Name: _____

GCSE (1 – 9)

Perpendicular Lines

Instructions

- Use **black** ink or ball-point pen.
- Answer all questions.
- Answer the questions in the spaces provided
– *there may be more space than you need.*
- Diagrams are **NOT** accurately drawn, unless otherwise indicated.
- You must **show all your working out.**

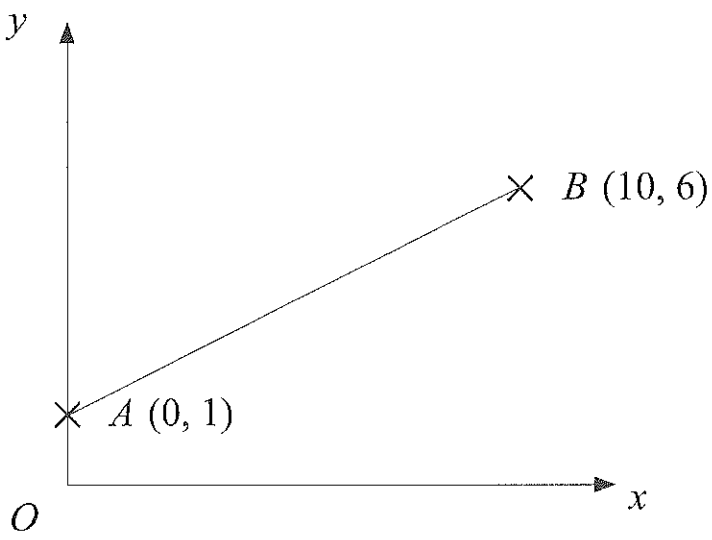
Information

- The marks for each question are shown in brackets
– *use this as a guide as to how much time to spend on each question.*

Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end

1.



A is the point (0, 1)
B is the point (10, 6)

The equation of the straight line through A and B is $y=\frac{1}{2}x+1$

a) Write down the equation of another straight line parallel to $y=\frac{1}{2}x+1$

$y=\frac{1}{2}x$ ..... (1)

b) Write down the equation of another straight line that passes through the point (0, 1)

$y=5x+1$ (1)

c) Find the equation of the line perpendicular to AB passing through B.

AB Gradient = $\frac{1}{2}$

Perp. gradient = -2

(10, 6)
x y

$y=-2x+c$

$6=-2(10)+c$

$6=-20+c$

$c=26$

$y=-2x+26$ (3)

2.

A straight line, L, passes through the point with coordinates (4, 7) and is perpendicular to the line with equation $y = 2x + 3$.

$m = 2$

Find an equation of the straight line L.

perp. gradient $= -\frac{1}{2}$

(4, 7)
x y

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

$7 = -\frac{1}{2}(4) + c$

$7 = -2 + c$

$c = 9$

$y = -\frac{1}{2}x + 9$ ..... (3)

3.

A straight line passes through the points (0, 5) and (3, 17).
Find the equation of the straight line. $x_1\ y_1$ $x_2\ y_2$

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$= \frac{17 - 5}{3 - 0}$$

$$= \frac{12}{3}$$

$$= 4$$

(0, 5)
x y

$y = 4x + c$

$5 = 4(0) + c$

$c = 5$

$y = 4x + 5$ ..... (3)

4. Show that line 3y = 4x - 14 is perpendicular to line 4y = -3x + 48.

$3y = 4x - 14 \quad (\div 3)$

$y = \frac{4}{3}x - \frac{14}{3}$

$m = \frac{4}{3}$

$4y = -3x + 48 \quad (\div 4)$

$y = \frac{-3}{4}x + 12$

$m = \frac{-3}{4}$

$\frac{4}{3} \times \frac{-3}{4} = -1$

..... (4)

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5. Here are the equations of 5 straight lines.

P: $y = 2x + 5$
Q: $y = -2x + 5$
R: $y = x + 5$
S: $y = -\frac{1}{2}x + 6$
T: $y = \frac{1}{2}x + 1$

a) Write down the letter of the line that is parallel to $y = x + 6$

.....R..... (1)

b) Write down the letter of the line that is perpendicular to $y = 2x - 1$

.....S..... (1)

6. The point A has the coordinates (2,5)
The point B has the coordinates (6,7)

a) Find the mid point of AB

(4, 6) (2)

b) Find the gradient of the line that passes through AB

$m = \frac{y_2 - y_1}{x_2 - x_1}$ (2, 5) (6, 7) $x_1\ y_1$ $x_2\ y_2$

$= \frac{7-5}{6-2}$

$= \frac{2}{4} = \frac{1}{2}$

1/2 (2)

c) Find the equation of the perpendiucular bisector to AB

perpendicular gradient $= -2$

$y = -2x + c$ (4, 6) $x\ y$

$6 = -2(4) + c$

$6 = -8 + c$

$c = 14$

$y = -2x + 14$ (3)

7. A circle C has centre $(2,5)$ x_1, y_1

The point A $(11, 8)$ lies on the circumference of the circle $x_2\ y_2$

Find the equation of the tangent to the circle at A

Gradient of radius: $\frac{y_2 - y_1}{x_2 - x_1}$

$= \frac{8-5}{11-2}$

$= \frac{3}{9}$

$= \frac{1}{3}$

perpendicular gradient $= -3$

$y = -3x + c$ ... $(11, 8)$ $x\ y$

$8 = -3(11) + c$

$8 = -33 + c$

$c = 41$

$y = -3x + 41$ ..... (5)

8. A cirlce has the equation $x^2+y^2=5$

a) Write down the centre of the circle

(0,0) (1)

b) Write down the exact length of the radius of the circle

$\sqrt{5}$ (1)

P is the point (1,2) on the cirlce $x^2+y^2=5$

c) Work out the equation of the tangent to the circle at P

(0,0) (1,2)
$x_1\ y_1$ $x_2\ y_2$

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$= \frac{2-0}{1-0}$$

$$= 2$$

perpendicular gradient $= -\frac{1}{2}$

$y = -\frac{1}{2}x + c$ (1,2)
$x\ y$

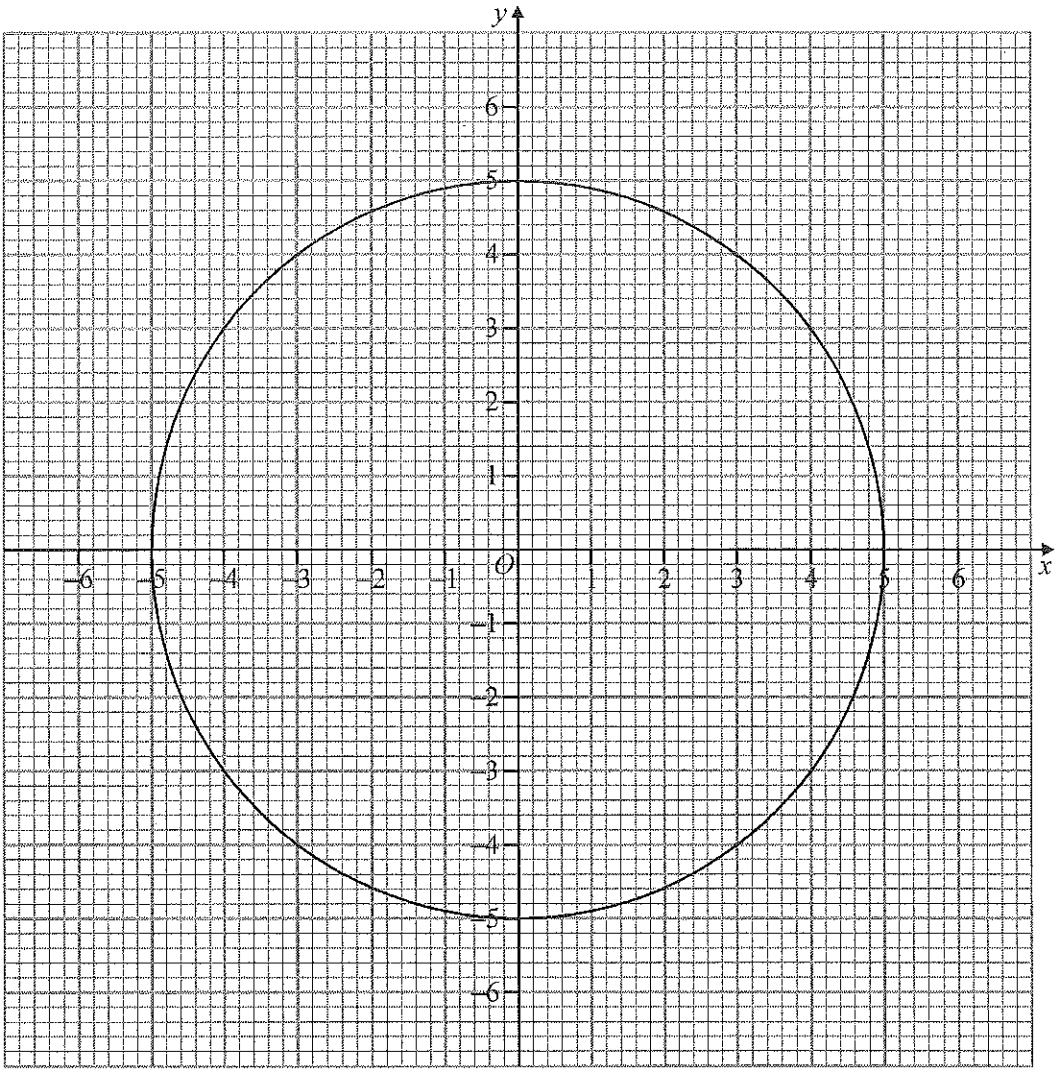
$2 = -\frac{1}{2}(1) + c$

$2 = -\frac{1}{2} + c$

$2\frac{1}{2} = c$

$y = -\frac{1}{2}x + \frac{5}{2}$ (4)

9. The diagram shows a circle of radius 5 cm, centre the origin.



Find the equation of the tangent to the circle at (3,4)
x y

$$m = \frac{y_2 - y_1}{x_2 - x}$$
$$= \frac{4-0}{3-0}$$
$$= \frac{4}{3}$$

perpendicular gradient $= -\frac{3}{4}$

$y = -\frac{3}{4}x + c$

$4 = -\frac{3}{4}(3) + c$

$4 = -\frac{9}{4} + c$

$4 = \frac{16}{4}$

$c = \frac{25}{4}$

$y = -\frac{3}{4}x + \frac{25}{4}$ (5)