COORDINATE GEOMETRY   1

1.- Find the equation of these straight lines
- a) The line through (-2,1) and slope –2.
- b) The line through (2,-1), parallel to $y = 2x + 1$
- c) The line through (1,-1) that makes an angle of 45° with x-axis.
- d) The line through (1,0) and (-3,2).

2. Find the midpoint, length and slope of the line joining the points A and B, leave your answers as a surd
- a) A = (1,16), B = (3,10)   b) A = (4,-2), B = (-5,1)

3. Find the equation of these straight lines
- a) The line through (1,2), parallel to $3x + y = 2$
- b) The line through (5,10), perpendicular to $2x - y = 7$

4. The line *r* passes through the points A(0,-2) and B(6,7)
- a) Find the equation of r.
- b) The line *s* has equation $x + y = 8$, *s* crosses the x-axis at C and the y-axis at D. Find the coordinates of C and D.
- c) *r* and *s* meet at point E. Find the coordinates of E.

5. Write the equation of a line which has a graph which is parallel to the line $y = 2x + 8$ y and contains the point (5, 5).

6. Find the relative position of lines *r* and *s* :

a) $\left. \begin{array}{l} r \equiv 2x - 3y = 1 \\ s \equiv x + 2y = -3 \end{array} \right\}$

b) $\left. \begin{array}{l} r \equiv y = 2x + 3 \\ s \equiv 2y - 4x = 6 \end{array} \right\}$

c) $\left. \begin{array}{l} r \equiv 2x - 3y = 1 \\ s \equiv 9y - 6x = 2 \end{array} \right\}$

SOLUTION

1.- Find the equation of these straight lines
   a) The line through (-2,1) and slope –2.
$$y - 1 = -2(x + 2) \rightarrow y = -2x - 3$$

   b) The line through (2,-1), parallel to $y = 2x + 1$
$$\text{parallel} \rightarrow \text{slope} \quad m = 2$$
$$y + 1 = 2(x - 2) \rightarrow y = 2x - 5$$

   c) The line through (1,-1) that makes an angle of 45° with x-axis.
     45° with the x-axis (two possibilities) $\rightarrow$ slope $\quad m = \pm 1$
$$y + 1 = 1(x - 1) \rightarrow y = x - 2 \; ; \; y + 1 = -1(x - 1) \rightarrow y = -x$$

   d) The line through (1,0) and (-3,2).
$$\frac{x - 1}{-3 - 1} = \frac{y - 2}{0 - 2} \rightarrow \frac{x - 1}{-4} = \frac{y - 2}{-2} \rightarrow 4y + 2x - 1 = 0$$

2. Find the midpoint, length and slope of the line joining the points A and B, leave your answers as a surd

a) A = (1,16), B = (3,10) $\qquad d(A,B) = \sqrt{(3-1)^2 + (10-16)^2} = \sqrt{40} = 2\sqrt{10}u$

b) A = (4,-2), B = (-5,1) $\qquad d(A,B) = \sqrt{(-5-4)^2 + (1+2)^2} = \sqrt{89}u$

3. Find the equation of these straight lines
a) The line through (1,2), parallel to $3x + y = 2 \rightarrow y = -3x + 2$
    $\text{parallel} \rightarrow \text{slope} \quad m = -3 ; \quad y - 2 = -3(x - 1) \rightarrow y = -3x + 5$

b) The line through (5,10), perpendicular to $2x - y = 7 \rightarrow y = 2x - 7$
$$\text{perpendicular} \rightarrow \text{slope} \quad m = -\frac{1}{2}$$
$$y - 10 = -\frac{1}{2}(x - 5) \rightarrow y = -\frac{1}{2}x + \frac{5}{2} + 10 \rightarrow y = -\frac{1}{2}x + \frac{25}{2}$$

4. The line r passes through the points A(0,-2) and B(6,7)
a) Find the equation of r.
$$\frac{x - 0}{6 - 0} = \frac{y + 2}{7 + 2} \rightarrow \frac{x}{6} = \frac{y + 2}{9} \rightarrow 9x = 6y + 12 \rightarrow 3x - 2y = 6$$
b) The line s has equation $x + y = 8$, s crosses the x-axis at C and the y-axis at D. Find the coordinates of C and D.
$$\left.\begin{array}{l} x + y = 8 \\ x = 0 \end{array}\right\} \rightarrow y = 8 \Rightarrow D(0,8); \quad \left.\begin{array}{l} x + y = 8 \\ y = 0 \end{array}\right\} \rightarrow x = 8 \Rightarrow C(8,0)$$

c) r and s meet at point E. Find the coordinates of E.
$$\left.\begin{array}{l} x + y = 8 \\ 3x - 2y = 6 \end{array}\right\} \rightarrow \left.\begin{array}{l} 2x + 2y = 16 \\ 3x - 2y = 6 \end{array}\right\} \rightarrow 5x = 22 \rightarrow x = \frac{22}{5} \rightarrow y = 8 - \frac{22}{5} = \frac{18}{5}$$
$$E\left(\frac{22}{5}, \frac{18}{5}\right)$$

5. Write the equation of a line which has a graph which is parallel to the line $y = 2x + 8\,y$ and contains the point (5, 5).

$\quad$ parallel $\rightarrow$ slope $\quad m = 2 \rightarrow y - 5 = 2(x - 5) \rightarrow y = 2x - 5$

6. Find the relative position of lines r and s:

a) $\left.\begin{array}{l} r \equiv 2x - 3y = 1 \\ s \equiv x + 2y = -3 \end{array}\right\} \rightarrow x = -2y - 3 \rightarrow 2(-2y - 3) - 3y = 1 \rightarrow -7y - 6 = 1 \rightarrow y = -1, x = -1$

the lines intersect at the point $(-7, -5)$

b) $\left.\begin{array}{l} r \equiv y = 2x + 3 \\ s \equiv 2y - 4x = 6 \end{array}\right\} \rightarrow 2(2x + 3) - 4x = 6 \rightarrow 0x = 0$ r and s are the same line

c) $\left.\begin{array}{l} r \equiv 2x - 3y = 1 \\ s \equiv 9y - 6x = 2 \end{array}\right\} \rightarrow \left.\begin{array}{l} 6x - 9y = 3 \\ -6x + 9y = 2 \end{array}\right\} 0x = 5$ r and s are parallel lines