

Knowledge	Application	TIPS
/12	/21	/10

Knowledge:

1. Given the points A(-1,5), B(2,9), C(-4, 8), then determine the following:

a) the slope of the line passing through AB.

[2] $m_{AB} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{9 - 5}{2 - (-1)} = \frac{4}{3}$ 4/3

b) the slope of the line perpendicular to the line segment AC.

[2] $m_{AC} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{8 - 5}{-4 - (-1)} = \frac{3}{-4 + 1} = \frac{3}{-3} = -1$ 1 (opp/rec)

c) the midpoint of the line segment BC.

[2] $M_{BC}(x,y) = \left(\begin{matrix} \text{average} \\ \text{of} \\ x \end{matrix}, \begin{matrix} \text{average} \\ \text{of} \\ y \end{matrix} \right)$ (-1, 8.5)
 $= \left(\frac{-4 + 2}{2}, \frac{9 + 8}{2} \right) = (-1, 8.5)$

d) the exact length of the line segment AC.

[2] $d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$ 3√2
 $= \sqrt{[-1 - (-4)]^2 + (5 - 8)^2} = \sqrt{(-1 + 4)^2 + (-3)^2} = \sqrt{9 + 9} = \sqrt{18} = \sqrt{9 \cdot 2} = \sqrt{9} \cdot \sqrt{2} = 3\sqrt{2}$

2. Determine the equation of the line in **standard form** that is **perpendicular** to the line $3x - 6y + 8 = 0$ and passes through the point P(-1,2).

[4] Step 1: Rearrange $3x - 6y + 8 = 0$
 $\frac{3x}{6} + \frac{8}{6} = \frac{6y}{6}$
 $y = \frac{1}{2}x + \frac{4}{3}$

Step 2: $m = -2$ P(-1,2)
 $y = m(x - p) + q$
 $y = -2[x - (-1)] + 2$
 $y = -2(x + 1) + 2$
 $y = -2x - 2 + 2$
 $y = -2x$ rearrange
2x + y = 0

\therefore The equation is $2x + y = 0$

6. The coordinates of two towns are $T(8,3)$ and $G(2,-9)$. Plot and label the two towns on the grid below. Draw a labelled diagram of the perpendicular bisector of the line segment joining these two towns. Determine algebraically the equation of the perpendicular bisector. If the two towns have decided to build a recreation centre at $(-5,2)$, determine if this is a good place to build. Justify your answer. You need slope point (Midpoint)

[8] Step 1: midpoint of \overline{GT}
 $M(x,y) = \left(\frac{8+2}{2}, \frac{-9+3}{2}\right) = (5, -3)$ ✓

Step 2: The slope of right bisector is opp. reciprocal of \overline{GT}

$$m_{GT} = \frac{-9-3}{2-8} = \frac{-12}{-6} = 2$$

$$m_{\text{bisector}} = -\frac{1}{2}$$

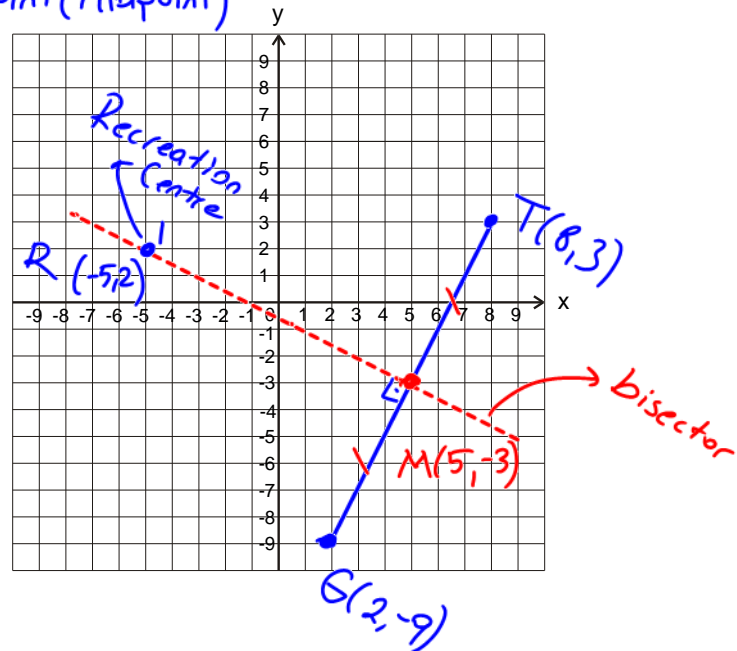
Step 3: $m = -\frac{1}{2}$ $M(5, -3)$

$$y = m(x-p) + q$$

$$y = -\frac{1}{2}(x-5) + (-3)$$

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

$$\boxed{y = -0.5x - 0.5}$$



We need to see if the recreation centre's distance is equal from both towns.

$$\text{distance from town } G = \sqrt{(-5-2)^2 + [2-(-9)]^2} = \sqrt{49+121} = \sqrt{170}$$

$$\text{distance from town } T = \sqrt{(-5-8)^2 + (2-3)^2} = \sqrt{169+1} = \sqrt{170}$$

if the recreation centre is built on $(-5,2)$, it'll be equidistant from both towns; therefore, it's a good place.

TIPS:

7. Determine the shortest distance from the point $Q(5, -4)$ to the line $4x - 3y + 18 = 0$. Include a fully labelled diagram. Include an algebraic solution.

[10]

