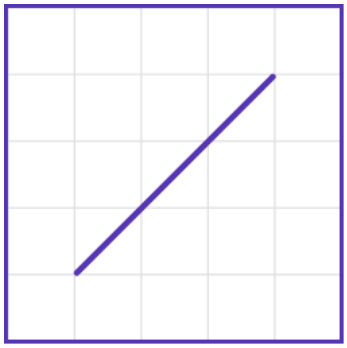
Gradient of a Line - Worksheet

Skill

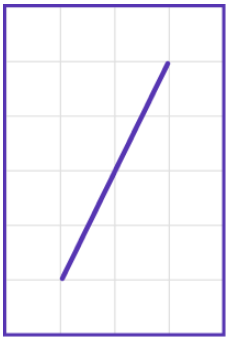
Group A - Gradient of a line segment

Find the gradient of the line segment PQ. Each square on the grid represents 1 unit.

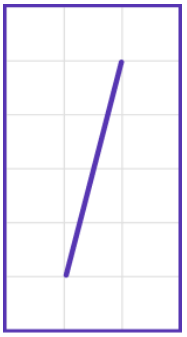
1)



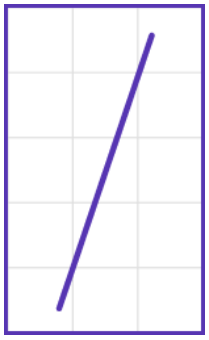
2)



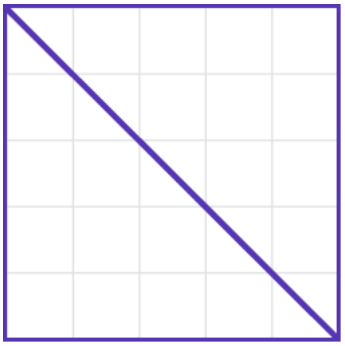
3)



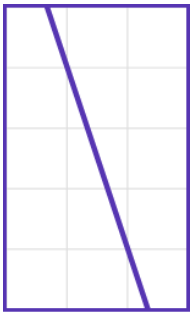
4)



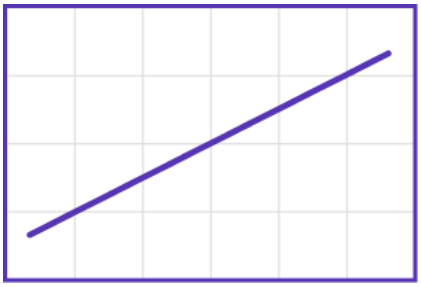
5)



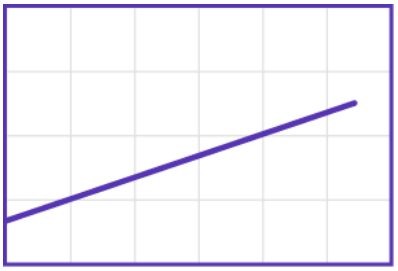
6)



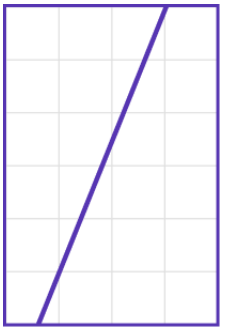
7)



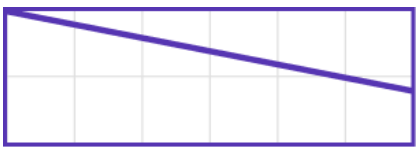
8)



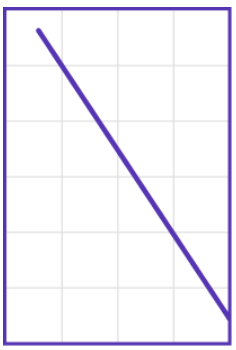
9)



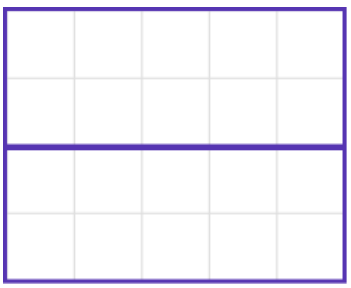
10)



11)



12)



Gradient of a Line - Worksheet

Group B - Calculating the gradient using coordinates

Given a pair of coordinates on a straight line, calculate the gradient of the line.

1) $(0, 0)$ and $(2, 4)$

2) $(3, 1)$ and $(7, 5)$

3) $(0, 7)$ and $(2, 1)$

4) $(2, 5)$ and $(4, 6)$

5) $(10, 3)$ and $(2, 9)$

6) $(3, -1)$ and $(5, 7)$

7) $(-2, 3)$ and $(8, 5)$

8) $(-3, -6)$ and $(5, 2)$

9) $(1, 3)$ and $(5, -9)$

10) $(2, -9)$ and $(3, -11)$

11) $(-8, 5)$ and $(10, -4)$

12) $(-5, 1)$ and $(10, -8)$

Group C - Gradient from the equation of a straight line

Find the gradient of each straight line given the equation.

1) $y = 2x + 1$

2) $y = 5 + 3x$

3) $y = 2 - x$

4) $-y = 8x$

5) $2y = 8x + 2$

6) $3y = -9 + 15x$

7) $2y - 1 = 4x$

8) $9x + 3y = 18$

9) $0.5y = 2 - 2.5x$

10) $\frac{x-y}{2} = 1$

11) $2x = \frac{6-2y}{7}$

12) $3(2y + 8x) = 12$

Gradient of a Line - Worksheet

Applied

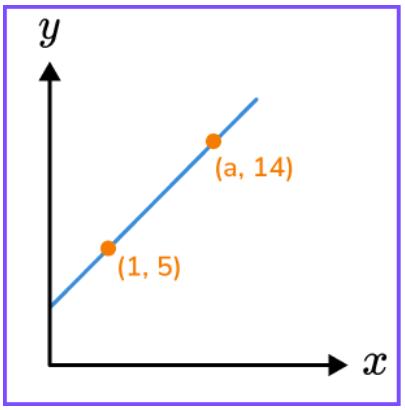
1 **(a)** This graph shows the cost of completing a project, based on how long the project takes.

What would be the cost of a project that takes 3 hours to complete?

(b) Work out the gradient of the line.

(c) What does the gradient of the line represent?

2 **(a)** The gradient of this line is 3. Work out the value of a.



(b) The y intercept of the line is $(0, 2)$. Write down the equation of the line.

3 Here are the equations of 3 lines. Circle the equation of the line with the steepest gradient.

$2y = 6x - 9$ $y = 4x + 7$ $3y - x - 6 = 0$

Gradient of a Line - Exam Questions

1) Below is a graph of a straight line L.

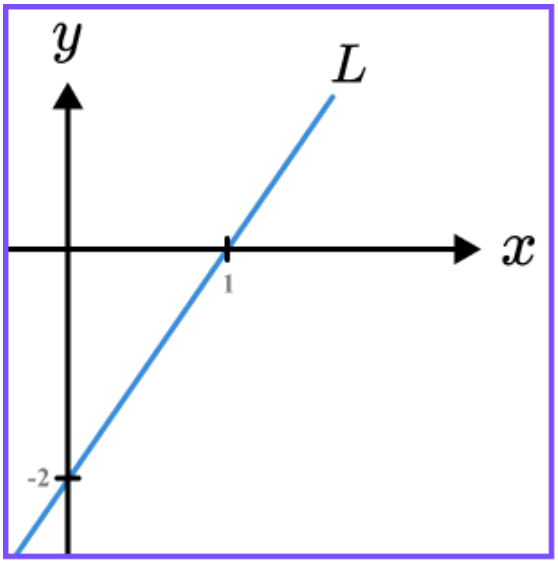


Diagram not to scale

(a) Calculate the gradient of L.

.....

(2)

(b) State the equation of L. Write your answer in the form $y = mx + c$.

.....

(2)

(c) State the equation of the line parallel to L, that passes through the origin.

.....

(1)

(5 marks)

Gradient of a Line - Exam Questions

2) Below is a sketch of the two lines $y = 2x - 4$ and $2y = 8 - x$.

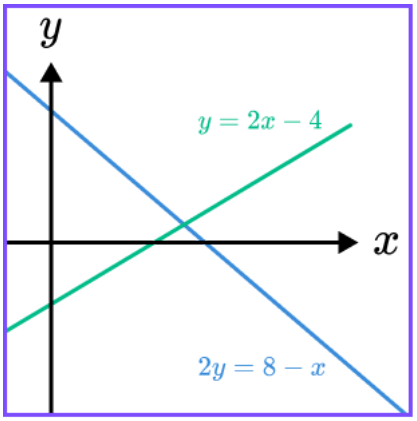


Diagram not to scale

(a) Find the gradient of the line $2y = 8 - x$.

.....

(2)

(b) Two lines are perpendicular if the product of their gradients is -1.
Are these two lines perpendicular?

.....

(2)

(4 marks)

---

3) **(a)** The point A has coordinates $(0, -1)$.
The point B has coordinates $(5, 19)$.

Lucy says the gradient of the line is $\frac{1}{4}$.
Charlotte says the gradient of the line is 4.

Who is correct? Show how you decide.

.....

(2)

Gradient of a Line - Exam Questions

(b) Write down the equation of the line that passes through points A and B.

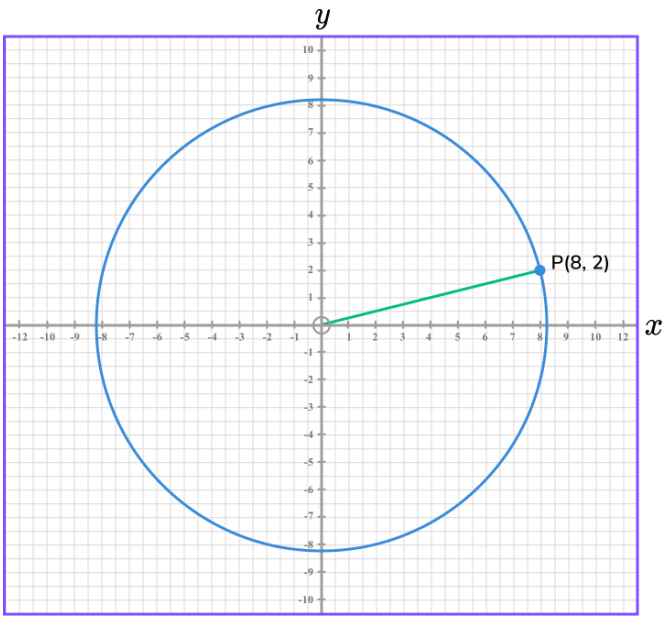
.....

(2)

(4 marks)

---

4 The circle with equation $x^2 + y^2 = 68$ passes through the point $(8,\ 2)$.

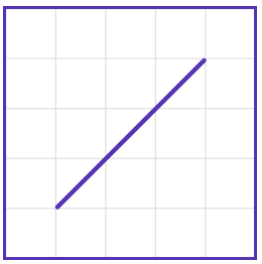
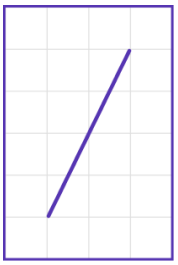
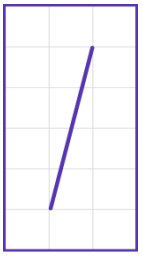
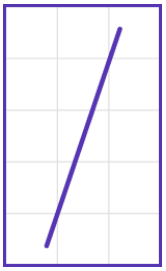
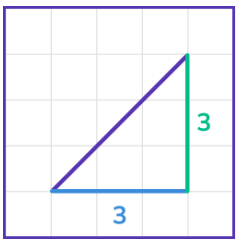
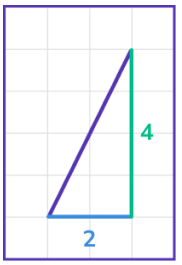
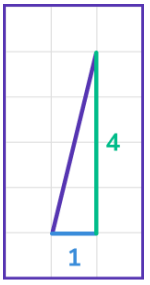
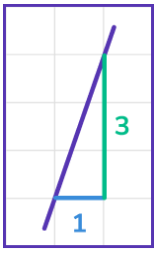


Find the gradient of the radius which touches the circle at the point $(8,\ 2)$.

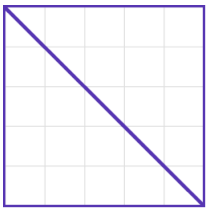
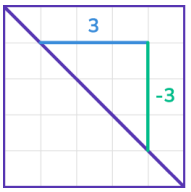
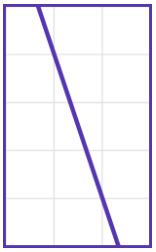
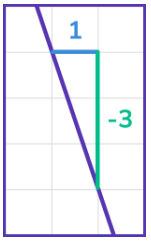
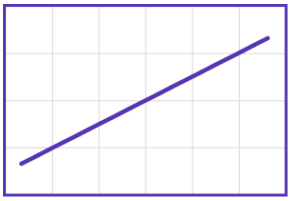
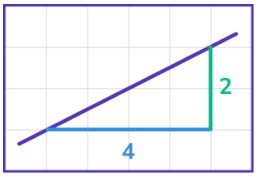
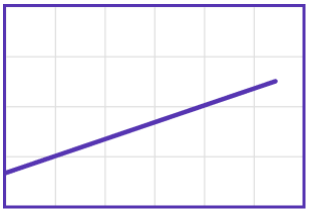
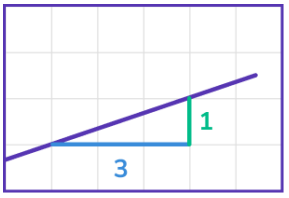
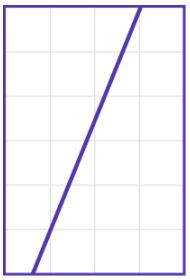
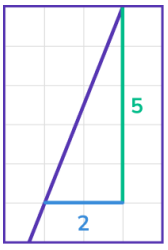
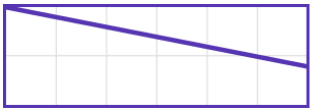
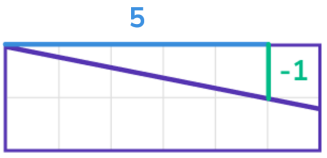
.....

(2)

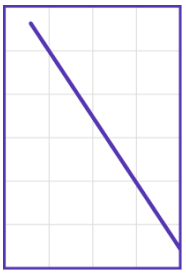
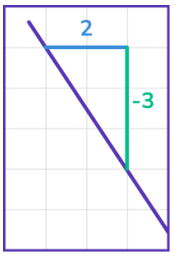
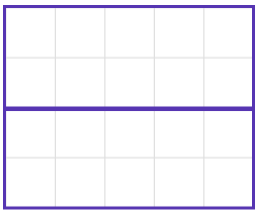
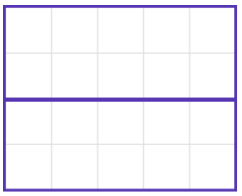
Gradient of a Line - Answers

	Question	
	Skill Questions	
Group A	Find the gradient of the line segment PQ. Each square on the grid represents 1 unit. **1)**  **2)**  **3)**  **4)** 	**1)**  $m = \frac{3}{3} = 1$ **2)**  $m = \frac{4}{2} = 2$ **3)**  $m = \frac{4}{1} = 4$ **4)**  $m = \frac{3}{1} = 3$

Gradient of a Line - Answers

Group A contd	**5)** 	**5)**  $m = \frac{-3}{3} = -1$
	6) 	**6)**  $m = \frac{-3}{1} = -3$
	7) 	**7)**  $m = \frac{2}{4} = \frac{1}{2} = 0.5$
	8) 	**8)**  $m = \frac{1}{3}$
	9) 	**9)**  $m = \frac{5}{2} = 2.5$
	10) 	**10)**  $m = \frac{-1}{5} = -0.2$

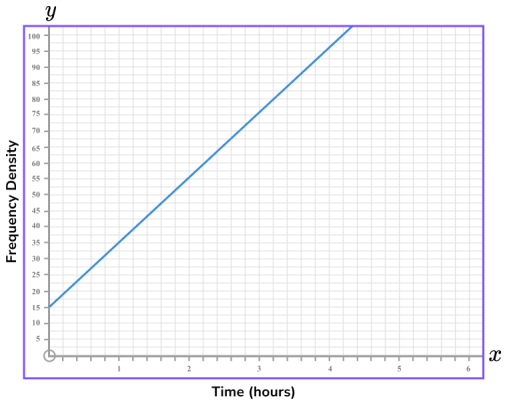
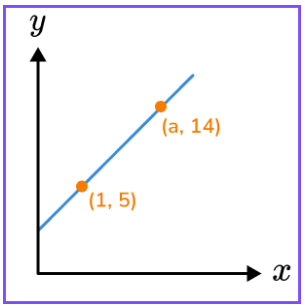
Gradient of a Line - Answers

Group A contd	**11)** 	**11)**  $m = \frac{-3}{2} = -1.5$
	12) 	**12)**  $m = 0$
Group B	Given a pair of coordinates on a straight line, calculate the gradient of the line.	
	1) $(0, 0)$ and $(2, 4)$	**1)** $\frac{4-0}{2-0} = 2$
	2) $(3, 1)$ and $(7, 5)$	**2)** $\frac{5-1}{7-3} = \frac{4}{4} = 1$
	3) $(0, 7)$ and $(2, 1)$	**3)** $\frac{1-7}{2-0} = \frac{-6}{2} = -3$
	4) $(2, 5)$ and $(4, 6)$	**4)** $\frac{6-5}{4-2} = \frac{1}{2}$
	5) $(10, 3)$ and $(2, 9)$	**5)** $\frac{9-3}{2-10} = \frac{6}{-8} = -\frac{3}{4}$
	6) $(3, -1)$ and $(5, 7)$	**6)** $\frac{7--1}{5-3} = \frac{7+1}{2} = \frac{8}{2} = 4$
	7) $(-2, 3)$ and $(8, 5)$	**7)** $\frac{5-3}{8--2} = \frac{2}{10} = \frac{1}{5}$
	8) $(-3, -6)$ and $(5, 2)$	**8)** $\frac{2--6}{5--3} = \frac{2+6}{5+3} = \frac{8}{8} = 1$
	9) $(1, 3)$ and $(5, -9)$	**9)** $\frac{-9-3}{5-1} = \frac{-12}{4} = -3$
	10) $(2, -9)$ and $(3, -11)$	**10)** $\frac{-11--9}{3-2} = \frac{-11+9}{1} = -2$
	11) $(-8, 5)$ and $(10, -4)$	**11)** $\frac{-4-5}{10--8} = \frac{-9}{10+8} = \frac{-9}{18} = -\frac{1}{2}$
	12) $(-5, 1)$ **and** $(10, -8)$	**12)** $\frac{-8-1}{10--5} = \frac{-9}{10+5} = \frac{-9}{15} = \frac{-3}{5}$

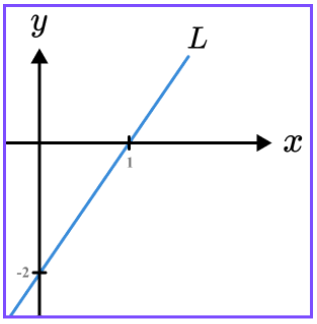
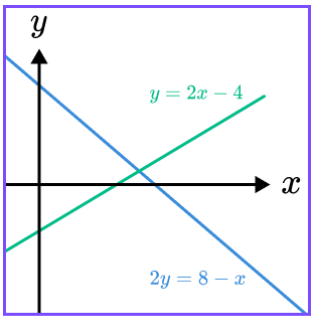
Gradient of a Line - Answers

Group C	Find the gradient of each straight line given the equation.	
	1) $y = 2x + 1$	**1)** $m = 2$
	2) $y = 5 + 3x$	**2)** $m = 3$
	3) $y = 2 - x$	**3)** $m = -1$
	4) $-y = 8x$	**4)** $m = -8$
	5) $2y = 8x + 2$	**5)** $m = 4$
	6) $3y = -9 + 15x$	**6)** $m = 5$
	7) $2y - 1 = 4x$	**7)** $m = 2$
	8) $9x + 3y = 18$	**8)** $m = -3$
	9) $0.5y = 2 - 2.5x$	**9)** $m = -5$
	10) $\frac{x-y}{2} = 1$	**10)** $m = 1$
	11) $2x = \frac{6-2y}{7}$	**11)** $m = -7$
	12) $3(2y + 8x) = 12$	**12)** $m = -4$

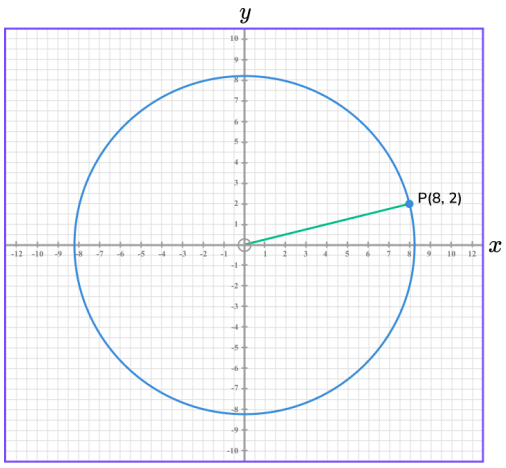
Gradient of a Line - Answers

	Question	Answer
	Applied Questions	
1	**a)** This graph shows the cost of completing a project, based on how long the project takes.  What would be the cost of a project that takes 3 hours to complete?	**a)** £75
	b) Work out the gradient of the line.	**b)** 20
	c) What does the gradient of the line represent?	**c)** The cost per hour of completing the project
2	**a)** The gradient of this line is 3. Work out the value of a.  	**a)** $\frac{14-5}{a-1} = \frac{9}{a-1} = 3$ $a = 4$
	b) The y intercept of the line is $(0, 2)$. Write down the equation of the line.	**b)** $y = 3x + 2$
3	Here are the equations of 3 lines. Circle the equation of the line with the steepest gradient. $2y = 6x - 9$ $y = 4x + 7$ $3y - x - 6 = 0$	$y = 3x - 4.5$ $y = \frac{1}{3}x + 2$ $y = 4x + 7$ has the steepest gradient

Gradient of a Line - Mark Scheme

	Question	Answer	
	Exam Questions		
1)	Below is a graph of a straight line L.  *Diagram not to scale*		
(a)	Calculate the gradient of L.	**(a)** $m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-2-0}{0-1}$ $m = 2$	**(1)** **(1)**
(b)	State the equation of L. Write your answer in the form $y = mx + c$.	**(b)** $c = -2$ $y = 2x - 2$	**(1)** **(1)**
(c)	State the equation of the line parallel to L, that passes through the origin.	**(c)** $y = 2x$	**(1)**
2)	Below is a sketch of the two lines $y = 2x - 4$ and $2y = 8 - x$.  *Diagram not to scale*		
(a)	Find the gradient of the line $2y = 8 - x$.	**(a)** Dividing by 2 to get $y = 4 - \frac{1}{2}x$ $m = -\frac{1}{2}$	**(1)** **(1)**
(b)	Two lines are perpendicular if the product of their gradients is -1. Are these two lines perpendicular?	**(b)** $2 \times -\frac{1}{2} = -1$ Yes, the lines are perpendicular.	**(1)** **(1)**

Gradient of a Line - Mark Scheme

3	**(a)**	The point A has coordinates $(0, -1)$. The point B has coordinates $(5, 19)$. Lucy says the gradient of the line is $\frac{1}{4}$. Charlotte says the gradient of the line is 4. Who is correct? Show how you decide.	Gradient: $\frac{19--1}{5-0} = \frac{20}{5} = 4$ Charlotte is correct.	**(1)** **(1)**
	(b)	Write down an equation of the line that passes through points A and B.	$c = -1$ $y = 4x - 1$	**(1)** **(1)**
4		The circle with equation $x^2 + y^2 = 68$ passes through the point $(8, 2)$.  Find the gradient of the radius which touches the circle at the point $(8, 2)$.	Gradient: $\frac{2-0}{8-0}$ $= \frac{1}{4}$	**(1)** **(1)**