Exercise 5.2

1. Write down the equations of the straight lines which pass through the given point and with the given gradient, in the form $y = mx + c$, where m is the gradient, in each of the following cases.
   (a) $(1, 3)$, $m = 4$ (b) $(-3, 2)$, $m = -2$
   (c) (a, b), $m = t$ (d) $(-\frac{5}{2}, -\frac{3}{2})$, $m = \frac{3}{4}$

2. Write down the equations of the straight lines which pass through the given pairs of points as below.
   (a) $(2, 1)$, $(3, 4)$ (b) $(-2, 6)$, $(4, -2)$
   (c) $(2, 7)$, $(-4, -3)$ (d) $(3, -2)$, $(-1, 4)$

3. Find the equation of the straight line which passes through the point $(2, 1)$ and is perpendicular to the line $2y + 3x - 2 = 0$.

4. Find the equation of the perpendicular bisector of the line which joins the following pairs of points.
   (a) $(-2, 4)$ and $(2, -6)$ (b) $(3, -1)$ and $(-5, 2)$

5. The coordinates of the points A, B, C, are $(1, 2)$, $(-3, -3)$ and $(6, -4)$ respectively. Find the equation of the line which passes through B and is perpendicular to AC.

6. Find the acute angle between the following pairs of straight lines. Give your answers in radians.
   (a) $x + y + 3 = 0$, $x - y + 2 = 0$ (b) $3x + y - 2 = 0$, $2x + 2y + 5 = 0$
   (c) $2x - 3y = 0$, $x + 2y = 0$ (d) $y = 3x - 1$, $y = \frac{1}{4}x + 2$

7. Find the equation of the straight line with positive gradient and inclined at an angle of $45°$ to the line $3y - x + 1 = 0$ and passing through the point $(2, 0)$.

8. $A(1, 4)$, $B(-1, 3)$, $C(1, -1)$ and $D(a, b)$ are the vertices of a rectangle. Find a and b.

9. Two of the four sides of a parallelogram lie on the lines $x - y + 1 = 0$ and $2x + 3y - 6 = 0$, and the diagonals meet at the point $(1, \frac{1}{2})$. Find the coordinates of the vertices of the parallelogram and the equations of the two remaining sides.

10. Find the perpendicular distance from the point $P(1, 4)$ to the following lines.
    (a) $3x + 4y + 8 = 0$ (b) $5x = 12y + 9$

11. Show that the points $M(-2, -2)$ and $N(2, 6)$ lie on the same side of the line $2x - y + 3 = 0$.

12. The point R divides the line joining the points $A(0, -2)$ and $B(8, -6)$ in the ratio $1 : 3$. Find the coordinates of the point R and the perpendicular distance of R to the line passing through the origin, O, and parallel to AB.

13. The point $R(X, Y)$ is equidistant from the line $x + y = 0$ and the point $(2, 2)$. Write down an equation connecting X with Y.

14. The point $P(X, Y)$ is equidistant from the lines $y = x$ and $y = 2x$. Find the equation of the curve on which P must lie.

15. $A(4, 4)$ and $B(0, 7)$ are two vertices of the triangle OAB with O as the origin. Find the equation of the line which bisects the angle OBA. If this line meets OA at C, show that C divides the line OA internally in the ratio $OB : BA$.

ANSWERS

Exercise 5.2

1. (a) $y = 4x - 1$ (b) $y = -2x - 4$
(c) $y = tx + (b - ta)$ (d) $y = \frac{3}{4}x + \frac{3}{8}$

2. (a) $y = 3x - 5$ (b) $3y + 4x = 10$
(c) $3y = 5x + 11$ (d) $2y + 3x = 5$

3. $3y - 2x + 1 = 0$

4. (a) $5y - 2x + 5 = 0$ (b) $6y - 16x - 19 = 0$

5. $6y - 5x + 3 = 0$

6. (a) $\frac{\pi}{2}$ (b) 0.46
(c) 1.05 (d) 1.00

7. $y = 2x - 4$

8. $a = 3$, $b = 0$

9. $(\frac{3}{5}, \frac{8}{5})$, $(\frac{7}{5}, -\frac{3}{5})$, $(\frac{12}{5}, \frac{2}{5})$, $(-\frac{2}{5}, \frac{3}{5})$
$2x + 3y - 1 = 0$, $y - x + 2 = 0$

10. (a) $\frac{27}{5}$ (b) 4

12. $(2, -3)$, $\frac{4}{5}\sqrt{5}$

13. $(X - Y)^2 = 8(X + Y - 2)$

14. $5(x - y)^2 = 2(2x - y)^2$

15. $2x + y = 7$