$ **2.** $\frac{56}{5}$ **3.** 84 **4.** 18 **5.** –30

NUMERICAL PROBLEMS

1. 6 **2.** 6 **3.** 336 **4.** 3 **5.** 9 **6.** 14 **7.** 7

8. 3 **9.** 64 **10.** 8

SELF PROGRESS ASSESSMENT FRAMEWORK

(CHAPTER : ALGEBRAIC EXPRESSIONS)

CONTENT	STATUS	DATE OF COMPLETION	SELF SIGNATURE
Theory			
In-Text Examples			
Solved Examples			
NCERT Exercises			
Exercise I			
Exercise II			
Short Note-1			
Revision - 1			
Revision - 2			
Revision - 3			
Remark			

NOTES :

1. In the status, put "completed" only when you have thoroughly worked through this particular section.
2. Always remember to put down the date of completion correctly. It will help you in future at the time of revision.

Space for Notes :