Chapter 13. Equation of A Straight Line

Ex 13.1

Answer 2.

The line $3y = 5x - 7$ passes through $(p,6)$

$\therefore$ $(p,6)$ will satisfy the equation of line

$3(6) = 5(p) - 7$

$\Rightarrow 25 = 5p$

$\Rightarrow p = 5$

Answer 3.

The line $3y = 5x - 7$ passes through $(p,6)$

$\therefore$ $(p,6)$ will satisfy the equation of line

$3(6) = 5(p) - 7$

$\Rightarrow 25 = 5p$

$\Rightarrow p = 5$

Answer 4.

The line $4x = 11 - 3y$ passes through the point $(a,5)$,

$\therefore$ $(a,5)$ will satisfy the equation of line

$4(a) = 11 - 3(5)$

$\Rightarrow 4a = -4$

$\Rightarrow a = -1$

Answer 5.

The line $y = 6 - \frac{3x}{2}$ passes through the point $(r,3)$

$\therefore$ $(r,3)$ will satisfy the equation of line

$$3 = 6 - \frac{3r}{2}$$

$$\Rightarrow -3 = -\frac{3r}{2}$$

$$\Rightarrow r = 2$$

Answer 6.

The line $\frac{3+5y}{2} = \frac{4x-7}{2}$ passes through the point $(1,k)$,

$\therefore$ $(1,k)$ will satisfy the equation of line

$$\frac{3+5k}{2} = \frac{4(1)-7}{3}$$

$$\Rightarrow 9 + 15k = 6$$

$$\Rightarrow 15k = -15$$

$$\Rightarrow k = -1$$

Answer 7.

Let the point of intersection of AB and line $4x+4y=11$ be the point $P(a,b)$,

Also given $4x+3y = 11$ bisects line segment AB

$\therefore$ AP : PB = 1 : 1

Coordinates of P are,

$$P(a,b) = P\left(\frac{6+4}{2}, \frac{m-9}{2}\right) = P\left(5, \frac{m-9}{2}\right)$$

Since $P(a,b)$ lies on the line $4x+3y=11$, $\therefore$ P will satisfy the equation of line

$$4(5) + 3\left(\frac{m-9}{2}\right) = 11$$

$$\frac{3m-27}{2} = 11 - 20$$

$$\Rightarrow 3m - 27 = -18$$

$$\Rightarrow 3m = 9$$

$$\Rightarrow m = 3$$

Answer 8.

Let the point of intersection of AB and the line 2x-5y+31=0 be the point R(a,b)

Also, given the line 2x - 5y+31=0 bisects the line segment AB

$\therefore$ AR : RB = 1 : 1

Coordinates of R are,

$$R(a,b) = R\left(\frac{-4+p}{2}, \frac{5+9}{2}\right) = R\left(\frac{-4+p}{2}, 7\right)$$

$\because$ R(a,b) lies on the line 2x-5y+31=0,

$\therefore$ R will satisfy the equation of the line

$$2\left(\frac{-4+p}{2}\right) - 5(7) + 31 = 0$$

$$\Rightarrow (-4+p) - 4 = 0$$

$$\Rightarrow p = 8$$

Answer 9.

Let the point of intersection of AB and the line 3x + 4y = 18 be the point P(a,b)

Also, given the line 3x+4y=18 bisects the line segment AB

$\therefore$ AP : PB = 1 : 1

Coordinates of P are,

$$P(a,b) = P\left(\frac{3-7}{2}, \frac{7+z}{2}\right) = P\left(-2, \frac{7+z}{2}\right)$$

$\because$ P(a,b) lies on the line 3x + 4y = 18,

$\therefore$ P will satisfy the equation of the line

$$3(-2) + 4\left(\frac{7+z}{2}\right) = 18$$

$$\Rightarrow 14 + 2z = 24$$

$$\Rightarrow 2z = 10$$

$$\Rightarrow z = 5$$

Answer 10.

Let the point of intersection of PQ and $5x - 3y + 1 = 0$ be the point R(a,b).

Also given the line $5x - 3y + 1 = 0$ divides the line segment PQ in the ratio 2 : 3,
i.e. PR : PQ = 2 : 5
Coordinates of R are,

$$R(a,b) = R\left(\frac{14+6}{5}, \frac{18+3m}{5}\right) = R\left(4, \frac{18+3m}{5}\right)$$

$\because$ R(a,b) lies on the line $5x-3y+1=0$,
$\therefore$ R will satisfy the equation of the line

$$5(4) - 3\left(\frac{18+3m}{5}\right) + 1 = 0$$

$$\Rightarrow -3\left(\frac{18+3m}{5}\right) = -21$$
$$\Rightarrow 18 + 3m = 35$$
$$\Rightarrow 3m = 17$$
$$\Rightarrow m = \frac{17}{3}$$

Answer 11.

Let the point of intersection of AB and the line $7x-8y=4$, be the point P(a,b).

Also, given the line $7x-8y = 4$ divides the line segment AB in the ratio 2 : 5.
i.e. AP : PB = 2 : 5
Coordinates of P are,

$$P(a,b) = P\left(\frac{12-40}{7}, \frac{2k-20}{7}\right) = P\left(-4, \frac{2k-20}{7}\right)$$

$\because$ P(a,b) lies on the line $7x - 8y = 4$,
$\therefore$ P will satisfy the equation of the line

$$7(-4) - 8\left(\frac{2k-20}{7}\right) = 4$$

$$-8\left(\frac{2k-20}{7}\right) = 32$$
$$2k - 20 = -28$$
$$2k = -8$$
$$k = -4$$

Answer 12.

Let the point of intersection of PQ and the line 5x+3y=25, be the point R(x,y)

Also, given the line 5x+3y = 25 divides the line segment PQ in the ratio 1 : 3.
i.e. PR : RQ = 1 : 3
Coordinates of R are,

$$R(x,y) = R\left(\frac{5+3b}{4}, \frac{8+12}{4}\right) = R\left(\frac{5+3b}{4}, 5\right)$$

$\because$ R(x, y) lies on the line 5x+3y=25
$\therefore$ R will satisfy the equation of the line

$$5\left(\frac{5+3b}{4}\right) + 3(5) = 25$$
$$\Rightarrow 5\left(\frac{5+3b}{4}\right) = 10$$
$$\Rightarrow 5+3b = 8$$
$$\Rightarrow 3b = 3$$
$$\Rightarrow b = 1$$

Answer 13.

Let the point P on the line segment AB be P(a,b)

Also, given that P(a,b) divides the line segment AB in the ratio 2 : 3
i.e. AP : PB = 2 : 3
Coordinates of P are,

$$P(a,b) = P\left(\frac{16-6}{5}, \frac{16+9}{5}\right) = P(2,5)$$

If P(a,b) lies on the line 7x-2y=4, then will satisfy the equation of the line
LHS 7(2) – 2(5) = 14 – 10 = 4 = RHS

Yes, the point P(2,5) lies on the line 7x – 2y = 4

Answer 14.

Let L(a,b) be the point on line segment PQ dividing it in the ratio 1 : 3

i.e. PL : LQ = 1 : 3
Coordinates of L are,

$$L(a,b) = L\left(\frac{11+9}{4}, \frac{-5+21}{4}\right)$$
$$= L(5, 4)$$

If L(a,b) lies on the line 2x+5y=20, then it will satisfy the equation of the line
LHS =2(5) + 5(4) = 10 + 20 = 30 ≠ RHS
No, L(a,b) does not lie on the line 2x+5y = 20

Answer 15.

Let the point on x-axis be P(x,y) which divides the line segment AB in the ratio 1 : 2,

i.e. AP : PB = 1 : 2

Coordinates of P are,

$$P(x, y) = P\left(\frac{5+4}{3}, \frac{6+6}{3}\right)$$

x = 3, y=4

If P(x,y) lies on the line 3x – 4y + 5 =0, then it will satisfy the equation of the line.

LHS =3(3) – 4(4)+ 5 = 9-9= 0= RHS

Yes, the point P lies on the line 3x-4y+5 = 0.

Ex 13.2

Answer 1.

(a) Slope of line = m = tan θ

$= \tan 60°$

$= \sqrt{3}$

$= 1.73$

(b) Slope of line = m = tan θ

$= \tan 50°$

$= 1.19$

(c) Slope of line = m = tan θ

$= \tan 45° = 1$

(d) Slope of line = m = tan θ

$= \tan 75°$

$$\tan(75°) = \tan(45° + 30°) = \frac{\tan 45° + \tan 30°}{1 - \tan 45° \tan 30°}$$

$$= \frac{1 + \frac{1}{\sqrt{3}}}{1 - \frac{1}{\sqrt{3}}} = \frac{\sqrt{3} + 1}{\sqrt{3} - 1}$$

$$= \frac{2.73}{0.73} = \frac{273}{73} = 3.73$$

(e) Slope of line = m = tan θ

$= \tan 30° = \frac{1}{\sqrt{3}}$

Answer 2.

(a) $\tan\theta = 0.4663$

$\therefore \theta = 25°$

(b) $\tan\theta = 1.4281$

$\therefore \theta = 55°$

(c) $\tan\theta = 3.0777$

$\therefore \theta = 72°$

(d) $\tan\theta = 5.6713$

$\therefore \theta = 80°$

(e) $\tan\theta = 0.5317$

$\therefore \theta = 28°$

Answer 3.

(a) Slope of line $= \frac{y_2 - y_1}{x_2 - x_1}$

$= \frac{8-5}{-1-2}$

$= -1$

(b) Slope of line $= \frac{y_2 - y_1}{x_2 - x_1}$

$= \frac{13-7}{5-3}$

$= 3$

(c) Slope of line $= \frac{y_2 - y_1}{x_2 - x_1}$

$= \frac{-7+1}{-9-5} = \frac{3}{2}$

$= 1.5$

(d) Slope of line $= \frac{y_2 - y_1}{x_2 - x_1}$

(e) Slope of line $= \frac{y_2 - y_1}{x_2 - x_1}$

$= \frac{0-5}{5-0}$

$= -1$

Answer 4.

(a) $A(x_1, y_1) = A(a^2m^2, 2am)$

$B(x_2, y_2) = B(p^2m^2, 2pm)$

$$\text{Slope of line AB} = \frac{y_2 - y_1}{x_2 - x_1}$$

$$= \frac{2pm - 2am}{p^2m^2 - a^2m^2}$$

$$= \frac{2m(p - a)}{m^2(p^2 - a^2)}$$

$$= \frac{2}{m} \times \frac{(p - a)}{(p + a)(p - a)}$$

$$= \frac{2}{m(p + a)}$$

$$= \frac{2}{pm + am}$$

(b) $A(x_1, y_1) = A(5pq, p^2q)$

$B(x_2, y_2) = B(5qr, qr^2)$

$$\text{Slope of line AB} = \frac{y_2 - y_1}{x_2 - x_1}$$

$$= \frac{qr^2 - p^2q}{5qr - 5pq}$$

$$= \frac{q(r^2 - p^2)}{5q(r - p)}$$

$$= \frac{1}{5}\frac{(r - p)(r + p)}{(r - p)}$$

$$= \frac{r + p}{5}$$

Answer 5.

(a) $3x-2y=5$

$3x-5=2y$

$\frac{3}{2}x-\frac{5}{2}=y$

$y=mx+c$

Slope $=\frac{3}{2}$

(b) $x+3y=7$

$3y=-x+7$

$y=-\frac{1}{3}x+\frac{7}{3}$

Slope $=-\frac{1}{3}$

(c) $5x-y=10$

$5x-10=y$

Slope $=5$

(d) $4x-2y=3$

$-2y=-4x+3$

$y=2x-\frac{3}{2}$

Slope $=2$

(e) $5x+2y=11$

$2y=-5x+11$

$y=\frac{-5}{2}x+\frac{11}{2}$

Slope $=-\frac{5}{2}$

Answer 6.

When the lines are perpendicular to the product of their slopes is -1.

i.e. $m_1 \times m_2 = -1$

(a) $2x-3y=4$

$3y=2x-4$

$y=\frac{2}{3}x-\frac{4}{3}$

Slope $m_1=\frac{2}{3}$

Required slope of line (m_2)

$m_1 \cdot m_2 = -1$

$\Rightarrow m_2 = \frac{-1}{m_1}$

$\Rightarrow m_2 = \frac{-1}{2/3} = \frac{-3}{2}$

(b) $5x+2y-9=0$

$2y = -5x+9$

$y = -\frac{5}{2}x + \frac{9}{2}$

$m_1 = -\frac{5}{2}$

Required slope $m_2 = \frac{-1}{m} = \frac{-1}{-5/2} = \frac{2}{5}$

(c) $3x + 4y = 13$

$4y = -3x + 13$

$y = \frac{-3}{4}x + \frac{13}{4}$

$m_1 = \frac{-3}{4}$

Required slope $= \frac{-1}{m_1} = \frac{4}{3}$

(d) $x-4y = 8$

$4y = x-8$

$y = \frac{1}{4}x - 2$

$m_1 = \frac{1}{4}$

Required slope $= \frac{-1}{m_1} = -4$

(e) $9x-3y=5$

$3y = 9x-5$

$y = 3x - \frac{5}{3}$

$m_1 = 3$

Required slope $= \frac{-1}{m_1} = \frac{-1}{3}$

Answer 7.

$$\text{Slope of line AB} = \frac{y_2 - y_1}{x_2 - x_1}$$

$$= \frac{5+1}{-7-3} = -\frac{3}{5}$$

Slope of line parallel to AB

$$= \text{Slope of AB}$$

$$= -\frac{3}{5}$$

Answer 8.

$$\text{Slope of line MN} = \frac{y_2 - y_1}{x_2 - x_1}$$

$$= \frac{3-9}{-2-4} = \frac{-6}{-6}$$

$$= -1$$

Slope of line parallel to MN = Slope of MN = 1

Answer 9.

$$\text{Slope of line PQ} = \frac{y_2 - y_1}{x_2 - x_1}$$

$$= \frac{13+3}{7-11} = \frac{16}{-4}$$

$$= -4$$

Slope of line parallel to PQ

$$= \text{Slope of PQ}$$

$$= -4$$

Answer 10.

Slope of line AB

$$\Rightarrow \frac{-1}{3} = \frac{6-9}{12-x}$$

$$\Rightarrow x - 12 = -9$$

$$\Rightarrow x = 3$$

Answer 11.

$$\text{Slope of line PQ} = \frac{y_2 - y_1}{x_2 - x_1}$$

$$\Rightarrow \frac{1}{3} = \frac{m-5}{2+7}$$

$$\Rightarrow 3 = m - 5$$
$$\Rightarrow m = 8$$

Answer 12.

$$\text{Slope of line AB} = \frac{y_2 - y_1}{x_2 - x_1}$$

$$\Rightarrow 1 = \frac{2p + 1 - 5}{p + 2}$$

$$\Rightarrow p + 2 = 2p - 4$$
$$\Rightarrow 6 = p$$

Answer 13.

$$\text{Slope of line PQ} = \frac{y_2 - y_1}{x_2 - x_1}$$

$$= \frac{5-1}{6-8}$$

$$= \frac{4}{-2}$$

$$\text{Slope} = -2$$

Also, Slope of line PQ = $\tan\theta$

$\therefore \tan\theta = -2$

$\theta = \tan^{-1}(-2)$

Inclination = $\tan^{-1}(-2)$

Answer 14.

$$\text{Slope of line PQ} = \frac{y_2 - y_1}{x_2 - x_1}$$

$$= \frac{-5-7}{7+5} = -1$$

Also, Slope of line AB = $\tan\theta$

$\therefore \tan\theta = -1$

$\tan\theta = \tan(90° + 45°)$

$\theta = 135°$

Inclination = 135°

Answer 15.

(a) $x = \frac{y}{2} - 5$

$y = 2x + 10$

$m_1 = 2$

Slope of required line(m_2) = $m_1 = 2$

(b) $x = \frac{3y}{2} + 2$

$3y = 2x - 4$

$y = \frac{2}{3}x - \frac{4}{3}$

$m_1 = \frac{2}{3}$

Slope of required line $(m_2) = m_1 = \frac{2}{3}$

(c) $\frac{3x}{4} + \frac{5y}{2} = 7$

$10y = -3x + 28$

$y = \frac{-3}{10}x + \frac{14}{5}$

$m_1 = \frac{-3}{10}$

Slope of required line $(m_2) = m_1 = \frac{-3}{10}$

(d) $\frac{x}{4} + \frac{y}{3} = 1$

$3x + 4y = 12$

$y = \frac{-3}{4}x + 3$

$m_1 = \frac{-3}{4}$

Slope of required line$(m_2) = m_1 = \frac{-3}{4}$

(e) $\frac{2x}{5} + \frac{y}{3} = 2$

$6x + 5y = 30$

$y = \frac{-6}{5}x + 6$

$m_1 = \frac{-6}{5}$

Slope of required line $(m_2) = m_1 = -\frac{6}{5}$

Answer 16.

When two lines are perpendicular to each other the product of their slope is -1.

i.e. $m_1 \times m_2 = -1$

(a) $\frac{x}{2} + \frac{y}{3} = \frac{4}{3}$

$3x + 2y = 8$

$y = -\frac{3}{2}x + 4$

$m_1 = \frac{-3}{2}$

Slope of required line $(m_2) = \frac{-1}{m_1} = \frac{2}{3}$

(b) $x - \frac{3y}{2} + 1 = 0$

$\frac{3y}{2} = x + 1$

$y = \frac{2}{3}x + \frac{2}{3}$

$m_1 = \frac{2}{3}$

Slope of required line $(m_2) = \frac{-1}{m_1} = \frac{-3}{2}$

(c) $\frac{3x}{4} - y = 5$

$y = \frac{3}{4}x - 5$

$m_1 = \frac{3}{4}$

Slope of required line $(m_2) = \frac{-1}{m_1} = \frac{-4}{3}$

(d) $3x - 5y = 9$

$y = \frac{3}{5}x - \frac{9}{5}$

$m_1 = \frac{3}{5}$

Slope of required line $(m_2) = \frac{-1}{m_1} = \frac{-5}{3}$

(e) $4x + y = 7$

$y = -4x + 7$

$m_1 = -4$

Slope of required line $(m_2) = \frac{-1}{m_1} = \frac{1}{4}$

Answer 17.

$$\text{Slope of AB } (m_1) = \frac{6-8}{-2-12} = \frac{-2}{-14} = \frac{1}{7}$$

$$\text{Slope of BC } (m_2) = \frac{0-6}{6+2} = \frac{-3}{4}$$

$$\text{Slope of AC } (m_3) = \frac{0-8}{6-12} = \frac{-8}{-6} = \frac{4}{3}$$

$$\text{Slope of BC} \times \text{Slope of AC} = m_2 \times m_3$$

$$= \frac{-3}{4} \times \frac{4}{3}$$

$$= -1$$

$\therefore$ AC and BC are perpendicular to each other and ABC form a right angled triangle.

Answer 18.

$$\text{Slope of PQ} = \frac{-5-1}{-1-2} = 2$$

$$\text{Slope of RS} = \frac{5+1}{1+2} = 2$$

$\because$ Slope of PQ = Slope of RS

$\therefore$ PQ || RS

$$\text{Also, Slope of QR} = \frac{5+5}{1+1} = 5$$

$$\text{Slope of SP} = \frac{-1-19}{-2-2} = 5$$

Slope of QR = Slope of SP

$\therefore$ QR || SP

Answer 19.

We have to prove that ABCD is a rhombus

$$\text{Slope of AC} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{5-8}{0-5} = \frac{-3}{-5} = \frac{3}{5}$$

$$\text{Slope of BD} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{9-4}{1-4} = \frac{5}{-3}$$

Thus, slope of AC x slope of BD = -1
So, the diagonals AC and BC are perpendicular to each other.
Hence, ABCD is a rhombus.

Answer 20.

$$\text{Slope of OM} = \frac{7-5}{1-5} = \frac{2}{-4} = \frac{-1}{2}$$

$$\text{Slope of PN} = \frac{8-4}{4-2} = \frac{4}{2} = 2$$

$$\text{Slope of OM} \times \text{Slope of PM} = \frac{1}{2} \times 2 = -1$$

$\therefore$ OM and PN bisect each other at 90°. Hence, MNOP is a square.

Ex 13.3

Answer 3.

$m = \tan 30°$,

$$= \frac{1}{\sqrt{3}}$$

Equation of line is given by,

$$\frac{y - y_1}{x - x_1} = m$$

$$\Rightarrow \frac{y - 5}{x - 2} = \frac{1}{\sqrt{3}}$$

$$\Rightarrow x - 2 = \sqrt{3}y - 5\sqrt{3}$$

$$\Rightarrow x - \sqrt{3}y - 2 + 5\sqrt{3} = 0$$

$$\Rightarrow \sqrt{3}y = x - 2 + 5\sqrt{3}$$

Answer 4.

$m = \tan (180° - 60°)$

$$= -\tan 60°$$

$$= -\sqrt{3}$$

Equation of line is given by

$$\frac{y - y_1}{x - x_1} = m$$

$$= \frac{y - 7}{x - 3} = -\sqrt{3}$$

$$\sqrt{3}x + y - 7 - 3\sqrt{3} = 0$$

Answer 5.

$m = \tan 45^\circ = 1$

Equation of line, $\frac{y - y_1}{x - x_1} = m$

$\frac{y-3}{x-8} = 1$

$\Rightarrow x - 8 = y - 3$

$\Rightarrow x - y = 5$

Answer 6.

$3x+4y = 11$

$4y = -3x + 11$

$y = \frac{-3}{4}x + \frac{11}{4}$

$m = \frac{-3}{4}$

Equation of line, $\frac{y - y_1}{x - x_1} = m$

$\frac{y-9}{x-2} = \frac{-3}{4}$

$4y - 36 = -3x + 6$

$3x + 4y = 42$

Answer 7.

$3x + y = 9$

$y = -3x + 9$

$m = -3$

Slope of required line $= \frac{1}{3}$

Equation of line is, $\frac{y - y_1}{x - x_1} = m$

$\frac{y+1}{x+5} = \frac{1}{3}$

$\Rightarrow x + 5 = 3y + 3$

$\Rightarrow x - 3y + 2 = 0$

Answer 8.

Let l be the perpendicular bisector of AB

$$\text{Slope of AB} = \frac{-6-6}{4+2} = \frac{-12}{6} = -2$$

$$\text{Slope of l i.e slope of line perpendicular to AB} = \frac{1}{2}$$

Let l intersects AB at P,

$\therefore$ AP : PB = 1 : 1

Coordinates of P are,

$$P(x_1 y_1) = P\left(\frac{-2+4}{2}, \frac{6-6}{2}\right) = P(1, 0)$$

Equation of l is $\frac{y - y_1}{x - x_1} = \text{slope}$

$$\frac{y-0}{x-1} = \frac{1}{2}$$

$$x - 1 = 2y$$

$$x - 2y - 1 = 0$$

Answer 9.

Let MN be perpendicular bisector of AB

$\therefore$ AP : PB = 1 : 1

Coordinates of P are,

$$P(a,b) = P\left(\frac{3-1}{2}, \frac{5+7}{2}\right) = P(1,6)$$

$$\text{Slope of AB} = \frac{7-5}{-1-3} = \frac{2}{-4} = \frac{-1}{2}$$

Slope of MN =2

Equation of Line MN is $\frac{y - y_1}{x - x_1} = \text{slope}$

$$\frac{y-6}{x-1} = 2$$

$$\Rightarrow 2x - 2 = y - 6$$

$$\Rightarrow 2x - y + 4 = 0$$

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

Answer 10.

$x + 3y = 6$.....(1)

$2x - 3y = 12$.....(2)

Adding (1) and (2) ,we get

$3x = 18$

$\Rightarrow x = 6$

And $y = 0$

Point of intersection of given line is (6,0)

Slope of $5x + 2y = 10$ is $\frac{-5}{2}$

Slope of required line is $\frac{-5}{2}$

Equation of required line is $\frac{y - y_1}{x - x_1}$ = slope

$\frac{y - 0}{x - 6} = \frac{-5}{2}$

$\Rightarrow -5x + 30 = 2y$

$\Rightarrow 5x + 2y - 30 = 0$

Answer 11.

$x + 2y + 1 = 0$ ----(1)

$2x - 3y = 12$ ----(2)

(1)can be rewritten as $2x + 4y = -2$....(3)

(2)can be rewritten as $2x - 3y = 12$....(4)

Subtracting (4)from (3) we get

$y = -2$

$x = 3$

i.e. (3,-2)

Point of intersection of (1) and (2) is (3,-2).

Slope of $2x + 3y = 9$ is $\frac{-2}{3}$

Slope of required line is $\frac{3}{2}$

Equation of required line is $\frac{y - y_1}{x - x_1} = m$

$\frac{y + 2}{x - 3} = \frac{3}{2}$

$\Rightarrow 3x - 9 = 2y + 4$

$\Rightarrow 3x - 2y = 13$

Answer 12.

$\frac{x}{10}+\frac{y}{5}=14 \Rightarrow x+2y=140---(1)$

$\frac{x}{8}+\frac{y}{6}=15 \Rightarrow 3x+4y=360---(2)$

(1)can be rewritten as $2x + 4y = 280....(3)$

(2)can be rewritten as $3x + 4y = 360.....(4)$

Subtracting (3) from(4), we get

$x = 80$

$y = 30$

Point of intersection of (1) and (2) is (80,30)

Slope of $x - 2y = 5$ is $\frac{1}{2}$

Equation of required line is $\frac{y-y_1}{x-x_1}=m$

$\frac{y-30}{x-80}=-2$

$\Rightarrow -2x + 160 = y - 30$

$\Rightarrow 2x + y = 190$

Answer 13.

Slope of $px + 5y + 7 = 0$ is $\frac{-p}{5}$

Slope of $2y = 5x - 6$ is $\frac{5}{2}$

Since the lines are given perpendicular to each other, the product of their slopes must be equal to -1.

$\frac{-p}{5}\times\frac{5}{2}=-1$

$\therefore p = 2$

Answer 14.

Slope of $3x - 2y + 4 = 0$ is $\frac{3}{2}$

Slope of $3x+my+6 = 0$ is $\frac{-3}{m}$

Since the lines are given parallel their slopes must be equal

$\therefore \frac{3}{2} = \frac{-3}{m} \Rightarrow m = -2$

Answer 15.

Slope of line $py=2x + 5$ is $\frac{2}{p}$

Slope of line $qx +3y= 2$ is $\frac{-q}{3}$

Since the lines are given parallel their slopes must be equal

$\therefore \frac{2}{p} = \frac{-q}{3}$

$\therefore pq = -6$

Answer 16.

Slope of line $ay = 2x + 4$ is $\frac{2}{a}$

Slope of line $4y+bx=2$ is $\frac{-b}{4}$

Since the lines are given perpendicular to each other, the product of the slopes must be equal to -1.

$\therefore \frac{2}{a} \times \frac{-b}{4} = -1$

$\therefore b = 2a$

Answer 17.

Let PS be the median of the ΔPQR from P

$\therefore$ RS : SQ = 1 : 1

Coordinates of S are,

$$S\left(\frac{8-4}{2}, \frac{3+7}{2}\right) = S(2,5)$$

Equation of PS is $\frac{y-y_1}{x-x_1} = \frac{y_2-y_1}{x_2-x_1}$

$$\frac{y-3}{x-5} = \frac{5-3}{2-5}$$

$$\Rightarrow 2x - 10 = -3y + 9$$

$$\Rightarrow 2x + 3y = 19$$

Answer 18.

Let CE be the median of ΔABC from C

$\therefore$ AE : EB = 1 : 1

By using mid-point formula

Coordinates of E are,

$$E\left(\frac{8-2}{2}, \frac{5+1}{2}\right) = E(3,3)$$

Equation of CE is $\frac{y-y_1}{x-x_1} = \frac{y_2-y_1}{x_2-x_1}$

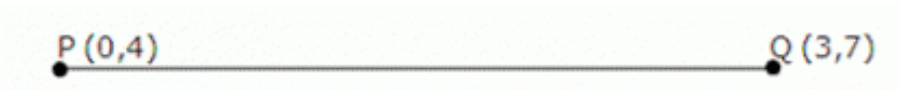
$$\frac{y-3}{x-3} = \frac{4-3}{5-3}$$

$$\Rightarrow x - 3 = 2y - 6$$

$$\Rightarrow x - 2y + 3 = 0$$

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

Answer 22.



$$\text{Slope of PQ} = \frac{7-4}{3-0} = 1$$

(i) $\tan\theta = 1$

$\therefore$ Gradient = 1

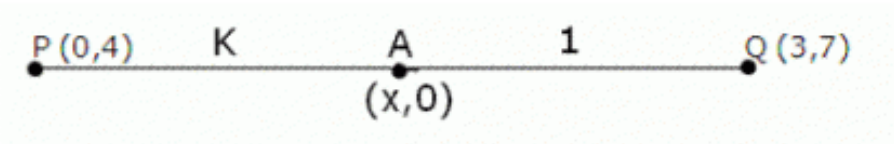
(ii) Equation of PQ $\rightarrow \frac{y-y_1}{x-x_1} = \text{slope}$

$$\frac{y-7}{x-3} = 1$$

$$\Rightarrow x - 3 = y - 7$$

$$\Rightarrow y = x + 4$$

(iii)



Let A(x, 0) divides PQ is the ratio k:1

Using section formula,

$$\text{Coordinates of A}(x,0) = \left(\frac{3k}{k+1}, \frac{7k+4}{k+1}\right)$$

Equating we get

$$\frac{7k+4}{k+1} = 0$$

$$7k + 4 = 0$$

Answer 25.

The altitude through X is perpendicular to YZ.

$$\text{Slope of } YZ = \frac{-4-4}{7+5} = \frac{-2}{3}$$

$$\Rightarrow m = \text{Slope of } YZ = \frac{-2}{3}$$

Slope line perpendicular to YZ will be

$$\frac{-1}{m} = \frac{3}{2}$$

This line passes through X(4, 9)

Using the point slope formula,

$$y - y_1 = m(x - x_1)$$

$$y - 9 = \frac{3}{2}(x - 4)$$

$$\Rightarrow 2y - 18 = 3x - 12$$

$$\Rightarrow 2y = 3x + 6$$