## Perpendicular Lines

## Quickfire Questions

| Gradient | Gradient of Perpendicular Line |
|---|---|
| $2$ | |
| $-3$ | |
| $\frac{1}{4}$ | |
| $5$ | |
| $-\frac{2}{7}$ | |
| $\frac{7}{5}$ | |

Problems

1. A line is goes through the point (9,10) and is perpendicular to another line with equation $y = 3x + 2$. What is the equation of the line?

2. A line $L_1$ goes through the points $A(1,3)$ and $B(3,-1)$. A second line $L_2$ is perpendicular to $L_1$ and passes through point B. Where does $L_2$ cross the x-axis?

3. Are the following lines parallel, perpendicular, or neither?

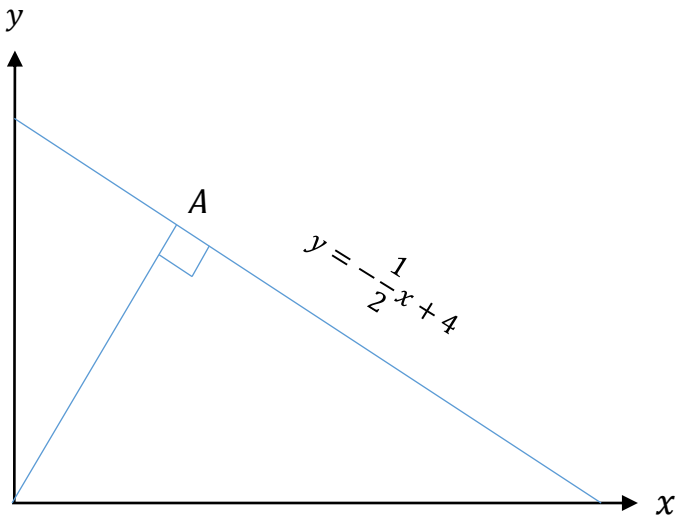
$$y = \frac{1}{2}x$$

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

Test Your Understanding

1. A line goes through the point (4,7) and is perpendicular to another line with equation $y = 2x + 2$. What is the equation of the line? Put your answer in the form $ax + by + c = 0$, where $a, b, c$ are integers.

2. Determine the point $A$.




Extension

1. *[MAT 2004 1D]*
What is the reflection of the point $(3,4)$ in the line $3x + 4y = 50$?

2. *[MAT 2014 1D]* The reflection of the point $(1,0)$ in the line $y = mx$ has coordinates: (in terms of $m$)

3. *[STEP I 2004 Q6]* The three points $A, B, C$ have coordinates $(p_1, q_1), (p_2, q_2)$ and $(p_3, q_3)$, respectively. Find the point of intersection of the line joining $A$ to the midpoint of $BC$, and the line joining $B$ to the midpoint of $AC$. Verify that this point lies on the line joining $C$ to the midpoint of $AB$.

The point $H$ has coordinates $(p_1 + p_2 + p_3, q_1 + q_2 + q_3)$. Show that if the line $AH$ intersects the line $BC$ at right angles, then $p_2^2 + q_2^2 = p_3^2 + q_3^2$, and write down a similar result if the line $BH$ intersects the line $AC$ at right angles.

Deduce that if $AH$ is perpendicular to $BC$ and also $BH$ is perpendicular to $AC$, then $CH$ is perpendicular to $AB$.