

COORDINATE GEOMETRY 2

1. Find the equation of the straight line through the point $A(-1,1)$ and perpendicular to line $y = -3x + 1$.
2. With point $A(2,3)$ and straight line $r : 2x - 3y + 4 = 0$
 - a) Write the equation of a line parallel to r and joining the point A .
 - b) Write the equation of a line perpendicular to r and joining the point A .
3. Plot these points and label each with the correct letter:
 $A = (2, 3)$ $B = (5, 12)$ $C = (10, 5)$
 - a) Draw triangle ABC .
 - b) Write the coordinates of the midpoint of \overline{AC} .
 - c) Find the length, correct to the nearest hundredth, of the median from B to \overline{AC} .
 - d) Write a correct equation for the line which contains the altitude from B to \overline{AC} .
4. Write the equation of the perpendicular bisector of \overline{AB} , with $A(-2,0)$ y $B(2,4)$.
5. With points $A(-1,3)$, $B(3,1)$ y $C(-3,-2)$
 - a) Write the equation of the perpendicular bisector of \overline{AB} .
 - b) Write the equation of a line parallel to \overline{AB} and joining the point C .
6. What is the centre and radius of each circle?
 - a) $x^2 + (y+1)^2 = 9$
 - b) $(x+2)^2 + (y-3)^2 = 8$
 - c) $(x-4)^2 + y^2 = 6$
 - d) $4x^2 + 4y^2 = 1$
7. Find the equation of the circle with the given centre and radius.
 - a) Centre $(-1,-1)$ and radius 3.
 - b) Centre $(0,-2)$ and radius $\sqrt{5}$ and radius.
 - c) Centre $(-3,3)$ and radius 1.

SOLUTION

1. Find the equation of the straight line through the point $A(-1,1)$ and perpendicular to line $y = -3x + 1$.

$$y = -3x + 1 \rightarrow m = -3, \text{ so perpendicular line has a slope of } m' = \frac{1}{3}$$

$$\text{Equation: } y - 1 = \frac{1}{3}(x + 1) \rightarrow y = \frac{1}{3}x + \frac{4}{3}$$

2. With point $A(2,3)$ and straight line $r : 2x - 3y + 4 = 0$

a) Write the equation of a line parallel to r and joining the point A .

$$r : 2x - 3y + 4 = 0 \rightarrow y = \frac{2}{3}x + \frac{4}{3} \rightarrow m = \frac{2}{3}$$

$$\text{Parallel line: } y - 3 = \frac{2}{3}(x - 2) \rightarrow y = \frac{2}{3}x + \frac{5}{3}$$

b) Write the equation of a line perpendicular to r and joining the point A .

$$\text{Perpendicular line: } m' = -\frac{3}{2} \rightarrow y - 3 = -\frac{3}{2}(x - 2) \rightarrow y = -\frac{3}{2}x + 6$$

3. Plot these points and label each with the correct letter:

$$A = (2, 3) \quad B = (5, 12) \quad C = (10, 5)$$

- a) Draw triangle ABC .
b) Write the coordinates of the midpoint of \overline{AC} .

$$M\left(\frac{2+10}{2}, \frac{3+5}{2}\right) \rightarrow M(6, 4)$$

- c) Find the length, correct to the nearest hundredth, of the median from B to \overline{AC} .

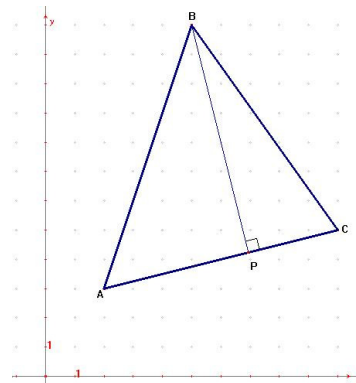
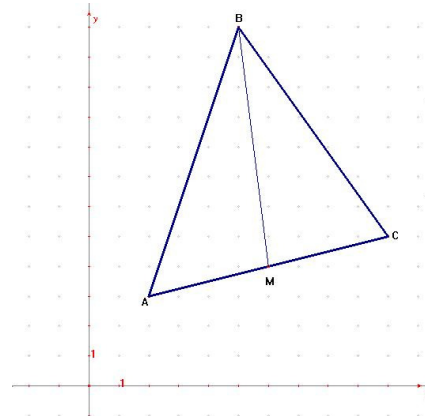
$$d(B, M) = \sqrt{(6-5)^2 + (4-12)^2} = \sqrt{1+64} = 8.06u$$

- d) Write a correct equation for the line which contains the altitude from B to \overline{AC} . The altitude is perpendicular to the line \overline{AC} , we calculate the slope of \overline{AC} : $m = \frac{5-3}{10-2} = \frac{2}{8} = \frac{1}{4}$ so the slope of the altitude is $m' = -4$

Equation of altitude : Point $B = (5, 12)$, slope

$$m' \rightarrow y - 12 = -4(x - 5)$$

$$y = -4x + 20 + 12 \rightarrow y = -4x + 32$$



4. Write the equation of the perpendicular bisector of \overline{AB} , with $A(-2,0)$ y $B(2,4)$.

$$\text{Midpoint of } \overline{AB}: M\left(\frac{-2+2}{2}, \frac{0+4}{2}\right) = (0,2)$$

$$\text{Slope of } \overline{AB}: m = \frac{4-0}{2+2} = 1 \rightarrow \text{slope perpendicular bisector: } m' = -1$$

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

5. With points $A(-1,3)$, $B(3,1)$ y $C(-3,-2)$

- a) Write the equation of the perpendicular bisector of \overline{AB} .

$$\text{Midpoint of } \overline{AB}: M\left(\frac{-1+3}{2}, \frac{3+1}{2}\right) = (1,2)$$

$$\text{Slope of } \overline{AB}: m = \frac{1-3}{3+1} = -\frac{2}{4} = -\frac{1}{2} \rightarrow \text{slope perpendicular bisector: } m' = 2$$

$$y - 2 = 2(x - 1) \rightarrow y = 2x$$

- b) Write the equation of a line parallel to \overline{AB} and joining the point C .

$$\text{Parallel to } \overline{AB} \rightarrow m = -\frac{1}{2} \rightarrow y + 2 = -\frac{1}{2}(x + 3) \rightarrow y = -\frac{1}{2}x - \frac{7}{2}$$

6. What is the centre and radius of each circle?

a) $x^2 + (y+1)^2 = 9 \rightarrow \text{Centre } (0,-1)$, radius $\sqrt{9} = 3$

b) $(x+2)^2 + (y-3)^2 = 8 \rightarrow \text{Centre } (-2,3)$, radius $\sqrt{8} = 2\sqrt{2}$

c) $(x-4)^2 + y^2 = 6 \rightarrow \text{Centre } (4,0)$, radius $\sqrt{6}$

d) $4x^2 + 4y^2 = 1 \rightarrow \text{Centre } (0,0)$, radius $\sqrt{\frac{1}{4}} = \frac{1}{2}$

7. Find the equation of the circle with the given centre and radius.

a) Centre $(-1,-1)$ and radius 3 $\rightarrow (x+1)^2 + (y+1)^2 = 9$

b) Centre $(0,-2)$ and radius $\sqrt{5}$ and radius $\rightarrow x^2 + (y+2)^2 = 5$

c) Centre $(-3,3)$ and radius 1 $\rightarrow (x+3)^2 + (y-3)^2 = 1$