CHAPTER

10

LINES AND TRIANGLES

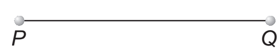
In this chapter, we study the Line, Triangle their types and properties etc.

Lines and Triangles are the branch of plane geometry. In which we study the two intersecting lines forms different types of angles and three intersecting lines forms a different types of triangles.

Definitions Related to Lines and Angles

Line Segment

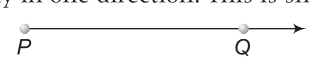
A line segment is a portion (or part) of a line. It has two end points.



It has a definite length. Distance between P and Q is called length of the line segment PQ.

Ray

A ray extends indefinitely in one direction. This is shown by an arrow *ie*,



P is called initial point. It has no definite length.

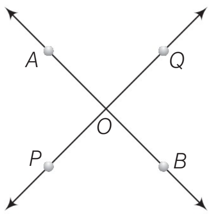
Line

A line segment PQ when extended indefinitely in both the directions is called a line.

- Line has no end point.
- Line has no definite length.
- Line is a set of infinite points.

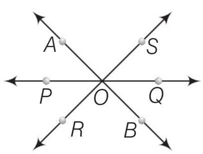
Intersecting Lines

Two lines having a common point, are called intersecting lines. This common point is called point of intersection. In the figure, '*O*' is the common point.



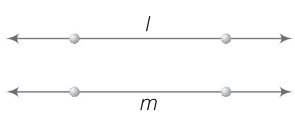
Concurrent Lines

Three or more lines in a plane which are intersecting at the same point, are called concurrent lines.



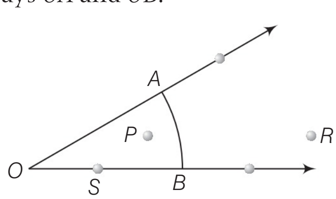
Parallel Lines

Two lines in a plane which do not intersect anywhere in a plane are called parallel lines.



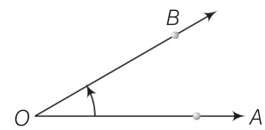
Angles

A figure consisting of two rays join with end points is called an angle. In the figure, $\angle AOB$ is a angle with rays *OA* and *OB*.

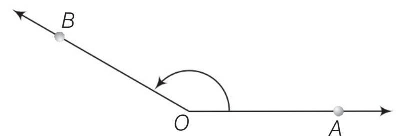


Classification of Angles

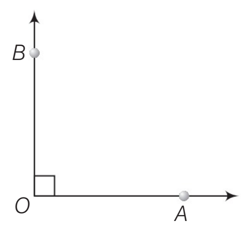
(i) **Acute Angle** An angle between $0°$ and $90°$ (less than $90°$) is called acute angle.



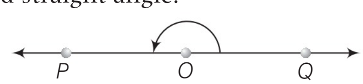
(ii) **Obtuse Angle** An angle between $90°$ and $180°$ (greater than $90°$) is called obtuse angle.



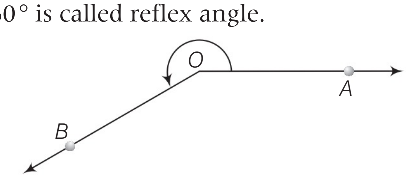
(iii) **Right Angle** An angle equal to $90°$ is called right angle.



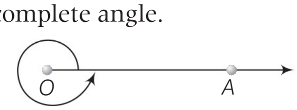
(iv) **Straight Angle** An angle equal to $180°$ is called straight angle.



(v) **Reflex Angle** An angle between $180°$ and $360°$ is called reflex angle.

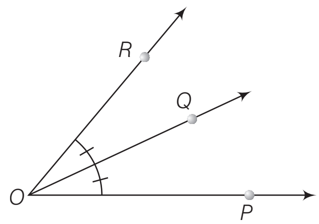


(vi) **Complete Angle** An angle equal to $360°$ is called complete angle.



(vii) **Bisector of an Angle** A ray OQ is called the bisector of $\angle POR$, if

$$\angle POQ = \angle ROQ.$$



$\therefore \quad \angle POQ = \angle QOR$

$$= \frac{1}{2} \angle POR$$

(viii) **Complementary Angles** Two angles are said to be complementary, if their sum is $90°$.

Complementary angles are complement of each other.

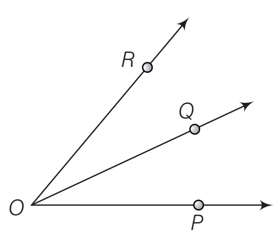
Complement of θ is $(90° - \theta)$.

(ix) **Supplementary Angles** Two angles are said to be supplementary, if their sum is $180°$.

Supplementary angles are supplement of each other.

Supplement of θ is $(180° - \theta)$.

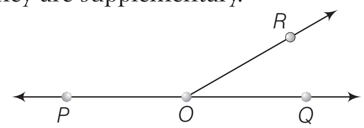
(x) **Adjacent Angles** Two angles are said to be adjacent, if they have a common vertex.



They have a common arm and their non-common arms are on either side of the common arm.

Here, $\angle POQ$ and $\angle ROQ$ are adjacent angles and have the same vertex O, a common arm OQ, the non- common arms OP, OR on either side of OQ.

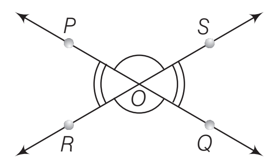
(xi) **Linear Pair** Two angles are said to form a linear pair of angles, if they are adjacent angles and they are supplementary.



$\therefore \quad \angle POR + \angle QOR = 180°$

If a ray stands on a line, then the sum of the adjacent angles so formed is $180°$.

(xii) **Vertically Opposite Angles** If two lines PQ and RS intersects at a point O, then the pair of $\angle POR$ and $\angle QOS$ or pair of $\angle POS$ and $\angle ROQ$ is said to be a pair of vertically opposite angles.



Vertically opposite angles are always equal.

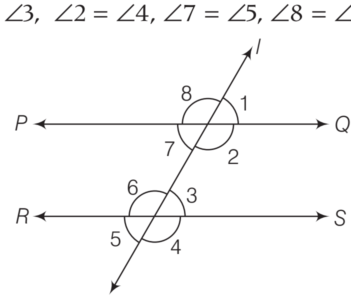
i.e. $\angle POR = \angle QOS$ and $\angle POS = \angle ROQ$

Properties of Parallel Lines

Let PQ and RS be two parallel lines, cut by a transversal l.

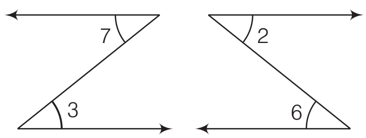
Then,

- Angles $\angle 1$, $\angle 8$, $\angle 5$ and $\angle 4$ are the exterior angles and $\angle 2$, $\angle 3$, $\angle 6$ and $\angle 7$ are the interior angles.
- Pairs of corresponding angles are equal
  i.e. $\angle 1 = \angle 3$, $\angle 2 = \angle 4$, $\angle 7 = \angle 5$, $\angle 8 = \angle 6$



- The sum of co-interior angles on the same side of transversal is $180°$.
  i.e., $\angle 2 + \angle 3 = 180°$ and $\angle 7 + \angle 6 = 180°$

- The pairs of opposite angles of transversal line is said to be alternate angles.



i.e., $\angle 7 = \angle 3$

$\angle 2 = \angle 6$

- The vertical opposite angles are equal, i.e.

$\angle 1 = \angle 7$; $\angle 2 = \angle 8$

and $\angle 3 = \angle 5$; $\angle 4 = \angle 6$

Example 1 Find the measure of an angle which is 28° more than its complement.

(a) 58° (b) 59°
(c) 60° (d) 61°

Sol. (*b*) Let measure of the required angle be $x°$.

Then, measure of its complement $= 90° - x$

$\therefore \quad x - (90° - x) = 28°$

$\Rightarrow \quad 2x = 118°$

$\Rightarrow \quad x = 59°$

Hence, the measure of the required angle is 59°.

Example 2 Find the measure of an angle, which is 32° less than its supplement.

(a) 74° (b) 73°
(c) 72° (d) 71°

Sol. (*a*) Let the measure of the required angle be x.

Then, measure of its supplement $= (180° - x)$

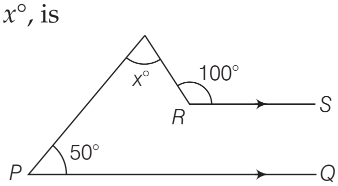
$\therefore \quad (180° - x) - x = 32°$

$\Rightarrow \quad 180° - 32° = 2x$

$\Rightarrow \quad 2x = 148°$

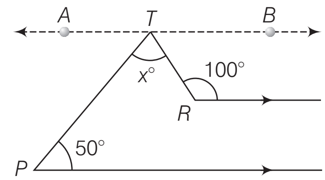
$\Rightarrow \quad x = 74°$

Example 3 In the given figure, $PQ \parallel RS$. The value of $x°$, is



(a) 120° (b) 50°
(c) 135° (d) 140°

Sol. (*b*) Draw $AB \parallel PQ$



$\angle ATP = \angle TPQ = 50°$

[$\because$ alternate interior angles]

$\angle BTR + \angle TRS = 180°$

[$\because$ sum of interior angles]

$\Rightarrow \quad \angle BTR = 80°$ and $\angle ATP + x + \angle BTR = 180°$

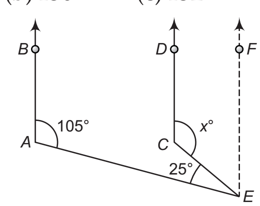
[$\because$ AB is the straight line]

$\Rightarrow \quad 50° + x + 80° = 180°$

$\therefore \quad x = 50°$

Example 4 In the given figure, $AB \parallel CD$, the value of x is

(a) 120° (b) 130° (c) 132° (d) 134°



Sol. (*b*) Let $CD \parallel EF$. Then, $x + \angle CEF = 180°$

[$\because$ sum of interior angles]

$\Rightarrow \quad \angle CEF = 180° - x$

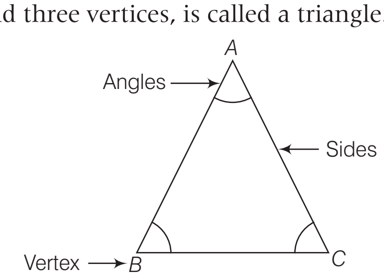
But $\quad \angle BAE + \angle AEF = 180°$

$\Rightarrow \quad 105° + 25° + (180° - x) = 180°$

$\therefore \quad x = 130°$

Triangle

A closed figure which has three sides, three angles and three vertices, is called a triangle.



Properties of Triangle

- The sum of three angles of a triangle is equal to $180°$.
- The sum of lengths of any two sides of triangle is greater than the length of third side.
- In a triangle, an exterior angle is equal to the sum of the two interior opposite angles.

Types of Triangle

Different types of triangle, according to their sides and angles are given below

I. According to their Sides

(i) Scalene Triangle If all sides are different in lengths called scalene triangle. In which all angles are different.

(ii) Isosceles Triangle If any two sides are equal in length called isosceles triangle. In which opposite angles of equal sides are also equal.

(iii) Equilateral Triangle If all three sides are equal in length called equilateral triangle. In which all three angles of triangles are equal to 60°.

II. According to their Angles

(i) Acute Angled Triangle : If each angle of triangle is less than 90°. It is called an acute angled triangle.

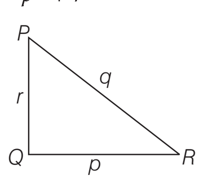
(ii) Right Angled Triangle : If any one angle of a triangle is $90°$. It is called right angled triangle.

(iii) Obtuse Angled Triangle : If any one angle of triangle is greater than 90°. It is called an obtuse angled triangle.

Pythagoras Theorem

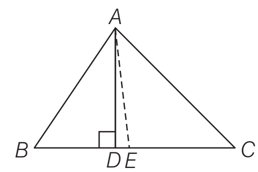
In a right angle triangle, the square of the hypotenuse equals the sum of the square of its other sides.

i.e., $q^2 = p^2 + r^2$



Altitude and Median of a Triangle

A line segment from a vertex of triangle, perpendicular to the line containing the opposite side is called an **altitude** of a triangle. In the figure AD is the altitude of a triangle.



A line segment that joins a vertex of a triangle to the mid-point of the opposite side is called median of triangle. In a figure, AE is the **median** of a triangle.

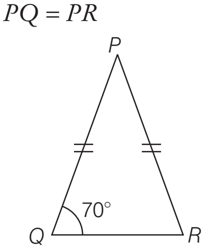
Note : Every triangle has three altitudes and three medians, which are drawn from each vertex.

Example 5 ΔPQR is an isosceles triangle with $PQ = PR$. If $\angle Q = 70°$, then the other angles of a triangle, are

(a) 40°, 70° (b) 35°, 75°
(c) 55°, 55° (d) None of these

Sol. (*a*) In ΔPQR, we have,

$$PQ = PR$$



i.e., $\angle Q = \angle R = 70°$

Since, $\angle P + \angle Q + \angle R = 180°$ [the sum of three angles of triangle]

$\therefore$ $\angle P + 140° = 180°$

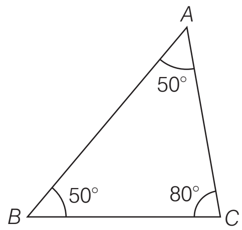
$\Rightarrow$ $\angle P = 180° - 140° = 40°$

Hence, the required angles of triangle are $\angle P = 40°$ and $\angle R = 70°$.

Example 6 In ΔABC, $\angle A = 50°$, $\angle B = 50°$, $\angle C = 80°$, which two sides of this triangle are equal.

(a) $AB = AC$ (b) $AC = BC$
(c) $AB = BC$ (d) None of these

Sol. (b) Since, $\angle A = \angle B = 50°$



Therefore, the sides opposite these angles must be equal.
The side opposite $\angle A$ is BC and the side opposite $\angle B$ is AC

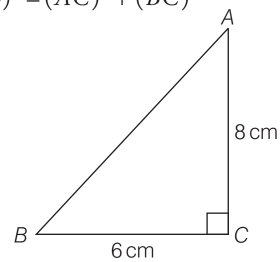
$\therefore$ In $\Delta ABC, AC = BC$

Example 7. The length of the sides of a right angle triangle are 6 cm and 8 cm. What is the length of the hypotenuse ?

(a) 11 cm (b) 10 cm (c) 9 cm (d) 8 cm

Sol. (b) Using Pythagoras theorem in ΔABC

$\therefore \quad (AB)^2 = (AC)^2 + (BC)^2$



$\Rightarrow \quad (AB)^2 = (8)^2 + (6)^2$

$\Rightarrow \quad (AB)^2 = 64 + 36$

$= 100$

$\Rightarrow \quad AB = 10$ cm

Hence, the length of the hypotenuse is 10 cm.

PRACTICE EXERCISE

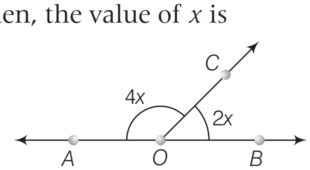
1. An angle is $14°$ more than its complement. Then, its measure is
(a) 166° (b) 86° (c) 76° (d) 52°

2. The measure of an angle is twice the measure of its supplementary angle. Then, its measure is
(a) 120° (b) 60° (c) 100° (d) 90°

3. How many least number of distinct points required to determine a unique line ?
(a) One (b) Two (c) Three (d) Infinite

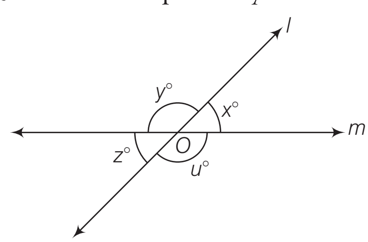
4. If OA and OB are opposite rays; a ray OC inclined. If one of the angle is 75°, then the measurement of the second angle is
(a) 105° (b) 70°
(c) 15° (d) None of these

5. In figure, $\angle AOC$ and $\angle BOC$ form a linear pair. Then, the value of x is



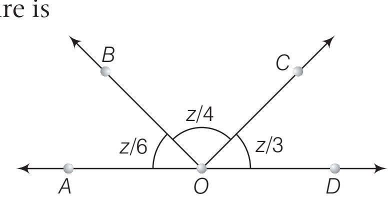
(a) 15° (b) 40° (c) 25° (d) 30°

6. Lines l and m intersect at O, forming angles as shown in figure. If $x = 45°$, then values of y, z and u are respectively



(a) 45°, 135°, 135°
(b) 135°, 135°, 45°
(c) 135°, 45°, 135°
(d) 115°, 45°, 115°

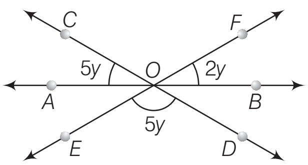
7. The value of z (in degrees), in the given figure is



(a) 180° (b) 216° (c) 240° (d) 40°

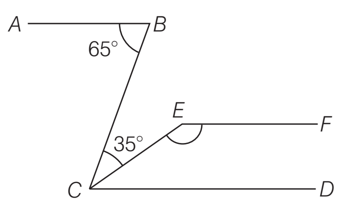
8. Which of the following statements is false?
(a) A line segment can be produced to any desired length
(b) Through a given point, only one straight line can be drawn
(c) Through two given points, it is possible to draw one and only one straight line
(d) Two straight lines can intersect in only one point

9. In the figure, the value of y is



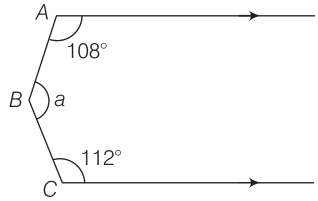
(a) 25°   (b) 35°
(c) 15°   (d) 40°

10. AB and CD are two parallel lines. The points B and C are joined such that $\angle ABC = 65°$. A line CE is drawn making angle of 35° with the line CB, EF is drawn parallel to AB, as shown in figure, then $\angle CEF$ is



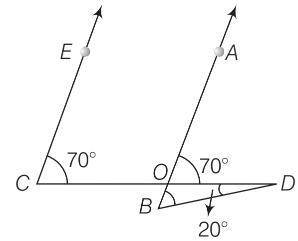
(a) 160°   (b) 155°
(c) 150°   (d) 145°

11. In the given figure, ray $A \parallel$ ray C, the value of 'a' is



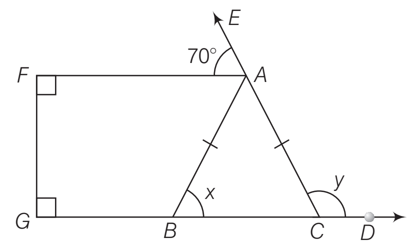
(a) 120°   (b) 140°
(c) 90°   (d) 150°

12. In the given figure, if $EC \parallel AB$, $\angle ECD = 70°$, $\angle BDO = 20°$, then $\angle OBD$ is



(a) 70°   (b) 60°   (c) 50°   (d) 20°

13. In the given figure, the value of x and y are respectively

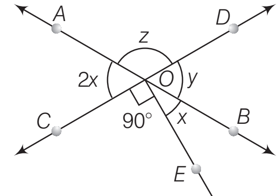


(a) 70°, 110°   (b) 110°, 70°
(c) 120°, 60°   (d) 70°, 90°

14. The earth makes a complete rotation about its axis in 24 h. Through what angle will it turn in 3 h 20 min?
(a) 60°   (b) 50°
(c) 70°   (d) 90°

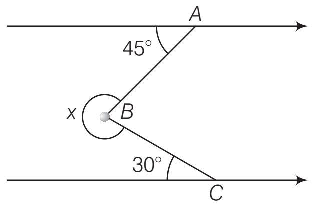
15. An angle is $\frac{2}{3}$rd of its complement and $\frac{1}{4}$th of its supplement, then the angle is
(a) 46°   (b) 56°
(c) 36°   (d) 40°

16. In the given figure, if $\angle COE = 90°$, then the value of x is



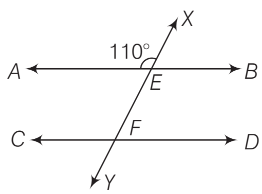
(a) 120°   (b) 60°
(c) 45°   (d) 30°

17. The value of x, in the figure is



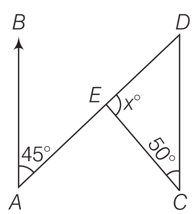
(a) 75° (b) 185° (c) 285° (d) 245°

18. In the given figure, AB and CD are two parallel lines. A line XY meets the lines AB and CD at E and F respectively. If $\angle XEA = 110°$, then $\angle EFD$ is



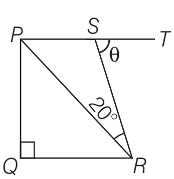
(a) 110° (b) 70° (c) 80° (d) 45°

19. In the given figure, $AB || CD$, $\angle BAE = 45°$, $\angle DCE = 50°$ and $\angle CED = x°$, then the value of x is



(a) 85° (b) 95°
(c) 130° (d) 135°

20. In the trapezium $PQRS$, $QR || PS$, $\angle Q = 90°$, $PQ = QR$ and $\angle PRS = 20°$. If $\angle TSR = \theta$, then value of θ is



(a) 75° (b) 55°
(c) 65° (d) 45°

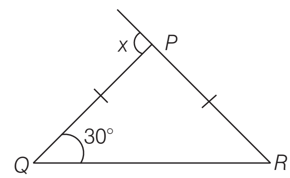
21. If ΔABC is an isosceles with $AB = AC$, if $\angle A = 80°$, then $\angle ABC$ will be

(a) 100° (b) 80°
(c) 50° (d) 40°

22. In ΔABC, $BC = CA$, its two equal angles are

(a) $\angle B = \angle C$
(b) $\angle A = \angle B$
(c) $\angle A = \angle C$
(d) $\angle A = \angle B = \angle C$

23. The value of x in figure, where ΔPQR is an isosceles with $PQ = PR$ will be



(a) 30° (b) 60°
(c) 90° (d) 150°

24. The length of the sides BC and AC of a right angled ΔABC are 3 cm and 4 cm, the length of hypotenuse will be

(a) 5 cm (b) 6 cm
(c) 14 cm (d) 10 cm

25. If the square of the hypotenuse (in cm) of an isosceles right triangle is 200 then the length of each side will be

(a) 15 cm (b) 200 cm
(c) 10 cm (d) None of these

26. In ΔABC all sides are of same length, then each angle will be

(a) 50° (b) 90°
(c) 60° (d) 180°

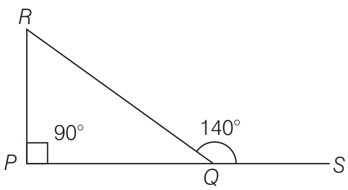
27. In a ΔABC, $AB = 11$ cm, $BC = 60$ cm and $AC = 61$ cm. What type of ΔABC ?

(a) Acute angled triangle
(b) Right angled triangle
(c) Obtuse angled triangle
(d) None of the above

28. The total number of triangles formed in a rectangle are

(a) 4 (b) 8
(c) 6 (d) 3

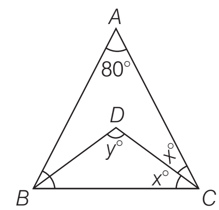
29. The value of $\angle PRQ$ in the given triangle is



(a) 50°
(b) 140°
(c) 90°
(d) 60°

30. ABC is a triangle such that $AB = 10$ and $AC = 3$. The side BC is
(a) equal to 7
(b) less than 7
(c) greater than 7
(d) None of the above

31. In the given figure, $\angle A = 80°$, $\angle B = 60°$, $\angle C = 2x°$ and $\angle BDC = y°$. BD and CD bisect angles B and C respectively. The value of x and y are respectively



(a) 10°, 160° (b) 15°, 70°
(c) 20°, 130° (d) 20°, 125°

32. If one of the angles of a triangle is greater than each of the two remaining angles by 30°, then the angles of the triangle are
(a) 40°, 40°, 100° (b) 50°, 50°, 80°
(c) 30°, 30°, 120° (d) 35°, 35°, 110°

Answers

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

Hints and Solutions

1. Let the angle be x, then its complement be $(90° - x)$.

$\therefore \quad x = (90° - x) + 14° \Rightarrow 2x = 104°$

$\therefore \quad x = \dfrac{104°}{2} = 52°$

2. Let the angle be x, then its supplementary be $(180° - x)$.

$\therefore \quad x = 2\,(180° - x) \Rightarrow x = 360° - 2x$

$\Rightarrow \quad 3x = 360°$

$\therefore \quad x = 120°$

3. One and only one straight line passes through two distinct points.

4. Since, OA and OB are opposite rays.
So, AB is a line.
Sum of the two angles $= 180°$

$\therefore$ Second angle $= 180° - 75° = 105°$

5. Since, $\angle AOC + \angle BOC = 180°$ [linear pair]

$\Rightarrow \quad 4x + 2x = 180°$

$\Rightarrow \quad 6x = 180°$

$\therefore \quad x = 30°$

6. $\because \quad x = z$ [vertically opposite angles]

$\Rightarrow \quad x = 45° \Rightarrow z = 45°$

and $y + x = 180°$ [linear pair]

$\Rightarrow \quad y = 180° - 45°$

$\therefore \quad y = 135°$

Also, $y = u$ [$\because$ vertically opposite angles]

$\Rightarrow \quad u = 135°$

$\therefore \quad y = 135°,$
$z = 45°,$
$u = 135°$

7. We have, $\frac{z}{6}+\frac{z}{4}+\frac{z}{3}=180°$ [$\because$ AOD is a line]

$\Rightarrow \quad \frac{2z+3z+4z}{12}=180°$

$\Rightarrow \quad \frac{9z}{12}=180°$

$\therefore \quad z=\frac{180°\times 12}{9}=240°$

8. Since, an infinite number of straight lines can be drawn through a given point.

Hence, (b) is false statement.

9. Since, OA, OB are opposite rays.

$\therefore \quad \angle AOC+\angle COF+\angle FOB=180°$

$\Rightarrow \quad 5y+5y+2y=180°$

[$\because$ $\angle COF=\angle EOD$ vertical opposite angle]

$\Rightarrow \quad 12y=180° \quad \Rightarrow \quad y=\frac{180°}{12°}=15°$

10. Since, $AB \parallel CD$

$\Rightarrow \quad \angle BCD=\angle ABC=65°$

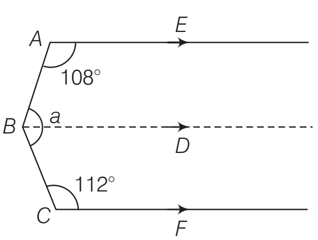
But, $\angle ECD=65°-\angle BCE$

$=65°-35°=30°$

Now, $\angle CEF+\angle ECD=180°$ [sum of co-interior angles is 180°; since $CD \parallel EF$]

$\therefore \quad \angle CEF=180°-30°=150°$

11.



Draw ray $AE \parallel$ ray $BD \parallel$ ray CF

Then, $\angle EAB+\angle ABD=180°$

[the sum of co-interior angles is 180°]

$\Rightarrow \quad 180°+\angle ABD=180°$

$\Rightarrow \quad \angle ABC=180°-108°$

$=72°$ ...(i)

and $\angle FCB+\angle CBD=180°$

$\Rightarrow \quad 112°+\angle CBD=180°$

$\Rightarrow \quad \angle CBD=180°-112°$

$=68°$ ...(ii)

Now, adding Eqs, (i) and (ii), we have

$\angle ABD+\angle CBD=72°+68°$

$\therefore \quad \angle ABC=140°$

Hence, $a=140°$

12. $\because \quad \angle AOD=\angle ECO$ [$\because$ $EC \parallel AB$]

$\Rightarrow \quad \angle AOD=70°$

So, $\angle BOD=110°$ [$\because$ AOB is the line]

In ΔBOD, $\angle OBD+\angle BOD+\angle ODB=180°$

$\Rightarrow \quad \angle OBD=180°-(110°+20°)$

$\therefore \quad \angle OBD=50°$

13. In ΔABC, $\angle ABC=\angle ACB=x$

[Angles opposite to equal sides are equal]

and $x+y=180°$

Now, $\angle EAF=\angle ACB=70°$

[corresponding angles]

$\therefore \quad x=70°$

$\Rightarrow \quad y=180°-70°$ [$\because$ linear pair]

$\therefore \quad y=110°$

14. In 24 h, earth covers an angle $=360°$

In 1 h, earth covers an angle $=\frac{360°}{24}$

In 3 h, 20 min earth will cover an angle

$=\frac{360°}{24}\times(3\text{ h }20\text{ min})$

$=\frac{360°}{24}\times\left(3+\frac{20}{60}\right)=\frac{360°}{24}\times\frac{10}{3}=50°$

15. Let angle be x, then its complement be $(90°-x)$.

$\therefore \quad \frac{2}{3}(90°-x)=x \Rightarrow 180°-2x=3x$

$\therefore \quad x=36°$

16. Since, $\angle BOD=\angle AOC$

[$\because$ vertically opposite angles]

$\Rightarrow \quad 2x=y$

Now, $\angle COE+\angle EOB+\angle BOD=180°$

[$\because$ COD is line or linear pair]

$\Rightarrow \quad 90°+x+2x=180°$

$\Rightarrow \quad 3x=90°$

$\therefore \quad x=30°$

17. Here, $\angle ABC = 45° + 30° = 75°$ [let ray $A \parallel$ ray C]

$\Rightarrow \quad x = 360° - \angle ABC = 360° - 75°$

$\therefore \quad x = 285°$

18. $\because \angle XEA = \angle BEF = 110°$ [vertically opposite angles]

$\therefore \quad \angle BEF + \angle EFD = 180°$ [co-interior angles]

$\Rightarrow \quad \angle EFD = 180° - 110° = 70°$

19. In a given figure, $AB \parallel CD$

$\therefore \quad \angle BAD = \angle ADC = 45°$ [alternate angle]

In ΔECD, $x° + 50° + 45° = 180° \Rightarrow x = 85°$

20. $\because PQ = QR \Rightarrow \angle QPR = \angle QRP = 45°$

and $PS \parallel QR$, $\angle SPR = \angle QRP = 45°$ [alternate angles]

$\therefore \theta = \angle PRS + \angle SPR = 20° + 45°$

$= 65°$ [by exterior angle theorem of ΔPSR]

21. Given, $\angle A = 80°$ and $AB = AC$

Therefore, $\angle B = \angle C = x$

[Opposite angles to equal sides are equal]

In ΔABC, $\angle A + \angle B + \angle C = 180°$

$\Rightarrow \quad 80° + x + x = 180°$

$\Rightarrow \quad 2x = 100°$

$\therefore \quad x = 50°$

22. Since in a ΔABC, $BC = CA$, therefore $\angle A = \angle B$

23. Since, $PQ = PR$

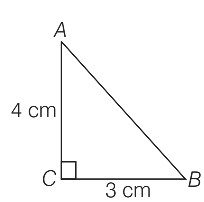
i.e., $\angle Q = \angle R = 30°$

Now, $\angle P = 180° - (30° + 30°) = 120°$

$\therefore \quad x = 180° - CP$ [linear pair]

$x = 180° - 120° = 60°$

24. Given $AC = 4$ cm, $BC = 3$ cm, $AB = ?$



By pythagoras theorem,

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

$= 4^2 + 3^2 = 16 + 9 = 25$

$\therefore \quad AB = \sqrt{25} = 5$ cm

25. Let the sides of a right isosceles triangle be x and x.

$\therefore \quad H^2 = x^2 + x^2 \Rightarrow 200 = 2x^2$

$\Rightarrow \quad x^2 = 100 \Rightarrow x = 10$ cm

26. Since, all sides of a triangle are of same length, therefore all angles are of equal, say x.

$\therefore \quad 3x = 180°$

$\Rightarrow \quad x = 60°$

27. Now, $AB^2 + BC^2 = 11^2 + 60^2$

$= 121 + 3600 = 3721$

and $AC^2 = (61)^2 = 3721$

$\because \quad AC^2 = AB^2 + BC^2$

Hence, ΔABC is right angled triangle.

28. The total number of triangle formed in a rectangle are 8.

29. $\because PQR$ is a line.

$\therefore \quad \angle PQR = 180° - 140° = 40°$

and in ΔPQR, $\angle RPQ + \angle PQR + \angle PRQ = 180°$

$\angle PRQ = 180° - (90° + 40°)$

$= 180° - 130° = 50°$

30. Since, the sum of any two sides of a triangle is greater than the third side, so BC must be greater than 7, then $AC + BC > AB$.

31. In the given figure,

$\angle C = 180° - \angle A - \angle B$

$\Rightarrow 2x = 180° - 80° - 60° = 40°$

$\therefore \quad x = 20°$

Also, $\angle B = 60° \Rightarrow \angle DBC = \frac{1}{2} \times 60° = 30°$

In ΔBDC, $\angle DBC + y + x = 180°$

$\Rightarrow 30° + y + 20° = 180° \Rightarrow y = 130°$

32. Since, $(x + 30°) + x + x = 180°$

$\Rightarrow \quad 3x = 150° \Rightarrow x = 50°$

$\therefore$ Angles are $50°, 50°, 80°$.