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INTERNATIONAL GCSE

Mathematics (Specification B) (9-1)

SAMPLE ASSESSMENT MATERIALS

Pearson Edexcel International GCSE in Mathematics (Specification B) (4MB1)

For first teaching September 2016
First examination June 2018

Pearson

Edexcel, BTEC and LCCI qualifications

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Acknowledgements

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Contents

Introduction

The Pearson Edexcel International GCSE in Mathematics (Specification B) is designed for use in schools and colleges. It is part of a suite of International GCSE qualifications offered by Pearson.

These sample assessment materials have been developed to support this qualification and will be used as the benchmark to develop the assessment students will take.

General marking guidance

These notes offer general guidance, but the specific notes for examiners appertaining to individual questions take precedence.

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

Guidance on the use of abbreviations

M	method mark awarded for a correct method or partial method
B	unconditional accuracy mark (no method needed)
A	accuracy mark (awarded after a correct method or process; if no method or process is seen then full marks for the question are implied but see individual mark schemes for more details)
oe	or equivalent
cao	correct answer only
ft	follow through (when appropriate as per mark scheme)
sc	special case
dep	dependent (on a previous mark)
indep	independent
awrt	answer which rounds to
isw	ignore subsequent working
ee	each error
oo	or omission
cc	correct conclusion
ncc	not corrected correctly
dp	decimal place

Write your name here

Surname	Other names

Pearson Edexcel
International GCSE

Centre Number | | | | | |

Candidate Number | | | | |

Mathematics B

Level 2
Paper 1

Sample assessment material for first teaching September 2016
Time: 1 hour 30 minutes

Paper Reference
4MB1/01

You must have:
Ruler graduated in centimetres and millimetres, protractor, compasses, pen, HB pencil, eraser, calculator. Tracing paper may be used.

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
  – *there may be more space than you need.*
- **Calculators may be used.**

Information

- The total mark for this paper is 100.
- 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.
- Check your answers if you have time at the end.
- Without sufficient working, correct answers may be awarded no marks.

Turn over ▶

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S 5 1 8 3 4 A 0 1 2 0

PEARSON

Answer ALL TWENTY EIGHT questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

1 Express $22\frac{1}{2}$ minutes as a percentage of one hour.

.....

(Total for Question 1 is 2 marks)

2 Without using a calculator and showing all your working, work out

$$3\frac{1}{8} \div 4\frac{1}{10}$$

Give your answer as a fraction in its simplest form.

.....

(Total for Question 2 is 2 marks)

3 Solve $\frac{2x+5}{4} = 1$

$x =$ .....

(Total for Question 3 is 2 marks)

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

4 Find the highest common factor (HCF) of 42, 84 and 154

HCF = ...

(Total for Question 4 is 2 marks)

5 The nth term of a sequence is given by $3n - 5$

Write down the first three terms of the sequence.

....., ..., ...

(Total for Question 5 is 2 marks)

6 (a) Write down the number of lines of symmetry of an isosceles triangle.

.....

(1)

(b) Write down the order of rotational symmetry of the capital letter H.

.....

(1)

(Total for Question 6 is 2 marks)

7 The point A has co-ordinates $(3, -4)$, with respect to the origin O.

The point C is such that $\overrightarrow{AC} = \begin{pmatrix} -5 \\ 7 \end{pmatrix}$

Express, as a column vector, the position vector of C.

$\begin{pmatrix} \quad \\ \quad \end{pmatrix}$

(Total for Question 7 is 2 marks)

8 The lengths of the sides of a rectangle, measured to the nearest 10 mm, are 90 mm and 40 mm.

Find the smallest possible perimeter, in mm, of the rectangle.

..... mm

(Total for Question 8 is 2 marks)

9 A fair 6-sided red dice and a fair 6-sided blue dice are rolled. The score on the red dice and the score on the blue dice are added together to get the total.

Given that the score on the red dice is 1, find the probability that the total is **less than 4**

.....

(Total for Question 9 is 2 marks)

10 $\left(\sqrt{x} + \sqrt{3}\right)^2 = y + 6\sqrt{2}$ where x and y are positive integers.

Find the value of x and the value of y.

$x =$ ....., $y =$ .....

(Total for Question 10 is 3 marks)

11 $\mathscr{E} = \{a, b, c, d, e, f, g, h, i, j\}$

$A = \{a, b, e, f\}$

$B = \{b, c, d, e, g, h\}$

$C = \{e, f, g, h, i, j\}$

Write down the elements of

(a) $A \cap B \cap C$

.....

(1)

(b) $(A \cup B)'$

.....

(1)

(c) $A' \cap C$

.....

(1)

(Total for Question 11 is 3 marks)

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DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

12 The heights of two similar cylinders are in the ratio 58 : 2

The volume of the larger cylinder is 500 cm^3

Find the volume of the smaller cylinder.

..... cm^3

(Total for Question 12 is 3 marks)

13 The straight line **L** has equation $3y = x - 4$

(a) Find the gradient of **L**.

.....

(2)

(b) Find the intercept of **L** on the y-axis.

.....

(1)

(Total for Question 13 is 3 marks)

14 The probability that a train arrives on time at a station is 0.76

Mary has a list of all the trains that are due to arrive at the station on Monday. She picks, at random, a train from this list.

(a) Write down the probability that this train **will not** arrive on time at the station on Monday.

.....

(1)

600 trains arrive at this station on Monday.

(b) Work out an estimate for the number of trains that **do** arrive on time at this station on Monday.

.....

(2)

(Total for Question 14 is 3 marks)

15 Find an equation of the straight line that passes through the points with co-ordinates (1, 4) and (–2, –5).

.....

(Total for Question 15 is 3 marks)

16

$$\mathbf{A} = \begin{pmatrix} 3 & -1 \\ 1 & 2 \end{pmatrix} \qquad \mathbf{B} = \begin{pmatrix} -4 & 2 \\ -3 & -1 \end{pmatrix}$$

Find

(a) $4\mathbf{A} - 3\mathbf{B}$

$\begin{pmatrix} & \\ & \end{pmatrix}$

(2)

(b) $\mathbf{AB}$

$\begin{pmatrix} & \\ & \end{pmatrix}$

(2)

(Total for Question 16 is 4 marks)

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

17

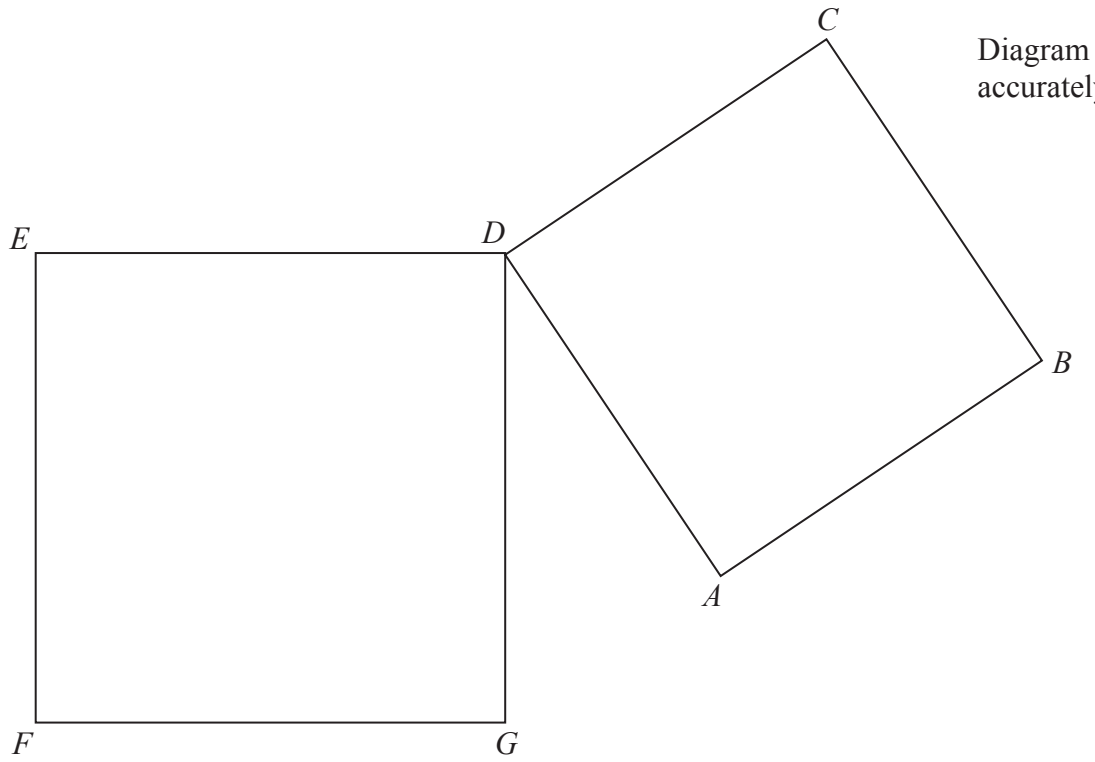


Diagram **NOT** accurately drawn

ABCD and *DEFG* are squares that are not identical.

Prove that $AE = CG$

(Total for Question 17 is 4 marks)

18 Solve the simultaneous equations

$$2x - y = 2$$
$$x + 3y = 15$$

$x =$ ..... , $y =$ .....

(Total for Question 18 is 4 marks)

19 y varies directly as the square root of x.

$y = 52$ when $x = 169$

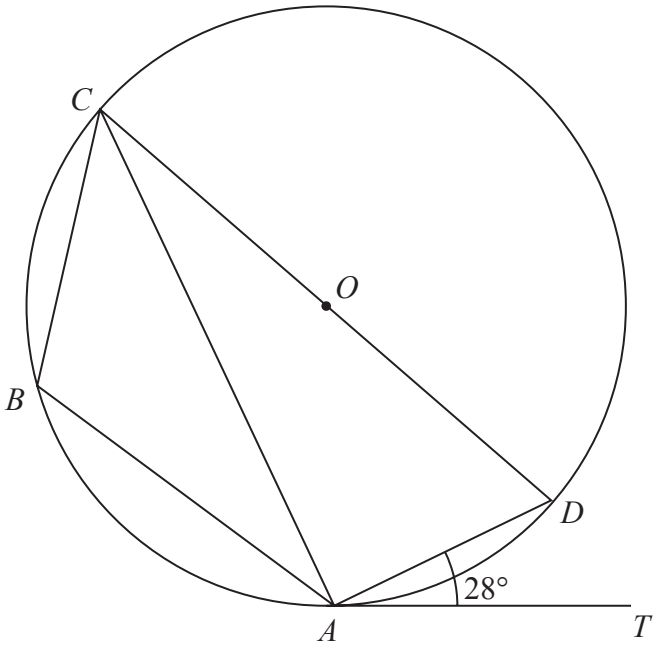
Find the value of x when $y = 68$

$x =$ .....

(Total for Question 19 is 4 marks)

20

Diagram **NOT** accurately drawn



ABCD is a quadrilateral so that the points *A*, *B*, *C* and *D* lie on a circle, centre *O*, with *COD* a diameter.
AT is the tangent to the circle at *A* and $\angle DAT = 28°$

Find the size, in degrees, of

(a) $\angle CDA$,

.....°

(3)

(b) $\angle CBA$.

.....°

(1)

(Total for Question 20 is 4 marks)

DO NOT WRITE IN THIS AREA

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DO NOT WRITE IN THIS AREA

21 x, y and n are three consecutive **even** numbers.

(a) Write down expressions for x and y in terms of n.

$x =$ ....., $y =$ .....

(1)

(b) Hence, show that the sum of three consecutive even numbers is a multiple of 6

(2)

(c) Find three consecutive positive even numbers whose sum is a square number.

.....

(1)

(Total for Question 21 is 4 marks)

22

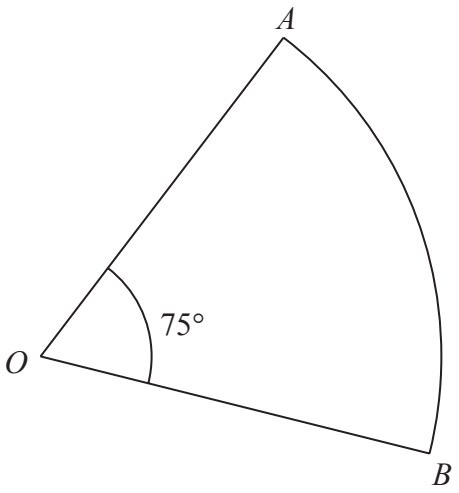

Diagram **NOT** accurately drawn

AOB is a sector of a circle, centre *O*, with $\angle AOB = 75°$
The area of the sector is 200 cm^2

Find, to 3 significant figures,

(a) the radius, in cm, of the circle,

.....cm

(2)

(b) the length, in cm, of the perimeter of the sector.

.....cm

(3)

(Total for Question 22 is 5 marks)

23 A student waits at a bus stop each day for the school bus.

Here are the number of minutes the student waited each day for nine days

6 4 11 9 4 5 6 5 4

(a) Write down the mode.

.....minutes

(1)

(b) Find the median.

.....minutes

(2)

(c) Work out the mean.

.....minutes

(2)

(Total for Question 23 is 5 marks)

24

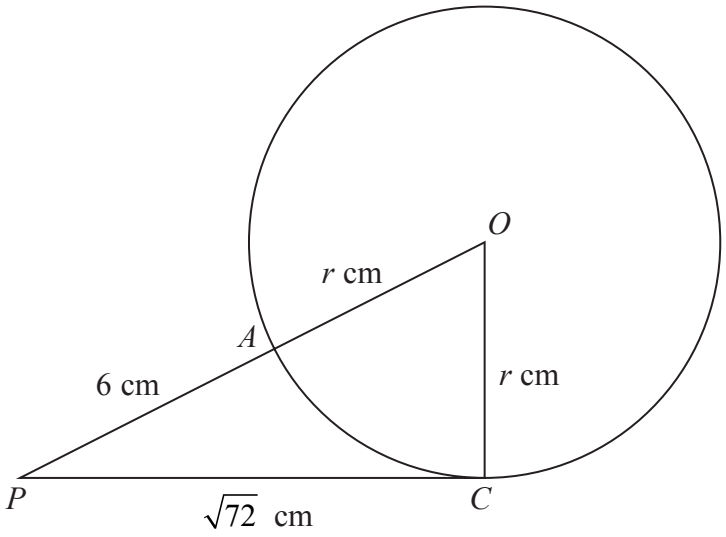

Diagram **NOT** accurately drawn

A and C are two points on the circumference of a circle centre O and radius r cm.

The point P is such that PC is a tangent to the circle and PAO is a straight line.

Given that $PC = \sqrt{72}$ cm and $PA = 6$ cm,

(a) write down an equation in r,

.....

(1)

(b) find the value of r,

$r =$ .....

(2)

(c) find the size, in degrees to 3 significant figures, of $\angle OPC$.

..... °

(2)

(Total for Question 24 is 5 marks)

DO NOT WRITE IN THIS AREA

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DO NOT WRITE IN THIS AREA

25 A rocket, R, is launched from horizontal ground.

The rocket moves vertically so that at time t seconds, the height, h metres, of R above the ground is given by

$$h = 90t + 14t^2 - t^3 \qquad 0 \leqslant t \leqslant 18$$

At time t seconds, the velocity of R is v m/s.

(a) Find an expression for v in terms of t.

$v =$ .....

(2)

(b) Find the time, in seconds, when R is instantaneously at rest.

Give your answer to 3 significant figures.

..... seconds

(4)

(Total for Question 25 is 6 marks)

26 (a) Use the factor theorem to show that $(2x + 3)$ is a factor of $2x^3 - 3x^2 - 17x - 12$

(2)

(b) Hence, factorise completely $2x^3 - 3x^2 - 17x - 12$

(4)

(Total for Question 26 is 6 marks)

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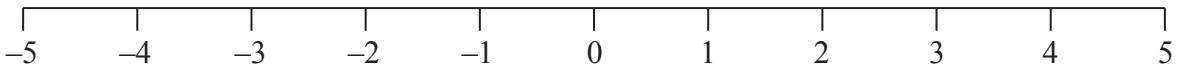
DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

27 (a) Solve the inequality $x^2 - x - 6 < 0$

(4)

(b) On the number line below represent your answer to part (a).



(2)

(Total for Question 27 is 6 marks)

28

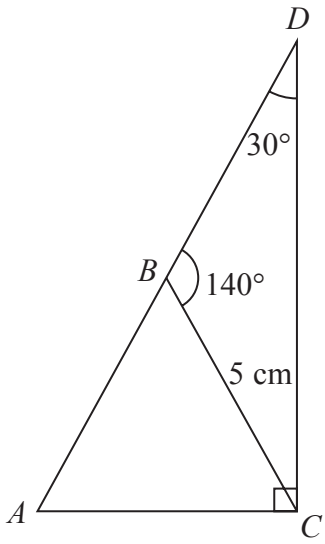


Diagram **NOT** accurately drawn

The diagram shows ΔBDC in which $BC = 5$ cm, $\angle BDC = 30°$ and $\angle CBD = 140°$

(a) Calculate the length, in cm to 3 significant figures, of DC.

.....cm

(3)

The line DB is extended to the point A so that the line AC is perpendicular to DC as shown in the diagram.

(b) Calculate the area, in cm^2 to 3 significant figures, of ΔABC.

.....cm

(4)

(Total for Question 28 is 7 marks)

TOTAL FOR PAPER IS 100 MARKS

International GCSE in Mathematics B - Paper 1 mark scheme

Question	Working	Answer	Mark	AO	Sub-total	Total
1	$\frac{22.5}{60}\times 100$	37.5(%)	M1 A1	1.1		**2**
2	$\frac{25}{8}\times\frac{10}{41}$ or $3.125 \div 4.1$ **N.B.** No working scores M0 A0	$\frac{125}{164}$ (cao)	M1 A1	1.1		**2**
3	$\frac{1}{2}x = 1 - 1.25$ or $2x = 4\times 1 - 5$	$-\frac{1}{2}$	M1 A1	1.3		**2**
4	$42 = 2 \times 3 \times 7$ $84 = 2 \times 2 \times 3 \times 7$ $154 = 2 \times 7 \times 11$ Prime factors of two of 42, 84 and 154 or $42 = 3 \times 14$ $84 = 6 \times 14$ $154 = 11 \times 14$ Two of above or Attempt at factor tree for two of the numbers	HCF = 14	M1 A1	1.1		**2**

Question	Working	Answer	Mark	AO	Sub-total	Total
5		–2, 1, 4	B2 (–1 eeoo)	1.3		**2**
6(a)		1	B1	2.6	1	
6(b)		2	B1		1	**2**
7	$\overrightarrow{OC} = \begin{pmatrix} 3 \\ -4 \end{pmatrix} + \begin{pmatrix} -5 \\ 7 \end{pmatrix}$	$\begin{pmatrix} -2 \\ 3 \end{pmatrix}$	M1 A1	2.8		**2**
8	85 mm or 35 mm	240	M1 A1	1.1 2.7		**2**
9	P(1, 1) + P(1, 2) = $\frac{1}{6} + \frac{1}{6}$ (oe)	$\frac{2}{6}$, $\frac{1}{3}$, 0.333, 33.3%	M1 A1	3.10		**2**
10	$x + 3 + 2\sqrt{3x} = y + 6\sqrt{2}$ $\sqrt{3x} = 3\sqrt{2}$	$x = 6, y = 9$	M1 M1 (DEP) A1	1.3		**3**
11(a)		*e*	B1	1.2	1	
11(b)		*i, j*	B1		1	
11(c)		*g, h, i, j*	B1		1	**3**

Question	Working	Answer	Mark	AO	Sub-total	Total
12	$\left(\frac{2}{5}\right)^3$ or $\left(\frac{5}{2}\right)^3$ seen **N.B.** accept ratio or decimal form $\frac{500}{V}=\left(\frac{5}{2}\right)^3$ (oe) (or $\sqrt[3]{500}$ seen $\left(\frac{2}{5}\times\sqrt[3]{500}\right)^3$ (oe))	 32 (cao)	B1 M1 (B1) (M1) A1	2.6		**3**
13 **(a)** **(b)**	$y=\frac{x-4}{3}$ **N.B.** The M marks is awarded once only	 $(m=)\frac{1}{3}$ $-\frac{4}{3}$	M1 A1 A1	1.4	 2 1	 **3**
14(a) **14(b)**	 0.76×600	$0.24, \frac{6}{25}, 24\%$ 456	 B1 M1 A1	 3.10	 1 2	 **3**

Question	Working	Answer	Mark	AO	Sub-total	Total
15	$\frac{y-4}{x-1}=\frac{-5-4}{-2-1}$ (oe) $y-4=(3)(x-1)$ (oe, removing denominators)	$y=3x+1$	M1 M1 DEP A1	1.4		**3**
16(a)		$\begin{pmatrix}24 & -10\\ 13 & 11\end{pmatrix}$	B2 (–1eeoo)	1.5	2	
16(b)		$\begin{pmatrix}-9 & 7\\ -10 & 0\end{pmatrix}$	B2 (–1eeoo)		2	**4**
17	$\begin{pmatrix}\because \angle EDG=\angle ADC=90^\circ\\ \text{and } \because \angle ADG \text{ is common}\end{pmatrix}$ $\angle EDA=\angle CDG$ $\therefore \Delta s \frac{EDA}{GDC}$ are congruent (SAS) Hence $AE=CG$ Two reasons (those in brackets above)	(cc)	 B1 B1 B1 B1	2.6		**4**

Question	Working	Answer	Mark	AO	Sub-total	Total
18	Rearranging st coefficient of x or y is the same in both equations or isolating x or y Subtract or adding equations or substituting expression for x or y to obtain y or x **N.B.** Allow a total of 1 slip in both M marks.	 $x = 3$ $y = 4$	M1 M1 DEP A1 A1	1.3		**4**
19	$52 = k\sqrt{169}$ (oe) $x = \left(\frac{68}{"4"}\right)^2$ (or $52 = k\sqrt{169}$ and $68 = k\sqrt{x}$ $\frac{\sqrt{x}}{\sqrt{169}} = \frac{\sqrt{x}}{13} = \frac{68}{52}$ (oe)) **N.B.** Just seeing above line without sight of the first line earns both M marks	$k = 4$ (oe, can be implied) $\left(\sqrt{x} = \frac{68}{4} \text{ (oe)}\right)$ x =289 (cao)	M1 A1 M1 DEP (M1) (M1 DEP) (A1) A1	1.4		**4**

Question	Working	Answer	Mark	AO	Sub-total	Total
20(a)	$\angle CAD = 90^\circ$, $\angle ACD = 28^\circ$	62	B1, B1 B1	2.6	3	
20(b)		118	B1 ft		1	**4**
21(a)		$x = n - 4, y = n - 2$	B1	1.3	1	
21(b)	$3n - 6$ n even $\therefore$ $3n - 6$ is divisible by 6	(cc)	M1 A1	1.1	2	
21(c)		10, 12, 14 (oe)	B1		1	**4**
22(a)	$\frac{75}{360} \times r^2 \times \pi = 200$	17.5 (17.48077…)	M1 A1	2.7 1.3	2	
22(b)	$\frac{75}{360} \times 2 \times \pi \times '17.5'$ $+2 \times '17.5'$	57.9 (57.84678…)	M1 M1 DEP A1	2.7	3	**5**

Question	Working	Answer	Mark	AO	Sub-total	Total
23(a)		4	B1	3.10	1	
23(b)	Rearranging the number of minutes in order		M1			
		5	A1		2	
23(c)	$\frac{6+4+11+9+4+5+6+5+4}{9}$		M1			
	$\left(=\frac{54}{9}\right)$	6	A1		2	**5**
24(a)	$(r+6)^2 = r^2+72$		B1	2.6	1	
	or $r=\sqrt{(r+6)^2-\left(\sqrt{72}\right)^2}$					
	or $6\times(6+2r)=72$ (oe)					
24(b)	$r^2+12r+36=r^2+72$ (oe)		M1	1.3		
	or $36+12r=72$	$r=3$ (cao)	A1	1.3	2	
24(c)	$\sin\angle OPC=\frac{'3'}{'3'+6}$ (oe)		M1	2.9		
		$\angle OPC = 90°$	A1	2.9	2	**5**

Question	Working	Answer	Mark	AO	Sub-total	Total
25(a)	$90 + 28t - 3t^2$ (2 terms correct)		M1	1.4		
		(cao)	A1	1.4	2	
25(b)	'$90 + 28t - 3t^2$' $= 0$ (oe)		M1	1.4		
	$\frac{+28 \pm \sqrt{(-28)^2 - 4\times(3)\times(-90)}}{2\times 3}$ (Solving 3 term quadratic)		M1 DEP	1.3		
	$\sqrt{1864}$, 43.17		B1	1.3		
		awrt 11.9	A1	1.4	4	**6**
26(a)	$2\times(-1.5)^3 - 3\times(-1.5)^2 - 17\times(-1.5) - 12$ (substitute)		M1	1.3		
		$= 0$	A1		2	
26(b)	$x^2 - 3x$		M1			
		$x^2 - 3x - 4$	A1			
	$(x-4)(x+1)$ (solving trinomial quadratic)		M1 INDEP			
		$(2x+3)(x-4)(x+1)$	A1		4	**6**

Question	Working	Answer	Mark	AO	Sub-total	Total
27(a)	Rewriting (or solving) $x^2 - x - 6 < 0$ as $(x-3)(x+2)$ (solving trinomial quadratic marking rules)		M1	1.3		
		$x = 3$ and $x = -2$	A1			
		$x < 3$ $x > -2$ (or $-2<x<3$)	A1ft A1ft (A2 ft)		4	
27(b)	Open circles at '$x = -2$ and $x = 3$' Line joining '$x = -2$ and $x = 3$'		B1 ft B1 ft		2	**6**
28(a)	**Penalise ncc ONCE only in question** $\frac{5}{\sin 30} = \frac{CD}{\sin 140}$		M1	2.9		
	$CD = \frac{5 \times \sin 140}{\sin 30}$		M1 DEP			
		6.43	A1		3	
28(b)	$\frac{AC}{'6.428'} = \tan 30 \quad (AC = 3.711)$		M1	2.9		
	$\angle BCA = 80^\circ$		M1	2.6		
	$\Delta ABC = \frac{1}{2} \times 'AC' \times 5 \times \sin '80'$		M1 DEP			
		9.14	A1	2.7	4	**7**

Write your name here

Surname	Other names

Pearson Edexcel
International GCSE

Centre Number | | | | | |

Candidate Number | | | | |

Mathematics B

Level 2
Paper 2

Sample assessment material for first teaching September 2016
Time: 2 hours 30 minutes

Paper Reference
4MB1/02

You must have:
Ruler graduated in centimetres and millimetres, protractor, compasses, pen, HB pencil, eraser, calculator. Tracing paper may be used.

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
  – *there may be more space than you need.*
- **Calculators may be used.**

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Advice

- Read each question carefully before you start to answer it.
- Check your answers if you have time at the end.
- Without sufficient working, correct answers may be awarded no marks.

Turn over ▶

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S 5 1 8 3 5 A 0 1 2 0

PEARSON

Answer ALL ELEVEN questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

1 Watches are sold in a shop for £80 each.

The watchmaker is paid 65% of this selling price for each of the first 100 watches sold.

He is paid 55% of the selling price for each of the next 50 watches sold and 45% of the selling price for each of any other watches that are sold.

One week 280 watches were sold.

Calculate the total amount, in £, that the watchmaker is paid for these watches.

(Total for Question 1 is 4 marks)

2 (a) Factorise $4x^2 - 25y^2$

(2)

(b) Simplify completely $\dfrac{x^2 - 11x + 24}{x + 5} \div \dfrac{x - 3}{2x^2 + 7x - 15}$

(5)

(Total for Question 2 is 7 marks)

3 On one day, 90 customers bought food at a supermarket.

All 90 customers bought at least one of soup (S), milk (M) and bread (B).

10 customers bought soup only.

45 customers bought milk only.

8 customers bought bread only.

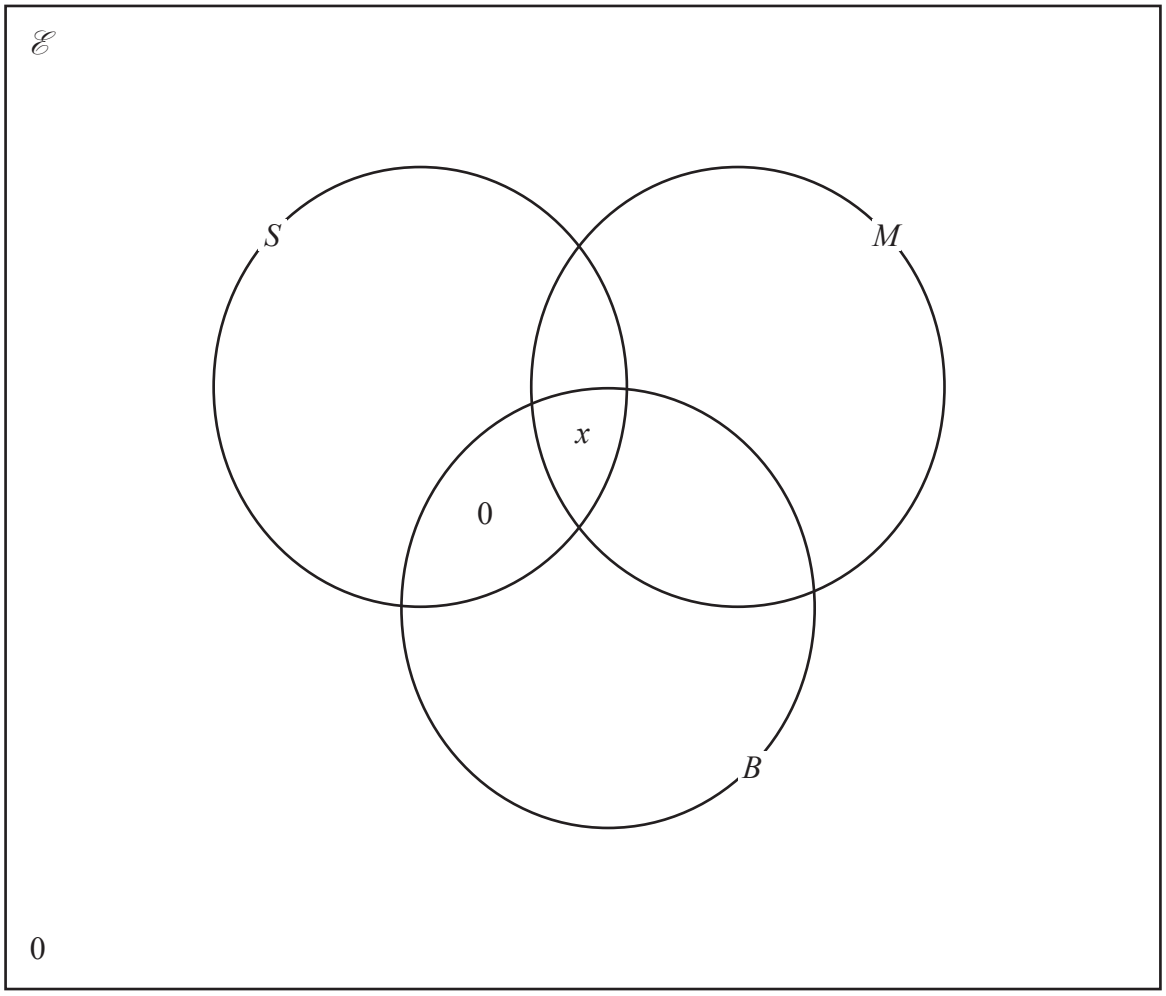
25 customers bought soup and milk.

13 customers bought milk and bread.

No customers bought soup and bread only.

x customers bought soup, milk and bread.

(a) Show all this information in the Venn diagram.



(2)

Question 3 continued

(b) Use the information in the Venn diagram to write down an equation in x.

(1)

(c) Hence find the value of x.

(1)

(d) Find

(i) n(S)

(ii) n($[M \cup B] \cap S'$)

(2)

(Total for Question 3 is 6 marks)

4 The curve C has the equation $y = 6 - x - 2x^2$

(a) Show that the co-ordinates of the stationary point of C are $\left(-\frac{1}{4},\ 6\frac{1}{8}\right)$

(4)

(b) (i) Find the gradient of the curve C at the points where $x = -1$ and $x = 0$

(ii) hence, or otherwise, explain why the stationary point of C is a maximum.

(2)

(Total for Question 4 is 6 marks)

5 Solve the simultaneous equations

$$x^2 + y^2 = 5$$
$$x + 1 = y$$

Show clear algebraic working.

(Total for Question 5 is 6 marks)

6 The distance from Manchester to Northampton is 160 km.

A motorist starts from Manchester at 9 00 a.m. and travels towards Northampton at a constant speed of 64 km/h until she arrives at Bradford, which is 48 km from Manchester.

At Bradford she rests for 24 minutes before continuing her journey at a constant speed to arrive at Northampton at 11 45 a.m.

(a) Using the grid on the next page, draw a graph to represent the motorist's journey.

(3)

(b) Calculate the motorist's speed, in km/h, for her journey from Bradford to Northampton.

(2)

At 9 30 a.m. a second motorist starts from Northampton to journey to Manchester on the same road as the first motorist.

The second motorist travels at a constant speed of 80 km/h.

(c) Draw, on the same grid, a straight line to represent the second motorist's journey.

(2)

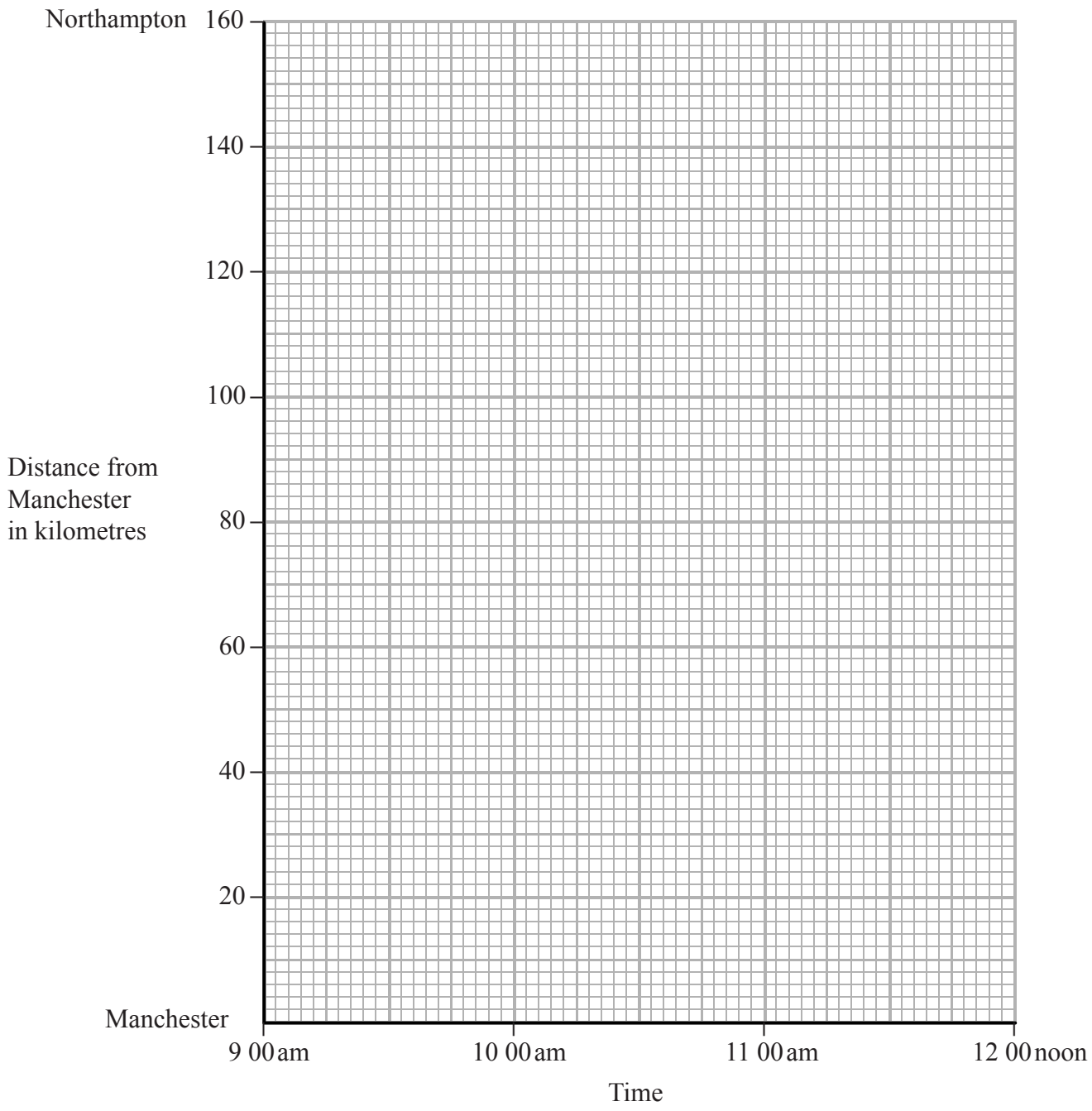
(d) Using your graph, write down

(i) the time at which two motorists meet,

(ii) how far both motorists are from Bradford when they meet.

(2)

Question 6 continued



(Total for Question 6 is 9 marks)

7

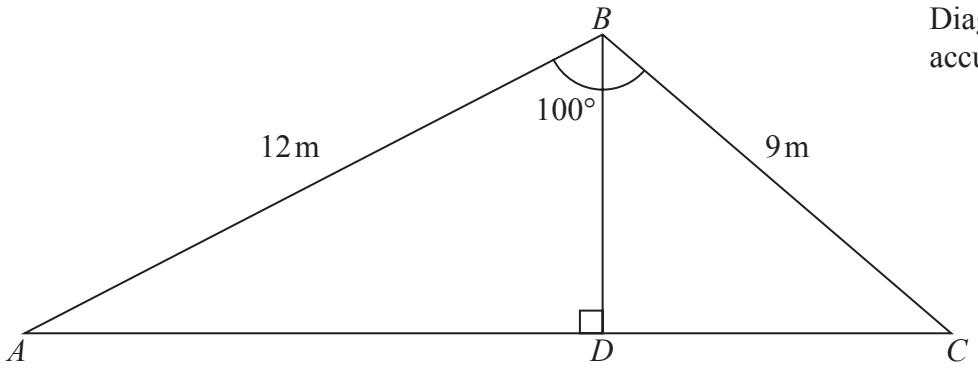


Diagram **NOT** accurately drawn

Figure 1

A, *B* and *C* are three points on horizontal ground such that $AB = 12$ m, $BC = 9$ m and $\angle ABC = 100°$ as shown in Figure 1.

Calculate to 3 significant figures,

(a) the length, in m, of *AC*,

(3)

(b) the size, in degrees, of $\angle CAB$.

(3)

D is the point on *AC* such that *BD* is perpendicular to *AC*.

(c) Calculate the area, in m^2 to 2 significant figures, of triangle *ABD*.

(3)

$$\left[\begin{array}{c}\text{Cosine rule: } a^2 = b^2 + c^2 - 2bc\cos A \\ \text{Sine rule: } \frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C} \\ \text{Area of triangle} = \frac{1}{2}ab\sin C\end{array}\right]$$

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Question 7 continued

(Total for Question 7 is 9 marks)

8 Part of the curve with equation $y = x^2 - 6x + 5$ is drawn on the grid.

(a) For $y = -2x^2 + \frac{21}{2}x - 10$ complete the table, giving your answers to 2 decimal places where necessary.

x	1	1.5	2	2.5	3	3.5	4	5
y	−1.5		3		3.5		0	−7.5

(3)

(b) On the grid, plot the points from your completed table and join them to form a smooth curve.

(3)

(c) Use the two curves on the grid to find estimates for the solutions of the equation

$$3x^2 - \frac{33}{2}x + 15 = 0$$

(2)

The curve with equation $y = x^2 - 6x + 5$ intersects the curve with equation $y = -2x^2 + \frac{21}{2}x - 10$ at points A and B.

(d) Work out the gradient of the straight line through A and B.

(3)

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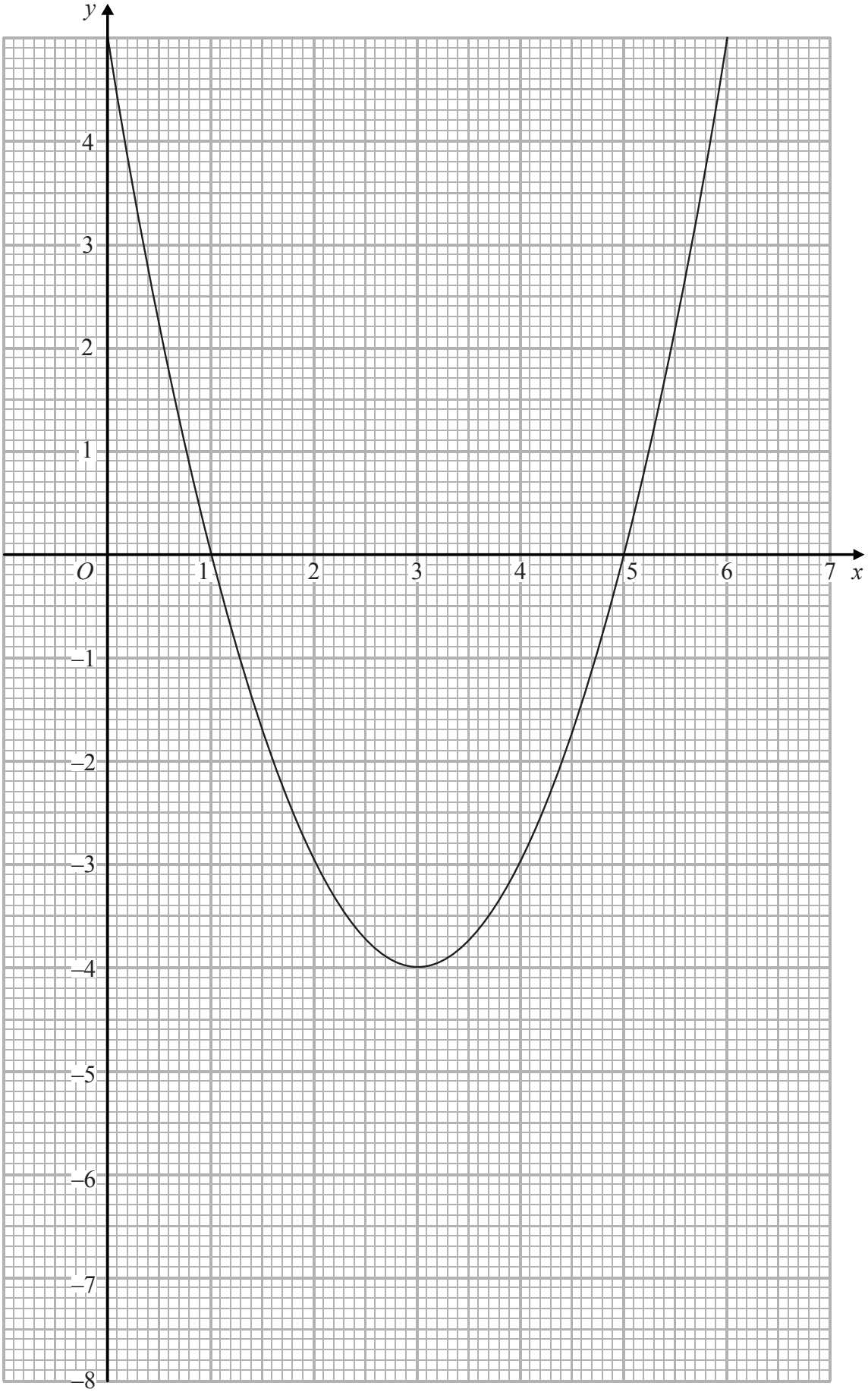


(Total for Question 8 is 11 marks)

9 Left-handed and right-handed people do a test. It is found that 80% of left-handed people pass the test and 90% of right-handed people pass the test.

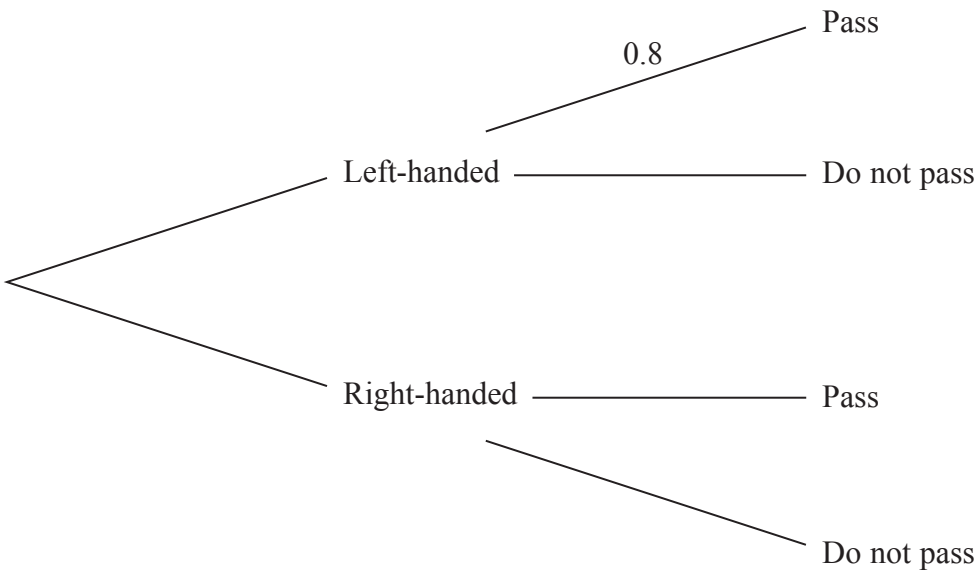
On the island of Sinestra, a fraction p of the population are left-handed and the remainder are right-handed.

A person on Sinestra is to be chosen at random to take the test.

(a) Write down the probability, in terms of p, that the person chosen is right-handed.

(1)

(b) Complete the probability tree diagram to show all the information.



(3)

On Sinestra the probability of passing the test is 5 times the probability of not passing the test.

(c) From your completed probability tree diagram, or otherwise, find the value of p.

(5)

A person on Sinestra is selected at random. Given that this person passed the test, use your answer to part (c) to

(d) determine the probability that this person is left-handed.

(3)

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Question 9 continued

(Total for Question 9 is 12 marks)

10 The vertices of triangle A are the points with coordinates (2, 6), (4, 2) and (6, 2).

(a) On the grid opposite, draw and label triangle A.

(1)

Triangle B is the image of triangle A under a reflection in the line with equation $y = -1$

(b) On the grid, draw and label the line with equation $y = -1$

(1)

(c) On the grid, draw and label triangle B.

(1)

Triangle B is transformed to triangle C by the enlargement with centre (0, –2) and scale factor $-\frac{1}{2}$

(d) On the grid, draw and label triangle C.

(3)

Triangle C is transformed to triangle D under the transformation with matrix **M** where

$$\mathbf{M} = \begin{pmatrix} -1 & 0 \\ 0 & 1 \end{pmatrix}$$

(e) On the grid, draw and label triangle D.

(3)

(f) Describe fully the transformation with matrix **M**.

(2)

(g) Describe fully the **single** transformation that maps triangle D onto triangle A.

(3)

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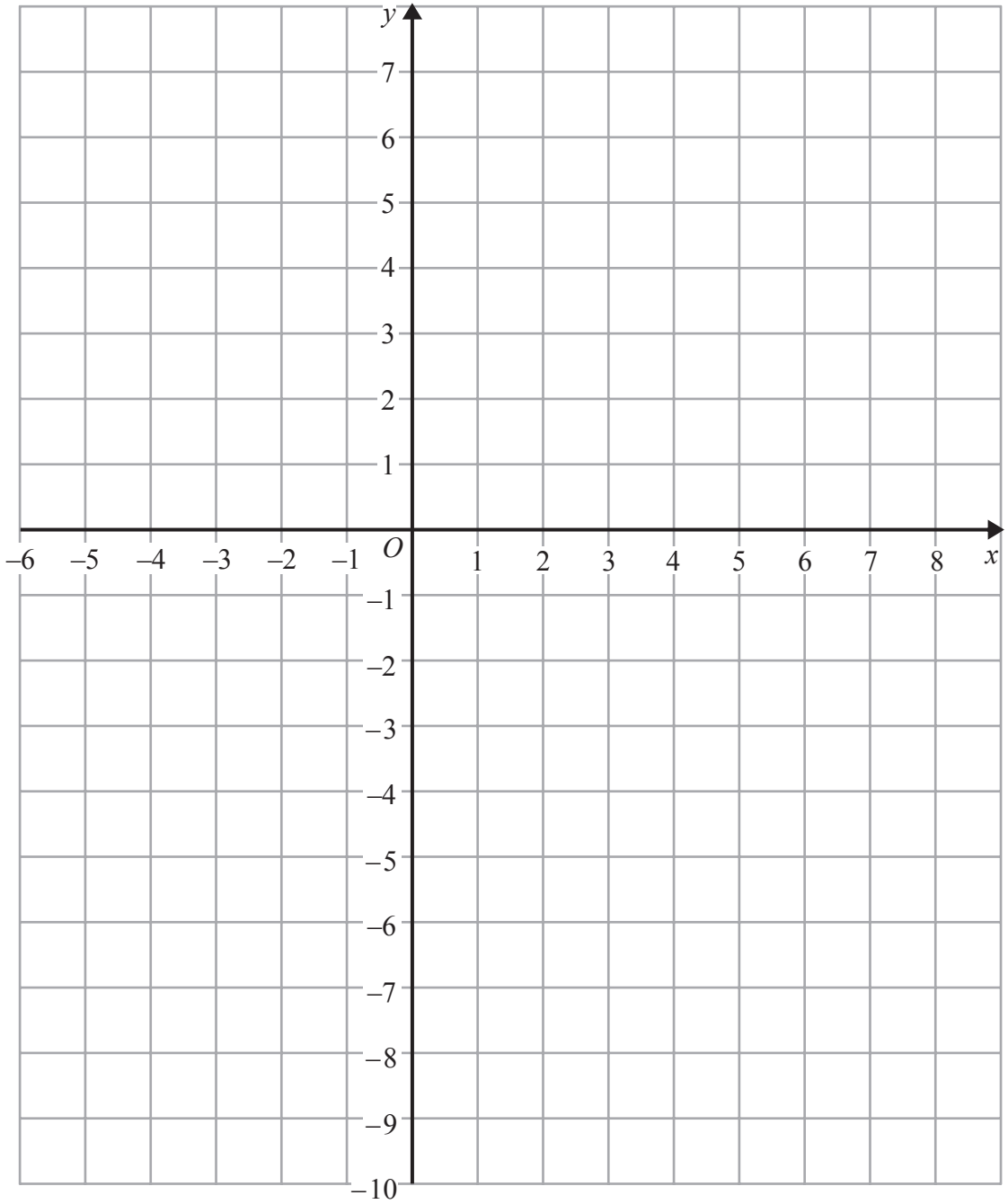
Question 10 continued



(Total for Question 10 is 14 marks)

11

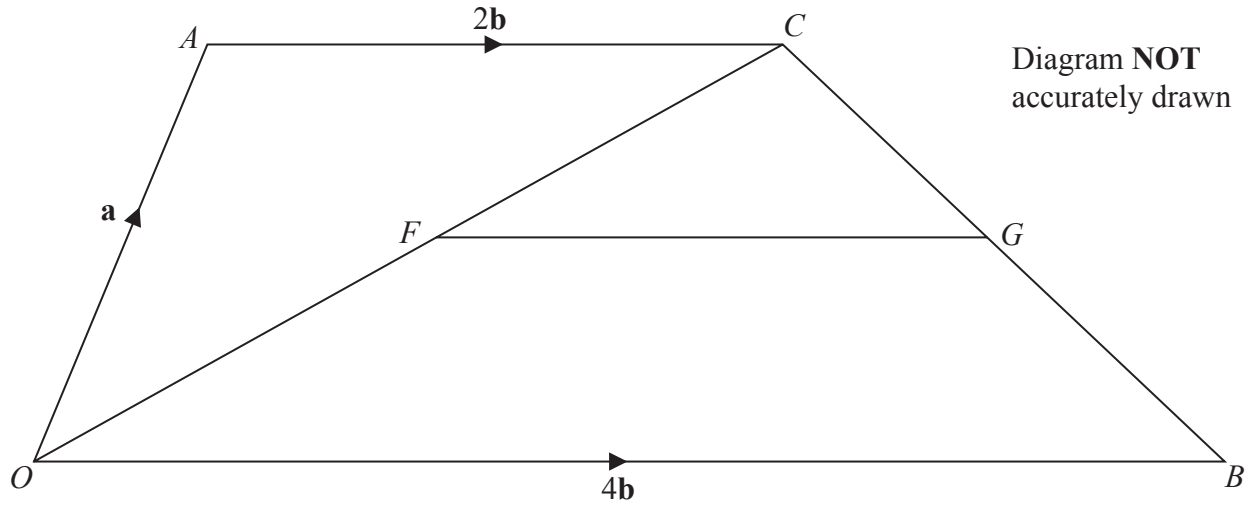


Diagram **NOT** accurately drawn

Figure 2

Figure 2 shows a quadrilateral $OACB$ where $\overrightarrow{OA} = \mathbf{a}$, $\overrightarrow{OB} = 4\mathbf{b}$ and $\overrightarrow{AC} = 2\mathbf{b}$
The point F on OC is such that $OF : OC = 2 : 5$
The point G on CB is such that $CG : CB = 3 : 5$

(a) Find, in terms of **a** and **b**,

(i) $\overrightarrow{OC}$,

(ii) $\overrightarrow{CG}$.

(4)

(b) (i) Show that $\overrightarrow{FG} = \lambda\mathbf{b}$, where λ is a constant.

(ii) Hence write down the value of λ.

(3)

(c) (i) Explain why ΔOCB is similar to ΔFCG.

(ii) Find the ratio (area of ΔOCB) : (area of ΔFCG) in the form $m : n$ where m and n are integers.

(4)

The area of ΔFCG is 18 cm^2

Calculate, in cm^2

(d) (i) the area of ΔOCB,

(ii) the area of $OACB$.

(5)

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Question 11 continued

Question 11 continued

(Total for Question 11 is 16 marks)

TOTAL FOR PAPER IS 100 MARKS

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International GCSE in Mathematics B - Paper 2 mark scheme

Question	Working	Answer	Mark	AO	Sub-total	Total
1	$\frac{65}{100}\times 80\times 100$ (=£5200) + $\frac{55}{100}\times 80\times 50$ (=£2200) $\frac{45}{100}\times 80\times (280-'150')$ (= £4680) '£5200' + '£2200' + '£4680' £12 080.00	£12 080.00	M1 M1 DEP M1 DEP A1	1.1		**4**
2(a)	$(2x-5y)(2x+5y)$ (at least one correct)	$(2x-5y)(2x+5y)$	M1 A1	1.3	2	
2(b)	$\frac{x^2-11x+24}{x+5}\times\frac{2x^2+7x-15}{x-3}$ Attempt at factorising a quadratic **NB:** For method, the two bracketed terms, when multiplied out, must give at least two of the three terms from the trinomial quadratic equation	$(x-8)(x-3)$ $(2x-3)(x+5)$ $(x-8)(2x-3)$	M1 M1 A1 A1 A1	1.3	5	**7**

Question	Working	Answer	Mark	AO	Sub-total	Total
3(a)		10, 45 and 8	B1	1.2		
		$25-x$, $13-x$	B1	1.2	2	
3(b)		c's six terms = 90	B1 ft	1.2	1	
3(c)		11 (cao and correctly obtained)	B1	1.3	1	
3(d)(i)		35 (cao)	B1	1.2		
3(d)(ii)	$66-'11'$ or $90-'35'$	55	B1 ft	1.2	2	**6**
4(a)						
	$\frac{dy}{dx}=-1-4x=0$ (1 term correct in a linear exp in x)		M1	1.4		
	Substitute 'x' in y.	$\therefore x=-\frac{1}{4}$	A1			
			M1			
		$\therefore y=6\frac{1}{8}$	A1		4	
4(b)(i)		$\frac{dy}{dx}(x=-1)=+3$, and $\frac{dy}{dx}(x=0)=-1$	B1			

Question	Working	Answer	Mark	AO	Sub-total	Total
4(b)(ii)	Since gradrients are +3, 0 and –1 at $x = -1$, $-\frac{1}{4}$ and 0 respectively, $\therefore \left(-\frac{1}{4}, 6\frac{1}{8}\right)$ is a maximum (cc)	(cc)	B1		2	**6**
5	$x^2 + (x+1)^2 = 5$ (substitute $y = x + 1$) $(x+2)(x-1) = 0$ (solving trinomial quadratic) Substituting $x = -2$ and $x = 1$ in $y = x + 1$ for the value of y) (or $(y-1)^2 + y^2 = 5$ (subst. $y = x + 1$) $(y-2)(y+1) = 0$ (solving trinomial quadratic) Substituting $y = 2$ and $y = -1$ in $y = x + 1$ for the value of x))	$x^2 + x - 2 = 0$ $x = -2$ and $x = 1$ ($y^2 - y - 2 = 0$) ($y = 2$ and $y = -1$) $x = -2, y = -1$ and $x = 1, y = 2$ (cc)	M1 A1 M1 INDEP A1 M1 DEP (M1) (A1) (M1) (A1) (M1 DEP) A1	1.3	6	**6**

Question	Working	Answer	Mark	AO	Sub-total	Total
6(a)	**N.B.** Second **B1 ft** is for a correct horizontal line, of correct length, drawn from the end of the first line segment. Third **B1 ft** is for their line, starting where their horizontal line finishes and terminates at Northampton at 11 : 45	each correct section of journey	B1,B1 ft, B1 ft	1.4	3	
6(b)	11 : 45 – '10:09' (96 minutes) **NB:** For method, the mark is awarded from 11 : 45 minus the start time from Bradford	70 km/h	M1 A1		2	
6(c)	**NB:** For **ft**, must finish at Manchester, 2 hours after leaving Northampton.	one straight line, correct starting point correct finishing point	B1 B1 ft		2	
6(d)(i) **6(d)(ii)**		10.33 (±2 min) 28 km (±1 km)	B1 ft B1 ft		2	**9**

Question	Working	Answer	Mark	AO	Sub-total	Total
7(a)	**Penalise not rounded correctly ONCE only in question** $AC^2 = 12^2 + 9^2 - 2\times12\times9\times\cos100$ $AC^2 = 225 + 37.5\ldots$		M1 M1 DEP	2.9		
		16.2m (16.2020…)	A1		3	
7(b)	$\frac{9}{\sin\angle CAB} = \frac{'16.2'}{\sin100}$ $\sin\angle CAB = \frac{9\times\sin100}{"16.2"}$ $(\text{or } 9^2 = 12^2 + "16.2"^2 - 2\times12\times"16.2"\times\cos\angle CAB$ $\cos\angle CAB = \frac{12^2 + "16.2"^2 - 9^2}{2\times12\times"16.2"})$		M1 M1 DEP (M1) (M1 DEP)	2.9		
		$\angle CAB = 33.2^o$ (33.164492…)	A1		3	
7(c)	$\sin"33.16" = \frac{BD}{12}\ \ (BD = 6.565)$ $\Delta ABD = \frac{1}{2}\times12\times"6.565"\times\sin\left(180-\left(90+"33.16"\right)\right)$ $(\text{or } \cos"33.16..." = \frac{AD}{12}\ \ (AD = 10.04524)$ $\Delta ABD = \frac{1}{2}\times12\times"10.04524"\times\sin\left("33.164492"\right))$		M1 M1 DEP (M1) (M1 DEP)	2.9 2.7 (2.9) (2.7) 2.7		
		$\Delta ABD = 32.97 \rightarrow$ 33 m^2	A1		3	**9**

Question	Working	Answer	Mark	AO	Sub-total	Total
8(a)		1.25, 3.75. 2.25	B1, B1, B1	1.4	3	
8(b)	Curve –1 mark for straight line segments each point missed each missed segment each point not plotted each point incorrectly plotted tramlines very poor curve	[–2.75, 0.25, 1.25] (oe)				
	N.B. Accuracy for both plotting and drawing is $\pm\frac{1}{2}ss$		B3 ft (–1 eeoo)		3	
8(c)		x = 1.15 (± 0.05) (from 'graph')	B1 ft			
		x = 4.35 (± 0.05) (from 'graph')	B1 ft		2	
	N.B. Accept (1.15, –2.18) B1 ft and (4.35, –0.57) B1 ft **SC:** 1.15 < x < 4.35 scores B1 B0					
8(d)	Reading off y values at x = '1.15' and '4.35' or choosing two points on AB and reading off the corresponding Δx and Δy		M1			
	gradient = $\frac{\Delta y}{\Delta x} = \frac{'(-2.18)' - '(-0.57)'}{'4.35' - '1.15'}$ ($\pm\frac{1}{2}ss$ for each coordinate element)		M1 DEP			
		gradient = –0.5 (+/–0.05 allowing $\pm\frac{1}{2}ss$) (cao)	A1		3	**11**

Question	Working	Answer	Mark	AO	Sub-total	Total
9(a)		$1-p$	B1	3.10	1	
9(b)		for each correct pair	B1 ft, B1, B1		3	
9(c)	P(pass) = 5 × (1 – P(pass))		M1			
	P(pass) = $\frac{5}{6}$		A1			
	awrt 0.838					
	P(pass)= '$\frac{5}{6}$' = one of $p\times'0.8'$ or $(1-p)\times'0.9'$		M1			
	P(pass)='$\frac{5}{6}$' = $p\times'0.8'+(1-p)\times'0.9'$		M1 DEP			
		$p=\frac{2}{3}$, 0.667	A1		5	
9(d)	any probability ÷ ('5/6')		M1			
	$\frac{\left('\frac{2}{3}'\times'0.8'\right)}{\left('\frac{5}{6}'\right)}$		M1 DEP			
		$\frac{48}{75}$ (oe), 0.64	A1		3	**12**

Question	Working	Answer	Mark	AO	Sub-total	Total
10(a)	**Penalise labelling ONCE only** Triangle A	triangle A drawn	B1	1.4	1	
10(b)		$y = -1$ drawn	B1	1.4	1	
10(c)		triangle B drawn	B1	2.8	1	
10(d)	At least two construction lines through (0, –2)		M1	2.8		
		triangle C drawn	A2 ft (–1 ee)	1.5	3	
10(e)	$\begin{pmatrix} -1 & 0 \\ 0 & 1 \end{pmatrix}$ " $\begin{pmatrix} -1 & -2 & -3 \\ 1 & -1 & -1 \end{pmatrix}$ "		M1	1.5		
		$\begin{pmatrix} 1 & 2 & 3 \\ 1 & -1 & -1 \end{pmatrix}$	A1 ft			
		triangle D drawn	A1		3	
10(f)		reflection $x = 0$ or y-axis	B1 B1	1.5	2	
10(g)	More than one transformation scores B0, B0, B0	enlargement scale factor 2 centre (0, –4)	B1 B1 B1	2.8	3	**14**

Question	Working	Answer	Mark	AO	Sub-total	Total
11(a)(i)		$\mathbf{a} + 2\mathbf{b}$	B1	2.8		
11(a)(ii)	$\overrightarrow{CB} = -$ (‘$\mathbf{a} + 2\mathbf{b}$’) $+ 4\mathbf{b}$		M1	2.8		
	$\overrightarrow{CG} = \frac{3}{5}$ ‘$(2\mathbf{b} - \mathbf{a})$’		M1	2.8		
		$\frac{3}{5}(2\mathbf{b} - \mathbf{a})$	A1	2.8	4	
11(b)(i)	$\overrightarrow{FG} = \frac{3}{5}$ ‘$(\mathbf{a} + 2\mathbf{b})$’ + ‘$\frac{3}{5}(2\mathbf{b} - \mathbf{a})$’		M1	2.8		
		$\overrightarrow{FG} = \frac{12}{5}\mathbf{b}$	A1	1.3		
11(b)(ii)		$\lambda = \frac{12}{5}$	B1 ft	2.8	3	
11(c)(i)	From given ratios and (b), $\Delta s\, FCG$ OCB are similar $\because \frac{FC}{OC} = \frac{CG}{CB} = \frac{FG}{OB} = \frac{3}{5}$ or give reasons for AAA or give reasons for SAS		M1	2.6		
		(cc)	A1	2.6		
11(c)(ii)	As $\Delta s\, FCG$ OCB are similar , $\therefore \lvert\Delta OCB\rvert : \lvert\Delta FCG\rvert = 5^2 : 3^2$		M1	2.6		

Question	Working	Answer	Mark	AO	Sub-total	Total
11(c)(ii) (cont'd)	**or** $\frac{\text{area V}OCB}{\text{area V}FCG} = \frac{\frac{1}{2}\times CO'\times CB'\times \sin C}{\frac{1}{2}\times CF'\times CG'\times \sin C}$ $= \frac{\frac{1}{2}\times CO'\times CB'\times \sin C}{\frac{1}{2}\times\frac{3}{5}CO'\times\frac{3}{5}CB'\times \sin C} = \frac{25}{9}$		(M1)	(2.7)		
		25 : 9	A1	2.7	4	
11(d)(i)	$\lvert\Delta OCB\rvert = \frac{25}{9}\times\lvert\Delta FCG\rvert = \frac{25}{9}\times 18$ (=50)	$\lvert\Delta OCB\rvert = 50$	M1	1.1		
			A1	1.1		
11(d)(ii)	$\lvert\Delta ACO\rvert = \frac{1}{2}\lvert\Delta OCB\rvert \quad (="25")$ $\left(\because \angle ACO = \angle COB \text{ and } \lvert AC\rvert = \frac{1}{2}\lvert OB\rvert\right)$		M1	2.7		
	$\therefore \lvert OACB\rvert = \lvert\Delta ACO\rvert + \lvert\Delta OCB\rvert = "25"+"50"$		M1 DEP	2.7		
		75 (cm^2) (cao)	A1	2.7	5	**16**

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