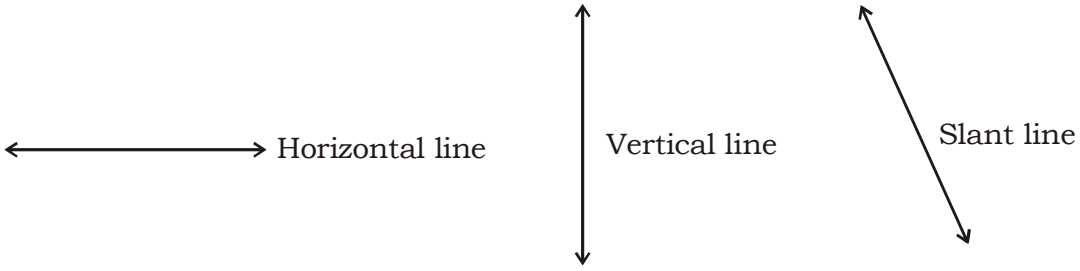
LINES, ANGLES & PARALLEL LINES

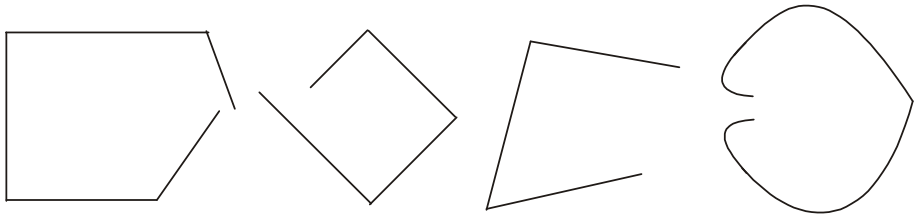
SYNOPSIS - 1

- A point has position but is said to have no magnitude. Its location can be ascertained.
- A line has length but is said to have no breadth.
- A surface has length and breadth but no thickness.
- A solid has length, breadth and thickness.
- A line may be straight or curved.
- A straight line has the same direction from point to point throughout its whole length.
- A curved line changes its direction continuously from point to point.
- A line has no end points. It extends indefinitely in both directions.
- Points lying on the same line are called collinear points.
- Number of lines joining two points at a time is given by a formula $\frac{n(n-1)}{2}$, where n = the total number of points such that no three of them are collinear.
- A plane is a flat surface extending indefinitely in all directions.
- **Incidence Properties in a Plane :**
  a) An unlimited number of lines can be drawn passing through a given point in a Plane.
  b) Only one line can be drawn through two different points in a plane. The line wholly lies in the plane containing the two points.
  c) Two different lines in a plane having a common point are called *Intersecting lines*. Two intersecting lines in a plane have only one common point.
  d) If two lines do not intersect and are equidistant from each other they become parallel lines.
  e) Points belonging to the same plane are called *Co-planar points.*
  f) Lines belonging to the same plane are called *Co-planar lines.*
- **Space :** The set of all points is called **space.** Space is an infinite set of points. Lines and planes are its subsets.
- If three or more lines pass through the same point they are called **concurrent lines** and the point through which they pass is called point of concurrence.

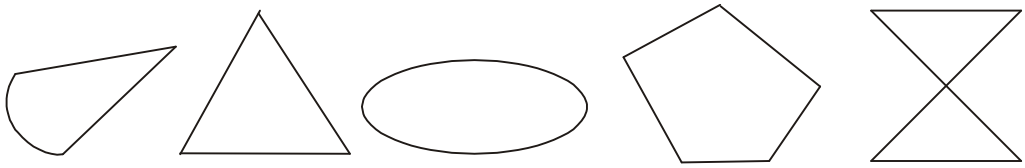
- **Types of lines :**



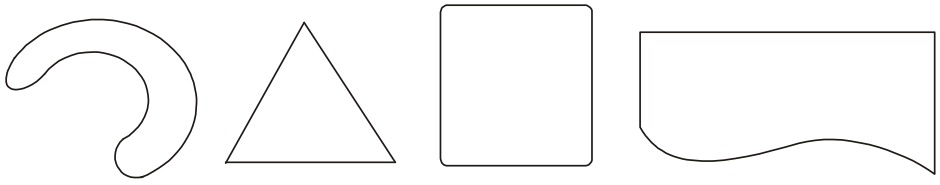
- **Open shapes :** These shapes are called open shapes because they do not begin and end at the same point.



- **Closed shapes :** These are also called closed curves. They begin and end at the same point



- **Simple closed curves :** A closed curve that does not cross itself is called a ***simple closed curve.***



- **Eulers formula :** V + F = E + 2.

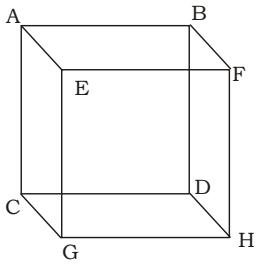
  Here, V = Number of vertices

  F = Number of faces

  E = The number of edges

  Example :

  Verification of Euler's formula for the following figure :



Sol: V = Number of vertices = 8
F = Number of faces = 6
E = The number of edges = 12.
$V + F = E + 2 \Rightarrow 8 + 6 = 12 + 2 \Rightarrow 14 = 14$ (L.H.S = R.H.S)

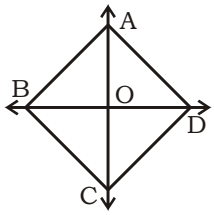
WORK SHEET - 1

1. **If number of vertices (V) = 12 and number of faces = 8, then the number of edges are**
   1) 16 2) 14 3) 18 4) 20

2. **Match the following groups.**

Group - A	Group - B
(a) Space	(i) Same line
(b) Plane	(ii) One point
(c) Intersecting line	(iii) Lines, planes
(d) Collinear points	(iv) Flat surface

   1) a – (ii), b – (i), c – (iii), d – (iv) 2) a – (i), b – (ii), c – (iii), d – (iv)
   3) a – (iii), b – (iv), c – (ii), d – (i) 4) a – (iv), b – (iii), c – (i), d – (ii)

3. 

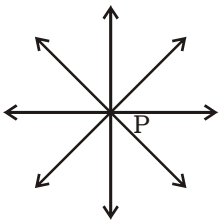
Number of lines passing through O is
   1) 6 2) 4 3) 5 4) 8

4. **If 'm' represents the number of lines joining two points at time, then the formula for finding 'x' is**
   1) $\frac{n(n+1)}{2}$ 2) $\frac{2n(n+1)}{3}$ 3) $\frac{n(n-1)}{2}$ 4) $\frac{n(n-1)}{3}$

5. **If 'x' represents number of lines through a given point 'p' in a plane, then the value of 'm' is**
   1) one 2) less than 10^{10} 3) 10^{10} 4) infinite

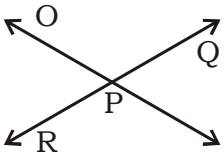
6. **The simplest of all geometrical figures which has no size but has position is**
   1) line 2) line segment 3) point 4) space

7. **Three or more points in a plane are said to be collinear, if they lie on the**
   1) same plane 2) same line 3) different lines 4) none

8. 

In the given figure point P is called

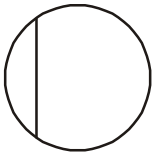
1) intersecting point 2) point of concurrence
3) collinear` 4) plane

9. 

In the given figure P, O and Q are

1) collinear 2) non-collinear 3) point 4) space

10. **Which one of the following is a simple closed curve**

1)  2)  3)  4)  5) 

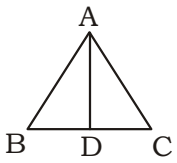
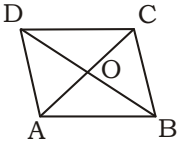
11. **Match the following :**

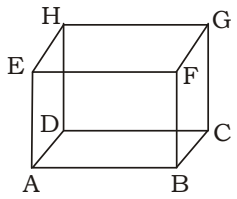
Group - A (Name of the Geometrical figure)	**Group - B (End points)**
(a) Line	(i) 2
(b) Line segment	(ii) 3 or more
(c) Ray	(iii) No
(d) Collinear points	(iv) 1

1) a - i, b - ii, c - iii, d - iv 2) a - iii, b - i, c - iv, d - ii

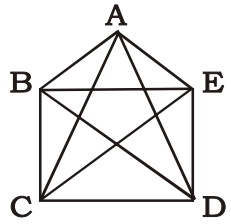
3) a - iii, b - i, c - ii, d - iv 4) a - iv, b - i, c - iii, d - ii

12. **Count the number of line segments in each of the following figures and match them with their numbers**

Group - A	**Group - B**
a) 	i) 10
b) 	ii) 12

c) 

iii) 5

d) 

iv) 8

v) 16

1) a - i, b - ii, c - iv, d - iii
2) a - iii, b - iv, c - ii, d - i
3) a - iv, b - i, c - iii, d - ii
4) a - i, b - iv, c - iii, d - ii

13. If $\overline{XY}$ = 228000cm, then its length in kilometres is

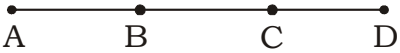
1) 28 km 2) 2.28 km 3) 0.28 km 4) 280 km

14. If AB = 3.06 km, then its length in decimetres is

1) 306 × 10^3 decimetre
2) 306 × 10^2 decimetre
3) 3.06 × 10^3 decimetre
4) 30.6 × 10^2 decimetre

15. If $\overline{AB}$ = 512 cm and $\overline{CD}$ = 4723 mm, then $\overline{AB}+\overline{CD}$ in metres is

1) 9.843 metres
2) 9.483 metres
3) 9.384 metres
4) 9.834 metres

16. 

If AD = (5x + 20)cm and AB = (x + 10) cm, CD= (2x + 5)cm, then (AC + BD) length is

1) (7x + 30)cm
2) (7x + 10)cm
3) (7x + 25)cm
4) (7x + 15)cm

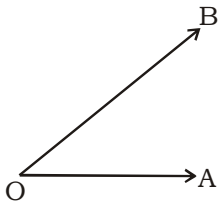
17. 

If AE = 47.6cm, CD = 12.09cm, AB = 8.903cm, AC = 16.57cm, DE = 10.896cm, then the total length (AC + CE + BE) cm. is

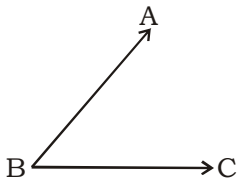
1) 8.6297 2) 86.297 3) 862.97 4) 8629.7

SYNOPSIS - 2

I. **Angle :** When two rays have a common end point they form an angle

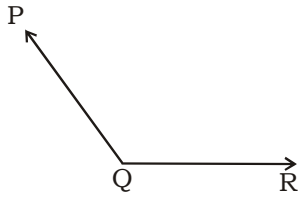


II. **Parts of an angle:**



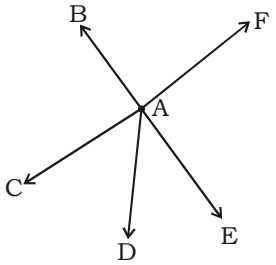
a) Rays $\overrightarrow{BA}$ and $\overrightarrow{BC}$ together form an angle.
b) The common end point (B) is called the *Vertex* of the angle.
c) BA and BC are called the *arms* of the angle.
d) The middle letter (B) is always the *Vertex* of the angle.

III. **Naming an angle :**



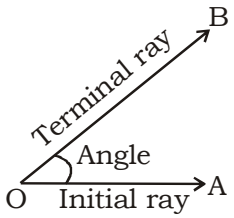
We can name the angles by using only capital letters as $\angle$PQR (or) $\angle$RQP (or) $\angle$Q.

IV. Infinite number of rays can be drawn with the same point.



V. Two rays with the same initial point and extending indefinitely in opposite directions along the same line are called *opposite rays*.

VI. By rotating a ray over another ray about their common initial point an angle can be formed. The ray $\overrightarrow{OA}$ is in fixed position and is known as the *initial ray*. The rotating ray $\overrightarrow{OB}$ is called the *terminal ray*.

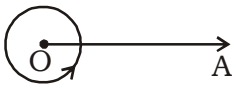


VII. **Types of angles:** $\overrightarrow{OA}$ and $\overrightarrow{OB}$ are two rays.

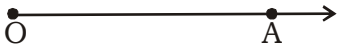
a) **Straight angle :** During rotation at one stage if $\overrightarrow{OA}$ and $\overrightarrow{OB}$ become opposite rays then the angle so formed is called a *straight angle*.

Here $\angle AOB = 180°$.

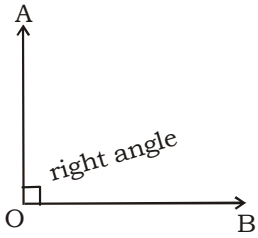
b) **Complete angle :** If we still continue the rotation after one complete rotation the terminal ray coincides with the initial ray, then the angle formed is called a *complete angle*.



c) **Zero angle :** An angle whose measure is 0^0 is called a *zero angle*. If two coinciding rays each OA have a common end point O, then $\angle AOA = 0°$.



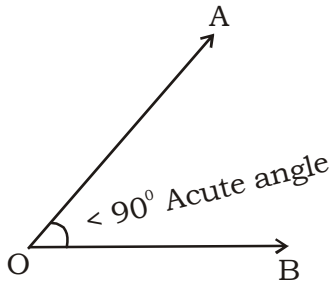
d) **Right angle :** An angle whose measure is 90° is called a *right angle*.



e) **Acute angle :**An angle whose measure is more than 0° but less than 90° is called an *Acute angle*

e.g.: 1°, 2° ..... < 90°

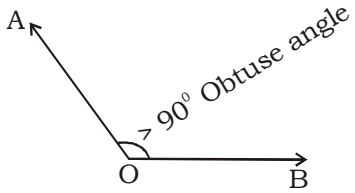
In the given figure $\angle AOB$ is an acute angle



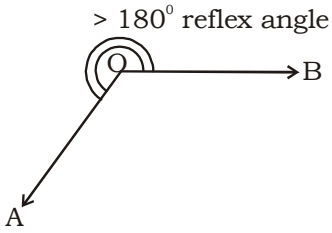
f) **Obtuse angle :** An angle whose measure is more than 90° but less than 180° is called an *obtuse angle*.

e.g.: $90\frac{1}{2}°$, 92°, 120°..... < 180°

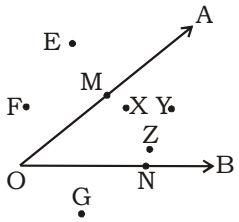
In the adjoining figure, $\angle$BOA is an *obtuse angle*.



g) **Reflex angle :** An angle whose measure is more than 180° but less than 360° is called a *reflex angle.*



VIII. Interior and Exterior of an angle:



An $\angle$AOB divides the plane of the paper into 3 parts:

a) The part consisting of all those points which lie inside the angle called the *interior of the angle*.
   e.g.: X, Y, Z
b) The part consisting of all those points which lie on the boundary of the angle.
   e.g.: M, N
c) The part consisting of all those points which lie outside the angle called the *exterior of the angle*.

e.g. E, F, G.

IX. Measurement of an angle:

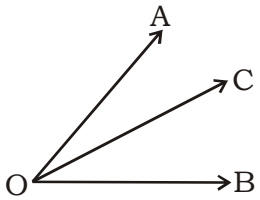
a) A complete rotation of a ray about O makes an angle of 360°.
b) The angle so formed is called a Complete angle.
c) Each one of 360 equal parts of a complete angle is called a degree written as 1°.
d) One degree (1°) is further divided into 60 equal parts, each called a minute written as 1′. 1′ is further divided into 60 equal parts each called a second written as 1″.
   1° = 60' and 1' = 60'' $\therefore$ 1° = 3600''

X. Angles made by minutes hand and hours hand of a clock :

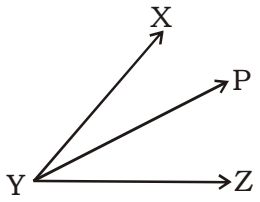
a) A minutes hand covers 6° every minute.
b) A minutes hand of a clock completes one rotation in 60 min. Therefore a minutes hand covers an angle of 360° in one hour.
c) A hours hand of a clock completes one rotation in 12 hours.
   It covers an angle of 360° ÷ 12 = 30° in 60 minutes.
   It covers an angle of 30° ÷ 60 = $\frac{1^\circ}{2}$ in 1 minute
   A hours hand of a clock completes 30^0 angle in an hour.
d) Difference between angles formed by a minutes hand and hours hand in 1 minute is $6^\circ - \frac{1}{2}^\circ = 5\frac{1}{2}^\circ$
e) Angle between minutes hand and hours hand
   1) At 3 AM = 90°
   2) At 6 AM = 180°
   3) At 9 AM = 90°
   4) At 12 AM = 0°

Operations with angles :

a) A ray which divides an angle into congruent angles is called the *bisector of the angle*

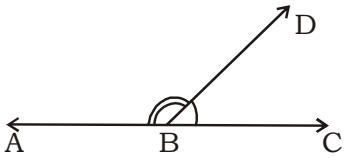


   If $\angle AOC = \angle BOC$, then OC is called the bisector of the angle
b) Two angles in a plane are called adjacent angles if they have the common vertex, a common side and their interiors do not have a common point.



$\angle$XYP and $\angle$PYZ are adjacent angles as they have a common vertex Y and a common arm $\overrightarrow{PY}$.

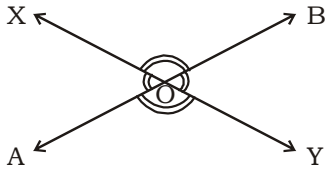
c) The pair of adjacent angles whose non common arms are opposite rays is called a **linear pair.**



$\angle$ABD, $\angle$CBD form a linear pair and form a straight angle

$\angle$ABD + $\angle$CBD = 180°

d) If two lines intersect then the angles forming no common side are called ***vertically opposite*** angles. The measures of the vertically opposite angles are equal.

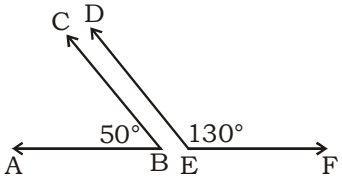


$\angle$AOX = $\angle$BOY

$\angle$BOX = $\angle$AOY

e) Two angles are said to be ***supplementary*** if the sum of their measures is 180°.

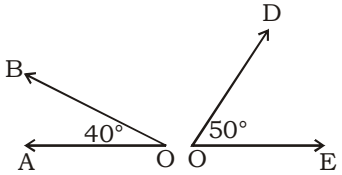
e.g. :



i.e., $\angle$ABC + $\angle$DEF = 180°

f) If the sum of the measures of two angles is equal to 90°, then they are called ***complementary angles.***

e.g. :

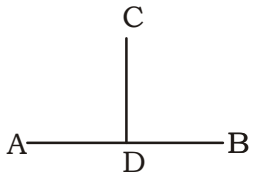


$\angle$AOB = 40°, $\angle$DOE = 50°

$\angle AOB + \angle DOE = 90°$

If two angles are complementary or supplementary they need not be adjacent angles.

g) If the measure of the angle between two lines is 90°, then the two lines are said to be perpendicular to each other CD $\perp$ AB, CD perpendicular to AB, $\angle ADC = \angle BDC = 90°$



WORK SHEET - 2

SINGLE ANSWER TYPE

1. Match the following:

Group - A	Group - B
1) 69°	a) obtuse angle
2) 91°	b) reflex angle
3) 359°	c) complete angle
4) 360°	d) acute angle

1) 1 - d, 2 - a, 3 - c, 4 - b 2) 1 - d, 2 - c, 3 - b, 4 - a
3) 1 - c, 2 - d, 3 – b, 4 - a 4) 1 - d, 2 - a, 3 - b, 4 - c

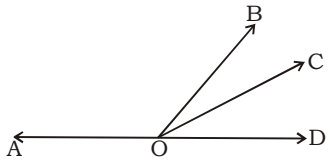
2. If the two hands of a clock shows the time of 7 am, then the angle between them is

1) 180° 2) 210° 3) 270° 4) 240°

3. If the minutes hand shows the time of 6.48 pm, then the angle swept by hand is

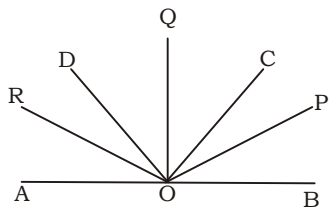
1) 272° 2) 278° 3) 288° 4) 298°

4. If $\angle AOB = 100°$, where $\angle BOC : \angle COD = 3 : 5$, then the $\angle AOC$ is



1) 140° 2) 150° 3) 130° 4) 125°

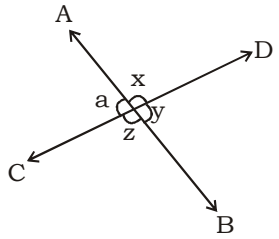
5. If $\angle BOC : \angle COD : \angle AOD = 3 : 4 : 2$, where OP, OQ, OD are bisectors of angles $\angle BOC$, $\angle BOD$ and $\angle AOD$, then $\angle POR$ is



1) 130^0 2) 180° 3) 140° 4) 160°

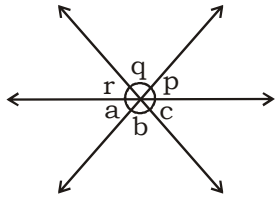
6. If $\angle X = 28° 29'38''$, $\angle Y = 112°56'26''$, where $\angle A$ and $\angle B$ are the complement and supplement of $\angle X$ and $\angle Y$, then $\angle A + \angle B$ is
1) 127°33'56'' 2) 128°33'56'' 3) 128°33'54'' 4) 128°32'56''

7. From the given figure, if x:y = 3:7, then the values of a and z are



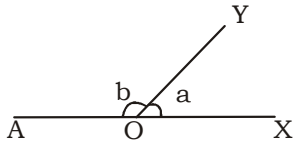
1) a = 54°, z = 126° 2) z = 54°, a = 126° 3) a = 64°, z = 126° 4) a = 54°, z = 132°

8. From the given figure if c = 28°, then the value of (a + b + p + q) is



1) 302° 2) 306° 3) 304° 4) 308°

9. If a – b = 20°, then the value of a and b are



1) a = 100°, b = 80° 2) a = 80°, b = 100° 3)a = 70°, b = 110° 4) a = 80°, b = 110°

10. If an angle x° is equal to supplement, then the angle is
1) $\frac{1}{3}$ right angle 2) $\frac{1}{4}$ straight angle 3) $\frac{1}{4}$ complete angle 4) $\frac{2}{5}$ Right angle

11. If $x - 10^0 = 60°$ where x is an acute angle, then the supplement of x is
1) 110° 2) 120° 3) 130° 4) 140°

12. If $2x + 210 = 260^0$, where x is an acute angle, then the complement of the angle x is
1) 60° 2) 75° 3) 65° 4) 70°

13. If two angles A and B which are complement to each other are in the ratio 3:2, then the angles
1) 54°, 36° 2) 60°, 30° 3) 70°, 20° 4) 44°, 46°

14. If two angles which are supplement to each other are in the ratio 2 : 7, then the angles are
1) 40°, 140° 2) 30°, 150° 3) 10°, 170° 4) 60°, 120°

15. If the supplement of an angle 5 times itself, then its complement is
1) 60° 2) 70° 3) 80° 4) 50°

16. If the complement of an angle $\frac{1}{5}$ times itself, then the angles are
1) $75^o, 15^o$ 2) $60^o, 30^o$ 3) $65^o, 25^o$ 4) $80^o, 10^o$

17. If the supplement of angle 40° less than thrice its supplement, then the angles are
1) 55°, 125° 2) 60°, 120° 3) 75°, 15° 4) 80°, 100°

18. If an angle lies between 180° and 270° is a/an
1) reflex 2) complete 3) acute 4) obtuse

19. If an angle lies between 105° and 130°, then it is _____ angle
1) acute 2) reflex 3) obtuse 4) complete

20. If a wheel makes one revolution in 1 second, then the angle made by it is
1) 270° 2) 180° 3) 360° 4) 90°

MULTI ANSWER TYPE

21. A ray contains
1) One end point 2) No definite length
3) Contains infinite number of points 4) Contains finite number of points

22. Which of the following is/are plane figure(s)
1) Triangle 2) Cube 3) Rectangle 4) Circle

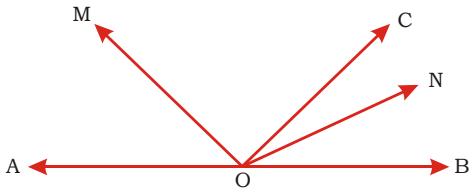
REASONING ANSWER TYPE

23. *Statement-I*: An angle divides the plane into two regions.

Statement-II: A point in the interior of the angle does not belong to the angle.

1) Both Statements are true, Statement II is the correct explanation of Statement I.
2) Both Statements are true, Statement II is not correct explanation of Statement I.
3) Statement I is true, Statement II is false.
4) Statement I is false, Statement II is true.

24.



Statement-I: From the diagram $\angle AOC = 100^0$ and OM and ON are bisectors of $\angle AOC$, and $\angle BOC$ respectively, then $OM \perp ON$.

Statement-II: The bisectors of linear pair forms right angle.

1) Both Statements are true, Statement II is the correct explanation of Statement I.
2) Both Statements are true, Statement II is not correct explanation of Statement I.
3) Statement I is true, Statement II is false.
4) Statement I is false, Statement II is true.

COMPREHENSION TYPE

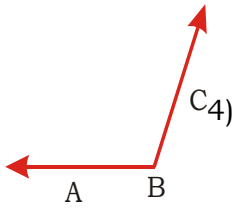
Writeup:1

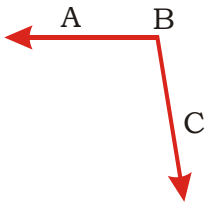
The straight line is generally called as line.Only one straight line is possible through two points on a plane.But we can draw infinite curved line through two points in a plane.

25. Which of the following figure is a straight line?

1) 

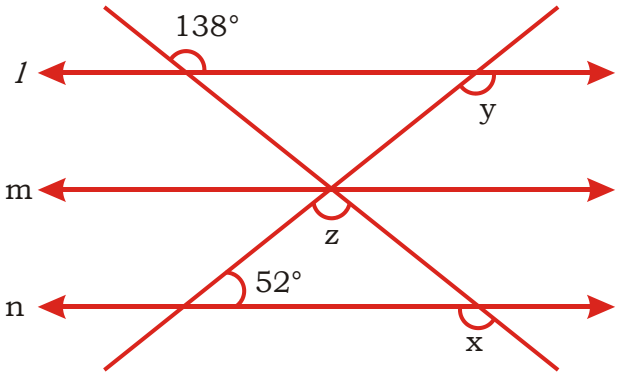
2) 

3) 

4) 

26. Two straight lines can't encloses
    1) Plane 2) Point 3) Curve 4) Line
27. Number of curves that can be drawn through two points are
    1) One 2) Two 3) Infinite 4) Four

Writeup:2



Answer the following from the above diagram

28. The value of X is
    1) 52° 2) 138° 3) 90° 4) 69°
29. Valu of Z in degrees is
    1) 60° 2) 138° 3) 52° 4) 76°
30. Relation between x and y is
    1) Congruent 2) Complementary 3) Supplementary 4) x<y

MATRIX MATCHING TYPE

31.

Column - I	Column - II
a) 90° – x°	1) Complete angle
b) 180°	2) Suplement of x
c) 360°	3) Complement of x
d) 180° – x°	4) Straight angle
	5) Reflex angle

32.

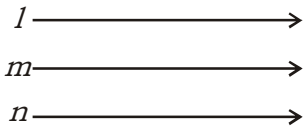
Column - I	Column - II
a) Vertex of the angle $\angle DEF$ is	1) $\overrightarrow{QP}, \overrightarrow{QR}$
b) In an angle $\angle PQR$ two initial rays are	2) $\overrightarrow{PQ}, \overrightarrow{PR}$
c) In $\angle AEB$ is also represented by angle	3) 2
d) The minimum number of arms required to form an angle is	4) E
	5) 3

INTEGER ANSWER TYPE

33. The angle formed by hands of a clock when the time is 9:00am _____.

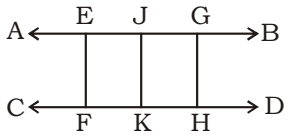
SYNOPSIS - 3

i) Two lines which are parallel to a given line are parallel to each other.



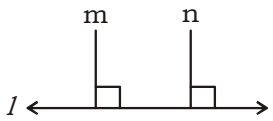
If $l \parallel m$ and $m \parallel n$, then $l \parallel n$.

ii) The distance between the parallel lines is always the same.



$AB \parallel CD \Rightarrow EF = GH = JK$

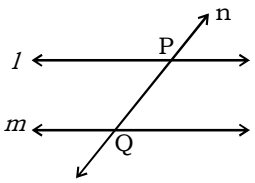
iii) Two lines perpendicular to a given line are parallel to each other.



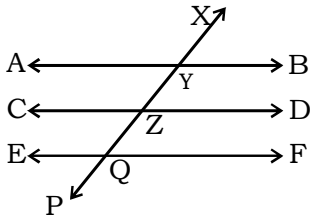
If $m \perp l$ and $n \perp l$, then $m \parallel n$

iv) All coplanar lines perpendicular to a given line are parallel to each other.

v) In the given figure, the transversal n intersect the two lines l and m at P and Q. $\overline{PQ}$ is the intercepted part of the line.

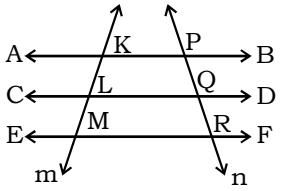


vi) Three lines are intersected by a transversal, two intercepts are formed.

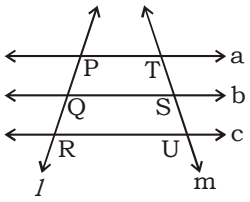


vii) Three lines are intersected by two transversals two sets of intercepts are formed

$\overline{KL}$ and $\overline{LM}$, $\overline{PQ}$ and $\overline{QR}$ are the intercepts.



viii) If a system of parallel lines makes equal intercepts on a transversal, then the system makes equal intercepts on any number of transversals drawn to them



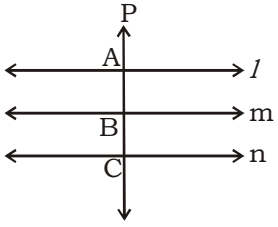
a) Transversal *l* makes equal intercepts on the parallel lines a, b and c i.e, PQ = QR

b) Transversal m also makes equal intercepts on the parallel lines a, b and c

i.e., TS = SU

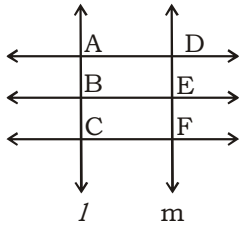
ix) Consider a system of three parallel lines *l*, m and n such that the distance between *l* and m is equal to the distance between m and n.

a)



l || m || n, transversal p is intersected by *l*, m and n at right angles at A, B and C.

b)



l and m are two transversals such that $\overline{AB} = \overline{BC} = \overline{DE} = \overline{EF}$, then $\frac{\overline{AB}}{\overline{BC}} = \frac{\overline{DE}}{\overline{EF}}$

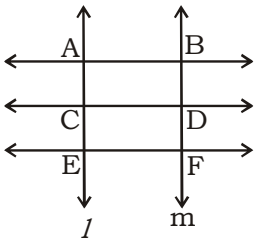
c) If a system of parallel lines makes equal intercepts on a transversal, then the distance between consecutive lines is the same

d) In a system of equidistant parallel lines intercepts made in any number of perpendicular transversals are equal.

Intercept Theorem:

- If three parallel lines make equal intercepts on one transversal then they make equal intercepts on any other transversal as well. Any number of parallel lines which are equidistant from one another make equal intercepts on all transversals drawn to them.

  When three or more parallel lines are intersected by two transversals they make intercepts on them which are in proportion.



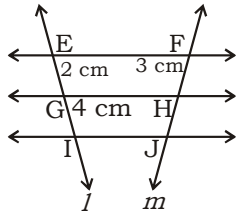
If AC = x cm and CE = y cm, then AC : CE or $\frac{AC}{CE} = \frac{x}{y}$

BD : DF or $\frac{BD}{DF} = \frac{x}{y}$

WORK SHEET - 3

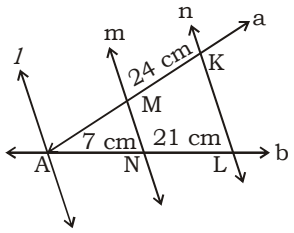
SINGLE ANSWER TYPE

1. From the given diagram if parallel lines, EF, GH, IJ are intercepted by transversals *l* and m. Where EG = 2 cm, GI = 4 cm, FH = 3 cm, then HJ is



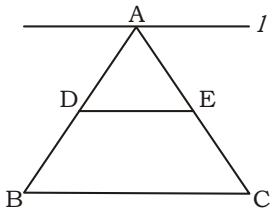
1) 8 cm 2) 9 cm 3) 12 cm 4) 6 cm

2. *l* || m || n and transversals a and b through A intersects them at A, M, K, N, L. If AN = 7 cm, NL = 21 cm, KM = 24 cm, then the length of intercept $\overline{AM}$ is



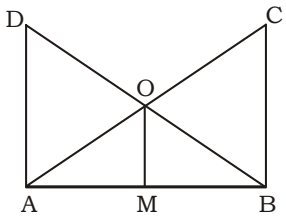
1) 8 cm 2) 9 cm 3) 10 cm 4) 12 cm

3. If *l* || ED || CB, where AB = 12 cm, AC = 16 cm, and EC = 4 cm, then the length of AD is



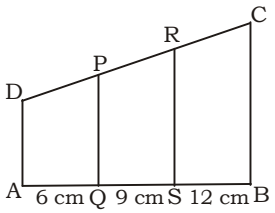
1) 6 cm 2) 9 cm 3) 10 cm 4) 8 cm

4. DA, CB, OM are each perpendicular to line segment AB where O is the point of intersection of AC and DB. If OA = 2.4 cm, OC = 3.6 cm, then AM : BM is



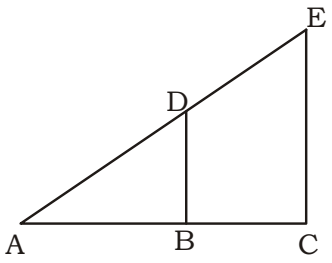
1) 2:1 2) 2:5 3) 2:3 4) 2:4

5. Given AD || PQ || RS || BC. If CD = 30 cm, then the length of DP, PR and RC are



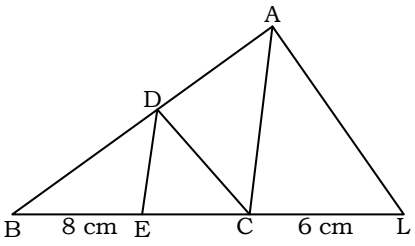
1) $6\frac{2}{3}$ cm, 10 cm, $13\frac{1}{3}$ cm
2) $13\frac{2}{3}$ cm, $6\frac{2}{3}$ cm, 10 cm
3) $13\frac{1}{3}$ cm, $6\frac{1}{3}$ cm, 10 cm
4) $13\frac{2}{3}$ cm, 6 cm, $10\frac{1}{3}$ cm

6. If BD || CE and AD : DE = 4:7, AB = 20 cm, then the length of of BC is



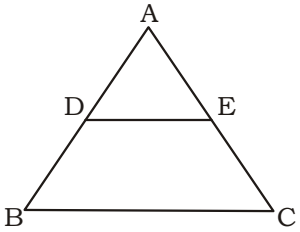
1) 25 cm 2) 30 cm 3) 40 cm 4) 35 cm

7. From the given diagram, If CD || LA and DE || AC, then the length of EC is



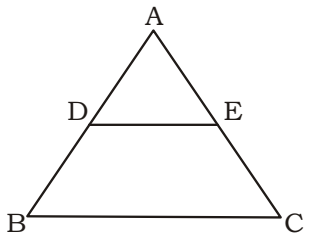
1) 8 cm 2) 6 cm 3) 4 cm 4) 2 cm

8. From the given diagram, If DE || BC, where AD = x, DB = x – 2, AE = x + 2, EC = x – 1, then the value of x is



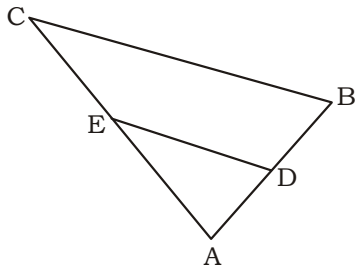
1) 6 cm 2) 2 cm 3) 3 cm 4) 4 cm

9. From the given diagram, If AD = 4x – 3, AE = 8x – 7, BD = 3x – 1, CE = 5x – 3, then the value of x is



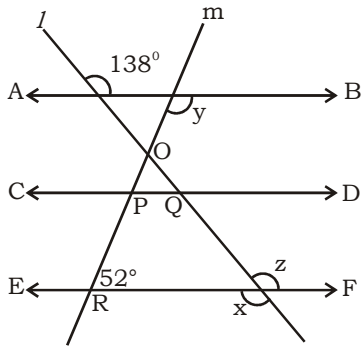
1) 2 cm 2) 1 cm 3) 3 cm 4) 4 cm

10. If DE || BC, where AD = 2 cm, BD = 6 cm and AC = 9 cm, then the length of AE is



1) 2.35 cm 2) 2.15 cm 3) 2.45 cm 4) 2.25 cm

11. If AB| | CD| | EF. Where *l* and m are transversals, then the values of x and y are

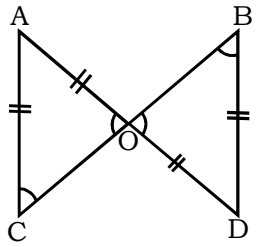


1) 148°, 128° 2) 128°, 138° 3) 138°, 128° 4) 138°, 140°

12. If two lines that are respectively perpendicular to two parallel lines, then they are _____to each other

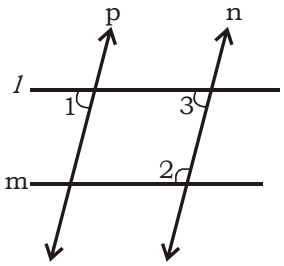
1) perpendicular 2) Intersecting
3) parallel 4) concurrent lines

13. If $\angle AOC = \angle ACO$ and $\angle BOD = \angle OBD$, then



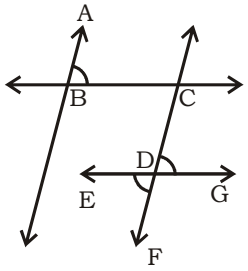
1) AC = BD 2) AC $\neq$ BD 3) AC $\parallel$ BD 4) AC $\not\parallel$ BD

14. If $l||m$ and $p||n$ and $\angle 1 = 75°$, then



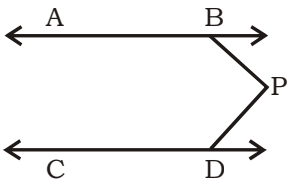
1) $\angle 2 = \angle 1 + 1/3$ of a right angle 2) $\angle 2 = \angle 1 + 2/3$ of a right angle
3) $\angle 2 = \angle 1 + 1/2$ of a right angle 4) $\angle 2 = \angle 1 + 1/6$ of a right angle

15. If AB || CF and BC || ED, then



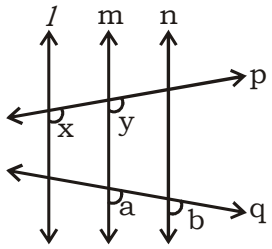
1) $\angle ABC = \angle BCD$ 2) $\angle FDE = \angle FDG$
3) $\angle ABC = \angle FDG$ 4) $\angle FDE = \angle ABC$

16. If AB || CD and P is any point as shown in the figure, then $\angle ABP + \angle BPD + \angle CDP$ is



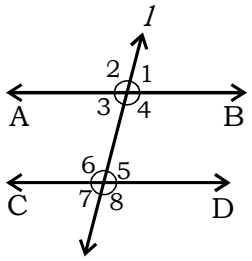
1) 72° 2) 180° 3) 540° 4) 360°

17. In the given figure $l||m||n$. If x = y and a = b, then



1) $l \not\parallel n$ 2) $l < n$ 3) $l > n$ 4) $l || n$

18. In the given figure, AB||CD and l is a transversal. If $\angle 2 = 2x + 30°$, $\angle 4 = x + 2y$ and $\angle 6 = (3y + 10^0)$, then $\angle 5$ is



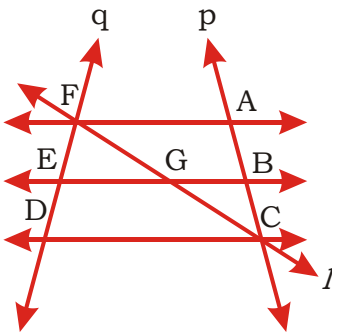
1) 60° 2) 70° 3) 50° 4) 80°

MULTI ANSWER TYPE

19. A, B, C are collinear if and only if

1) AB + BC = AC 2) BC = AB + AC 3) AB = BC + AC 4) $BC^2 = AB^2 + AC^2$

20. In the given figure, collinear points are _____



1) A, B, C 2) D, E, F 3) F, G, C 4) D, G, B

REASONING ANSWER TYPE

21. *Statement-I*: If AX = 0.3 cm, XB = 4cm, AB = 3.7 cm then A, B, X are called collinear.

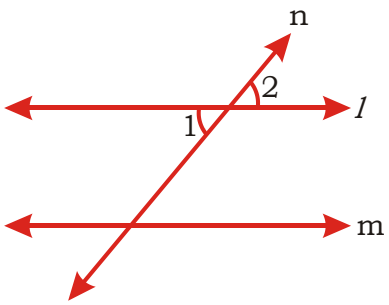
Statement-II: The lines which belong to the same plane are called non - coplanar lines.

1) Both Statements are true, Statement II is the correct explanation of Statement I.

2) Both Statements are true, Statement II is not correct explanation of Statement I.

3) Statement I is true, Statement II is false.

4) Statement I is false, Statement II is true.



22. *Statement-I*: In the given figure *l*, m are parallel lines and n is a transversal, then $\angle 1 = \angle 2$.

Statement-II: In the given figure *l* is parallel to m and vertically opposite angles are equal.

1) Both Statements are true, Statement II is the correct explanation of Statement I.

2) Both Statements are true, Statement II is not correct explanation of Statement I.

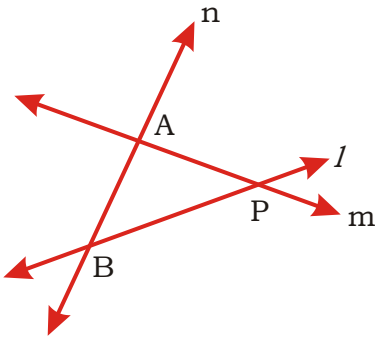
3) Statement I is true, Statement II is false.

4) Statement I is false, Statement II is true.

COMPREHENSION TYPE

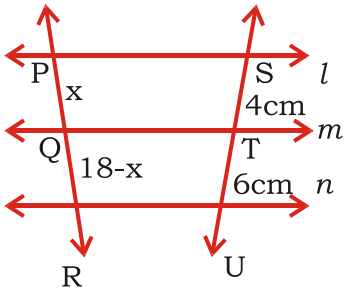
Writeup: 1

By using given figure answer the following questions



23. The distance between A and B is called
    1) $\overline{AB}$ 2) Intercept
    3) Length of the line AB 4) None
24. The line 'n' is called
    1) Transversal 2) Intersecting lines
    3) Parallel line 4) Perpendicular line
25. The lines *l* and m intersecting at 1) A
    2) B 3) P 4) Q

Writeup:2



In the given figure *l*//*m*//*n* and PR, SU are transvesals

PR = 18 cm, UT = 6 cm, TS = 4 cm

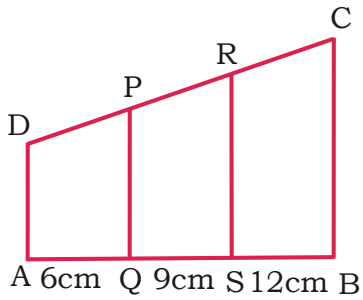
26. The length of QR is
    1) 10.8 cm 2) 5.8 cm 3) 5 cm 4) 4.2 cm
27. The length of PQ
    1) 28.8 cm 2) 7.2 cm 3) 11 cm 4) 132 cm
28. The value of PR + UT is
    1) 20 cm 2) 22.8 cm 3) 24 cm 4) 22 cm

MATRIX MATCHING TYPE

29.

Column - I	Column - II
a) Maximum number of points of intersection at three different lines is	1) Infinite
b) Three points P, Q and R are collinear, if PR + RQ = PQ the point lies between P and Q	2) 3
c) If *l* ||n and m||n then	3) R
d) Coincident lines have common points	4) *l*||m

30. In the given figure, AD || PQ || RS || BC. If CD = 30 cm.



Column - I	Column - II
a) the length of DP is	1) $6\frac{2}{3}$cm.
b) the length of PR is	2) $13\frac{1}{3}$cm.
c) the length of RC is	3) 10 cm.
d) CR – DP =	4) 8 cm.
	5) 9 cm.

INTEGER ANSWER TYPE

31. The sum of adjacent angles in a linear pair is _____.

KEY & HINTS

WORK SHEET – 1 (KEY)				
1) 3	2) 3	3) 1	4) 3	5) 4
6) 3	7) 2	8) 2	9) 2	10) 2
11) 2	12) 2	13) 2	14) 2	15) 1
16) 3	17) 2			

11. (a) – iii (b) – i (c) – iv (d) – ii

13. 100000 cm = 1 km

$$228000\text{cm} = \frac{228000}{100000} = 2.28\text{km}$$

14. 10000 decimetre = 1 kilometre

$$30.6 \text{ km in decimetre} = 3.06 \times 10000 = \frac{306}{100} \times 10000 = 306 \times 10^2 \text{decimetre}$$

15. Given $\overline{AB}$ = 512 cm, $\overline{CD}$ = 4723 mm

We know 100 cm = 1 metre
1000 mm = 1 metre

$\therefore \quad \overline{AB} + \overline{CD} = \frac{512}{100} + \frac{4723}{1000}$ = 5.12 m + 4.723 m = 9.843 metres.

16. BD = AD – AB = (5x + 20) – (x + 10) = 5x + 20 – x – 10 = (4x + 10)cm
AC = AD – CD = (5x + 20) – (2x + 5) = 5x + 20 – 2x – 5 = (3x + 15) cm
$\therefore$ AC + BD = 4x + 10 + 3x + 15 = (7x + 25) cm
17. CE = AE – AC = 47.6 cm – 16.57 cm = 31.03 cm
BE = AE – AB = 47.6 cm – 8.903 cm = 38.697 cm
$\therefore$ (AC + CE + BE) = 16.57 + 31.030 + 38.697 = 86.297 cm

WORK SHEET – 2 (KEY)

1) 4	**2)** 2	**3)** 3	**4)** 3	**5)** 1
6) 2	**7)** 2	**8)** 3	**9)** 1	**10)** 3
11) 1	**12)** 3	**13)** 1	**14)** 1	**15)** 1
16) 1	**17)** 1	**18)** 1	**19)** 3	**20)** 3
21) 1,2,3	**22)** 1,3,4	**23)** 4	**24)** 1	**25)** 1
26) 1	**27)** 3	**28)** 2	**29)** 4	**30)** 1
31) (2,3), (3,5), (1,2), 2	**32)** 4,1,4,3	**33)** 90		

1. 1 - d, 2 - a, 3 - b, 4 - c
2. The angle covered by hours hand in one hour = 30°
The angle covered by hours hand in 7 hours = $7 \times 30^0 = 210°$
3. The angle covered by minutes hand in 1 minute = 6°
The angle covered by minutes hand in 48 minutes = $48 \times 6^0 = 288^0$
4. $\angle AOB + \angle BOD = 180°$ (Linear pair)
$\Rightarrow \quad 100^o + \angle BOD = 180°$
$\Rightarrow \quad \angle BOD = 80°$ and given $\angle BOC : \angle COD = 3 : 5$
$\therefore$ Total ratio = 3 + 5 = 8
$\Rightarrow \quad \angle BOC = \frac{3}{8} \times 80 = 30°$

and $\angle AOC = \angle AOB + \angle BOC = 100° + 30° = 130°$

5. Total Ratio = 3 + 4 + 2 = 9

$\angle BOC = \frac{3}{9} \times 180^o = 60°$

$\angle COD = \frac{4}{9} \times 180^o = 80°$

$\angle AOD = \frac{2}{9} \times 180^o = 40°$

OP is the bisector of $\angle BOC \Rightarrow \angle POC = \frac{1}{2} \angle BOC$

$\therefore \angle POC = \frac{1}{2} \times 60^o = 30°$

OR is bisector of $\angle AOD \Rightarrow \angle DOR = \frac{1}{2} \angle AOD$

$\therefore \angle DOR = \frac{1}{2} \times 40^o = 20°$

Now, $\angle POR = \angle POC + \angle COD + \angle DOR$ = 30° + 80° + 20° = 130°

$\therefore \angle POR = 130°$

6. $\angle X + \angle A = 90°$ (Complementary angles) $\Rightarrow \angle A = 90° - \angle X$
$\angle Y + \angle B = 180°$ (Supplementary angles) $\Rightarrow \angle B = 180° - \angle Y$
$\angle A = 90° - 28°29'38'' = 89°59'60'' - 28°29'38'' = 61°30'22''$
$\angle B = 180° - 112°56'26'' = 179° 59'60'' - 112°56'26'' = 67°03'34''$
$\therefore \angle A + \angle B = 61°30'22'' + 67°03'34'' = 128°33'56''$

7. x : y = 3 : 7
Total ratio x + y = 10
x + y = 180° (Q Linear pair)

$\Rightarrow x = \frac{3}{10} \times 180^o = 54° \Rightarrow z = 54^0$ (Q Vertically opposite angles)

$\Rightarrow y = \frac{3}{10} \times 180^o = 126° \Rightarrow a = 126^0$ (Q Vertically opposite angles)

8. c + p + q = 180° (straight angle)
$\Rightarrow$ 28° + p + q = 180° $\Rightarrow$ p + q = 152°
but p = a, b = q (vertically opposite angles)
$\therefore$ p + q + a + b = 152° + 152° = 304°

9. a + b = 180° (Linear pair) and a – b = 20° given
Put $a = 20^o + b$ in a + b = 180°
$\Rightarrow 20^o + b + b = 180^o \Rightarrow 2b = 160^o \Rightarrow b = 80^0$
$\therefore a = 20^o + b = 20^o + 80^o = 100°$

10. Supplement of x is also x
$x + x = 180^o \Rightarrow 2x = 180^o \Rightarrow x = 90°$

$\therefore \frac{1}{4}$ Complete angle $= \frac{1}{4} \times 360^o = 90° \Rightarrow x =$

11. $x - 10^o = 60° \Rightarrow x = 60° + 10° \Rightarrow x = 70°$
$\therefore$ Supplement of 70° is $180^o - 70^o = 110°$
12. $2x + 210^o = 260^o \Rightarrow 2x = 50^o \Rightarrow x = 25°$
$\therefore$ Complement of 25° is 90° – 25° = 65°
13. Given two angles A and B are complement to each other and are in the ratio 3 : 2.
Let the angles be 3x and 2x
$3x + 2x = 90^o \Rightarrow 5x = 90^o \Rightarrow x = 18^o$
$\therefore \quad \angle A = 3x = 3 \times 18^o = 54^o$ and $\angle B = 2x = 2 \times 18^o = 36^o$
14. Given the angles are in the ratio 2 : 7 and they are supplement to each other.
Let the angles be 2x and 7x
$2x + 7x = 180^o \Rightarrow 9x = 180^o \Rightarrow x = 20^o$
$\therefore$ Angles are 40^o, 140^o
15. Let the angles be x, 5x
$\Rightarrow x + 5x = 180^o \Rightarrow 6x = 180^o \Rightarrow x = 30°$
$\therefore$ The complement of 30° is 90° – 30° = 60°
16. Let angles be x, $\frac{1x}{5} \Rightarrow x + \frac{x}{5} = 90^o$

$\Rightarrow \frac{5x + 1x}{5} = 90° \Rightarrow 6x = 90^o \times 5 \Rightarrow x = \frac{90^o \times 5}{6} = 75°$

$\therefore$ The angles are 75°, 90° – 15° = 75°, 15°
17. Let the angles be x and (3x – 40)
$x + 3x - 40 = 180^o \Rightarrow 4x = 220^o \Rightarrow x = 55°$
Angles are 55°, $3 \times 55^o - 40^o = 55°, 125°$
18. Conceptual
19. Conceptual
20. Conceptual

WORK SHEET – 3 (KEY)				
1) 4	2) 1	3) 2	4) 3	5) 1
6) 4	7) 3	8) 4	9) 2	10) 4
11) 3	12) 3	13) 3	14) 1	15) 4
16) 4	17) 4	18) 3	19) 1,2,3	20) 1,2,3
21) 3	22) 1	23) 2	24) 1	25) 3
26) 1	27) 2	28) 3	29) 1,3,4,1	30) 1,3,2,1
31) 180				

1. By intercept theorem $\frac{EG}{GI} = \frac{FH}{HJ}$

   From the diagram, EG = 2 cm, GI = 4 cm, FH = 3 cm

   $\frac{2}{4} = \frac{3}{HJ} \Rightarrow$ 2HJ = 12 cm $\Rightarrow$ HJ = 6 cm

2. By intercept theorem $\frac{AN}{NL} = \frac{AM}{MK}$

   $\Rightarrow \frac{7}{21} = \frac{AM}{24} \Rightarrow \frac{1}{3} = \frac{AM}{24} \Rightarrow$ 3AM = 24 $\Rightarrow$ AM = 8 cm

3. Let AD = x cm, EC = 4 cm, AE = AC – EC = 16 cm – 4 cm = 12 cm
   BD = AB – AD = (12 – x) cm, AE = 12 cm, EC = 4 cm

   $\frac{AD}{DB} = \frac{AE}{EC} = \frac{x}{12-x} = \frac{12}{4} = \frac{x}{12-x} = 3$

   $\Rightarrow$ x = 3 (12 – x) $\Rightarrow$ x = 36 – 3x $\Rightarrow$ 4x = 36 $\Rightarrow$ x = 9 cm

   $\therefore$ AD = 9 cm

4. Given AD || OM || BC

   By Intercept theorem $\frac{OA}{OC} = \frac{AM}{MB} \Rightarrow \frac{2.4}{3.6} = \frac{AM}{MB} \Rightarrow \frac{AM}{MB} = \frac{2}{3}$

   $\therefore$ AM : MB = 2 : 3

5. By intercept theorem AQ : QS : SB = DP : PR : RC

   $\Rightarrow$ 6 : 9 : 12 = DP : PR : RC [Q From the diagram AQ = 6 cm, QS = 9 cm, SB = 12 cm]

$\Rightarrow$ 2 : 3 : 4 = DP : PR : RC

Total ratio = 2 + 3 + 4 = 9 and CD = 30 cm

$\therefore$ $DP = \frac{2}{9}\times 30 = \frac{20}{3} = 6\frac{2}{3}\text{cm}$, $PR = \frac{3}{9}\times 30 = 10$ cm, $CR = \frac{4}{9}\times 30 = \frac{40}{3} = 13\frac{1}{3}\text{cm}$

6. By intercept theorem $\frac{AB}{BC} = \frac{AD}{DE} \Rightarrow \frac{20}{BC} = \frac{4}{7} \Rightarrow 4 \times BC = 20 \times 7$

$\Rightarrow BC = \frac{20\times 7}{4} \Rightarrow BC = 35$ cm

7. From the diagram BE = 8 cm, CL = 6 cm and DE || AC

By intercept theorem $\frac{BE}{EC} = \frac{BD}{AD}$, Here DC || AL .....(1)

By intercept theorem $\frac{BC}{CL} = \frac{BD}{AD}$ .....(2)

From (1) and (2) we get, $\frac{BE}{EC} = \frac{BC}{CL}\left(Q\ \frac{BD}{AD} = \frac{BC}{CL}\right)$

$\Rightarrow \frac{8}{EC} = \frac{8+CE}{6}$ (Q BC = BE + EC)

$\Rightarrow$ EC (8 + CE) = 8 × 6 $\Rightarrow$ $8EC + EC^2 = 48$

put EC = 4 cm (By guess method)

$\Rightarrow 8 \times 4 + 4^2 = 48$ cm

$\therefore$ EC = 4 cm

8. Given AD = x, DB = x – 2, AE = x + 2, EC = x – 1

By intercept theorem $\frac{AD}{DB} = \frac{AE}{EC} \Rightarrow \frac{x}{x-2} = \frac{x+2}{x-1} \Rightarrow x(x-1) = (x+2)(x-2)$

$\Rightarrow x^2 - x = x^2 + 2x - 2x - 4 \Rightarrow x^2 - x = x^2 - 4 \Rightarrow x = 4$

9. $\frac{AD}{BD} = \frac{AE}{CE} \Rightarrow \frac{4x-3}{3x-1} = \frac{8x-7}{5x-3}$

$\Rightarrow (4x-3)(5x-3) = (3x-1)(8x-7)$

$\Rightarrow 20x^2 - 12x - 15x + 9 = 24x^2 - 21x - 8x + 7$

$\Rightarrow 20x^2 - 27x + 9 = 24x^2 - 29x + 7$

$\Rightarrow 9 - 7 = 24x^2 - 20x^2 - 29x + 27x$

$\Rightarrow 2 = 4x^2 - 2x$

By guess method put x = 1

$\Rightarrow 2 = 4(1)^2 - 2(1)$

$\Rightarrow 2 = 4 - 2 \Rightarrow 2 = 2$ cm

$\therefore$ x = 2 cm

10. Let AE = x cm, EC = (9 – x) cm

AD : BD = 2 : 6 = 1 : 3

By intercept theorem, $\frac{AE}{EC} = \frac{AD}{BD} \Rightarrow \frac{x}{9-x} = \frac{2}{6}$

$\Rightarrow$ $6x = 2(9 - x)$ $\Rightarrow$ $6x = 18 - 2x$

$\Rightarrow$ $8x = 18$ $\Rightarrow$ $x = 2.25$ cm

11. Given AB||EF

Sum of cointerior angles = 180°

$\Rightarrow$ $52 + y = 180^0 \Rightarrow y = 128°$

and also AB ||EF

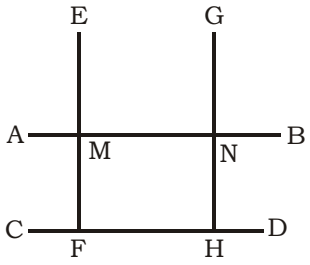
$z = 138°$ (corresponding angles are equal)

$\Rightarrow$ $x = z = 138°$ (vertically opposite angles are equal)

$\therefore$ $x = 138°$

12. Two lines EF and GH are perpendicular to two parallel lines AB, CD.

$\angle AME = \angle MNG = 90°$



These are corresponding angles and they are equal

$\therefore$ EF||GH

13. Given $\angle AOC = \angle ACO$ and $\angle BOD = \angle OBD$

But $\angle AOC = \angle BOD$ (vertically opposite angles)

Therefore $\angle ACO = \angle OBD$

These are alternate angles $\Rightarrow$ AC||BD

14. Given p||n

$\angle 1 = \angle 3$ (Corresponding angles) and $\angle 1 = 75° \Rightarrow \angle 3 = 75°$

$\angle 3 + \angle 2 = 180°$ (sum of cointerior angles = 180°)

$\Rightarrow$ $75 + \angle 2 = 180° \Rightarrow \angle 2 = 180° - 75° = 105° \Rightarrow \angle 2 = \angle 1 + \frac{1}{3} \times 90°$

$\Rightarrow$ $\angle 2 = \angle 1 + \frac{1}{3}$ × right angle

15. $\angle ABC = \angle BCD$ (alternate angles are equal)

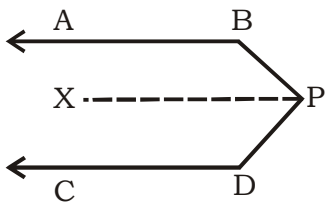
AB||CD $\Rightarrow$ $\angle BCD = \angle CDG$ (alternate angles)

$\therefore$ $\angle ABC = \angle CDG$

But $\angle CDG = \angle FDE$(vertically opposite angles)

$\therefore$ $\angle ABC = \angle FDE$

16. Draw PX||AB||CD



$\angle ABP + \angle BPX = 180°$ .....(1) (Sum of cointerior angles = 180^0)

$\angle CDP + \angle DPX = 180°$ ..... (2) (Sum of cointerior angles = 180°)

Now, Adding (1) and (2)

$\angle ABP + \angle BPX + \angle DPX + \angle CDP = 360°$

$\Rightarrow \angle ABP + \angle BPD + \angle CDP = 360^0$ (Q $\angle BPX + \angle DPX = \angle BPD$)

17. Given x = y these are corresponding angles $\Rightarrow$ $l||m$

also given a = b, these are corresponding angles $\Rightarrow$ $m||n$

$\therefore$ $l||m$ and $m||n \Rightarrow l||n$.

18. $\angle 2 = \angle 4$ (vertically opposite angles are equal)

$2x + 30° = x + 2y° \Rightarrow x = 2y - 30°$. But $\angle 4 = \angle 6$

$\Rightarrow x + 2y = 3y + 10° \Rightarrow x = y + 10$

$\therefore 2y - 30° = y + 10° \Rightarrow y = 40°$

$\angle 6 = 3y + 10° = 3 \times 40° + 10 = 130°$

and $\angle 5 + \angle 6 = 180°$ (linear pair)

$\Rightarrow \angle 5 + 130° = 180° \Rightarrow \angle 5 = 50°$

29. AQ : QS : SB = 6 : 9 : 12 $\Rightarrow$ = 2 : 3 : 4

$2k + 3k + 4k = 30 \Rightarrow 9k = 30 \Rightarrow k = \frac{30}{9} = \frac{10}{3}$

Length of OP $= 2k = 2 \times \frac{10}{3} = \frac{20}{3} = 6\frac{2}{3}$ cm

Length of PR $= 3k = 3 \times \frac{10}{3} = 10$ cm

Length of RC $= 4k = 4 \times \frac{10}{3} = \frac{40}{3} = 13\frac{1}{3}$ cm

CR – OP $= \frac{40}{3} - \frac{20}{3} = \frac{20}{3} = 6\frac{2}{3}$