

**Perpendicular Lines**

1. From the following set of equations, which pairs would you expect to be perpendicular?

**A:**  $y = 2x + 6$

**B:**  $y = \frac{2}{3}x + 3$

**C:**  $y = -\frac{1}{2}x + 1$

**D:**  $y = \frac{1}{2}x + 5$

**E:**  $y = -2x + 4$

**F:**  $y = -\frac{1}{2}x + 2$

 and 
 and 
 and 

2. The equations of 5 lines are listed below:

A  $y = 6x - 3$

B  $y = 2x - 5$

C  $y = 2x + 2$

D  $y = 6x - 5$

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

a) Which line is parallel to A?

b) Which line is parallel to C?

c) Which line is perpendicular to B and C?

3. Write down the equations of 2 lines which are parallel to  $y = -4x + 3$

4. Write down the equations of 2 lines which are perpendicular to  $y = 3x + 8$

5. Determine whether the following pairs of lines are perpendicular or not. You will need to rearrange some of the equations first so they are in the form  $y = mx + c$ .

	Line A	Line B	Perpendicular?
1	$y = -4x + 3$	$4y + x = -1$	
2	$y = -\frac{2}{3}x + 4$	$3x + 2y = 1$	
3	$2x - 5y = -3$	$5x + 2y = 6$	
4	$x - 3y = 9$	$8y + 24x = 16$	
5	$x + y = 6$	$4y - 4x = 12$	
6	$y = -x + 8$	$x - y = -1$	

6. Find equation of the line through  $(10, 3)$  which is perpendicular to the line  $y = -5x + 2$ .
  
7. Find equation of the line through  $(8, 5)$  which is perpendicular to the line  $y = \frac{1}{4}x + 10$ .
  
8. Find equation of the line through  $(4, 10)$  which is perpendicular to the line  $y = -\frac{2}{3}x + 2$ .
  
9. Find equation of the line through  $(8, -2)$  which is perpendicular to the line  $4x - 2y = 6$ .
  
10. Find equation of the line through  $(-2, -3)$  which is perpendicular to the line  $2y + 4x = 8$ .

**Extension**

A. Find the equation of the line which passes through the intersection point of the lines  $y = x + 3$  and  $y = 11 - 3x$  and is parallel to  $x + y = 2$

B. Find the equation of the perpendicular bisector of the line joining the points  $(4, 3)$  and  $(8, 11)$ .

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**D:**  $y = \frac{1}{2}x + 5$

**E:**  $y = -2x + 4$

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**A** and **F****A** and **C****D** and **E**

2. The equations of 5 lines are listed below:

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C  $y = 2x + 2$

D  $y = 6x - 5$

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

d) Which line is parallel to A? **D**e) Which line is parallel to C? **B**f) Which line is perpendicular to B and C? **E**

3. Write down the equations of 2 lines which are parallel to  $y = -4x + 3$

2 lines where  $y = -4x + c$ eg  $y = -4x - 2$  and  $y = -4x + 1$ 

4. Write down the equations of 2 lines which are perpendicular to  $y = 3x + 8$

2 lines where  $y = -\frac{1}{3}x + c$ eg  $y = -\frac{1}{3}x + 3$  and  $y = -\frac{1}{3}x - 2$ 

5. Determine whether the following pairs of lines are perpendicular or not. You will need to rearrange some of the equations first so they are in the form  $y = mx + c$ .

	Line A	Line B	Perpendicular?
1	$y = -4x + 3$	$4y + x = -1$	<b>N</b>
2	$y = -\frac{2}{3}x + 4$	$3x + 2y = 1$	<b>N</b>
3	$2x - 5y = -3$	$5x + 2y = 6$	<b>Y</b>
4	$x - 3y = 9$	$8y + 24x = 16$	<b>Y</b>
5	$x + y = 6$	$4y - 4x = 12$	<b>Y</b>
6	$y = -x + 8$	$x - y = -1$	<b>Y</b>

6. Find equation of the line through  $(10, 3)$  which is perpendicular to the line  $y = -5x + 2$ .

$$y = \frac{x}{5} + 1$$

7. Find equation of the line through  $(8, 5)$  which is perpendicular to the line  $y = \frac{1}{4}x + 10$ .

$$y = -4x + 37$$

8. Find equation of the line through  $(4, 10)$  which is perpendicular to the line  $y = -\frac{2}{3}x + 2$ .

$$y = \frac{3x}{2} + 4$$

9. Find equation of the line through  $(8, -2)$  which is perpendicular to the line  $4x - 2y = 6$ .

$$y = -\frac{x}{2} + 2$$

10. Find equation of the line through  $(-2, -3)$  which is perpendicular to the line  $2y + 4x = 8$ .

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

### Extension

C. Find the equation of the line which passes through the intersection point of the lines  $y = x + 3$  and  $y = 11 - 3x$  and is parallel to  $x + y = 2$

Intersection:  $(2, 5)$

Line:  $y = -x + 7$

D. Find the equation of the perpendicular bisector of the line joining the points  $(4, 3)$  and  $(8, 11)$ .

Midpoint:  $(6, 7)$

Gradient of line joining  $(4, 3)$  and  $(8, 11) = \frac{11-3}{8-4} = \frac{8}{4} = 2$

Equation of perpendicular bisector:  $y = -\frac{x}{2} + 10$