Coordinate geometry

UNIT 5: The gradient of a straight line

QUESTION **1** Use the gradient formula $m = \dfrac{y_2 - y_1}{x_2 - x_1}$ to find the gradient of the straight line passii

through the following points.

a (1, 5) and (2, –7)

b (–1, –2) and (3, 4)

c (–2, –3) and (4, –7)

d (2, 4) and (–1, 3)

e (5, 4) and (–1, 5)

f (6, –2) and (8, –3)

g (–3, 6) and (–5, –1)

h (8, 10) and (5, 1)

i (3, 4) and (8, 6)

j (8, 1) and (4, 5)

k (–3, 6) and (2, 4)

l (0, 0) and (6, 9)

QUESTION **2** Show that (1, –1), (–1, 5) and (3, –7) are collinear.

QUESTION **3** Which of the following sets of points are collinear?

a (1, 5), (–2, 3), (4, –2)

b (0, 9), (4, 7), (6, 6)

c (–2, –3), (0, 1), (–1, –1)

QUESTION **4** Show that the four points A(2, 6), B(5, 2), C(1, –1) and D(–2, 3) are the vertices of a parallelogram.

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UNIT 6: Using the point gradient formula to find the equation of a line

QUESTION **1**   Find the general form of the equation of a line if it passes through:

a   the point (3, 4) and has gradient 2.

b   the point (1, 3) and has gradient –1.

c   the origin and has gradient 2.

d   the point (1, 5) and has gradient –2.

e   the point (2, 5) and has gradient 1.

f   the point (1, 4) and has gradient 4.

g   the point (–2, 7) and has gradient $\frac{1}{2}$.

h   the point (2, 1) and has gradient $\frac{1}{4}$.

i   the point (3, 6) and has gradient 4.

j   the point (3, 3) and has gradient 2.

k   the point (–5, 5) and has gradient –2.

l   the point (1, –2) and has gradient 3.

QUESTION **2**   Find the equation of a straight line that passes through the point (2, –3) and has a gradient of 2.

QUESTION **3**   Find the equation of a straight line that has a gradient of 3 and passes through the mid-point of the interval joining the points (3, 5) and (7, 7).

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UNIT 7: Using the two point formula to find the equation of a line

QUESTION 1 Find the general form of the equation of a line if it passes through the points:

a   (1, 2) and (3, 4)

b   (1, 3) and (2, 5)

c   (–1, 2) and (–3, –5)

d   (–2, 4) and (3, 4)

e   (0, 0) and (5, 8)

f   (2, 2) and (5, 5)

g   (1, 4) and (5, 6)

h   (0, –2) and (–1, –6)

i   (3, 4) and (5, 6)

j   (7, 2) and (3, 4)

k   (3, 1) and (1, 7)

l   (6, 3) and (4, 2)

QUESTION 2 Find the equation of the line that passes through the points (1, 5) and (2, 7). Show by substitution that the point (0, 3) lies on this line.

QUESTION 3 Find the equation of the straight line that passes through the points (0, 0) and $(2p, 3p)$

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UNIT 8: Parallel and perpendicular lines

QUESTION **1**   State whether the following pairs of lines are parallel or not.

a $x+3y+9=0$ and $x+3y-7=0$ _____   b $2x+y=6$ and $3x-7y=9$ _____

c $3x-7y+8=0$ and $3x-7y=2$ _____   d $x+2y=6$ and $x+2y-5=0$ _____

e $x+y-2=0$ and $x+y-7=0$ _____   f $y=4x+3$ and $y=4x-5$ _____

g $y=2x+1$ and $y=2x+8$ _____   h $y=3x-1$ and $y=-5x+7$ _____

QUESTION **2**   State whether the following pairs of lines are perpendicular or not.

a $x-3y=7$ and $3x-y-2=0$ _____   b $5x-3y+7=0$ and $3x+5y-6=0$ _____

c $2x+7y=8$ and $3x-4y+7=0$ _____   d $8x-3y=2$ and $3x+8y=9$ _____

e $5x-6y=15$ and $6x-5y+3=0$ _____   f $2x-3y+7=0$ and $3x+2y+5=0$ _____

g $2x-9y=7$ and $3x+6y=8$ _____   h $x-2y=6$ and $2x+y=7$ _____

QUESTION **3**   State whether the following pairs of lines are parallel, perpendicular or neither.

a $x-2y+5=0$ and $2x-4y-8=0$ _____   b $3x-y-3=0$ and $9x-3y+1=0$ _____

c $x+7y=0$ and $2x-9y=0$ _____   d $x+y-7=0$ and $3x-3y+3=0$ _____

e $3x-4y+2=0$ and $8x+6y-3=0$ _____   f $4x-8y=8$ and $2x+9y=6$ _____

g $x+3y-2=0$ and $2x+6y-5=0$ _____   h $x-5y-2=0$ and $10x+2y+3=0$ _____

QUESTION **4**   Find the general form of the equation of the straight line passing through:

a   the point (2, 5) and parallel to the line $3x-y+7=0$. _____

_____

b   the origin and parallel to the line $4x-5y+6=0$. _____

_____

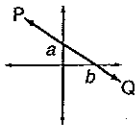c   the point (–2, 3) and perpendicular to the line $2x+y=9$. _____

_____

d   the point (3, –4) and perpendicular to the line $x-y+5=0$. _____

_____

QUESTION **5**   Show that the two lines $x-2y+7=0$ and $2x+y-16=0$ are perpendicular to each othe

_____

_____

Coordinate geometry
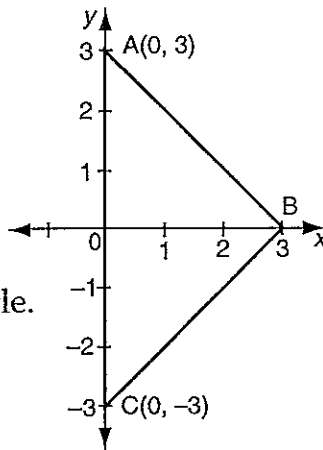
Instructions for SECTION 1
- You have 15 minutes to answer Section 1
- Each question is worth 2 marks
- Attempt ALL questions
- Calculators are NOT to be used
- Fill in only ONE CIRCLE for each question

Mark

1 The point (3, 6) lies on the line:

Ⓐ $x + 2y + 12 = 0$ Ⓑ $x + 2y - 12 = 0$ Ⓒ $2x + y + 12 = 0$ Ⓓ $2x + y - 12 = 0$

[2]

2 What is the gradient of the line that passes through the points (–2, 0) and (0, 4)?

Ⓐ $\dfrac{1}{2}$ Ⓑ 2 Ⓒ $-\dfrac{1}{2}$ Ⓓ -2

[2]

3 What is the slope of the line PQ?

Ⓐ $\dfrac{a}{b}$ Ⓑ $\dfrac{b}{a}$ Ⓒ $-\dfrac{a}{b}$ Ⓓ $-\dfrac{b}{a}$

[2]

4 Find the length of the interval AB joining the points A(4, 2) and B(10, 10).

Ⓐ 5 Ⓑ 10 Ⓒ 6 Ⓓ 8

[2]

5 What is the equation of the line parallel to the x-axis passing through P(2, 4)?

Ⓐ $x = 4$ Ⓑ $y = 2$ Ⓒ $x = 2$ Ⓓ $y = 4$

[2]

6 The graph $3x + y = 9$ cuts the x-axis at the point:

Ⓐ (3, 0) Ⓑ (0, 3) Ⓒ (0, 9) Ⓓ (9, 0)

[2]

7 What is the equation of the line which passes through the point (–2, 3) and has a gradient of –2?

Ⓐ $y = 2x - 1$ Ⓑ $y = -2x - 1$ Ⓒ $y = 2x - 7$ Ⓓ $y = 2x + 7$

[2]

8 Which of the following is a linear equation?

Ⓐ $y = x^2 + 7$ Ⓑ $y = 5 - \dfrac{7}{x}$ Ⓒ $y = 6 - 7x$ Ⓓ $y = \sqrt{x} - 3$

[2]

9 The mid-point of the interval joining the points (3, 7) and (–5, 3) is:

Ⓐ (5, –1) Ⓑ (–1, 5) Ⓒ (–5, 1) Ⓓ (–5, –1)

[2]

10 What is the gradient of the line represented by the equation $3x - 5y = 5$?

Ⓐ $\dfrac{3}{5}$ Ⓑ $\dfrac{5}{3}$ Ⓒ 3 Ⓓ –5

[2]

Total marks achieved for SECTION 1 /2(

Coordinate geometry

Instructions for SECTION 2
- You have 20 minutes to answer ALL of Section 2
- Each question is worth 2 marks
- Attempt ALL questions
- Calculators may be used

Questions	Answers	Marks
The interval AB is between the points $(-3, 2)$ and $(6, 2)$ on a number plane. Find:		
1 the mid-point of AB.	_____	2
2 the length of AB.	_____	2
3 the gradient of AB.	_____	2
The equation of a line is $2x - y - 3 = 0$:		
4 Make y the subject of this equation.	_____	2
5 What is the gradient of this line?	_____	2
6 What is the y-intercept of this line?	_____	2
7 Is this line parallel to the line $y = 2x + 1$?	_____	2
From the diagram opposite:		
8 Find the mid-point of AC.	_____	2
9 What is the length of AC?	_____	2
10 Show that $\triangle ABC$ is isosceles.	_____	2
11 Show that $\triangle ABC$ is a right angled triangle.	_____	2
12 Find the mid-point M of AB.	_____	2
13 Find the gradient of OM.	_____	2
14 Show that the line which passes through the mid-points of AC and AB is parallel to BC.	_____	2
15 Change the equation $y = 3x - 1$ to the general form.	_____	2

Diagram (near questions 8–14):
- y-axis marked 3, 2, 1, −1, −2, −3
- A(0, 3) at top
- B on x-axis near 3
- C(0, −3) at bottom
- x-axis marked 1, 2, 3

Total marks achieved for SECTION 2 /30

Answers

PAGE 43 1 a $x=3, y=2\frac{1}{2}$ b $x=5, y=1\frac{1}{3}$ c $x=5, y=1\frac{4}{5}$ d $x=3, y=4$ e $x=-2, y=5$ f $x=-1, y=-5$ 2 a $x=4, y=0$ 28, $y=-18$ c $x=1, y=3$ d $x=1\frac{1}{2}, y=-\frac{1}{2}$

PAGE 44 1 a $x=6, y=4$ b $x=0, y=3$ c $x=-4, y=0$ d $x=0, y=2$ e $x=3, y=-1$ f $x=1, y=4$ 2 a $x=5, y=2$ b $x=3$, c $x=-6, y=-5$ d $x=5, y=3\frac{2}{3}$
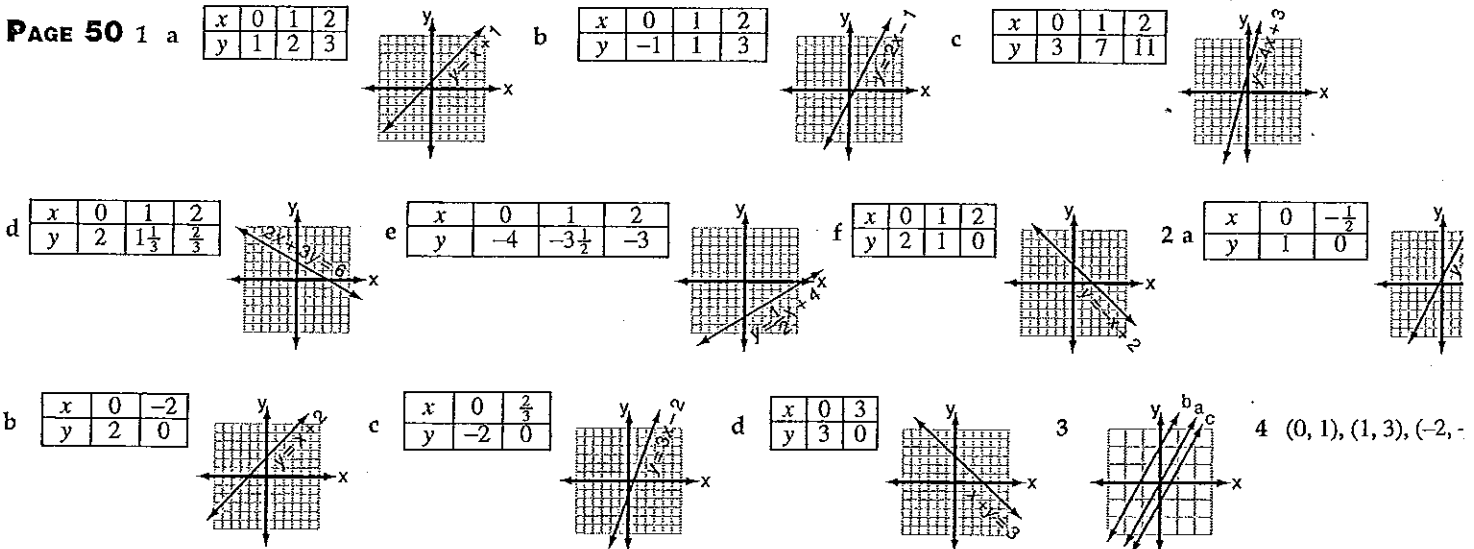
PAGE 45 1 C 2 C 3 C 4 C 5 A 6 C 7 D 8 B 9 D 10 B

PAGE 46 1 $x=6, y=-\frac{1}{3}$ 2 $x=5, y=\frac{1}{2}$ 3 $x=5\frac{1}{3}, y=2$ 4 $x=1\frac{1}{2}, y=-1$ 5 $x=8, y=1$ 6 $x=1, y=4$ 7 $x=2, y=4$ 8 x $y=4$ 9 $x=7, y=-\frac{1}{3}$ 10 $x=-19, y=46$ 11 $x=3, y=-\frac{1}{5}$ 12 $x=1, y=2$ 13 $x=9, y=1$ 14 $a=9, b=-5$ 15 $x=2, y=8$

PAGE 47 1 a 5 units b 10 units c $2\sqrt{10}$ units d $4\sqrt{5}$ units e 5 units f $2\sqrt{5}$ units 2 a $AB=3$ units, $BC=4$ units, $CA=5$ unit; Yes rt $\angle$d $\triangle$ b $AB=2\sqrt{5}$ units, $BC=\sqrt{53}$ units, $CA=\sqrt{34}$ units; No it is not a rt $\angle$d $\triangle$ 3 a $\sqrt{41}$ units, 41 b $\left(5+6\sqrt{2}+\sqrt{29}\right)$ units

PAGE 48 1 a $(0,6)$ b $(2,6)$ c $(-2,1)$ d $(4,4)$ e $(4,0)$ f $(0,4)$ g $(2,-3)$ h $(6,2)$ i $(3,7)$ j $(4,6)$ k $(0,0)$ l $(0,0)$ 2 $(2,6), (4\frac{1}{2},2), (\frac{1}{2},1)$ 3 a Midpoint of PR $(5,1\frac{1}{2})$, midpoint of QR $(9,4\frac{1}{2})$ b 5 units

PAGE 49 1 a $2x+3y-7=0$ b $x-y+9=0$ c $3x-2y-6=0$ d $3x-8y-5=0$ e $5x-y-8=0$ f $2x-y-1=0$ g $4x+y-$ h $8x-5y-7=0$ i $3x-y+4=0$ j $x-3y+3=0$ k $x-y+14=0$ l $9x-8y+3=0$ 2 a $y=2x+4$ b $y=-\frac{2}{5}x+7$ c $y=$ d $y=\frac{3}{8}x+\frac{9}{8}$ e $y=-3x$ f $y=7x-14$ g $y=-x+1$ h $y=3x-8$ i $y=3x-6$ j $y=-2x+7$ k $y=\frac{8}{7}x-\frac{10}{7}$ l $y=-3x$ 3 a $b=1$ b $m=7, b=-3$ c $m=1, b=5$ d $m=-2, b=3$ e $m=\frac{1}{2}, b=-2$ f $m=\frac{1}{4}, b=-1$ g $m=-\frac{1}{2}, b=-4$ h $m=-1, b=0$ 4 a $y=$ b $y=7x-2$ c $y=-x+4$ d $y=\frac{1}{2}x+3$ e $y=\frac{-4x}{3}+3$ f $y=2x+9$

PAGE 50 1 a

x	0	1	2
y	1	2	3

b

x	0	1	2
y	-1	1	3

c

x	0	1	2
y	3	7	11

d

x	0	1	2
y	2	$1\frac{1}{3}$	$\frac{2}{3}$

e

x	0	1	2
y	-4	$-3\frac{1}{2}$	-3

f

x	0	1	2
y	2	1	0

2 a

x	0	$-\frac{1}{2}$
y	1	0

b

x	0	-2
y	2	0

c

x	0	$\frac{2}{3}$
y	-2	0

d

x	0	3
y	3	0

3

4 $(0,1), (1,3), (-2,$

PAGE 51 1 a -12 b $1\frac{1}{2}$ c $-\frac{2}{3}$ d $\frac{1}{3}$ e $-\frac{1}{6}$ f $-\frac{1}{2}$ g $3\frac{1}{2}$ h 3 i $\frac{2}{5}$ j -1 k $-\frac{2}{5}$ l $1\frac{1}{2}$ 2 $\frac{5+1}{-1-1}=\frac{-7-5}{3+1}=\frac{-7+1}{3-1}$ 3 b and c 4 m of $AB = m$ of $CD = \frac{-4}{3}$ and m of $BC = m$ of $DA = \frac{3}{4}$

PAGE 52 1 a $2x-y-2=0$ b $x+y-4=0$ c $2x-y=0$ d $2x+y-7=0$ e $x-y+3=0$ f $4x-y=0$ g $x-2y+16=0$ h $x-4y+2=0$ i $4x-y-6=0$ j $2x-y-3=0$ k $2x+y+5=0$ l $3x-y-5=0$ 2 $2x-y-7=0$ 3 $3x-y-4=0$

PAGE 53 1 a $x-y+1=0$ b $2x-y+1=0$ c $7x-2y+11=0$ d $y=4$ e $8x-5y=0$ f $x-y=0$ g $x-2y+7=0$ h $4x-y-$ i $x-y+1=0$ j $x+2y-11=0$ k $3x+y-10=0$ l $x-2y=0$ 2 $2x-y+3=0; 0-3+3=0$ 3 $3x-2y=0$

PAGE 54 1 a yes b no c yes d yes e yes f yes g yes h no 2 a no b yes c no d yes e no f yes g no h yes 3 a p: b parallel c neither d perpendicular e perpendicular f neither g parallel h neither 4 a $3x-y-1=0$ b $4x-5y=0$ c $x-2y+$ d $x+y+1=0$