Unit 5(Lines & Angles)

Multiple Choice Questions (MCQs)

Question 1:

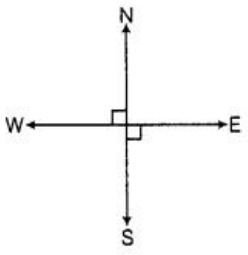
The angles between North and West and South and East are

(a) complementary (b) supplementary

(c) both are acute (d) both are obtuse

Solution :

(b)



From the above figure, it is clear that the angle between North and West is 90° and South and East is 90°.

∴ Sum of these two angles = 90° + 90° = 180°

Hence, the two angles are supplementary, as their sum is 180°.

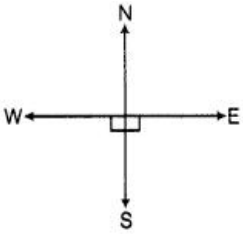
Question 2:

Angles between South and West and South and East are

(a) vertically opposite angles (b) complementary angles

(c) making a linear pair (d) adjacent but not supplementary

Solution :

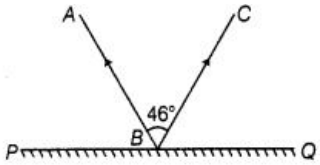


From the above figure, we can say that angle between South and West is 90° and angle between South and East is 90°. So, their sum is 180°.

Hence, both angles make a linear pair.

Question 3:

In the given figure, PQ is a mirror, AB is the incident ray and BC is the reflected ray. If ∠ABC = 46°, then ∠ABP is equal to



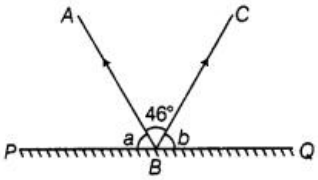
(a) 44° (b) 67°
(c) 13° (d) 62°

Solution :

(b) We know that, the angle of incidence is always equal to the angle of reflection.

$\angle ABP = \angle CBQ$

i.e. $a = b$



Now, sum of all the angles on a straight line is 180°. [$\because \angle ABC = 46°$, given]

$\therefore \quad a + 46° + b = 180°$

$\Rightarrow \quad 2a = 180° - 46°$ [$\because a = b$]

$\Rightarrow \quad 2a = 134°$

$\Rightarrow \quad a = \frac{134°}{2} = 67°$

$\therefore \quad \angle ABP = 67°$

Question 4:

If the complement of an angle is 79°, then the angle will be of

(a) 1° (b) 11°
(c) 79° (d) 101°

Solution :

(b) Let the angle be x°. Then, the complement of x will be (90 – x)°.

Given, complement of x° is 79°.

$\therefore \quad (90 - x)° = 79°$

$\Rightarrow \quad x° = 90° - 79° = 11°$

Therefore, the required angle is 11°.

Note Sum of the complementary angles is 90°.

Question 5:

Angles, which are both supplementary and vertically opposite are

(a) 95°, 85° (b) 90°, 90°
(c) 100°, 80° (d) 45°, 45°

Solution :

(b) Two angles are said to be supplementary, if their sum is 180°. Also, if two angles are vertically opposite, then they are equal.

Therefore, angles given in option (b) are supplementary as well as vertically opposite.

Question 6:

The angle which makes a linear pair with an angle of 61°, is of

(a) 29° (b) 61 °
(c) 122° (d) 119°

Solution :

(d) Let the required angle be x°. It is given that x° makes a linear pair with 61°.

$\therefore \quad x + 61° = 180°$ [$\because$ sum of angles forming linear pair is 180°]

$\Rightarrow \quad x = 180° - 61° = 119°$

Question 7:

The angles x and 90°- x are

(a) supplementary (b) complementary

(c) vertically opposite (d) making a linear pair

Solution :

(b) Sum of the given angles = x + 90° – x = 90°

Since, the sum of given two angles is 90°.

Hence, they are complementary to each other.

Question 8:

The angles x – 10° and 190° – x are

(a) interior angles on the same side of the transversal

(b) making a linear pair

(c) complementary

(d) supplementary

Solution :

(d) Sum of the given angles

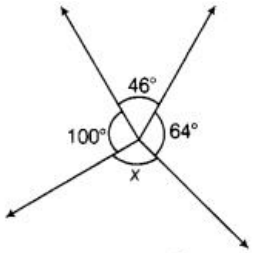
= (x – 10°)+ (190° – x)= x -10° + 190° – x

= (x-x) + (190°-10°)=0 + 180°= 180°

Since, the sum of given angles is 180°, Hence, they are supplementary.

Question 9:

In the given figure, the value of x is



(a) 110° (b) 46°

(c) 64° (d)150°

Solution :

(d) We know that, the sum of all angles around a point is 360°.

∴ 100°+46°+64°+x = 360°

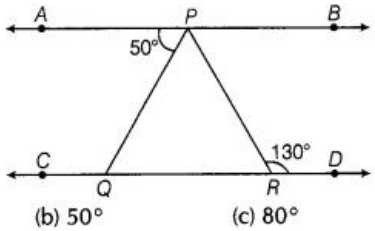
⇒ 210°+ x = 360°

⇒ x = 360° -210°

⇒ x = 150°

Question 10:

In the given figure, if AB||CD, ∠APQ = 50° and ∠PRD = 130°, then ∠QPR is

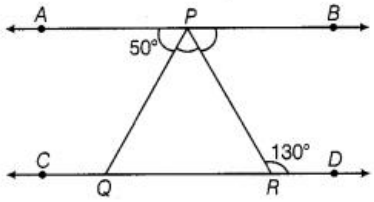


(a) 130° (b) 50° (c) 80° (d) 30°

Solution :

(c) Since, AB and CD are parallel and PR is a transversal.

$\therefore$ $\angle BPR + \angle PRD = 180°$ [$\because$ sum of consecutive interior angles is 180°]



$\Rightarrow$ $\angle BPR + 130° = 180°$ [$\because \angle PRD = 130°$]

$\Rightarrow$ $\angle BPR = 180° - 130°$

$\Rightarrow$ $\angle BPR = 50°$

Also, $\angle APQ + \angle QPR + \angle BPR = 180°$

[$\because$ sum of all the angles on a straight line is 180°]

$\Rightarrow$ $50° + \angle QPR + 50° = 180°$

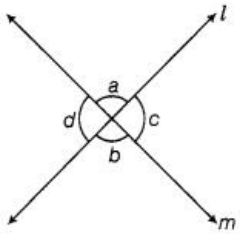
$\Rightarrow$ $\angle QPR + 100° = 180°$

$\Rightarrow$ $\angle QPR = 180° - 100°$

$\therefore$ $\angle QPR = 80°$

Question 11:

In the given figure, lines l and m intersect each other at a point. Which of the following is false?



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

(c) $\angle a + \angle d = 180°$ (d) $\angle a = \angle d$

Solution :

(d) From the given Figure it is clear that, $\angle a = \angle b$ and $\angle c = \angle d$

[vertically opposite angles]

Also, $\angle a + \angle d = 180°$

and $\angle b + \angle c = 180°$ [linear pair]

Question 12:

If angle P and angle Q are supplementary and the measure of angle P is 60°, then the measure of angle Q is

(a) 120° (b) 60° (c) 30° (d) 20°

Solution :

(a) It is given that, angles P and 0 are supplementary. Hence, the sum of P and O will be 180°

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

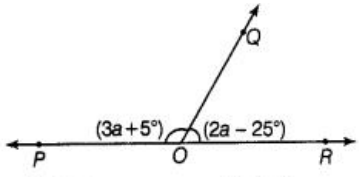
$\Rightarrow$ $60° + \angle Q = 180°$ [$\because \angle P = 60°$, given]

$\Rightarrow$ $\angle Q = 180° - 60°$

$\Rightarrow$ $\angle Q = 120°$

Question 13:

In the given figure, POR is a line. The value of a is



(a) 40° (b) 45° (c) 55° (d) 60

Solution :

(a) Since, POR is a line. So, the sum of angles forming linear pair is 180°

$\therefore \quad \angle POQ + \angle ROQ = 180°$

$\Rightarrow \quad (3a + 5)° + (2a - 25°) = 180°$

$\Rightarrow \quad 3a + 5° + 2a - 25° = 180°$

$\Rightarrow \quad 5a - 20° = 180°$

$\Rightarrow \quad 5a = 180° + 20°$

$\Rightarrow \quad 5a = 200°$

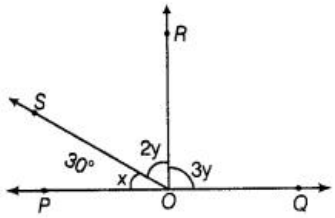
$\Rightarrow \quad a = \frac{200°}{5}$

$\Rightarrow \quad a = 40°$

Hence, the value of a is 40°.

Question 14:

In the given figure, POQ is a line. If x = 30°, then ∠QOR is



(a) 90° (b) 30° (c) 150° (d) 60°

Solution :

(a) It is given that, POO is a line. Since, sum of all the angles on a straight line is 180°.

Therefore, $x + 2y + 3y = 180°$

$\Rightarrow \quad x + 5y = 180°$ [$\because x = 30°$, given]

$\Rightarrow \quad 30° + 5y = 180°$

$\Rightarrow \quad 5y = 180° - 30°$

$\Rightarrow \quad 5y = 150°$

$\Rightarrow \quad y = \frac{150°}{5}$

$\Rightarrow \quad y = 30°$

$\therefore \quad \angle QOR = 3y = 3 \times 30° = 90°$

Question 15:

The measure of an angle which is four times its supplement, is

(a) 36° (b) 144° (c) 16° (d) 64°

Solution :

(b) Let the required angle be x. Then, its supplement will be (180° – x).

It is given that, the angle is four times its supplement.

Therefore, $x = 4(180° - x)$

$\Rightarrow \quad x = 4 \times 180° - 4x$

$\Rightarrow \quad x + 4x = 720°$

$\Rightarrow \quad 5x = 720°$

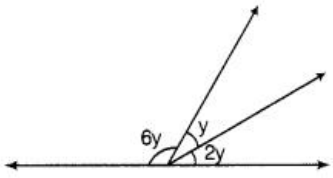
$\Rightarrow \quad x = \frac{720°}{5}$

$\Rightarrow \quad x = 144°$

Hence, the required angle is 144°.

Question 16:

In the given figure, the value of y is



(a) 30° (b) 15° (c) 20° (d) 22.5°

Solution :

(c) Since, sum of all the angles on a straight line is 180°.

Therefore, $6y + y + 2y = 180°$

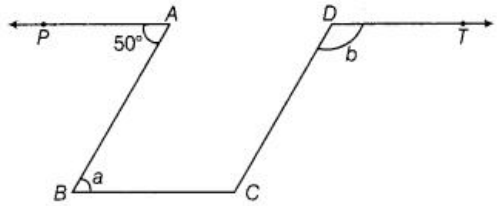
$\Rightarrow$ $9y = 180°$

$\Rightarrow$ $y = \frac{180°}{9}$

$\therefore$ $y = 20°$

Question 17:

In the given figure, PA || BC|| DT and AB || DC. Then, the values of a and b are respectively



(a) 60°, 120°
(b) 50°, 130°
(c) 70°, 110°
(d) 80°, 100°

Solution :

(b) It is given that, PA || BC and AB is transversal.

$\therefore$ $\angle PAB = \angle ABC$ [alternate interior angles]

$\Rightarrow$ $50° = a$

Also, $AB || DC$ and BC is transversal.

$\therefore$ $\angle ABC + \angle DCB = 180°$ [consecutive interior angles]

$\Rightarrow$ $a + \angle DCB = 180°$

$\Rightarrow$ $\angle DCB = 180° - a$

$\Rightarrow$ $\angle DCB = 180° - 50°$ [$\because a = 50°$]

$\Rightarrow$ $\angle DCB = 130°$

Also, $BC || DT$ and DC is transversal.

$\therefore$ $\angle CDT = \angle DCB$ [alternate interior angles]

$\Rightarrow$ $b = 130°$ [$\because \angle DCB = 130°$]

Question 18:

The difference of two complementary angles is 30°. Then, the angles are

(a) 60°, 30°
(b) 70°, 40°
(d) 20°, 50°
(d) 105°, 75°

Solution :

(a) Let one of the angle be x. Since, the difference between the two angles is 30°, then the other angle will be (x – 30°).

Also, the two angles are complementary, so their sum is equal to 90°.

$\therefore$ $x + (x - 30°) = 90°$

$\Rightarrow$ $x + x - 30° = 90°$

$\Rightarrow$ $2x = 90° + 30°$

$\Rightarrow$ $2x = 120°$

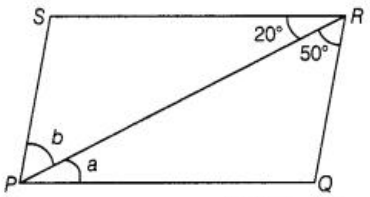
$\Rightarrow$ $x = \frac{120°}{2}$

$\Rightarrow$ $x = 60°$

$\therefore$ Required angles are 60° and (60° – 30°), i.e. 60° and 30°.

Question 19:

In the given figure, PQ || SR and SP|| RQ. Then, angles a and b are respectively



(a) 20°, 50°
(b) 50°, 20°
(c) 30°, 50°
(d) 45°, 35°

Solution :

(a) Given, PQ || SR and PR is transversal.

$\therefore \quad \angle QPR = \angle SRP$ [alternate interior angles]

$\Rightarrow \quad a = 20°$

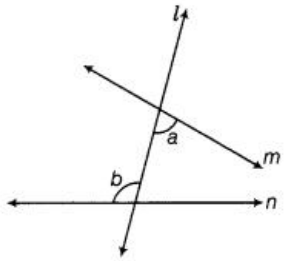
Also, $SP \parallel RQ$ and PR is transversal.

$\therefore \quad \angle SPR = \angle QRP$ [alternate interior angles]

$\Rightarrow \quad b = 50°$

Question 20:

In the given figure, a and b are



(a) alternate exterior angles (b) corresponding angles

(c) alternate interior angles (d) vertically opposite angles

Solution :

(c) In the given figure, a and b are alternate interior angles as both lie on opposite sides of transverse line.

Question 21:

If two supplementary angles are in the ratio 1: 2, then bigger angle is

(a) 120° (b)125° (c)110° (d)90°

Solution :

(a) It is given that the angles are in the ratio of 1 : 2. Let the angles will be x and 2x. Also, the two angles are supplementary, i.e. their sum is equal to 180°.

$\therefore \quad x + 2x = 180°$

$\Rightarrow \quad 3x = 180°$

$\Rightarrow \quad x = \frac{180°}{3}$

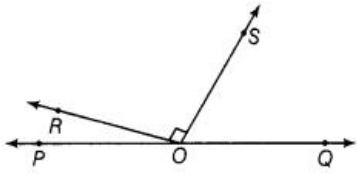
$\Rightarrow \quad x = 60°$

Hence, the required angles are 60° and 2 × 60°, i.e. 60° and 120°.

∴ Bigger of the two angles is 120°.

Question 22:

In the given figure, ∠ROS is a right angle and ∠POR and ∠QOS are in the ratio 1 : 5. Then, ∠QOS measures



(a) 150° (b) 75° (c) 45° (d) 60°

Solution :

(b) Since ∠POR and ∠QOS are in the ratio 1 : 5 Let angles will be x and 5x, respectively.

We know that, the sum of angles forming linear pair is 180°.

$$\therefore \quad \angle POR + \angle ROS + \angle QOS = 180^\circ$$
$$\Rightarrow \quad x + 90^\circ + 5x = 180^\circ$$
$$\Rightarrow \quad 6x = 180^\circ - 90^\circ$$
$$\Rightarrow \quad 6x = 90^\circ \Rightarrow x = \frac{90^\circ}{6}$$
$$\Rightarrow \quad x = 15^\circ$$
$$\therefore \quad \angle QOS = 5x = 5 \times 15^\circ$$
$$\Rightarrow \quad \angle QOS = 75^\circ$$

Question 23:

Statements (I) and (II) are as given below:

I: If two lines intersect, then the vertically opposite angles are equal.

II: If a transversal intersects two other lines, then the sum of two interior angles on the same side of the transversal is 180°.

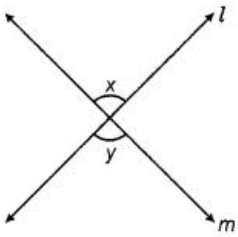
Then,

(a) both (I) and (II) are true (b) (I) is true and (II) is false

(c) (I) is false and (II) is true (d) both (I) and (II) are false

Solution :

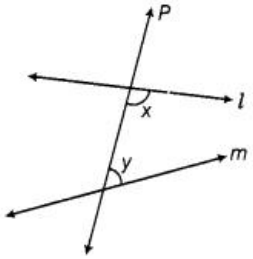
(b) **Statement I**



If lines l and m intersect each other, then x and y are known as vertically opposite angles. The vertically opposite angles so formed are equal.

$\therefore \quad x = y$

Statement II



If two lines l and m are intersected by a transversal P, then the sum of two interior angles will be 180°, only if l and m are parallel.

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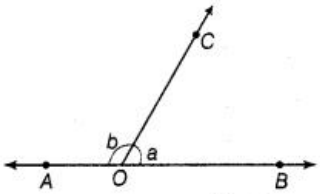
Question 24:

For the given figure, statements p and q are given below:

p : a and b are forming a linear pair.

q : a and b are forming a pair of adjacent angles.

Then,



(a) both p and q are true (b) p is true and q is false

(c) p is false and q is true (d) both p and q are false

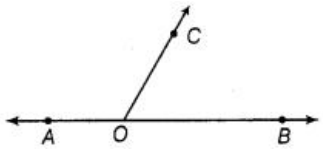
Solution :

(a) Two angles are called adjacent angles, if they have a common vertex and a common arm but no common interior points. A linear pair is a pair of adjacent angles whose non-common sides are opposite rays.

∴ a and b are pair of adjacent angles and form a linear pair.

Question 25:

In the given figure, ∠AOC and ∠BOC from a pair of



(a) vertically opposite angles

(b) complementary angles

(c) alternate interior angles

(d) supplementary angles

Solution :

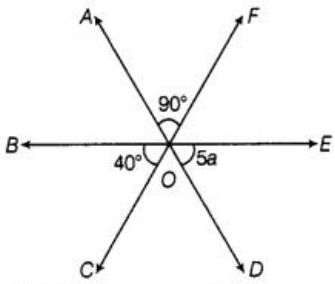
(d) Since, ∠AOC and ∠BOC are on the same line AOB and forming linear pair.

∴∠AOC + ∠BOC=180°

Hence, ∠AOC and ∠BOC are supplementary angles.

Question 26:

In the given figure, the value of a is



(a) 20° (b) 15° (c) 5° (d) 10°

Solution :

(d) From the given figure, we can say that

$$\angle BOC = \angle EOF \quad \text{[vertically opposite angles]}$$

$$\Rightarrow \quad 40° = \angle EOF$$

Since, sum of all the angles on a straight line is 180°.

$$\therefore \quad \angle AOF + \angle FOE + \angle EOD = 180°$$

$$\Rightarrow \quad 90° + 40° + 5a = 180°$$

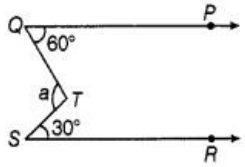
$$\Rightarrow \quad 130° + 5a = 180° \Rightarrow 5a = 180° - 130°$$

$$\Rightarrow \quad 5a = 50°$$

$$\Rightarrow \quad a = \frac{50°}{5} = 10°$$

Question 27:

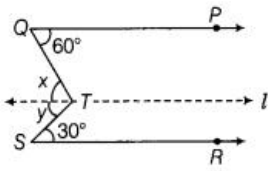
In the given figure, if QP|| SR, the value of a is



(a) 40° (b) 30° (c) 90° (d) 80°

Solution :

(c) Draw a line l parallel to QP.



$\therefore$ $\angle PQT = x$

$\Rightarrow$ $x = 60°$ [alternate interior angles]

Also, $\angle RST = y$

$\Rightarrow$ $y = 30°$ [alternate interior angles]

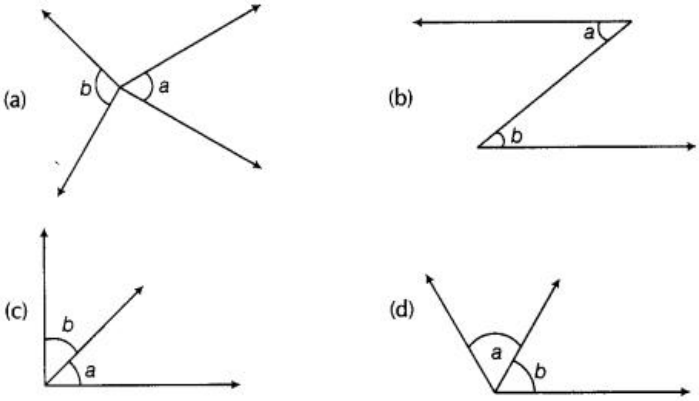
Now, $a = x + y$

$\Rightarrow$ $a = 60° + 30°$

$\Rightarrow$ $a = 90°$

Question 28:

In which of the following figures, a and b are forming a pair of adjacent angles?



Solution :

(d) Two angles are called adjacent angles, if they have a common vertex and a common arm but no common interior points.

$\therefore$ In option (d), a and b form a pair of adjacent angles.

Question 29:

In a pair of adjacent angles, (i) vertex is always common, (ii) one arm is always common, and (iii) uncommon arms are always opposite rays.

Then,

(a) all (i), (ii) and (iii) are true (b) (iii) is false

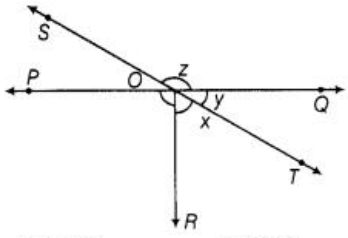
(c) (i) is false but (ii) and (iii) are true (d) (ii) is false

Solution :

(b) Two angles are called adjacent angles, if they have a common vertex and a common arm but no common interior points. It is not necessary that uncommon arms must be always opposite rays.

Question 30:

In the given figure, lines PQ and ST intersect at 0. If $\angle POR = 90°$ and x : y = 3:2, then z is equal to



(a) 126° (b) 144° (c) 136° (d) 154°

Solution :

(b) Since, $\angle POR$, $\angle ROT$ and $\angle TOQ$ lies on a straight line POQ, then their sum is equal to 180°.

$\therefore \quad \angle POR + \angle ROT + \angle TOQ = 180°$

$\Rightarrow \quad 90° + x + y = 180°$

$\Rightarrow \quad x + y = 180° - 90°$

$\Rightarrow \quad x + y = 90°$ ...(i)

Also, $x : y = 3 : 2$ [given]

Let $x = 3a$ and $y = 2a$

$\therefore \quad 3a + 2a = 90°$ [from Eq. (i)]

$\Rightarrow \quad 5a = 90°$

$\Rightarrow \quad a = \frac{90°}{5} = 18°$

Now, $x = 3a = 3 \times 18° = 54°$ and $y = 2a = 2 \times 18° = 36°$

Since, y and z forms a linear pair.

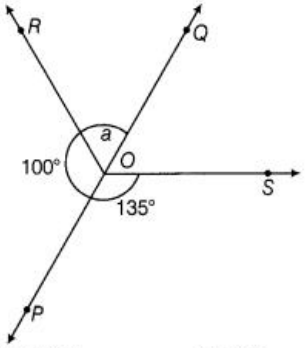
$\therefore \quad y + z = 180°$

$\Rightarrow \quad 36° + z = 180° \Rightarrow z = 180° - 36°$ [$\because y = 36°$]

$\Rightarrow \quad z = 144°$

Question 31:

In the given figure, POQ is a line, then a is equal to



(a) 35° (b) 100° (c) 80° (d) 135°

Solution :

Since, POQ is a line

Here, $\angle POR$ and $\angle QOR$ form a linear pair.

$\therefore \quad \angle POR + \angle QOR = 180°$ [$\because$ sum of the linear pair is 180°]

$\Rightarrow \quad 100° + a = 180°$

$\Rightarrow \quad a = 180° - 100° = 80°$

Question 32:

Vertically opposite angles are always

(a) supplementary (b) complementary

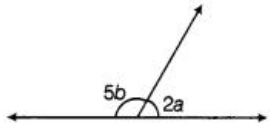
(c) adjacent (d) equal

Solution :

(d) When two lines intersect, then vertically opposite angles so formed are equal.

Question 33:

In the given figure, a=40°. The value of b is



(a) 20° (b) 24° (c) 36° (d) 120°

Solution :

(a) From the given figure it is clear that,

$2a + 5b = 180°$ [linear pair]

$\Rightarrow 2 \times 40° + 5b = 180°$ [$\because a = 40°$]

$\Rightarrow 80° + 5b = 180°$

$\Rightarrow 5b = 180° - 80°$

$\Rightarrow 5b = 100°$

$\Rightarrow b = \frac{100°}{5}$

$\therefore b = 20°$

Question 34:

If an angle is 60° less than two times of its supplement, then the greater angle is

(a) 100° (b) 80° (c) 60° (d)120°

Solution :

(a) Let the angle be x, then its supplement will be (180°-x).

It is given that, the angle 60° less than 2 times of its supplement.

Then, $2(180° - x) - x = 60°$

$\Rightarrow 360° - 2x - x = 60°$

$\Rightarrow 360° - 3x = 60°$

$\Rightarrow 360° - 60° = 3x$

$\Rightarrow 300° = 3x$

$\Rightarrow x = \frac{300°}{3}$

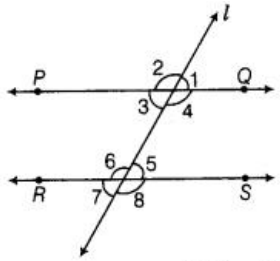
$\Rightarrow x = 100°$

If $x = 100°$, then other angle $= 180° - x = 180° - 100° = 80°$

So, the greater angle is 100°.

Question 35:

In the given figure, PQ || RS. If ∠1 = (2a + b)° and ∠6 = (3a – b)° , then the measure of ∠2 in terms of b is



(a) $(2 + b)°$ (b) $(3 - b)°$

(c) $(108 - b)°$ (d) $(180 - b)°$

Solution :

(c) From the given figure, $\angle 1 = \angle 5$ [corresponding angles]

$\Rightarrow \angle 5 = (2a + b)°$ [$\because \angle 1 = (2a + b)°$, given]

Also, $\angle 5 + \angle 6 = 180°$ [linear pair]

$\Rightarrow (2a + b)° + (3a - b)° = 180°$ [$\because \angle 6 = (3a - b)°$, given]

$\Rightarrow (2a + 3a) + (b - b) = 180°$

$\Rightarrow 5a = 180°$

$\Rightarrow a = \frac{180°}{5}$

$\Rightarrow a = 36°$

Now, $\angle 1 + \angle 2 = 180°$ [linear pair]

$\Rightarrow \angle 2 = 180° - \angle 1$

$\Rightarrow \angle 2 = 180° - (2a + b)°$ [$\because \angle 1 = (2a + b)°$, given]

$\Rightarrow \angle 2 = 180° - 2a - b$

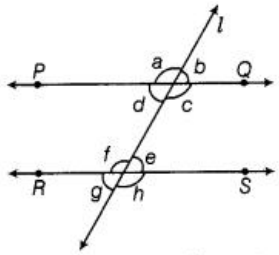
$\Rightarrow \angle 2 = 180° - 2 \times 36° - b$ [$\because a = 36°$]

$\Rightarrow \angle 2 = 180° - 72° - b$

$\Rightarrow \angle 2 = (108 - b)°$

Question 36:

In the given figure, PQ || RS and a : b =3 : 2. Then, f is equal to



(a) 36° (b) 108°
(c) 72° (d) 144°

Solution :

(b) We have, a:b = 3:2

Let a = 3x and b=2x

Since, a and b form a linear pair.

$\therefore \quad a+b=180°$

$\Rightarrow \quad 3x+2x=180°$

$\Rightarrow \quad 5x=180°$ [∵sum of linear pair of angles is 180°]

$\Rightarrow \quad x=\frac{180°}{5}$

$\Rightarrow \quad x=36°$

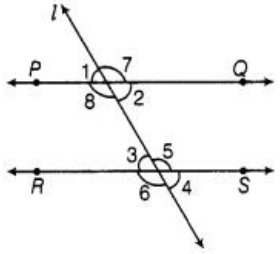
$\therefore \quad a=3x \Rightarrow a=3\times36°=108°$

Now, $f=a$ [corresponding angles]

$\Rightarrow \quad f=108°$

Question 37:

In the given figure, line l intersects two parallel lines PQ and RS. Then, which one of the following is not true?



(a) ∠1 = ∠3 (b) ∠2 = ∠4 (c) ∠6 = ∠7 (d) ∠4 = ∠8

Solution :

(d) From the given figure, PQ || RS and l is transversal, Therefore,

	∠1 = ∠3	[corresponding angles]
	∠2 = ∠4	[corresponding angles] ... (i)
Also,	∠5 = ∠6	[vertically opposite angles] ...(ii)
and	∠5 = ∠7	[corresponding angles] ...(iii)
⇒	∠6 = ∠7	[from Eqs. (ii) and (iii)]
Also,	∠2 + ∠8 = 180°	[linear pair]
⇒	∠4 + ∠8 = 180°	[∠2 = ∠4]

Question 38:

In the above figure (Q. No. 37), which one of the following is not true?

(a) ∠1+ ∠5=180° (b) ∠2 + ∠5=180°

(c) ∠3 + ∠8=180° (d) ∠2 + ∠3=180°

Solution :

(d) From the above figure, ∠2 and ∠3 are alternate interior angles.

Hence, ∠2 = ∠3

Question 39:

In the given figure (Q.No. 37), which of the following is true?

(a) ∠1 = ∠5 (b) ∠4 = ∠8 (c) ∠5 = ∠8 (d) ∠3 = ∠7

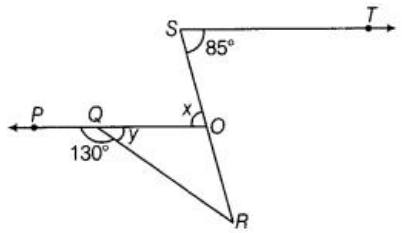
Solution :

(c) From the above figure, ∠5 and ∠8 are alternate interior angles.

Hence, ∠5 =∠8

Question 40:

In the given figure, PQ || ST. Then, the value of x + y



(a) 125° (b) 135° (c) 145° (d) 120°

Solution :

(b) Since, PQ || ST, then PO will also parallel to ST.

Now, PO || ST and OS is transversal.

Therefore,

$x = 85°$ [alternate interior angles]

Now, $y + 130° = 180°$ [linear pair]

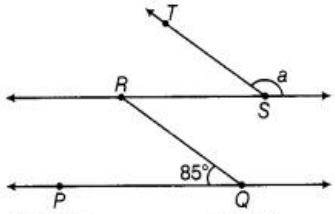
$\Rightarrow \quad y = 180° - 130°$

$\Rightarrow \quad y = 50°$

$\therefore \quad x + y = 85° + 50° = 135°$

Question 41:

In the given figure, if PQ || RS and QR || TS, then the value of a is



(b) 90° (c) 85° (d) 75°

Solution :

(a) Since, PQ || RS and QR is transversal.

$\therefore \quad \angle PQR = \angle SRQ$ [alternate interior angles]

$\Rightarrow \quad \angle SRQ = 85°$

Also, $ST \parallel QR$ and RS is transversal.

$\therefore \quad \angle SRQ = \angle RST$ [alternate interior angles]

$\Rightarrow \quad \angle RST = 85°$

Now, $\angle RST + a = 180°$ [linear pair]

$\Rightarrow \quad a = 180° - \angle RST$

$\Rightarrow \quad a = 180° - 85°$

$\Rightarrow \quad a = 95°$ [$\because \angle RST = 85°$]

Fill in the blanks

In questions 42 to 56, fill in the blanks to make the statements true.

Question 42:

If sum of measures of two angles is 90°, then the angles are_____.

Solution :

Complementary

The sum of two complementary angles is 90°.

Question 43:

If the sum of measures of two angles is 180°, then they are_____.

Solution :

Supplementary

The sum of two supplementary angles is 180°.

Question 44:

A transversal intersects two or more than two lines at_____points.

Solution :

Distinct

A transversal intersects two or more than two lines at distinct points.

In question 45 to 48, if a transversal intersects two parallel lines, then

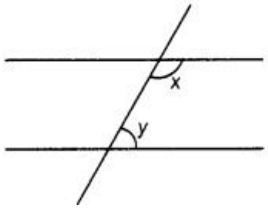
Question 45:

sum of interior angles on the same side of a transversal is_____.

Solution :

180°

Sum of interior angles on the same side of a transversal is 180°.



In the above figure, x + y = 180°.

Question 46:

Alternate interior angles have one common_____.

Solution :

Arm

Two alternate interior angles have one common arm.

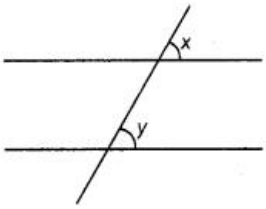
Question 47:

Corresponding angles are on the_____side of the transversal.

Solution :

Same

Two corresponding angles are on the same side of the transversal.



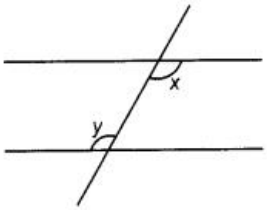
Question 48:

Alternate interior angles are on the_____side of the transversal.

Solution :

Opposite

Two alternate interior angles are on the opposite side of the transversal



Question 49:

Two lines in a plane which do not meet at a point anywhere, are called_____lines.

Solution :

Parallel

If two lines are parallel, then they will never meet each other.

Question 50:

Two angles forming a_____pair are supplementary.

Solution :

Linear

If two angles form a linear pair, then their sum will be 180°. Hence, they are supplementary.

Question 51:

The supplement of an acute angle is always_____angle.

Solution :

Obtuse

If angle is acute angle, then its supplement will be an obtuse angle. As, if we subtract an angle which is less than 90° from 180°, then result will be an angle greater than 90°.

Question 52:

The supplement of a right angle is always_____angle.

Solution :

Right

Let x be the supplement of the right angle.

Then, $x + 90° = 180° \Rightarrow x = 180° – 90° = 90°$

Question 53:

The supplement of an obtuse angle is always_____angle.

Solution :

Acute

The supplement of an obtuse angle is always an acute angle. As, if we subtract an obtuse angle from 180°, then result will be an acute angle, i.e. 90°.

Question 54:

In a pair of complementary angles, each angle cannot be more than_____.

Solution :

90°

Two angles are said to be complementary angles, if their sum is 90°. Hence, if two angles are complementary, then each angle cannot be more than 90°.

Question 55:

An angle is 45°. Its complementary angle will be_____.

Solution :

45°

Let x be the required angle.

Then, $x + 45° = 90° \Rightarrow x = 90° – 45° = 45°$

Question 56:

An angle which is half of its supplement is of_____.

Solution :

60°

Let the required angle be x. Then, its supplement will be (180°-x).

It is given that x is the half of it supplement i.e. (180°-x).

Therefore, $x = \frac{1}{2}(180° - x)$

$\Rightarrow \quad 2x = 180° - x$

$\Rightarrow \quad 2x + x = 180°$

$\Rightarrow \quad 3x = 180°$

$\Rightarrow \quad x = \frac{180°}{3}$

$\Rightarrow \quad x = 60°$

True / False

In questions 57 to 71, state whether the statements are True or False.

Question 57:

Two right angles are complementary to each other.

Solution :

False

Measure of right angle is 90°. So, the sum of two right angles = 90° + 90° = 180°.

Complementary angles are those whose sum is equal to 90°.

Hence, two right angles are never be complementary.

Question 58:

One obtuse angle and one acute angle can make a pair of complementary angles

Solution :

False

Since, sum of two complementary angles is 90°, so sum of one obtuse and one acute angles cannot make a pair of complementary angles as obtuse angle is greater than 90°.

Question 59:

Two supplementary angles are always obtuse angles.

Solution :

False

If two angles are supplementary angles, then it is not necessary that they are always obtuse angles.

e.g. 60° and 120° are supplementary angles but both are not obtuse.

Question 60:

Two right angles are always supplementary to each other.

Solution :

True

Measure of a right angle is 90°. Then, sum of two right angles will be (90°+ 90°) = 180°. So, two right angles are always supplementary to each other.

Question 61:

One obtuse angle and one acute angle can make a pair of supplementary angles.

Solution :

True

One obtuse angle and one acute angle can make a pair of supplementary angles, e.g. 60° and 120° are supplementary angles. So, one is 60° i.e. acute angle and other is 120°, i.e. obtuse angle.

Question 62:

Both angles of a pair of supplementary angles can never be acute angles.

Solution :

True

Acute angles are those which are less than 90°.

Both angles of a pair of supplementary angles can never be acute.

Question 63:

Two supplementary angles always form a linear pair.

Solution :

False

Linear pair is always in a straight line.

Question 64:

Two angles making a linear pair are always supplementary.

Solution :

True

Because linear pair is always in a straight line and straight line makes 180° angle.

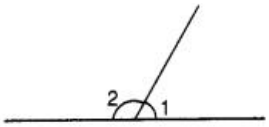
Question 65:

Two angles making a linear pair are always adjacent angles.

Solution :

True

e.g.



From the above figure, ∠1 and ∠2 form a linear pair and are adjacent angles.

Question 66:

Vertically opposite angles form a linear pair.

Solution :

False

Two angles making a linear pair are always adjacent angles.

Question 67:

Interior angles on the same side of a transversal with two distinct parallel lines are complementary angles.

Solution :

False

Interior angles on the same side of a transversal with two distinct parallel lines are supplementary angles.

Question 68:

Vertically opposite angles are either both acute angles or both obtuse angles.

Solution :

True

Vertically opposite angles are equal. So, if one angle is acute, then other angle will be acute and if one angle is obtuse, then the other will be obtuse.

Question 69:

A linear pair may have two acute angles.

Solution :

False

A linear pair either have both right angles or one acute and one obtuse angle, because angles forming linear pair is 180°.

Question 70:

An angle is more than 45°. Its complementary angle must be less than 45°.

Solution :

True

e.g. Let one angle = 50°

∴ The other angle = 90 – 50° = 40° < 45°

Question 71:

Two adjacent angles always form a linear pair.

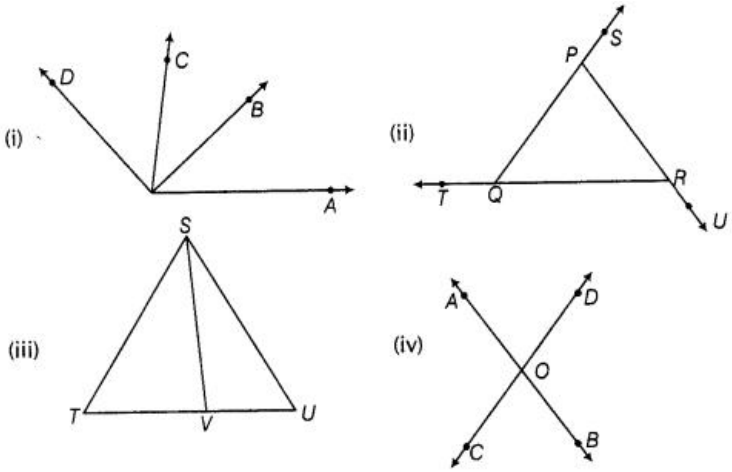
Solution :

False

Two adjacent angles do not always form a linear pair, but the angles forming linear pair are always adjacent angles.

Question 72:

Write down each pair of adjacent angles shown in the following figures.



Solution :

Two angles are called adjacent angles, if they have a common vertex and a common arm but no common interior points.

Hence, following are adjacent angles:

(i) (a) $\angle AOB, \angle BOC$ (b) $\angle AOB, \angle BOD$
(c) $\angle BOC, \angle COD$ (d) $\angle AOC, \angle COD$

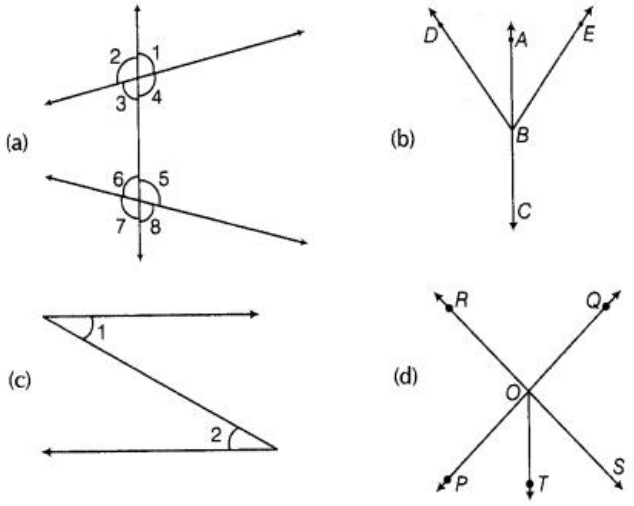
(ii) (a) $\angle PQR, \angle PQT$ (b) $\angle SPR, \angle RPQ$
(c) $\angle PRQ, \angle QRU$

(iii) (a) $\angle TSV, \angle VSU$ (b) $\angle SVU, \angle SVT$

(iv) (a) $\angle AOC, \angle AOD$ (b) $\angle AOD, \angle BOD$
(c) $\angle BOD, \angle BOC$ (d) $\angle BOC, \angle AOC$

Question 73:

In each of the following figures, write, if any, (i) each pair of vertically opposite angles, and (ii) each linear pair.



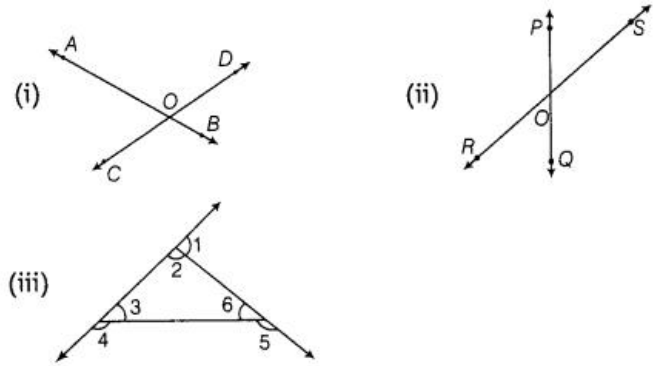
Solution :

Vertically opposite angles are the angles, opposite to each other when two lines cross,
A linear pair is a pair of adjacent angles whose non-common sides are opposite rays.
Following are vertically opposite angles and linear pair in the above figure:

Figure	Vertically opposite angles	Linear pair
(a)	$\angle 1, \angle 3$; $\angle 2, \angle 4$; $\angle 5, \angle 7$; $\angle 6, \angle 8$	$\angle 1, \angle 2$; $\angle 1, \angle 4$; $\angle 4, \angle 3$; $\angle 3, \angle 2$; $\angle 5, \angle 8$; $\angle 8, \angle 7$; $\angle 7, \angle 6$, $\angle 6, \angle 5$
(b)	Nil	$\angle ABD, \angle DBC$; $\angle ABE, \angle EBC$.
(c)	Nil	Nil
(d)	$\angle ROQ, \angle POS$; $\angle ROP, \angle QOS$	$\angle ROP, \angle POS$; $\angle ROT, \angle TOS$; $\angle QOS, \angle SOP$; $\angle QOT$ $\angle TOP$; $\angle ROQ, \angle QOS$; $\angle ROQ, \angle ROP$.

Question 74:

Name the pairs of supplementary angles in the following figures:



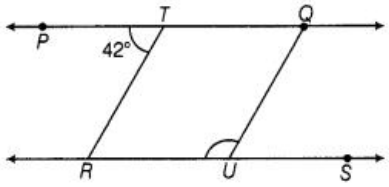
Solution :

When the sum of the measures of two angles is 180°, the angles are called supplementary angles. Linear pair angles are supplementary angles as their sum is 180°.
Following are the pairs of supplementary angles in the above figures:

Figure	Pair of supplementary angles
(i)	$\angle AOD, \angle AOC$; $\angle AOC, \angle BOC$; $\angle BOC, \angle BOD$; $\angle AOD, \angle BOD$
(ii)	$\angle POS, \angle SOQ$; $\angle POR, \angle QOR$
(iii)	$\angle 1, \angle 2$; $\angle 5, \angle 6$; $\angle 3, \angle 4$

Question 75:

In the given figure, PQ || RS, TR || QU and ∠PTR = 42°. Find ∠QUR.



Solution :

Since, PQ and RS are parallel and TR is transversal.

Therefore,

$\angle PTR = \angle TRU$ [alternate interior angles]

$\Rightarrow \quad \angle TRU = 42°$

Now, TR is parallel to QU and RS is transversal.

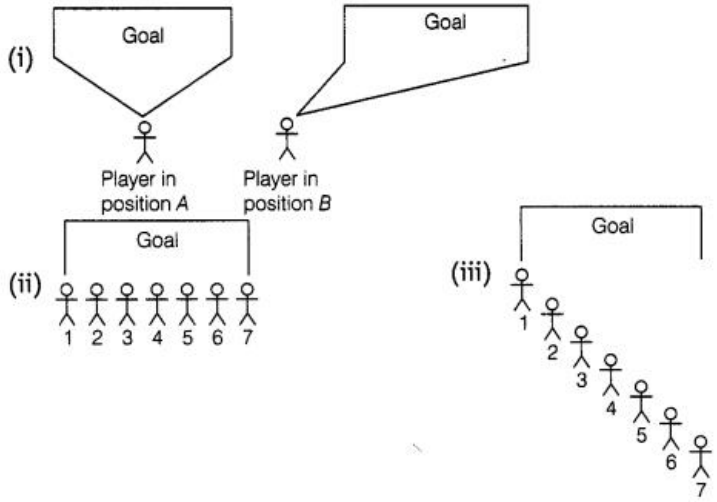
Therefore, $\angle TRU + \angle RUQ = 180°$ [consecutive interior angles]

$\Rightarrow \quad 42° + \angle RUQ = 180°$

$\Rightarrow \quad \angle RUQ = 180° - 42° \quad = 138°$

Question 76:

The drawings below (figure), show angles formed by the goalposts at different positions of a football player. The greater the angle, the better chance the player has of scoring a goal. e.g. The player has a better chance of scoring a goal from position A than from position B.



In parts (a) and (b) given below, it may help to trace the diagrams and draw and measure angles.

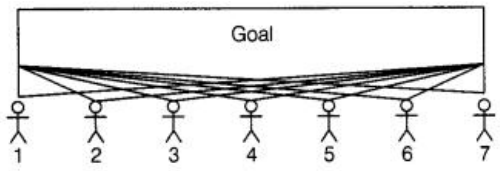
(a) Seven football players are practicing their kicks. They are lined up in a straight line infront of the goalpost [figure (ii)]. Which player has the best (the greatest) kicking angle?

(b) Now the players are lined up as shown in figure (iii). Which player has the best kicking angle?

(c) Estimate atleast two situations, such that the angles formed by different positions of two players are complement to each other.

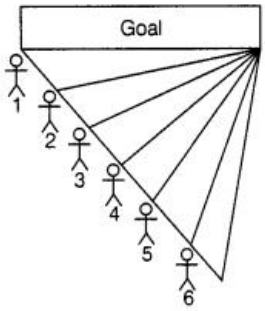
Solution :

(a)



Since, angle made by 4 is greatest. Hence, he has the best kicking angle.

(b)



From the above figure, we can say that player 4 has the best kicking angle, as it is greatest.

(c) Since, the angles are complementary. Hence, two situations are 45°, 45° and 30°, 60°.

Question 77:

The sum of two vertically opposite angles is 166°. Find each of the angles.

Solution :

When two lines intersect, then vertically opposite angles so formed are equal.

Let x be the measure of each vertically opposite angles.

Then, $x + x = 166°$

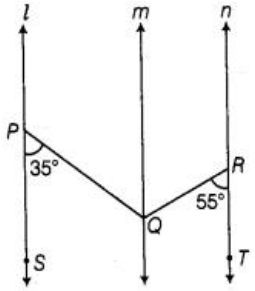
$\Rightarrow 2x = 166°$

$\Rightarrow x = \frac{166°}{2} = 83°$

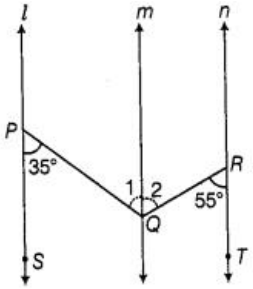
So, the measure of each angle is 83°.

Question 78:

In the given figure, l || m || n. ∠QPS = 35° and ∠QRT = 55°. Find ∠PQR.



Solution :



From the above figure, $\angle 1 = 35°$ [alternate angles]

$\angle 2 = 55°$ [alternate angles]

$\therefore \angle PQR = \angle 1 + \angle 2 = 35° + 55° = 90°$

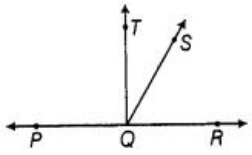
Question 79:

In the given figure, P, Q and R are collinear points and TQ ⊥ PR. Name:

(a) pair of complementary angles.

(b) two pairs of supplementary angles.

(c) four pairs of adjacent angles.



Solution :

(a) Complementary angles are those whose sum is 90°.

∴ ∠TQS and ∠SQR are pair of complementary angles, as their sum is 90°.

(b) Supplementary angles are those whose sum is 180°.

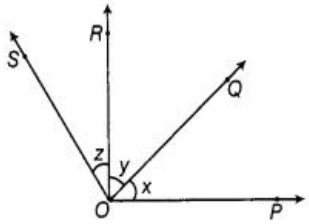
∴ ∠SQR, ∠SQP; ∠TQR, ∠TQP are pair so supplementary angles.

(c) Two angles are called adjacent angles, if they have a common vertex and a common arm but no common interior points.

∴ ∠SQR, ∠SQT, ∠TQR, ∠TQP, ∠SQT, ∠TQP; ∠PQS, ∠SQR are pairs of adjacent angles.

Question 80:

In the given figure, OR ⊥ OP.



(i) Name all the pairs of adjacent angles.

(ii) Name all the pairs of complementary angles.

Solution :

By definition of adjacent angles and complementary angles, we can say that following pairs are adjacent angles and complementary angles.

Adjacent angles: ∠x, ∠y; ∠x + ∠y, ∠z; ∠y, ∠z; ∠x, ∠y + ∠z.

Complementary angles: ∠x, ∠y

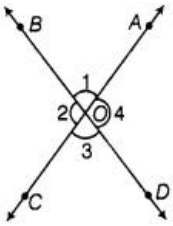
Question 81:

If two angles have a common vertex and their arms form opposite rays (figure). Then,

(a) how many angles are formed?

(b) how many types of angles are formed?

(c) write all the pairs of vertically opposite angles.



Solution :

(a) Total 13 angles are formed, namely ∠AOB, ∠BOC, ∠COD, ∠DOA, ∠AOC, ∠BOD, ∠DOB, ∠AOD, ∠BOA, ∠COB, ∠DOC, ∠AOA.

(b) Following types of angles are formed:

(i) Linear pair

(ii) Supplementary

(iii) Vertically opposite

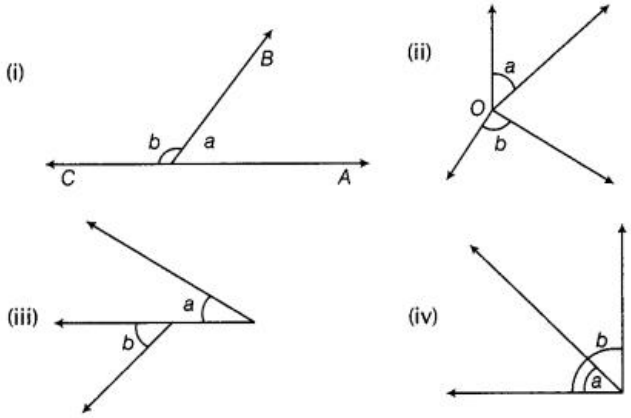
(iv) Adjacent

(c) Following are the pair of vertically opposite angles:

∠1, ∠3; ∠2, ∠4.

Question 82:

In the given figure, are the following pairs of angles adjacent? Justify your answer.

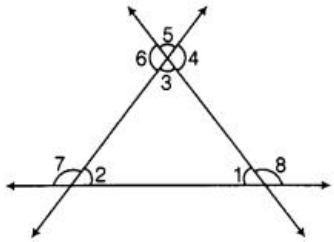


Solution :

Two angles are called adjacent angles, if they have a common vertex and a common arm but no common interior points. Hence, a and b form a pair of adjacent angle only in (i).

Question 83:

In the given figure, write all the pairs of supplementary angles.



Solution :

Supplementary angles are those angles whose sum is 180°. Hence, following are the pairs of supplementary angles:

1. ∠1, ∠8
2. ∠2, ∠7
3. ∠3, ∠4
4. ∠4, ∠5
5. ∠5, ∠6
6. ∠6, ∠3

Question 84:

What is the type of other angle of a linear pair, if

(a) one of its angle is acute?

(b) one of its angles is obtuse?

(c) one of its angles is right?

Solution :

Sum of angles of linear pair is 180°.

(a) If one angle is acute angle, then other angle will be obtuse. As, if we subtract an acute angle from 180°, we get an angle which is greater than 90°.

(b) If one angle is obtuse angle, then other angle will be acute. As, if we subtract an obtuse angle from 180°, we get an angle which is less than 90°.

(c) If one angle is right angle, then other angle will also be right angle. As, if we subtract 90° from 180°, we get 90°.

Question 85:

Can two acute angles form a pair of supplementary angles? Give reason in support of your answer.

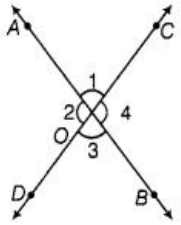
Solution :

Acute angles are those angles which are less than 90°. If we add two angles which are less than 90°, we get the result less than 180°, e.g. If we add 60° and 70°, we get 60°+ 70° = 130° <180°

Hence, two acute angles cannot form a pair of supplementary angles.

Question 86:

Two lines AB and CD intersect at 0 (see the figure). Write all the pairs of adjacent angles by taking angles 1, 2, 3 and 4 only.



Solution :

Two angles are called adjacent angles, if they have a common vertex and a common arm, but no common interior points.

Hence, following are the pairs of adjacent angles taking 1,2, 3, 4 angles only,

i.e. ∠1, ∠2 ; ∠2, ∠3; ∠3, ∠4; ∠4, ∠1.

Question 87:

If the complement of an angle is 62°, then find its supplement.

Solution :

Let the angle be x°. We know that, sum of two complementary angles is 90°.

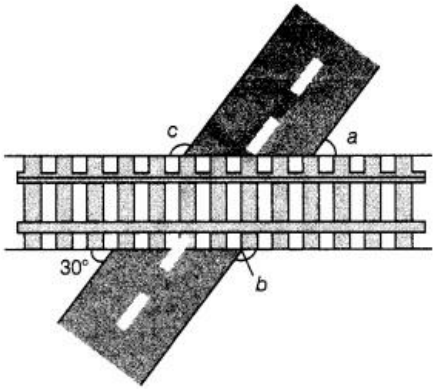
$\therefore \quad x + 62° = 90° \Rightarrow x = 90° - 62° = 28°$

Supplement of any angle is (180° – angle).

$\therefore$ Supplement of $x = 180° - 28° = 152°$

Question 88:

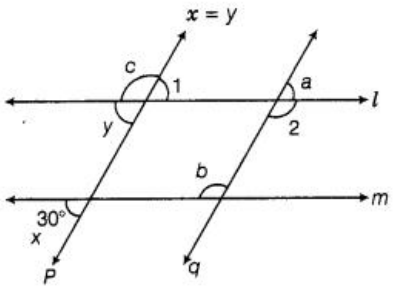
A road crosses a railway line at an angle of 30° as shown in the figure. Find the values of a, b and c.



Solution :

Lines l and m are parallel, P is transversal and x = 30°

Therefore,



[corresponding angles]

$\Rightarrow \quad y = 30°$

Now, $c + y = 180°$ [linear pair]

$\Rightarrow \quad c + 30° = 180°$

$\Rightarrow \quad c = 180° - 30°$

$\Rightarrow \quad c = 150°$

Now, $\angle 1 + c = 180°$ [linear pair]

$\Rightarrow \quad \angle 1 + 150° = 180°$

$\Rightarrow \quad \angle 1 = 180° - 150° = 30°$

$\therefore \quad \angle 1 = a$ [corresponding angles]

$\Rightarrow \quad a = 30°$

Also, $\angle 2 + a = 180°$ [linear pair]

$\Rightarrow \quad \angle 2 + 30° = 180°$

$\Rightarrow \quad \angle 2 = 180° - 30° = 150°$

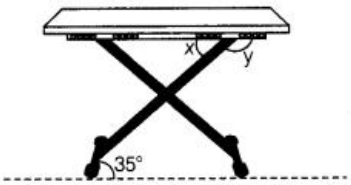
Again, $\angle 2 = b$ [alternate interior angles]

$\Rightarrow \quad b = 150°$

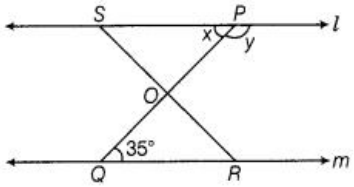
Hence, $a = 30°$, $b = 150°$ and $c = 150°$

Question 89:

The legs of a stool make an angle of 35° with the floor, as shown in the given figure. Find the angles x and y.



Solution :



Since, l m are parallel lines and PQ is transversal.

$\therefore \quad x = \angle PQR$ [alternate interior angles]

$\Rightarrow \quad x = 35°$ [$\because \angle PQR = 35°$]

Again, $x + y = 180°$ [linear pair]

$\Rightarrow \quad 35° + y = 180°$

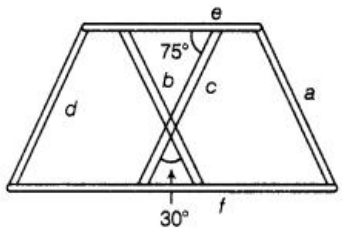
$\Rightarrow \quad y = 180° - 35° = 145°$

Question 90:

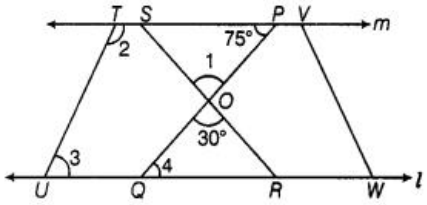
Iron rods a, b, c, d, e and f are making a design in a bridge as shown in the given figure, in which a|| b, c || d and e|| f. Find the marked angles between

(i) b and c (ii) d and e

(iii) d and f (iv) c and f



Solution :



Since, l, m are two parallel lines and PQ, RS and TU are transversal.

Then, $\angle 4 = \angle QPS$ [alternate interior angles]

$\Rightarrow$ $\angle 4 = 75°$ [$\because \angle QPS = 75°$]

Again, $\angle 1 = \angle QOR$ [vertically opposite angles]

$\Rightarrow$ $\angle 1 = 30°$ [$\because \angle QOR = 30°$]

Also, PQ and TU are parallel and m and l are transversal.

Therefore, $\angle 2 + \angle QPT = 180°$ [consecutive interior angles]

$\Rightarrow$ $\angle 2 = 180° - 75°$ [$\because \angle QPT = 75°$, given]

$\Rightarrow$ $\angle 2 = 105°$

Also, $\angle 2 + \angle 3 = 180°$

$\Rightarrow$ $105° + \angle 3 = 180°$

$\Rightarrow$ $\angle 3 = 180° - 105°$

$\Rightarrow$ $\angle 3 = 75°$

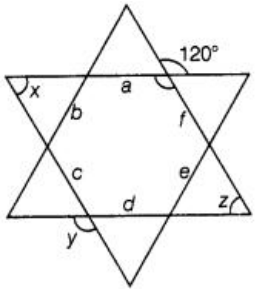
Hence,

(i) 30° (ii) 105°

(iii) 75° **(iv) 75°**

Question 91:

Amisha makes a star with the help of line segments a, b, c, d, e and f, in which a || d, b || e and c || f. Chhaya marks an angle as 120° as shown in the given figure and Amisha to find the ∠x, ∠y and ∠z. Help Amisha in finding the angles.



Solution :

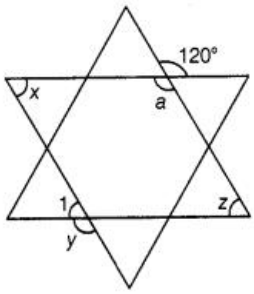
From the given figure, we have

$\angle a = 120°$ [vertically opposite angles]

Now, $\angle x + \angle a = 180°$ [consecutive interior angles]

$\Rightarrow \angle x + 120° = 180°$

$\Rightarrow \angle x = 180° - 120° = 60°$



Again, $\angle x = \angle 1$ [alternate interior angles]

$\Rightarrow 60° = \angle 1$

Also, $\angle 1 + \angle y = 180° \Rightarrow 60° + \angle y = 180°$ [linear pair]

$\Rightarrow \angle y = 180° - 60° = 120°$

Also, $\angle z + \angle a = 180°$ [consecutive interior angles]

$\Rightarrow \angle z + 120° = 180°$

$\Rightarrow \angle z = 180° - 120° = 60°$

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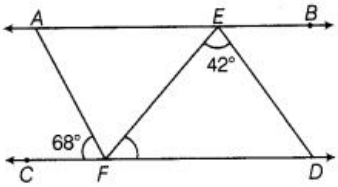
Question 92:

In the given figure, AB || CD, AF || ED, ∠AFC = 68° and ∠FED = 42°. Find ∠EFD.



Solution :

AF and ED are parallel and EF is transversal.

Then, $\angle AFE = \angle FED$ [alternate interior angles]

$\Rightarrow \angle AFE = 42°$ [$\because \angle FED = 42°$]

Now, $\angle AFC + \angle AFE + \angle EFD = 180°$

[$\because$ sum of all the angles on a straight line is 180°]

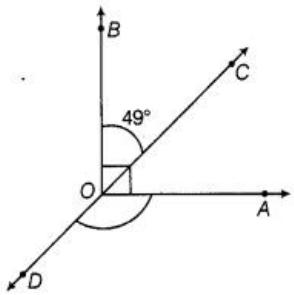
$\Rightarrow 68° + 42° + \angle EFD = 180°$

$\Rightarrow 110° + \angle EFD = 180°$

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

Question 93:

In the given figure, OB is perpendicular to OA and ∠BOC = 49°. Find ∠AOD.



Solution :

From the given figure, we have

$\angle DOB + \angle BOC = 180°$ [linear pair]

$\Rightarrow$ $\angle DOB + 49° = 180°$ [$\because \angle BOC = 49°$]

$\Rightarrow$ $\angle DOB = 180° - 49° = 131°$

Now, $\angle DOB + \angle BOA + \angle AOB = 360°$

[$\because$ sum of all the angles around a point is 360°]

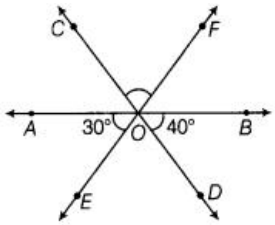
$\Rightarrow$ $131° + 90° + \angle AOD = 360°$ [$\because \angle DOB = 131°, \angle BOA = 90°$]

$\Rightarrow$ $221° + \angle AOD = 360°$

$\Rightarrow$ $\angle AOD = 360° - 221° = 139°$

Question 94:

Three lines AB, CD and EF intersect each other at 0. If ∠AOE = 30° and ∠DOB = 40° (see the figure) find ∠COF.



Solution :

From the given figure, we have

$\angle AOE + \angle EOD + \angle DOB = 180°$

[$\because$ sum of all the angles on a straight line is 180°]

$\Rightarrow$ $30° + \angle EOD + 40° = 180°$

$\Rightarrow$ $\angle EOD = 180° - 70°$

$\Rightarrow$ $\angle EOD = 110°$

Again, $\angle EOD = \angle COF$ [vertically opposite angles]

$\Rightarrow$ $\angle COF = 110°$

Question 95:

Measures (in degrees) of two complementary angles are two consecutive even integers. Find the angles.

Solution :

Let the two consecutive angles be x and x + 2. Since, both angles are complementary. So, their sum will be 90°.

$\therefore$ $x + (x + 2) = 90°$

$\Rightarrow$ $x + x + 2 = 90°$

$\Rightarrow$ $2x = 90° - 2$

$\Rightarrow$ $2x = 88°$

$\Rightarrow$ $x = 44°$

Therefore, the angles are 44° and 44° + 2 = 46°.

Question 96:

If a transversal intersects two parallel lines and the difference of two interior angles on the same side of a transversal is 20°, find the angles.

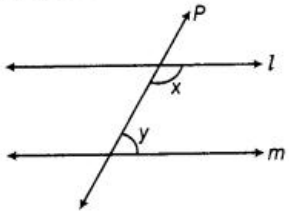
Solution :

Let the two interior angles on the same side of transversal are x and y.

Given, their difference is 20°.

$\therefore \quad x - y = 20° \Rightarrow y = x - 20°$ ...(i)

Since, l and m are parallel and P is transversal.



Then, $x + y = 180°$ [$\because$ sum of an interior angles is 180°]

$\therefore \quad x + x - 20° = 180°$ [from Eq. (i)]

$\Rightarrow \quad 2x = 180° + 20°$

$\Rightarrow \quad 2x = 200°$

$\Rightarrow \quad x = \frac{200°}{2} = 100°$

Now, $y = x - 20°$

$\therefore \quad y = 100° - 20° = 80°$

Therefore, the angles are 100° and 80°, respectively

Question 97:

Two angles are making a linear pair. If one of them is one-third of the other, then find the angles.

Solution :

Let one angle be x. It is given that other angle is one-third of first.

So, other angle will be $\frac{1}{3}x$.

Again, given that both the angles are making a linear pair.
So, their sum will be 180°.

$\therefore \quad x + \frac{1}{3}x = 180°$

$\Rightarrow \quad \frac{3x + x}{3} = 180°$ [taking LCM of 1 and 3 on LHS]

$\Rightarrow \quad \frac{4x}{3} = 180°$

$\Rightarrow \quad x = \frac{180° \times 3}{4}$

$\Rightarrow \quad x = 135°$

Hence, the angles are 135° and $\frac{1}{3} \times 135°$, i.e. 135° and 45°.

Question 98:

Measures (in degrees) of two supplementary angles are consecutive odd integers. Find the angles.

Solution :

Let two consecutive odd integers x, x + 2. It is given that both are supplementary angles. So, their sum will be 180°.

$\therefore \quad x + (x + 2) = 180°$

$\Rightarrow \quad 2x = 180° - 2$

$\Rightarrow \quad 2x = 178° = \frac{178°}{2}$

$\Rightarrow \quad x = 89°$

Hence, the two angles are 89° and 91°.

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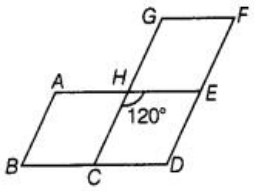
Question 99:

In the given figure, AE || GF || BD, AB || CG || DF and ∠CHE = 120°. Find ∠ABC and ∠CDE.



Solution :

Since, BD || AE and CG is transversal.

Therefore, $\angle BCH = \angle EHC$ [alternate interior angles]

$\Rightarrow$ $\angle BCH = 120°$

Again, $CG \| DF$ and BD is transversal.

Therefore, $\angle BCH = \angle CDE$ [corresponding angles]

$\Rightarrow$ $\angle CDE = 120°$

Also, $AB \| CG$ and BC is transversal.

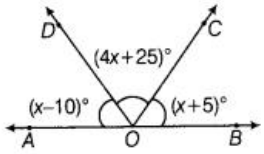
Therefore, $\angle ABC + \angle BCH = 180°$ [consecutive angles]

$\Rightarrow$ $\angle ABC = 180° - 120°$

$\Rightarrow$ $\angle ABC = 60°$

Question 100:

In the given figure, find the value of ∠BOC, if points A, O and B are collinear.



Solution :

Since, A, 0 and B are collinear. Then, AOB will be a straight line and sum of all the angles on a straight line is 180°.

$\therefore$ $\angle AOD + \angle DOC + \angle COB = 180°$

$\Rightarrow$ $(x - 10)° + (4x - 25)° + (x + 5)° = 180°$

$\Rightarrow$ $x - 10° + 4x - 25° + x + 5 = 180°$

$\Rightarrow$ $6x - 30° = 180°$

$\Rightarrow$ $6x = 180° + 30°$

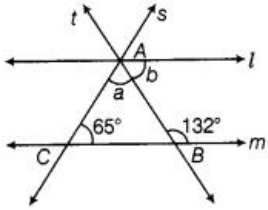
$\Rightarrow$ $6x = 210° \Rightarrow x = 35°$

Now, $\angle BOC = (x + 5)°$

$= (35 + 5)° = 40°$

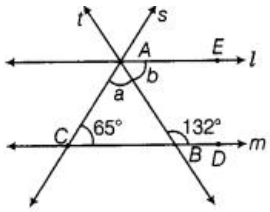
Question 101:

In the given figure, if l || m, find the values of a and b.



Solution :

Since, l, m are parallel lines and t is transversal.



Therefore, $\angle EAB + \angle DBA = 180°$ [consecutive interior angles]

$\Rightarrow b + 132° = 180°$

$\Rightarrow b = 180° - 132°$

$\Rightarrow b = 48°$

Again, l, m are parallel lines and s is transversal.

Therefore, $\angle EAC + \angle BCA = 180°$ [consecutive interior angles]

$\Rightarrow a + b + 65° = 180°$

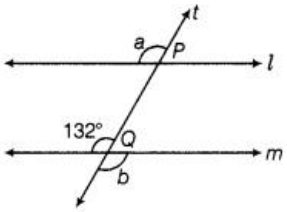
$\Rightarrow a + 48° + 65° = 180°$ [$\because b = 48°$]

$\Rightarrow a = 180° - 48° - 65°$

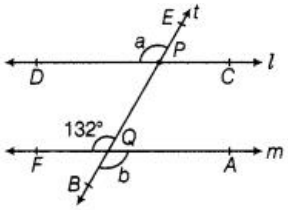
$\Rightarrow a = 67°$

Question 102:

In the given figure, l || m and a line t intersects these lines at P and Q, respectively. Find the sum 2a + b.



Solution :



From the above figure, we can say that

$\angle AQB = \angle FQP$ [vertically opposite angles]

$\Rightarrow b = 132°$

Since, l, m are parallel lines and t is transversal.

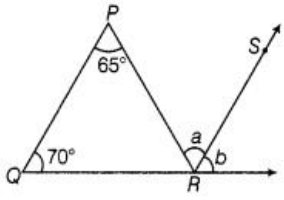
Therefore, $\angle EPD = \angle PQF$ [corresponding angles]

$\Rightarrow a = 132°$

Now, $2a + b = 2 \times 132° + 132° = 264° + 132° = 396°$

Question 103:

In the given figure, QP|| RS. Find the values of a and b.

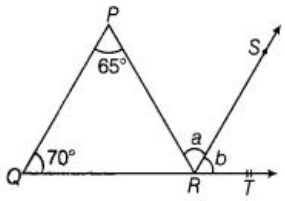


Solution :

Since, QP || RS and PR is transversal.

Therefore, $\angle QPR = \angle SRP$ [alternate interior angles]

$\Rightarrow$ $65° = a \Rightarrow a = 65°$

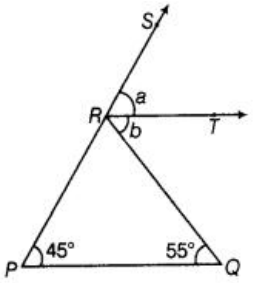


Also, $\angle SRT = \angle PQR$ [corresponding angles]

$\Rightarrow$ $b = 70°$

Question 104:

In the given figure, PQ || RT. Find the value of a + b.



Solution :

Since, PQ || RT and RQ is transversal.

Therefore, $\angle TRQ = \angle RQP$ [alternate interior angles]

$\Rightarrow$ $b = 55°$

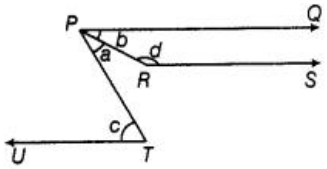
Also, $\angle SRT = \angle SPQ$ [corresponding angles]

$\Rightarrow$ $a = 45°$

$\therefore$ $a + b = 45° + 55° = 100°$

Question 105:

In the given figure, PQ, RS and UT are parallel lines.



(i) If $c = 57°$ and $a = \frac{c}{3}$, find the value of d.

(ii) If $c = 75°$ and $a = \frac{2}{5}c$, find b.

Solution :

(i) Since, PQ || UT and PT is transversal,

(i) Since, $PQ \| UT$ and PT is transversal.

Therefore, $\angle QPT = \angle UTP$ [alternate interior angles]

$\Rightarrow$ $a + b = c$

$\Rightarrow$ $\frac{c}{3} + b = c$ $\left[\because a = \frac{c}{3}, \text{given}\right]$

$\Rightarrow$ $b = c - \frac{c}{3}$

$\Rightarrow$ $b = \frac{3c - c}{3}$

$\Rightarrow$ $b = \frac{2c}{3} = \frac{2}{3} \times 57°$ [$\because c = 57°$, given]

$\therefore$ $b = 38°$

Again, $PQ \| RS$ and PR is transversal.

Therefore, $\angle QPR + \angle PRS = 180°$ [consecutive interior angles]

$\Rightarrow$ $b + d = 180°$

$\Rightarrow$ $d = 180° - b$

$\Rightarrow$ $d = 180 - 38°$ [$\because b = 38°$]

$\Rightarrow$ $d = 142°$

(ii) Since, $PQ \| UT$ and PT is transversal.

Therefore, $\angle QPT = \angle UTP$ [alternate interior angles]

$\Rightarrow a + b = c$

$\Rightarrow b = c - a$

$\Rightarrow b = c - \frac{2}{5}c$ $\left[\because a = \frac{2}{5}c, \text{given}\right]$

$\Rightarrow b = \frac{5c - 2c}{5}$

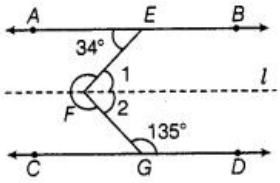
$\Rightarrow b = \frac{3c}{5}$

$\Rightarrow b = \frac{3 \times 75°}{5}$ [$\because c = 75°$, given]

$\Rightarrow b = 45°$

Question 106:

In the given figure, AB || CD. Find the reflex ∠EFG.



Solution :

Construct a line l parallel to AB, passing through F. l is parallel to both AB and CD.

Then, $\angle 1 = 34°$ [alternate angles]

and $\angle 2 + 135° = 180°$ [consecutive angles]

$\Rightarrow \angle 2 = 180° - 135°$

$\Rightarrow \angle 2 = 45°$

$\therefore \angle EFG = \angle 1 + \angle 2$

$\Rightarrow \angle EFG = 34° + 45°$

$\Rightarrow \angle EFG = 79°$

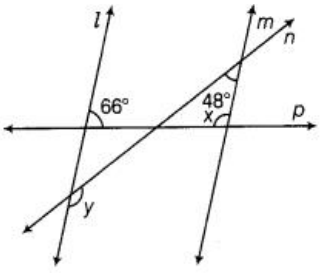
$\therefore$ Reflex of $\angle EFG = 360° - \angle EFG$

$= 360° - 79°$ [$\because \angle EFG = 79°$]

$= 281°$

Question 107:

In the given figure, two parallel lines l and m are cut by two transversals n and p. Find the values of x and y.



Solution :

Since, lines l and mare parallel and p is transversal.

Therefore, $x + 66° = 180°$ [consecutive angles]

$\Rightarrow x = 180° - 66°$

$\Rightarrow x = 114°$

Again, lines l, m are parallel and n is transversal.

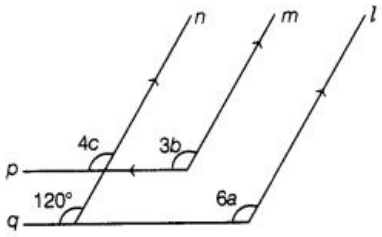
Therefore, $y + 48° = 180°$ [consecutive angles]

$\Rightarrow y = 180° - 48°$

$\Rightarrow y = 132°$

Question 108:

In the given figure, l, m and n are parallel lines, and the lines p and q are also parallel. Find the values of a, b and c.



Solution :

Since, lines l, n are parallel and q is transversal.

Therefore, $6a = 120°$ [corresponding angles]

$\Rightarrow$ $a = \frac{120°}{6} \Rightarrow a = 20°$

Also, lines p, q are parallel and n is transversal.

Therefore, $4c = 120°$ [corresponding angles]

$\Rightarrow$ $c = \frac{120°}{4}$

$\Rightarrow$ $c = 30°$

Again, lines m, n are parallel and p is transversal.

Therefore, $4c = 3b$ [corresponding angles]

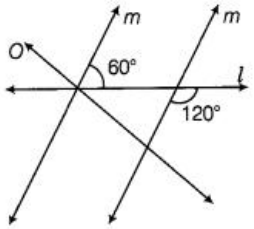
$\Rightarrow$ $b = \frac{4c}{3}$

$\Rightarrow$ $b = \frac{4 \times 30°}{3}$

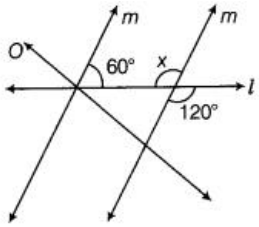
$\Rightarrow$ $b = 40°$

Question 109:

In the given figure, state which pair of lines are parallel. Give reason.



Solution :



$x = 120°$ [vertically opposite angles]

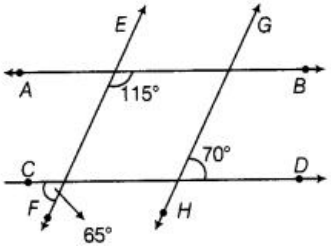
Now, $x + 60° = 120° + 60° = 180°$

Since, the sum of consecutive interior angles is 180°. Hence, m and n will be parallel.

Question 110:

In the given figure, examine whether the following pairs of lines are parallel or not.

(i) *EF* and *GH* (ii) *AB* and *CD*



Solution :

From the given figure, $x = 65°$ [vertically opposite angles]

and $y = 180° - 70°$ [linear pair]

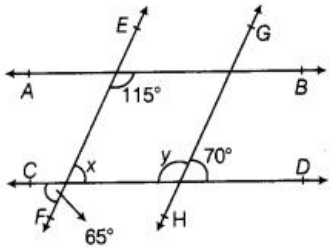
$\Rightarrow$ $y = 110°$

(i) Now, $x + y = 65° + 110° = 175° \neq 180°$

Hence, EF and GH are not parallel.

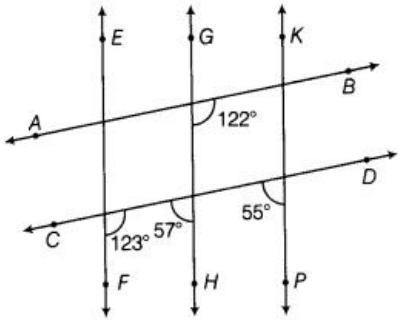
(ii) Also, $x + 115° = 65° + 115° = 180°$

Hence, AB and CD are parallel.



Question 111:

In the given figure, find out which pair of Lines are parallel.



Solution :

From the given figure,

$\angle 1 = 180° - 123°$ [linear pair]

$\Rightarrow$ $\angle 1 = 57°$

Also, $\angle 2 = 180° - 57°$ [linear pair]

$\Rightarrow$ $\angle 2 = 123°$

Now, $\angle 1 + \angle 2 = 57° + 123° = 180°$

If sum of the consecutive angles are 180°, then the lines are parallel.

$\therefore$ $EF \| GH$

Now, $\angle 3 = 180° - \angle 2$ [linear pair]

$\Rightarrow$ $\angle 3 = 180° - 123° = 57°$

Also, $\angle 4 = 180° - 55°$ [linear pair]

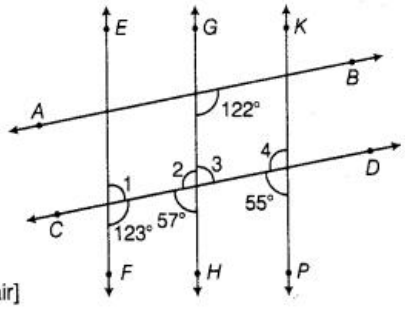
$= 125°$

$\therefore$ $\angle 3 + \angle 4 = 57° + 125° = 182° \neq 180°$

So, GH and KP are not parallel.

Also, $\angle 3 + 122° = 57° + 122° = 179° \neq 180°$

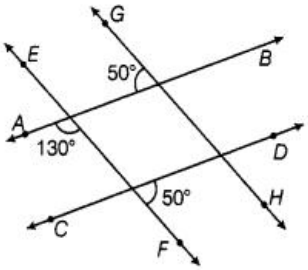
Hence, AB and CD are not parallel.



Question 112:

In the given figure, show that

(i) $AB \| CD$ (ii) $EF \| GH$



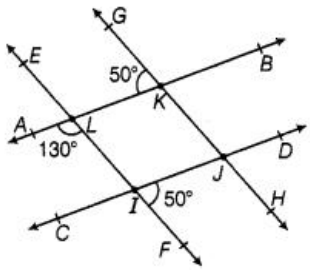
Solution :

From the given figure,

(i) From the given figure,

$\angle CIF + \angle FIJ = 180°$ [linear pair]

$\Rightarrow$ $\angle CIF = 180° - \angle FIJ = 180° - 50° = 130°$



Now, $\angle ALI = \angle CIF = 130°$

$\therefore$ $AB \| CD$ as their corresponding angles are equal.

(ii) From the given figure,

$\angle GKL + \angle LKJ = 180°$ [linear pair]

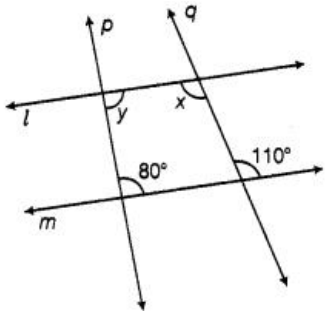
$\Rightarrow$ $\angle LKJ = 180° - \angle GKL = 180° - 50° = 130°$

Now, $\angle ALI = \angle LKJ = 130°$

$\therefore$ $EF \| GH$ as their corresponding angles are equal.

Question 113:

In the given figure, two parallel lines l and m are cut by two transversals p and q. Determine the values of x and y.

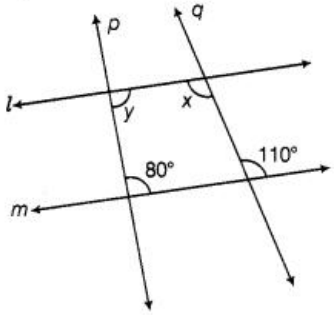


Solution :

From the given figure, $x = 110°$ [alternate interior angles]

and $y + 80° = 180°$

[$\because$ sum of interior angles on the same side of transversal is 180°]



$\Rightarrow$ $y = 180° - 80°$

$\Rightarrow$ $y = 100°$