IGCSE

Mathematics (Specification B)

Edexcel IGCSE in Mathematics (Specification B) (4MB0)

First examination 2011

A PEARSON COMPANY

Contents

Introduction

These sample assessment materials have been prepared to support the specification.

The aim of these materials is to provide students and centres with a general impression and flavour of the actual question papers and mark schemes in advance of the first operational examinations.

Sample assessment papers

Paper Reference(s)

4MB0/01

Edexcel IGCSE

Mathematics B

Paper 1

Sample Assessment Material

Time: 1 hour 30 minutes

Materials required for examination
Ruler graduated in centimetres and millimetres, protractor, compasses, pen, HB pencil, eraser, calculator. Tracing paper may be used.

Items included with question papers
Nil

Instructions to Candidates

In the boxes above, write your centre number, candidate number, your surname, initials and signature.
Check that you have the correct question paper.
Answer ALL the questions in the spaces provided in this question paper.
If you need more space to complete your answer to any question, use additional answer sheets.

Information for Candidates

The marks for individual questions and the parts of questions are shown in round brackets: e.g. **(2)**.
Full marks may be obtained for answers to all questions.
There are 30 questions in this question paper. The total mark for this paper is 100.
There are 16 pages in this question paper. Any blank pages are indicated.
You may use a calculator.

Advice to Candidates

Show all stages in any calculations.
Work steadily through the paper. Do not spend too long on one question.
If you cannot answer a question, leave it and attempt the next one.
Return at the end to those you have left out.

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Turn over

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1. Richard Divers played Bobby Spinsky in a chess tournament. They played a total of 48 games. The results for these 48 games were:

Richard Divers won 26 games
Bobby Spinsky won 14 games
Drawn   8 games

A pie chart is to be drawn to show this information.

(a) Calculate the size, in degrees, of the angle of the sector representing the number of games won by Richard Divers.

°

....
(2)

(b) Using the circle, draw an accurate pie chart illustrating the information.
State clearly the size of the angle of each sector.

(2)

(Total 4 marks)

Q1
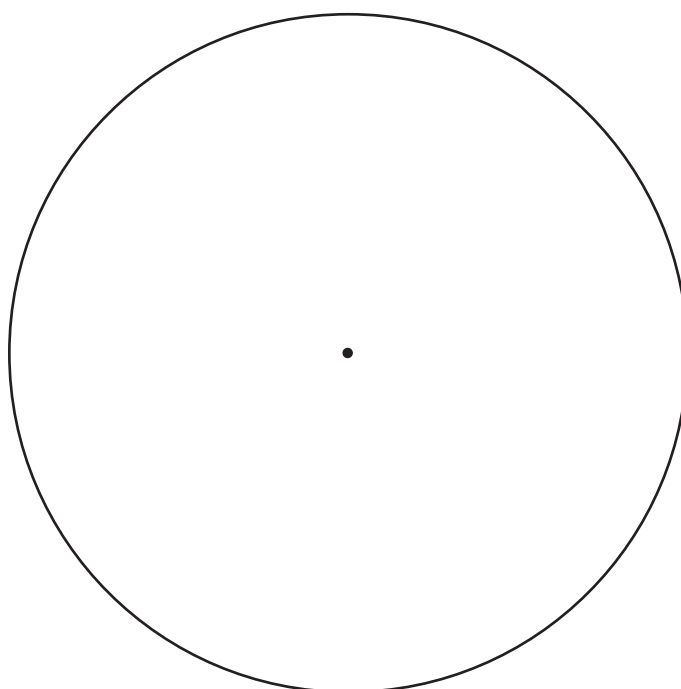
2.
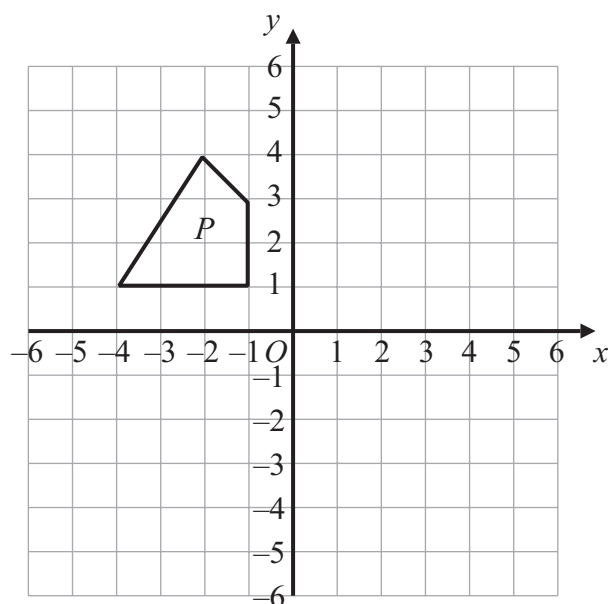
The shape *P* is transformed to the shape *Q* by a clockwise rotation of 90° about the point (2, 0).

(a) Draw and label the shape *Q* on the grid.

(2)

The shape *Q* is transformed to the shape *R* by a reflection in the line *y* = 1

(b) Draw and label the shape *R* on the grid.

(2)

Q2

(Total 4 marks)

3.
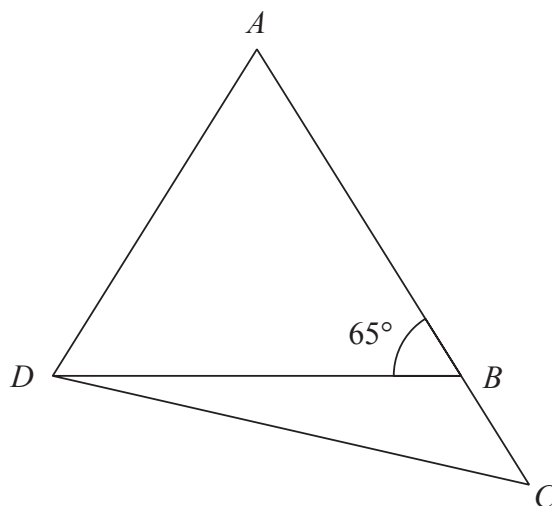
ABD is an isosceles triangle with *AB* = *AD*, and ∠*ABD* = 65°.
The side *AB* is extended to the point *C* so that *AD* = *DC*.
Find the size, in degrees, of ∠*BDC*.

°

....

Q3

(Total 3 marks)

4. Find the Highest Common Factor (HCF) of 135, 180 and 225

....

(Total 2 marks)

5. Given that $x : y = 6 : 5$ and $y : z = 4 : 5$, find the ratios $x : y : z$, in integer form.

$x : y : z = $ ....

(Total 2 marks)

6.
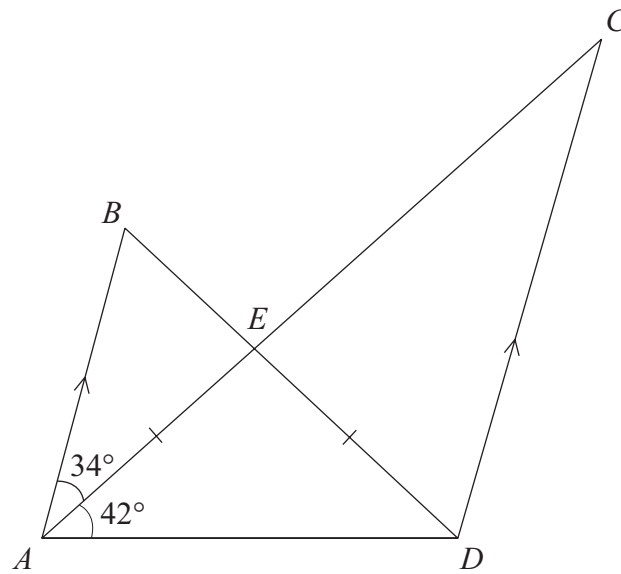
In the diagram, *AB* is parallel to *DC*, *AE* = *ED*, $\angle EAB = 34°$ and $\angle EAD = 42°$. Calculate the size, in degrees, of $\angle CDE$.

°

....

(Total 3 marks)

7. Given that $\mathbf{A} = \begin{pmatrix} 1 & 3 \\ 5 & -1 \end{pmatrix}$ and $\mathbf{B} = \begin{pmatrix} 3 & 1 & 4 \\ -4 & 3 & 1 \end{pmatrix}$, calculate the matrix product **AB**.

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

Q7

(Total 3 marks)

8. Magda bought a television set and sold it to Tarek at a profit of $17\frac{1}{2}\%$.
The price which Tarek paid was £97.29.
Calculate the price, in £, Magda paid for the television set.

£ ....

Q8

(Total 2 marks)

9.
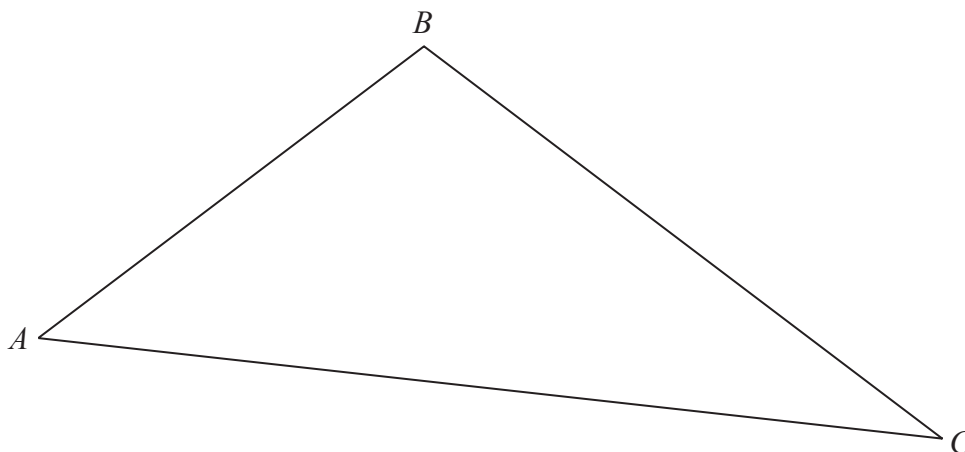
ABC is a triangle.

(a) Draw the line which is equidistant from sides *AB* and *AC*.

(2)

(b) Show, by shading, the region inside the triangle *ABC* of points which are closer to *AB* than to *AC*.

(1)

Q9

(Total 3 marks)

10. Given that sin $x°$ = 0.5 and that $90 \leqslant x \leqslant 180$, find the value of cos $x°$.
Give your answer to 3 significant figures.

cos $x°$ = ...

(Total 2 marks)

Q10

11. An unbiased standard die is to be rolled twice. Find the probability that the total of the two rolls is 3, giving your answer as a fraction.

....

(Total 3 marks)

Q11

12. Solve the inequality

(a) $5x - 8 > 16$,

....
(1)

(b) $7x - 22 \leqslant 5x - 8$.

....
(2)

x is an integer which satisfies both the inequalities in part (a) and part (b).

(c) Write down all the possible values of x.

....
(2)

(Total 5 marks)

13. A sector of area $50\,\text{cm}^2$ and angle $60°$ is cut from a circle.

(a) Calculate the radius, in cm, of the circle.
Give your answer correct to 3 significant figures.

.... cm
(3)

(b) Calculate the perimeter, in cm, of the sector.
Give your answer correct to 3 significant figures.

.... cm
(3)

(Total 6 marks)

14. (a) Express $\dfrac{7}{329}$ as a decimal to 3 significant figures.

....
(1)

(b) Express your answer to part (a) in standard form.

....
(1)   Q14

(Total 2 marks)

15. $T = 2\pi\sqrt{\left(\dfrac{l}{g}\right)}$

Make l the subject of the formula.

$l = $ Q15

(Total 3 marks)

16.
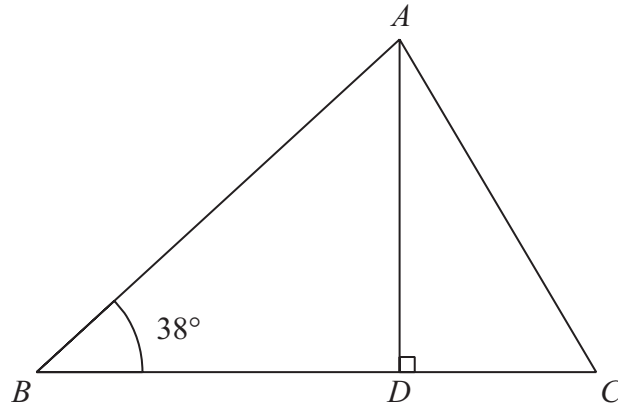
In the acute angled triangle *ABC*, ∠*ABC* = 38° and *BC* = 15 cm. The area of triangle *ABC* is 60 cm² and *D* is the point on *BC* such that ∠*ADC* = 90°.

Calculate

(a) the length, in cm, of *AD*,

.... cm

(2)

(b) the length, in cm to 3 significant figures, of *BD*,

.... cm

(2)

(c) the length, in cm to 3 significant figures, of *AC*.

.... cm

(2)

(Total 6 marks)

Q16

17. Factorise $3x^2 - 2x - 5$

....

Q17

(Total 2 marks)

18. $\mathcal{E}$ = {2, 3, 4, 5, 6, 7, 8, 9},

A = {prime numbers},

B = {odd numbers}.

List the elements of

(i) $A \cap B'$,

....

(ii) $A' \cap B$,

....

(iii) $(A \cap B') \cup (A' \cap B)$.

....

Q18

(Total 3 marks)

19. Given that $\mathbf{a} = \begin{pmatrix} 2 \\ 1 \end{pmatrix}$ and $\mathbf{b} = \begin{pmatrix} -3 \\ 4 \end{pmatrix}$ and $\mathbf{c} = 2\mathbf{a} - 3\mathbf{b}$,

find $\mathbf{c}$.

....

(Total 2 marks)

Q19

20. Solve the equation $\dfrac{x}{4} - \dfrac{x+2}{5} = \dfrac{5}{8}$.

$x =$ ....

(Total 3 marks)

Q20

21. Express $\sqrt{75} + \sqrt{12}$ in the form $a\sqrt{b}$, where a and b are integers.
Show your working.

....

(Total 4 marks)

Q21

22.
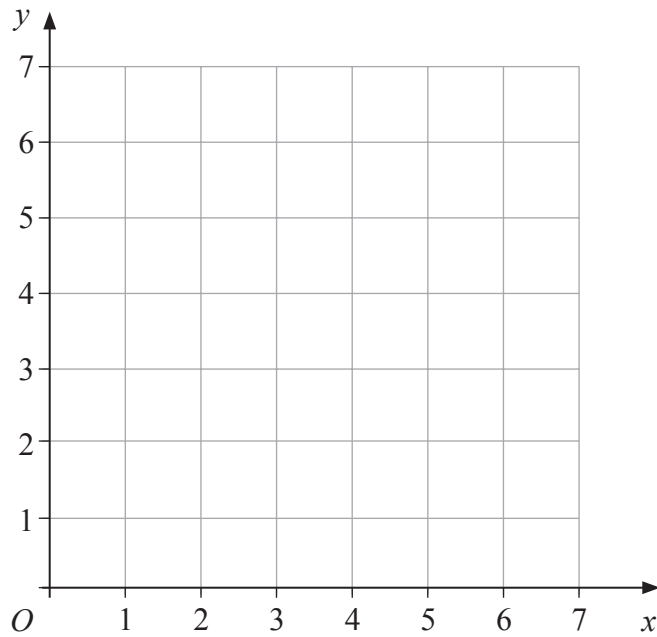
The point A is such that $\overrightarrow{OA} = \begin{pmatrix} 6 \\ 4 \end{pmatrix}$.

(a) Mark and label A in the diagram.

(1)

(b) Calculate the magnitude of the vector $\overrightarrow{OA}$.
Give your answer correct to 3 significant figures.

....

(2)

(Total 3 marks)

Q22

23. Simplify fully $\dfrac{x^2 - 5x}{x^2 - 25}$

....

(Total 3 marks)

Q23

24. The six numbers 1, 7, 11, 19, 30 and x have a mean of $3x$.
Work out the value of x.

$x =$ ....

(Total 3 marks)

Q24

25. Describe, in set notation, the region shaded in each Venn diagram.

(a)

....
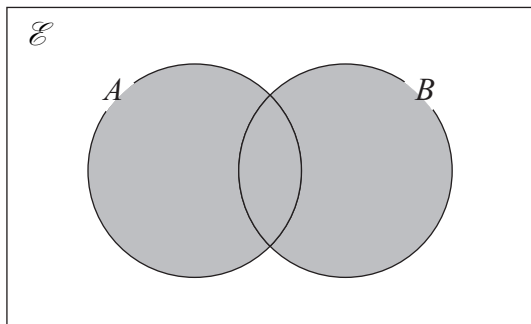
(1)

(b)

....

(1)

(c)

....

(1)
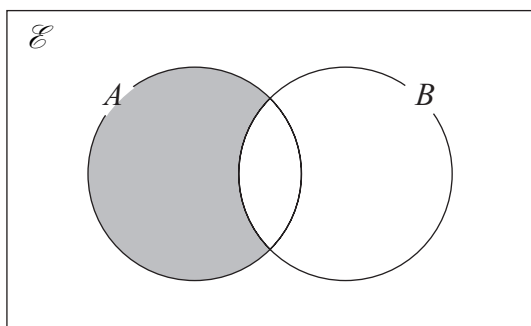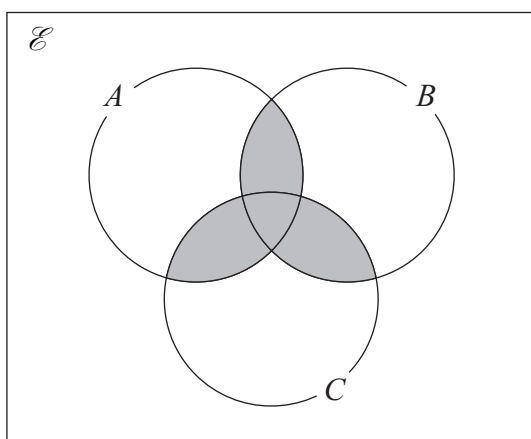
(Total 3 marks)

26. $y = x^4 - 2x^{-4}$

Find $\dfrac{dy}{dx}$.

$\dfrac{dy}{dx} = $ ....

(Total 3 marks)

27. The volume of a sphere varies directly as the cube of its radius. The volume of a sphere of radius r is V.
Find the radius R, in terms of r, of a sphere with volume $64V$.

$R = $ ....

(Total 4 marks)

28. *A* and *B* are two similar solids with volumes 48 cm³ and 2058 cm³ respectively.
The length of one side of *B* is 21 cm.
Calculate the length, in cm, of the corresponding side of *A*.

.... cm

(Total 4 marks)

29.
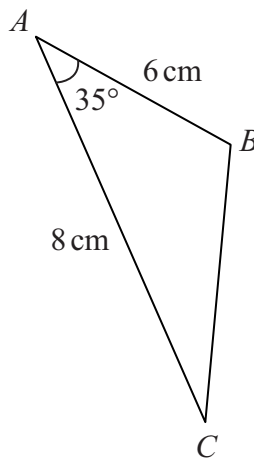
Diagram **NOT**
accurately drawn

In triangle *ABC*, *AB* = 6 cm, *AC* = 8 cm and ∠*BAC* = 35°.

Calculate, to 3 significant figures,

(a) the length of *BC*,

.... cm

(3)

(b) the size of ∠*ACB*.

°

....

(3)

(Total 6 marks)

30. A particle is moving in a straight line through O.
The displacement s of the particle from O at time t seconds ($t \geqslant 0$) is given by
$s = t^3 - 27t + 2$.
Find the value of t when the velocity of the particle is zero.

$t =$ ....

(Total 4 marks)

TOTAL FOR PAPER: 100 MARKS

END

Centre No.						Paper Reference							Surname	Initial(s)
Candidate No.						**4**	**M**	**B**	**0**	**/**	**0**	**2**	Signature	

Edexcel IGCSE

Mathematics B

Paper 2

Sample Assessment Material

Time: 2 hours 30 minutes

Materials required for examination	**Items included with question papers**
Ruler graduated in centimetres and millimetres, protractor, compasses, pen, HB pencil, eraser, calculator. Tracing paper may be used.	Nil

Instructions to Candidates

In the boxes above, write your centre number, candidate number, your surname, initials and signature.
Check that you have the correct question paper.
Answer ALL the questions in the spaces provided in this question paper.
If you need more space to complete your answer to any question, use additional answer sheets.

Information for Candidates

The marks for individual questions and the parts of questions are shown in round brackets: e.g. **(2)**.
Full marks may be obtained for answers to all questions.
There are 11 questions in this question paper. The total mark for this paper is 100.
There are 24 pages in this question paper. Any blank pages are indicated.
You may use a calculator.

Advice to Candidates

Show all stages in any calculations.
Work steadily through the paper. Do not spend too long on one question.
If you cannot answer a question, leave it and attempt the next one.
Return at the end to those you have left out.

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N 3 5 5 3 4 A 0 1 2 4

1. $(x+4)$ is a factor of $3x^3 + 8x^2 + px - 60$, where p is a constant.

    (a) Find the value of p.

    (2)

    (b) Using your value of p, factorise completely $3x^3 + 8x^2 + px - 60$

    (4)
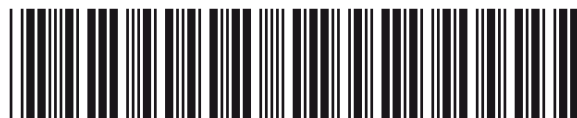
(Total 6 marks)

2.
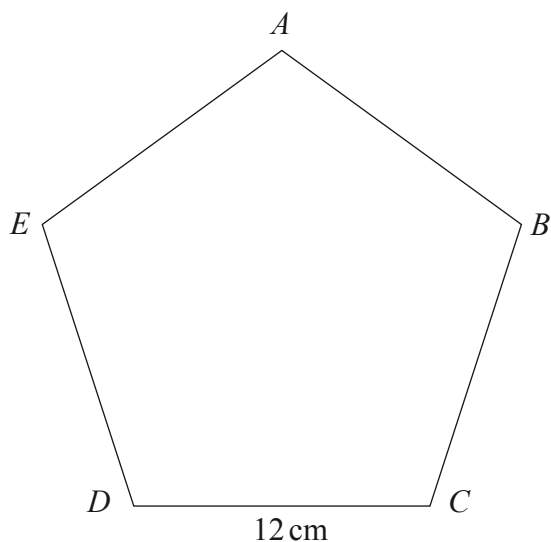
Figure 1

In Figure 1 *ABCDE* is a regular pentagon with sides of length 12 cm.
Find the area, in cm^2 to 3 significant figures, of the pentagon *ABCDE*.

(5)

[Area of a triangle = $\frac{1}{2} bc \sin A$ Area of a trapezium = $\frac{1}{2} (a + b) h$]

(Total 5 marks)

3.
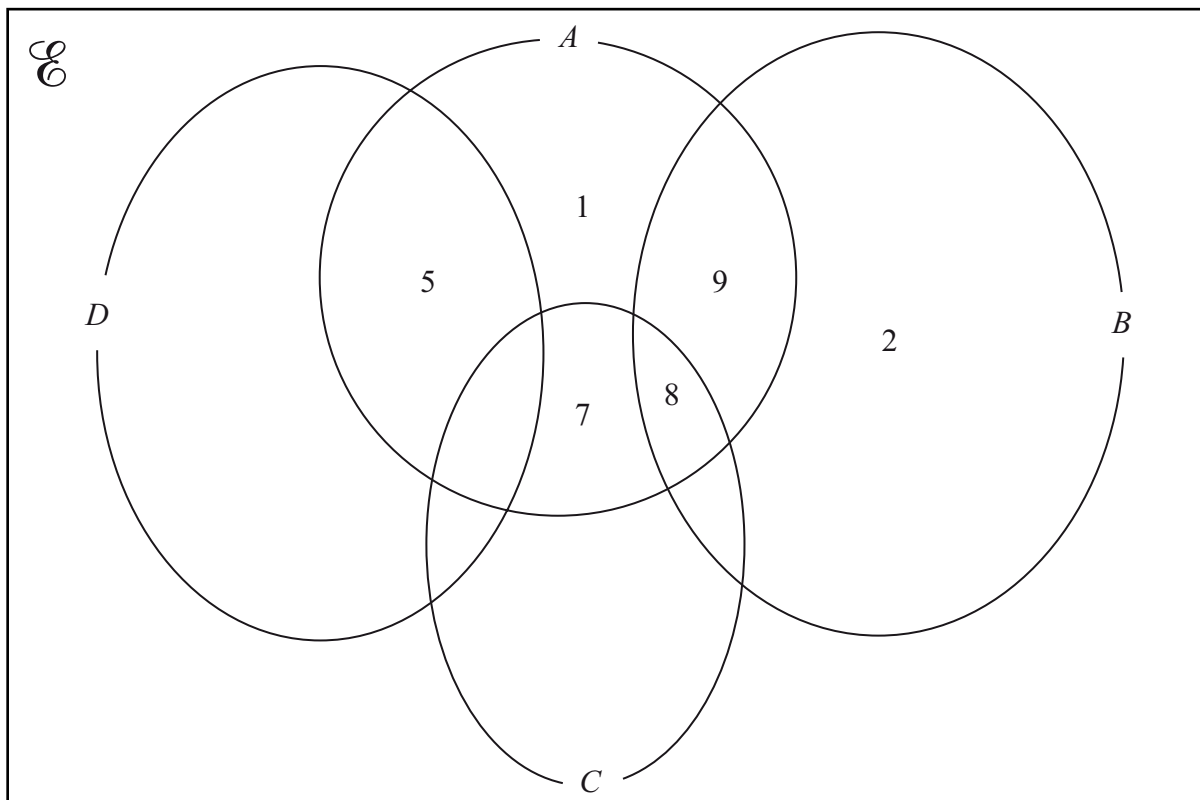
Figure 2

$\mathcal{E} = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11\}$,
$A = \{1, 5, 6, 7, 8, 9\}$,
$B = \{2, 8, 9, 10\}$,
$C = \{3, 6, 7, 8, 10, 11\}$,
$D = \{4, 5, 6, 11\}$.

Six of the elements of $\mathcal{E}$ are shown in the Venn diagram.

(a) Complete the Venn diagram with the remaining elements.

(2)

List the elements of

(b) $A \cap B \cap C$,

(1)

(c) $(B \cup C) \cap A$,

(1)

(d) $(C \cup D)' \cap A$.

(1)

Question 3 continued

(Total 5 marks)

Q3

4.
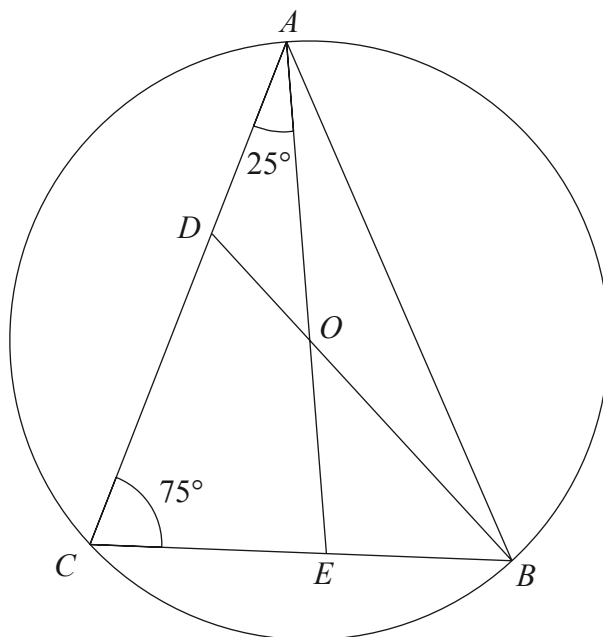
Figure 3

In Figure 3, O is the centre of the circle ABC.
The points D and E are on AC and BC respectively so that BOD and AOE are straight lines.
$\angle ACE = 75°$ and $\angle CAE = 25°$. Calculate the size, in degrees, of

(a) $\angle DOE$,

(2)

(b) $\angle OBE$,

(2)

(c) $\angle CAB$.

(2)

Question 4 continued

(Total 6 marks)

Q4

5. A bag contains 5 red sweets, 3 green sweets and 2 yellow sweets. A sweet is to be taken at random from the bag and eaten. A second sweet is then to be taken at random from the bag.

(a) Complete the tree diagram.

First
sweet

Second
sweet

$\frac{4}{9}$ red

green

yellow

red

$\frac{5}{10}$ red

green

yellow

green

$\frac{2}{10}$

red

yellow

green

$\frac{1}{9}$ yellow

(3)
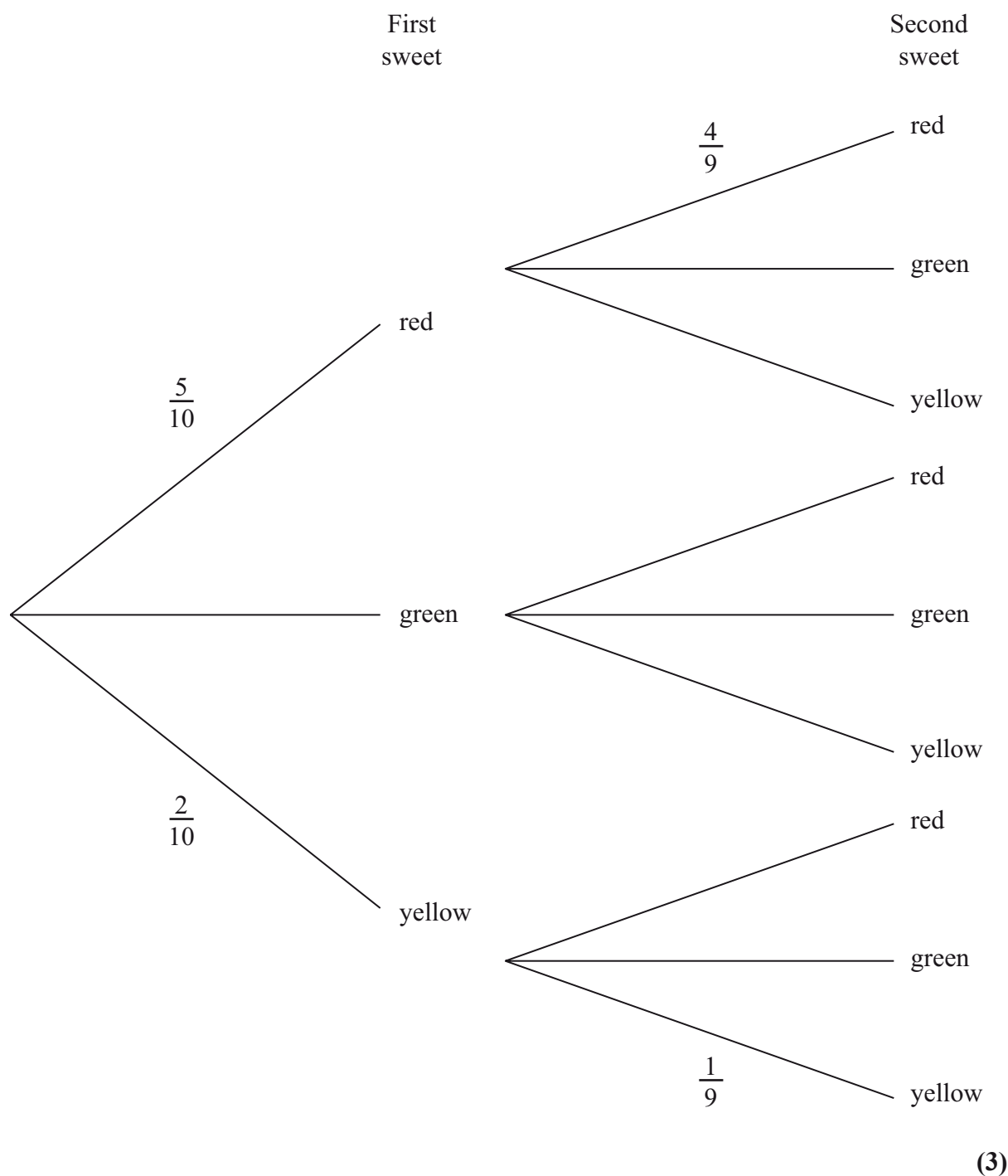
(b) Calculate the probability that

(i) both sweets will be green,

(ii) the two sweets will be of different colours,

(iii) at most one of the two sweets will be yellow.

(7)

Question 5 continued

(Total 10 marks)

6. The table gives information about the ages of the population of a country.

Age (a years)	Number (millions)
$0 \leqslant a < 10$	9
$10 \leqslant a < 20$	8
$20 \leqslant a < 35$	10
$35 \leqslant a < 50$	19
$50 \leqslant a < 55$	4
$55 \leqslant a < 65$	7
$65 \leqslant a < 80$	4
$80 \leqslant a < 100$	1

(a) On the graph paper below, using a scale of 1 cm to represent 10 years on the Age axis, draw a histogram to represent this information.

(4)

(b) Write down the class interval in which the median lies.

(1)

(c) Calculate, giving your answer in years and months, an estimate of the mean age of the population.

(4)

(Total 9 marks)
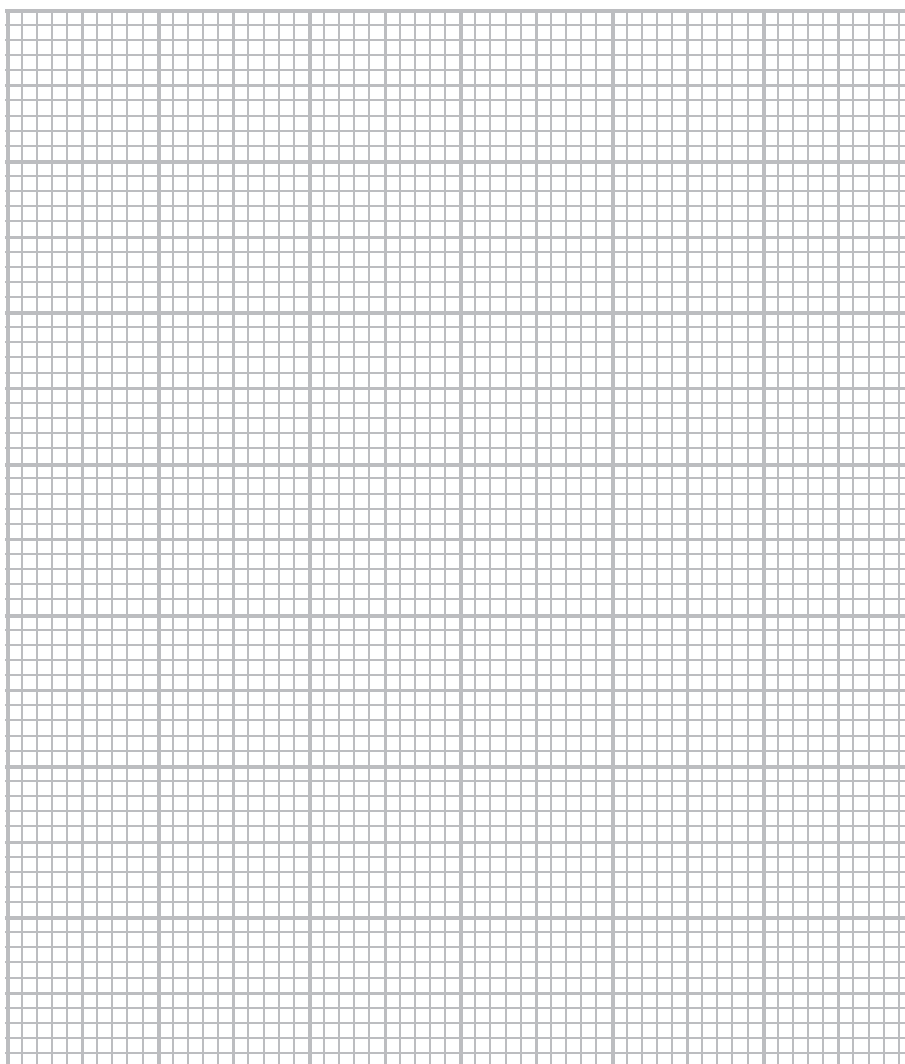
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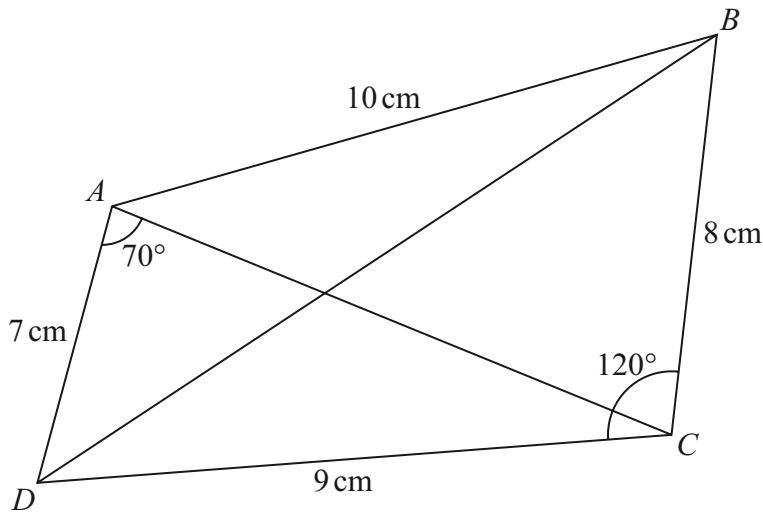
Figure 4

In the quadrilateral *ABCD*, ∠*BCD* = 120°, *AB* = 10 cm, *BC* = 8 cm, *CD* = 9 cm and
AD = 7 cm.

Calculate, to 3 significant figures,

(a) the length, in cm, of *BD*,

(3)

(b) the size, in degrees, of ∠*ABD*.

(3)

Given that ∠*CAD* = 70°, calculate, to 3 significant figures,

(c) the size, in degrees, of ∠*ACD*.

(3)

[Sine Rule: $\dfrac{a}{\text{Sin } A} = \dfrac{b}{\text{Sin } B} = \dfrac{c}{\text{Sin } C}$ Cosine Rule: $a^2 = b^2 + c^2 - 2bc \cos A$]

Question 7 continued

(Total 9 marks)

Q7

8.
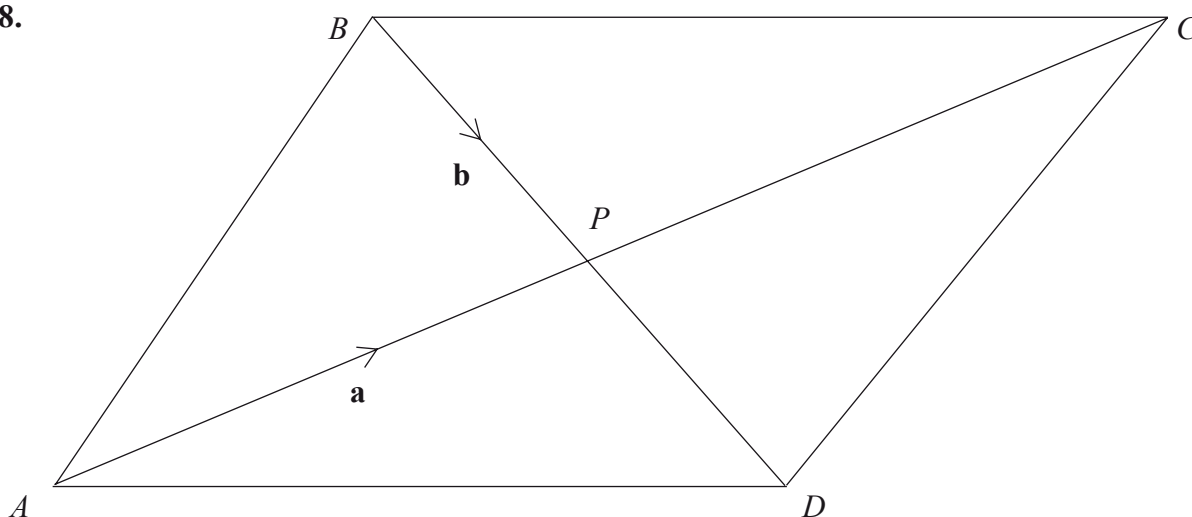
Figure 5

In Figure 5, $\overrightarrow{AP} = \mathbf{a}$, $\overrightarrow{BP} = \mathbf{b}$, $\overrightarrow{AC} = \mu\,\overrightarrow{AP}$ and $\overrightarrow{BD} = \lambda\overrightarrow{BP}$.

(a) (i) Find $\overrightarrow{PD}$ in terms of $\mathbf{b}$ and λ.

    (ii) Find $\overrightarrow{AD}$ in terms of $\mathbf{a}$, $\mathbf{b}$ and λ.

(3)

(b) (i) Find $\overrightarrow{PC}$ in terms of $\mathbf{a}$ and μ.

    (ii) Find $\overrightarrow{BC}$ in terms of $\mathbf{a}$, $\mathbf{b}$ and μ.

(3)

Given that $\overrightarrow{AD} = \overrightarrow{BC}$,

(c) find the value of λ and the value of μ.

(4)

(d) State the geometrical name of the quadrilateral *ABCD*.

(1)

Question 8 continued

Q8

(Total 11 marks)

9. The coordinates of the vertices of $\triangle ABC$ are $A(1, 1)$, $B(2, 0)$ and $C(2, 2)$.

(a) On the graph below, draw and label $\triangle ABC$.

(1)
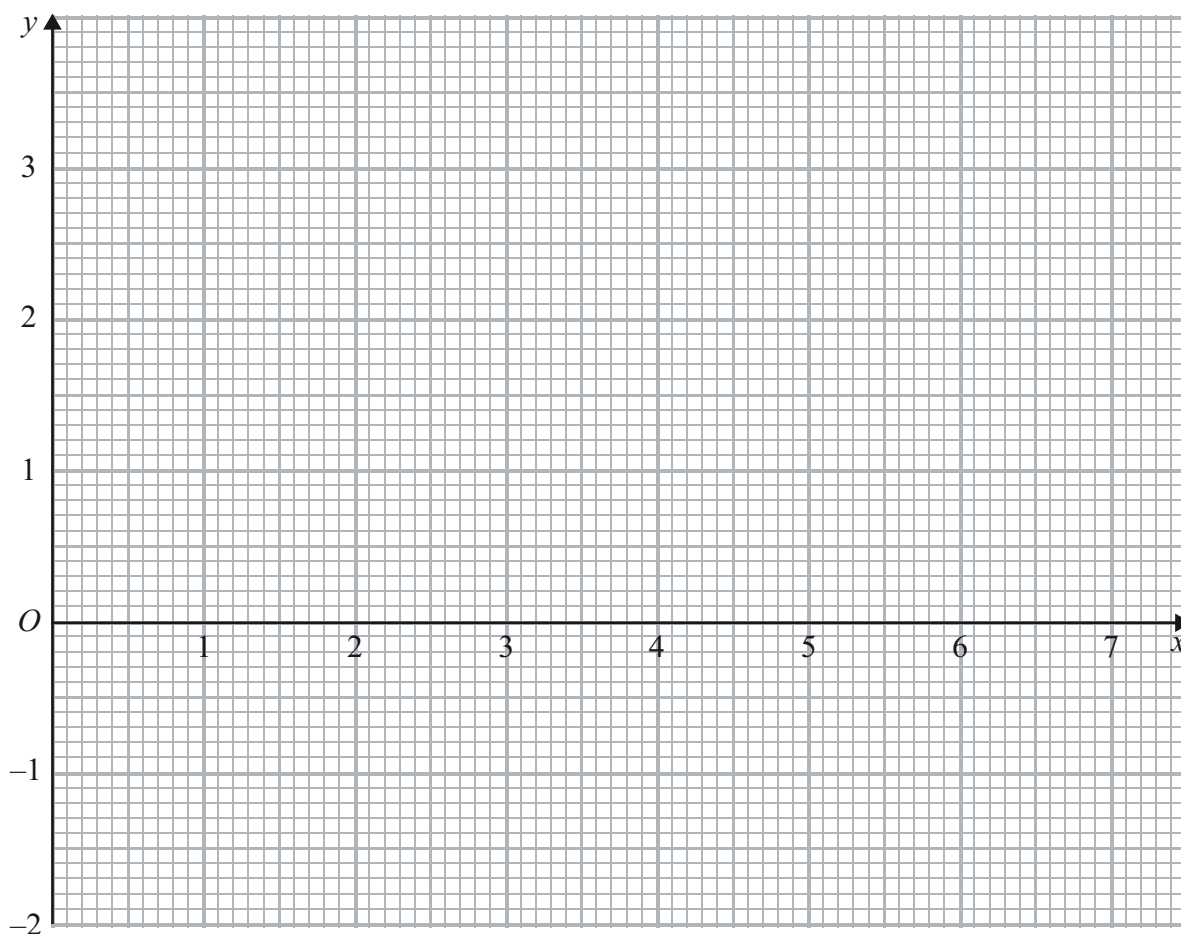
The matrix $\mathbf{P} = \begin{pmatrix} 2 & 1 \\ 0 & 1 \end{pmatrix}$.

(b) Calculate the matrix product $\mathbf{P}\begin{pmatrix} 1 & 2 & 2 \\ 1 & 0 & 2 \end{pmatrix}$.

(2)

$\triangle A'B'C'$ is the image of $\triangle ABC$ under the transformation represented by the matrix **P**.

(c) Draw and label $\triangle A'B'C'$.

(1)

The matrix $\mathbf{Q} = \begin{pmatrix} 0 & \frac{1}{2} \\ -\frac{1}{4} & \frac{1}{4} \end{pmatrix}$.

(d) Draw and label $\triangle A''B''C''$ which is the image of $\triangle A'B'C'$ under the transformation represented by the matrix **Q**.

(3)

$\triangle ABC$ can be mapped onto $\triangle A''B''C''$ by a rotation about (0, 0) followed by an enlargement.

(e) Describe fully the rotation and the enlargement.

(3)

Q9

(Total 10 marks)

10.
$$f: x \mapsto 5 - 4x - x^2,$$

$$g: x \mapsto \frac{1}{x-1}, \ x \neq 1.$$

(a) Find (i) f(3), (ii) $g\left(\dfrac{4}{3}\right)$, (iii) fg(2).

(4)

(b) Find $g^{-1}(x)$.
Write your answer in the form $g^{-1}: x \mapsto \ .....$

(2)

(c) Write down the value of x which needs to be excluded from any domain of g^{-1}.

(1)

(d) Solve the equation gf(x) = -1.

(6)

Question 10 continued

(Total 13 marks)

11. A train starts from rest at a station A and comes to rest 120 seconds later at station B. The speed, v m/s, of the train t seconds after leaving station A is given by

$$v = \frac{t}{10\ 000}(120 - t)^2.$$

(a) Complete the table below.

t	0	10	20	40	60	70	80	100	120
$120 - t$	120	110		80		50		20	0
$120 - t$	120	110		80		50		20	0
v	0	12.1		25.6		17.5		4	0

(3)

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

(3)

(c) From your graph, estimate the maximum speed of the train, in m/s.

(2)

(d) By drawing a suitable tangent, estimate the acceleration, in m/s^2, of the train at $t = 10$.

(3)

The total distance travelled by the train in the journey between the two stations is 1728 metres.

(e) Calculate the average speed, in m/s, of the train during the journey from A to B.

(2)

(f) From your graph, estimate for how many seconds the speed of the train is greater than the average speed.

(3)
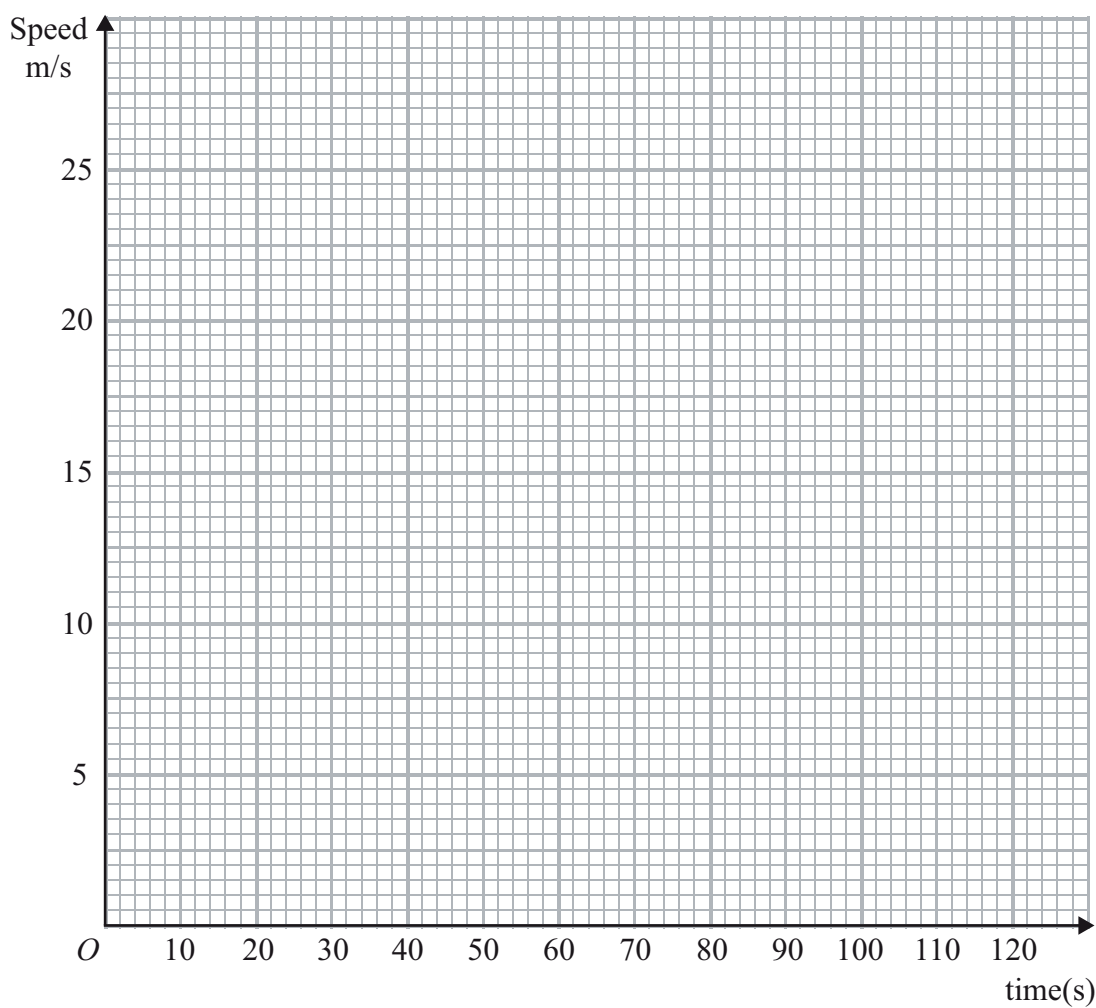
Question 11 continued

(Total 16 marks)

TOTAL FOR PAPER: 100 MARKS

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Sample mark schemes

General Marking Guidance

- 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.

- **Types of mark**
  - M marks: method marks
  - A marks: accuracy marks
  - B marks: unconditional accuracy marks (independent of M marks)

- **Abbreviations**
  - cao – correct answer only
  - ft – follow through
  - isw – ignore subsequent working
  - SC - special case
  - oe – or equivalent (and appropriate)
  - dep – dependent
  - indep – independent
  - eeoo – each error or omission

- **No working**

  If no working is shown then correct answers normally score full marks
  If no working is shown then incorrect (even though nearly correct) answers score no marks.

- **With working**

  If there is a wrong answer indicated on the answer line always check the working in the body of the script (and on any diagrams), and award any marks appropriate from the mark scheme.
  If it is clear from the working that the "correct" answer has been obtained from incorrect working, award 0 marks.

Any case of suspected misread loses A (and B) marks on that part, but can gain the M marks.

If working is crossed out and still legible, then it should be given any appropriate marks, as long as it has not been replaced by alternative work.

If there is a choice of methods shown, then no marks should be awarded, unless the answer on the answer line makes clear the method that has been used.

If there is no answer on the answer line then check the working for an obvious answer.

- **Follow through marks**

  Follow through marks which involve a single stage calculation can be awarded without working since you can check the answer yourself, but if ambiguous do not award.

  Follow through marks which involve more than one stage of calculation can only be awarded on sight of the relevant working, even if it appears obvious that there is only one way you could get the answer given.

- **Ignoring subsequent work**

  It is appropriate to ignore subsequent work when the additional work does not change the answer in a way that is inappropriate for the question: eg. incorrect cancelling of a fraction that would otherwise be correct

  It is not appropriate to ignore subsequent work when the additional work essentially makes the answer incorrect eg algebra.

  Transcription errors occur when candidates present a correct answer in working, and write it incorrectly on the answer line; mark the correct answer.

- **Probability**

  Probability answers must be given a fractions, percentages or decimals. If a candidate gives a decimal equivalent to a probability, this should be written to at least 2 decimal places (unless tenths).

  Incorrect notation should lose the accuracy marks, but be awarded any implied method marks.

  If a probability answer is given on the answer line using both incorrect and correct notation, award the marks.

  If a probability fraction is given then cancelled incorrectly, ignore the incorrectly cancelled answer.

- **Linear equations**

  Full marks can be gained if the solution alone is given on the answer line, or otherwise unambiguously indicated in working (without contradiction elsewhere). Where the correct solution only is shown substituted, but not identified as the solution, the accuracy mark is lost but any method marks can be awarded.

- **Parts of questions**

  Unless allowed by the mark scheme, the marks allocated to one part of the question CANNOT be awarded in another

Paper 1

Question Number	Working	Answer	Mark	Notes
1(a)	$\dfrac{26}{48} \times 360$	195°	2	M1 A1

Question Number	Working	Answer	Mark	Notes
1(b)	One sector correct with the angle marked $\pm 2°$ Completely correct	195°, 105°, 60°	2	M1 A1

Question Number	Working	Answer	Mark	Notes
2(a)	Triangle drawn	Q drawn	2	B2 (-1eeoo)

Question Number	Working	Answer	Mark	Notes
2(b)	Triangle drawn	R	2	B2 (-1eeoo) ft on their quadrilateral

Question Number	Working	Answer	Mark	Notes
3	$\angle DAC = 50°$ Correct method leading to $\angle ADC = 80°$ OR $\angle CBD = 115°$ (could be implied)	$\angle BDC = 15°$	3	B1 M1 A1

Question Number	Working	Answer	Mark	Notes
4	any common factor (ie 9 , 5, 15) but **not** 3	45	2	B1 B1

Question Number	Working	Answer	Mark	Notes
5	$x{:}y = 24{:}20$ $y{:}z = 20{:}25$	24:20:25	2	M1 for either ratio A1

Question Number	Working	Answer	Mark	Notes
6	$\angle EDA = 42^o$ or $\angle AED = 96^o$ $\angle ACD = 34^o$ or $\angle ADC = 104^o$ or $\angle ABE = 62^o$ or 180 – (34 + 2 x 42) or clearly identified in c's diagram	$\angle CDE = 62^o$	3	B1 B1 B1

Question Number	Working	Answer	Mark	Notes
7		$\begin{pmatrix} -9 & 10 & 7 \\ 19 & 2 & 19 \end{pmatrix}$	3	B3 (–1 eeoo)

Question Number	Working	Answer	Mark	Notes
8	$\dfrac{97.29}{1.175}$ oe **NB:** *Treat* 17% *as a misread*	£82.80	2	M1 A1 Accept 82.8 oe

Question Number	Working	Answer	Mark	Notes
9(a)	line drawn from A into the Δ line drawn correctly	line	2	B1 B1

Question Number	Working	Answer	Mark	Notes
9(b)	correct shading	region	1	B1

Question Number	Working	Answer	Mark	Notes
10	$x = 150^o$	–0.866	2	B1 B1

Question Number	Working	Answer	Mark	Notes
11	$\left(\dfrac{1}{6}\right)^2$ or 36 outcomes $\left(\dfrac{1}{6}\right)^2 + \left(\dfrac{1}{6}\right)^2$ or 2 possibilities	$\dfrac{1}{18}$	3	B1 M1 A1 cao

Question Number	Working	Answer	Mark	Notes
12(a)	o.e	$x > \dfrac{24}{5}$	1	B1

Question Number	Working	Answer	Mark	Notes
12(b)	$7x - 5x \leq 22 - 8$	$x \leq 7$	2	M1 A1

Question Number	Working	Answer	Mark	Notes
12(c)	all integers satisfying c's inequalities	5, 6, 7	2	M1 A1

Question Number	Working	Answer	Mark	Notes
13(a)	$\dfrac{60}{360} \times \pi \times r^2 = 50$ $r = \sqrt{50 \times \dfrac{1}{\pi} \times \dfrac{360}{60}}$ isolating r	9.77	3	M1 M1 A1

Question Number	Working	Answer	Mark	Notes
13(b)	$\dfrac{60}{360} \times 2 \times \pi \times "9.77"$ Ans $+ 2 \times "9.77"$	29.8	3	M1 M1 DEP A1

Question Number	Working	Answer	Mark	Notes
14 (a)		0.0213	1	B1

Question Number	Working	Answer	Mark	Notes
14 (b)		2.13×10^{-2}	1	B1 Ft from (a)

Question Number	Working	Answer	Mark	Notes
15	$\frac{T}{2\pi} = \sqrt{\left(\frac{l}{g}\right)}$ oe $\frac{T^2}{4\pi^2} = \frac{l}{g}$ (ie removal of square root)	$l = \frac{gT^2}{4\pi^2}$ oe	3	M1 (allow 1 error only) M1 (DEP) A1 **N.B:** *The order of the 2 Ms can be reversed.* $T - 2\pi$ *scores* M0 M0 A0. *Using* $\frac{22}{7}$ *instead of* π *correctly scores* M1 M1 A0.

Question Number	Working	Answer	Mark	Notes
16 (a)	$\frac{1}{2} \times 15 \times h = 60$	$h = 8$ cm	2	M1 A1

Question Number	Working	Answer	Mark	Notes
16 (b)	"8" $\div BD$ = tan 38	10.2 cm	2	M1 A1

Question Number	Working	Answer	Mark	Notes
16 (c)	$AC = \sqrt{"8"^2 + (15 - "10.2"^2)^2}$ 9.33 cm using 10.2 (9.31 using "10.24")	9.31	2	M1 A1

Question Number	Working	Answer	Mark	Notes
17	Attempt to factorise quadratic	$(3x - 5)(x + 1)$	**2**	M1 A1 Alternative: $3(x - \frac{5}{3})(x + 1)$

Question Number	Working	Answer	Mark	Notes
18 (i)		2	**1**	B1

Question Number	Working	Answer	Mark	Notes
18 (ii)		9	**1**	B1

Question Number	Working	Answer	Mark	Notes
18 (iii)		2, 9	**1**	B1 (ft)

Question Number	Working	Answer	Mark	Notes
19	$2\begin{pmatrix} 2 \\ 1 \end{pmatrix} - 3\begin{pmatrix} -3 \\ 4 \end{pmatrix}$ $\begin{pmatrix} 2 \times 2 + 3 \times 3 \\ 2 \times 1 - 3 \times 4 \end{pmatrix}$	$\begin{pmatrix} 13 \\ -10 \end{pmatrix}$	**2**	M1 (1 sign error) A1

Question Number	Working	Answer	Mark	Notes
20	$10x - 8(x + 2) = 25$ $10x - 8x - 16 = 25$	$x = 20.5$ oe	**3**	M1 error only A1 (oe, ie, $2x = 41$) A1

Question Number	Working	Answer	Mark	Notes
21	$\sqrt{25 \times 3} + \sqrt{4 \times 3}$ $\sqrt{5^2 \times 3} + \sqrt{2^2 \times 3}$ $5\sqrt{3} + 2\sqrt{3}$	$7\sqrt{3}$	**4**	M1 M1 (DEP) M1 (DEP) A1 If no working seen, A1 only

Question Number	Working	Answer	Mark	Notes
22 (a)	*A* correctly placed and labelled	Point	1	B1

Question Number	Working	Answer	Mark	Notes
22 (b)	$\sqrt{(6^2 + 4^2)}$ (o.e)	7.21	2	M1 A1

Question Number	Working	Answer	Mark	Notes
23	$\dfrac{x(x-5)}{(x+5)(x-5)}$	$\dfrac{x}{x+5}$	3	M1 (factorising numerator, Indep) M1 (factorising denominator, Indep) A1

Question Number	Working	Answer	Mark	Notes
24	$\dfrac{1+7+11+19+30+x}{6} = 3x$ oe $68 + x = 18x$ oe	$x = 4$	3	M1 M1 A1

Question Number	Working	Answer	Mark	Notes
25 (a)	oe	$A \cup B$	1	B1

Question Number	Working	Answer	Mark	Notes
25 (b)	oe	$A \cap B'$ or $(A \cup B) \cap B'$	1	B1

Question Number	Working	Answer	Mark	Notes
25 (c)	oe	$(A \cap B) \cup (A \cap C) \cup (C \cap B)$ or $(A \cap B) \cup (A \cap C \cap B') \cup (B \cap C \cap A')$	1	B1

Question Number	Working	Answer	Mark	Notes
26		$4x^3 + 8x^{-5}$	3	B1 for $4x^3$ seen B1 for $+8x^n$ seen B1 for cao

Question Number	Working	Answer	Mark	Notes
27	$V = kr^3$ (or V: $64V = r^3$: R^3) (o.e) $64V = kR^3$ (or $\dfrac{1}{64} = \dfrac{r^3}{R^3}$) (o.e) $R^3 = 64r^3$ (o.e)	$R = 4r$	4	M1 M1 M1 A1

Question Number	Working	Answer	Mark	Notes
28	Ratio of volumes = 8: 343 Ratio of lengths = 2:7 C's ($\dfrac{2}{7}$) × 2	6 cm	4	B1 B1 M1 A1

Question Number	Working	Answer	Mark	Notes
29 (a)	$BC =$ $\sqrt{6^2 + 8^2 - 2 \times 6 \times 8 \cos 35}$ $= \sqrt{100 - 96 \cos 35}$	4.64..	3	M1 M1 A1

Question Number	Working	Answer	Mark	Notes
29 (b)	$\dfrac{6}{\sin \angle ABC} = \dfrac{"4.64"}{\sin 35}$ $\sin \angle ABC = \dfrac{6 \times \sin 35}{"4.64"}$	47.8	3	M1 M1 A1

Question Number	Working	Answer	Mark	Notes
30	$3t^2 - 27$, one term correct $3t^2 - 27$ seen "$3t^2 - 27$" = 0	$t = 3$	**4**	M1 M1 A1 A1

Paper 2

Question Number	Working	Answer	Mark	Notes
1 (a)	$3\,(-4)^3 + 8\,(-4)^2 + p\,(-4) - 60 = 0$	$p = -31$	**2**	M1 A1

Question Number	Working	Answer	Mark	Notes
1 (b)	$3x^2 - 4x\ldots$ $3x^2 - 4x - 15$ attempt to factorise c's trinomial quadratic	$(x + 4)\,(3x + 5)$ $(x - 3)$	**4**	M1 A1 M1(INDEP) A1

Question Number	Working	Answer	Mark	Notes
2	36° OR 54° OR 72° seen	248 cm²	**5**	B1
	height = 6 × tan "108/2"			M1
	= 8.26 (8.2583)			
	area of one triangle = $\frac{1}{2}$×"8.2583"×12			M1(DEP)
	area of pentagon =			M1(DEP)
	5 × $\frac{1}{2}$×"8.2583"×12			
	OR			
	O centre of pentagon,			
	$DO = \dfrac{12 \times \sin 54}{\sin 72}$ (= 10.208) o.e			M1
	$\Delta DOC = \dfrac{1}{2} \times 12 \times "10.208" \times \sin 54$ o.e			M1(DEP)
	area of pentagon = 5×"ΔDOC"			
	OR			M1(DEP)
	area of triangle = $\dfrac{1}{2} \times 12^2 \times \sin 108$			
	=68.5 (68.4761)			
	area of trapezium =			M1
	$\frac{1}{2}$×"11.4127"×(12 + 2×"9.7082"			
	(= 179.273)			
	area of pentagon ="68.5" +			M1(DEP)
	$\frac{1}{2}$×"11.4127"×(12 + 2×"9.7082")			
	No mixing and matching methods			
				M1(DEP)
				A1 cao

Question Number	Working	Answer	Mark	Notes
3 (a)		A: 6, B:10 C: 3, 6, 10, 11 D: 4, 6, 11	**2**	B2 (-1 eeoo)

Question Number	Working	Answer	Mark	Notes
3 (b)		8	**1**	B1

Question Number	Working	Answer	Mark	Notes
3 (c)		6, 7, 8, 9	**1**	B1

Question Number	Working	Answer	Mark	Notes
3 (d)		1, 9	**1**	B1

Question Number	Working	Answer	Mark	Notes
4 (a)	$\angle AOB = 2 \times 75$	$\angle DOE = 150$	**2**	M1 A1

Question Number	Working	Answer	Mark	Notes
4 (b)	$\angle AEC = 80$ or $\angle BDC = 55$ or $\angle ABC = 65$ $\angle AEB = 100$,	$OBE = 80$	**2**	B1 B1

Question Number	Working	Answer	Mark	Notes
4 (c)	$BAO = 15$ or $ABC = 65$	$CAB = 40$	**2**	B1 B1

Question Number	Working	Answer	Mark	Notes
5 (a)	2 correct probabilities 4 correct probabilities 8 correct probabilities	1st sweet green = $\dfrac{3}{10}$ Completed second branches: $\{\dfrac{4}{9}, \dfrac{3}{9}, \dfrac{2}{9}\}$ $\{\dfrac{5}{9}, \dfrac{2}{9}, \dfrac{2}{9}\}$ $\{\dfrac{5}{9}, \dfrac{3}{9}, \dfrac{1}{9}\}$, oe	**3**	B1 B1 B1

Question Number	Working	Answer	Mark	Notes
5 (b) (i)	c's $\dfrac{3}{10}$ × c's $\dfrac{2}{9}$	$\dfrac{1}{15}$ oe	**2**	M1 A1 Ft from (a)

Question Number	Working	Answer	Mark	Notes
5 (b) (ii)	Attempt to gather at least two consistent pairs of probabilities together Complete method, Eg, $\dfrac{15}{90} + \dfrac{15}{90} + \dfrac{10}{90} + \dfrac{10}{90} + \dfrac{6}{90} + \dfrac{6}{90}$ Or $1 - \dfrac{28}{90}$	$\dfrac{31}{45}$ oe	**3**	M1 M1 (dep) A1

Question Number	Working	Answer	Mark	Notes
5 (b) (iii)	$1 - \dfrac{2}{10} \times \dfrac{1}{9}$	$\dfrac{44}{45}$ oe	**2**	M1 A1

Question Number	Working	Answer	Mark	Notes
6 (a)	8 rectangles drawn, all correct widths histogram drawn and labelled with heights proportional to: 9, 8, 6.7, 12.7, 8, 7, 2.7, 0.5 (1/10 values for frequency density)	Histogram	**4**	B1 B3 (-1eeoo)

Question Number	Working	Answer	Mark	Notes
6 (b)		4th interval	1	B1

Question Number	Working	Answer	Mark	Notes
6 (c)	Discrete values: 5 of 4.5, 14.5, 27, 42, 52, 59.5, 72, 89.5 9 x "4.5" + 8 x "14.5" + 10 x "27" + 19 x "42" + 4 x "52" + 7 x "59.5" + 4 x "72" + 1 x "89.5" Sum divided by 62 **Or** Continuous values	35 y 11 m 36 y 5 mon	4	B1 M1 (slip) A1 A1

Question Number	Working	Answer	Mark	Notes
7 (a)	$BD^2 = 8^2 + 9^2 - 2 \times 8 \times 9 \times \cos 120$ $BD = \sqrt{(8^2 + 9^2 - 2 \times 8 \times 9 \times \cos 120)}$	14.7	3	M1 M1 (dep) A1

Question Number	Working	Answer	Mark	Notes
7 (b)	$7^2 =$ $10^2 + \text{"14.7"} - 2 \times 10 \times \text{"14.7"} \times \cos \angle ABD$ $\cos \angle ABD = \dfrac{10^2 + 14.7^2 - 7^2}{2 \times 10 \times 14.7}$	41.8	3	M1 M1 dep A1

Question Number	Working	Answer	Mark	Notes
7 (c)	$\dfrac{7}{\sin \angle ACD} = \dfrac{9}{\sin 70}$ $\sin \angle ACD = \dfrac{7 \times \sin 70}{9}$	47.0	3	M1 M1 (Dep) A1

Question Number	Working	Answer	Mark	Notes
8 (a)(i)		$(\lambda - 1)\,\mathbf{b}$	1	B1

Question Number	Working	Answer	Mark	Notes
8 (a)(ii)	(o.e)	$\mathbf{a} + $ "$(\lambda - 1)\ \mathbf{b}$"	2	M1 A1

Question Number	Working	Answer	Mark	Notes
8 (b)(i)		$(\mu - 1)\ \mathbf{a}$	1	B1

Question Number	Working	Answer	Mark	Notes
8 (b)(ii)	(o.e)	$\mathbf{b} + $ "$(\mu - 1)\ \mathbf{a}$"	2	M1 A1

Question Number	Working	Answer	Mark	Notes
8 (c)	$(\lambda - 2)\ \mathbf{b} = (\mu - 2)\ \mathbf{a}$ $(\lambda - 2) = 0$ and $(\mu - 2) = 0$	$\lambda = 2, \mu = 2$	4	M1 M1 A1, A1

Question Number	Working	Answer	Mark	Notes
8 (d)		Parallelogram	1	B1

Question Number	Working	Answer	Mark	Notes
9 (a)	ΔABC drawn and labelled	Triangle	1	B1

Question Number	Working	Answer	Mark	Notes
9 (b)		$\begin{pmatrix} 3 & 4 & 6 \\ 1 & 0 & 2 \end{pmatrix}$	2	B2 (−1eeoo)

Question Number	Working	Answer	Mark	Notes
9 (c)	$\Delta A'B'C'$ drawn and labelled	Triangle	1	B1

Question Number	Working	Answer	Mark	Notes
9 (d)	$\Delta A''B''C''$ drawn and labelled	Triangle	3	B3 ft (-1eeoo)

Question Number	Working	Answer	Mark	Notes
9 (e)	*rotation*, clockwise 90º , about (0, 0) *enlargement*, scale factor $\frac{1}{2}$, about (0, 0)	Explanation	3	B3 (-1 eeoo)

Question Number	Working	Answer	Mark	Notes
10 (a) (i)		−16	1	B1

Question Number	Working	Answer	Mark	Notes
10 (a)(ii)		3	1	B1

Question Number	Working	Answer	Mark	Notes
10 (a)(iii)	g(2) = 1 f(1)= 0	0	2	M1, A1

Question Number	Working	Answer	Mark	Notes
10 (b)	$yx - y = 1$ **or** $x - 1 = \dfrac{1}{y}$	$\dfrac{1+x}{x}$ **or** $\dfrac{1}{x} + 1$	2	M1 A1

Question Number	Working	Answer	Mark	Notes
10 (c)		0	1	B1

Question Number	Working	Answer	Mark	Notes
10 (d)	$\dfrac{1}{(5 - 4x - x^2 - 1)} = -1$ $1 = -4 + 4x + x^2$ (o.e.) $x^2 + 4x - 5 = 0$ attempt to factorise a trinomial quadratic	$x = -5, 1$	6	M1 M1 dep A1 M1 ind A1, A1

Question Number	Working	Answer	Mark	Notes
11 (a)	100, 60, 40 100, 60, 40 20, 21.6, 12.8	20, 21.6, 12.8	**3**	B1 B1 B1

Question Number	Answer	Mark	Notes
11 (b)	Curve	**3**	B3 – 1 mark for incorrect /non uniform scale, straight line segments each point missed each missed segment each point not plotted each point incorrectly plotted tramlines poor curve

Question Number	Working	Answer	Mark	Notes
11 (c)	Identifying c's value of v a turning point	25.6	**2**	M1 A1

Question Number	Working	Answer	Mark	Notes
11 (d)	Tangent drawn at t = 10 Rise and tread values correctly from c's triangle	0.75 – 1.25	**3**	M1 M1 dep A1

Question Number	Working	Answer	Mark	Notes
11 (e)	1728 ÷ 120	14.4 m/s (oe)	**2**	M1 A1

Question Number	Working	Answer	Mark	Notes
11 (f)	Line drawn between v = 14 and v = 14.5 One correct value for t seen (±1/2 small square from c's graph)	62 - 66	**3**	M1 M1 dep A1