

# GRAYS TUITION CENTRE – Online Tutoring

**WEEK: 22**

**Week Beginning: (17/08/2020)**

**Subject: MATHS**

**Year: GCSE**

## Lesson Objective:

- Continuing straight line graphs and looking at how the gradients of normal lines relate to gradients of perpendicular lines
- Extending practice on linear equation and being comfortable with manipulating and solving them

## Class Worksheets

- Page 198-201 GCSE Maths 4-9 Elmwood (Blue book)
- Exam style questions

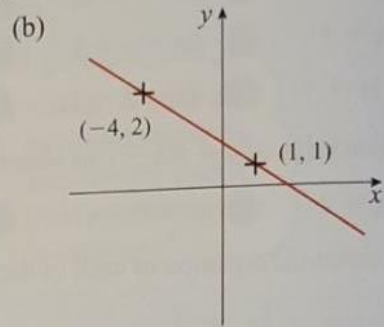
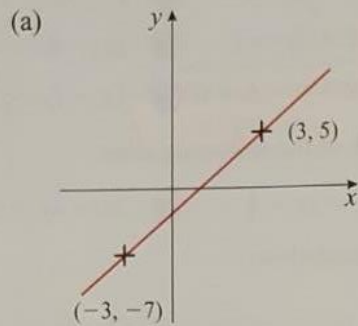
## Homework

- Finish Classwork for homework

## Additional Notes

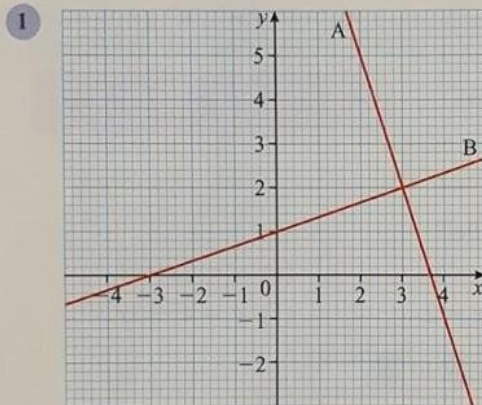
- All homework from last week will be marked at the beginning of the lesson. Make sure that you have your homework with you in the lesson and are ready to mark it
- **Also prepare any questions if you struggled with the homework so I can help you.**
- All lesson worksheets and homework for next week (**due Week 23**) worksheets can be found below

- 37 Find the equation of the line that is parallel to the line  $y = 4x - 5$  and passes through  $(3, 2)$ .
- 38 Find the equation of the line that is parallel to the line  $2x + y = 1$  and passes through  $(1, -4)$ .
- 39 Find the equation of each line below:



## E Gradients of perpendicular lines

### E6.7



Line A and Line B above are perpendicular (at right angles).

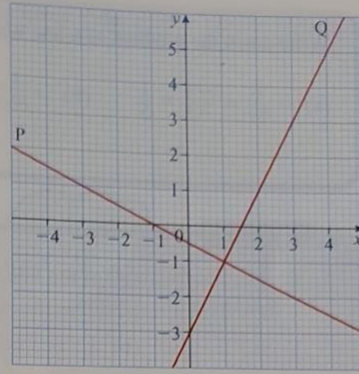
- Find the gradient of line A.
- Find the gradient of line B.
- Multiply together the gradient of line A and the gradient of line B.

Can you still?

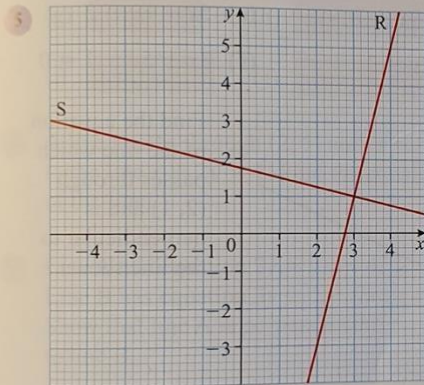
### Mixed

- Carl and Dan earn the same amount each week. Carl gets a 5% pay rise and now earns £477.75. Dan only gets a 3% pay increase. How much does Dan earn now?
- Simplify  $\frac{4}{\sqrt{2}} + \sqrt{18}$
- $P$  is directly proportional to the square root of  $Q$ .  
 $P = 12$  when  $Q = 9$ .  
Find the value of  $P$  when  $Q = 36$ .
- Expand  $(x + 4)^2$
- Truncate 7.81932 to two decimal places.

- 2 Line P and line Q are perpendicular (at right angles).
- Find the gradient of line P.
  - Find the gradient of line Q.
  - Find the *product* of the gradient of line P and the gradient of line Q.



- What do you notice about your answers to part (c) in both questions 1 and 2?
- If a line has a gradient of 4, what is the gradient of a line perpendicular to this one?



Line R has a gradient of 4.  
Line S is perpendicular to line R.

Find the gradient of line S  
to check if your answer to  
question 4 was correct.

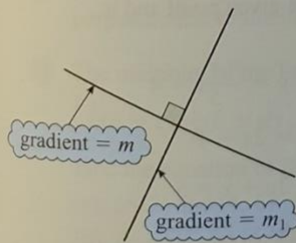


## Key Facts

The product of the gradients of two perpendicular lines is  $-1$

$$m m_1 = -1 \quad \text{so} \quad m = -\frac{1}{m_1}$$

Given a line with gradient  $= m_1$ , to find the gradient of a perpendicular line, find the reciprocal of  $m_1$  (i.e.  $\frac{1}{m_1}$ ) then change its sign (i.e.  $-\frac{1}{m_1}$ ).



Write down the gradient of a line which is perpendicular to a line of gradient (a)  $-5$ , (b)  $\frac{2}{3}$

(a)  $-\frac{1}{m_1} = \frac{-1}{-5} = \frac{1}{5}$       (b)  $-\frac{1}{m_1} = \frac{-1}{2/3} \left(\times 3\right) = -\frac{3}{2}$  (the simplest way is to turn the fraction upside down and change the sign)

### E6.8

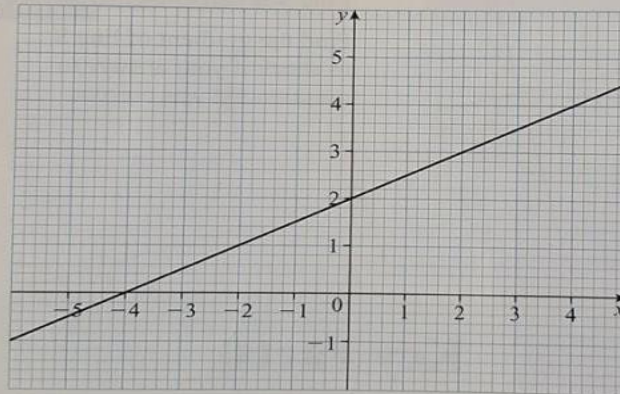
1 Find the gradient of the line which is perpendicular to a line with each gradient given below:

- (a) 7      (b) 1      (c)  $-4$       (d)  $-8$       (e)  $\frac{1}{3}$       (f)  $\frac{2}{5}$   
 (g)  $-\frac{1}{6}$       (h)  $-\frac{3}{4}$       (i)  $-\frac{9}{2}$       (j)  $-0.5$       (k)  $0.2$       (l) 0

2 Write down the gradient of any line which is perpendicular to:

- (a)  $y = 3x - 2$       (b)  $y = -\frac{2}{3}x + 7$       (c)  $5x + 8y = 3$   
 (d)  $4y = x + 7$       (e)  $6x - 2y = 3$       (f)  $3x + 5y - 1 = 0$

3



Find the equation of the line which passes through  $(2, 1)$  and is perpendicular to the line shown.

4 Find the equation of the line which passes through the given point and is perpendicular to the given line.

- (a)  $(0, 3)$   $y = \frac{1}{3}x + 6$       (b)  $(0, -2)$   $y = -\frac{1}{5}x + 4$   
 (c)  $(1, 1)$   $y = 8 - \frac{1}{4}x$       (d)  $(2, 5)$   $y = 2x - 1$   
 (e)  $(1, 4)$   $2y - x = 3$       (f)  $(-6, 2)$   $3y + x = 5$   
 (g)  $(-3, -3)$   $3x + y = 7$       (h)  $(4, -1)$   $4x - 2y = 9$   
 (i)  $(-1, 6)$   $x + y - 6 = 0$       (j)  $(-4, -3)$   $6x + 3y - 5 = 0$

5, (b)  $\frac{2}{3}$

to turn  
down  
)

5 A line passes through (3, 0) and is parallel to the line  $y = 5x - 3$ . Find the equation of the line.

6 Line P has equation  $5y - 2x = 13$ .  
Line Q has equation  $2y + 5x = 7$ .  
Show that line P is perpendicular to line Q.

7 Without drawing any of these lines, put them into pairs of lines which are perpendicular to one another.

(a)  $3y - 2x = 7$  (b)  $y = -\frac{1}{3}x + 5$

(c)  $2y + x = 9$  (d)  $5y + x = 9$

(e)  $3x + 2y = 11$  (f)  $y = 2x + 1$

(g)  $y = x + 3$  (h)  $y - 3x = 10$

(i)  $y = 5x - 1$  (j)  $y = -x + 5$

8 A line passes through (2, 5) and is parallel to the line  $x + 2y = 1$ . Find the equation of the line.

9 Line A has equation  $7y = 3x - 4$ .  
Line B has equation  $3y = 5 - 7x$ .  
Show that line A is perpendicular to line B.

10 Find the equation of the line which passes through (3, 2) and is perpendicular to the line which joins (-1, 0) to (3, 2).

11 The midpoint of the line joining (a, b) to (c, d) has co-ordinates given by  $(\frac{1}{2}(a + c), \frac{1}{2}(b + d))$ .

Find the equation of the perpendicular bisector of the line joining:

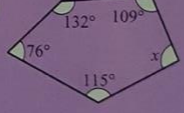
- (a) (6, 2) and (4, 6)
- (b) (-1, 3) and (4, 2)
- (c) (2, 5) and (-4, 3)

Can you still?

Mixed  
Do not use a  
calculator

1 Draw a Venn diagram to show the prime factors of 42 and 112. Use the Venn diagram to find the HCF and LCM of 42 and 112.

2 Work out  $(4 \times 10^{-19}) \times (8 \times 10^7)$  leaving the answer in standard form.

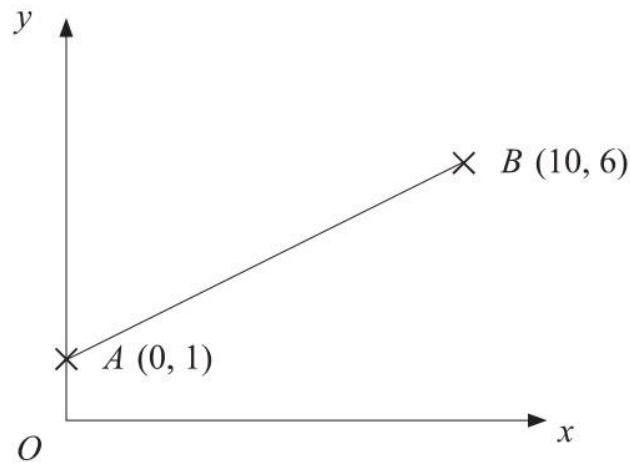
3  Find the value of angle x.

4 Solve  $x^2 - 6x + 8 = 0$

5 Solve  $\frac{1}{3}(x - 1) = \frac{1}{6}x + 2$

6 Expand  $(x + 2)^3$

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

..... (1)

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

..... (1)

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

..... (3)

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

..... (4)

---

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  $y = x + 6$

..... (1)

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

..... (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

..... (2)

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

..... (2)

c) Find the equation of the perpendicular bisector to AB

..... (3)