N5

National Qualifications
SPECIMEN ONLY

Mark

SQ29/N5/02

Mathematics
Paper 2

Date — Not applicable

Duration — 1 hour and 30 minutes

SQ29N502

Fill in these boxes and read what is printed below.

Full name of centre

Town

Forename(s)

Surname

Number of seat

Date of birth

Day	Month	Year
D D	M M	Y Y

Scottish candidate number

Total marks — 50

You may use a calculator.

Attempt ALL questions.

Use **blue** or **black** ink. Pencil may be used for graphs and diagrams only.

Write your working and answers in the spaces provided. Additional space for answers is provided at the end of this booklet. If you use this space, write clearly the number of the question you are attempting.

Square-ruled paper is provided at the back of this booklet.

Full credit will be given only to solutions which contain appropriate working.

State the units for your answer where appropriate.

Before leaving the examination room you must give this booklet to the Invigilator.
If you do not, you may lose all the marks for this paper.

X SQA

FORMULAE LIST

The roots of

$ax^2 + bx + c = 0$ are $x = \dfrac{-b \pm \sqrt{(b^2 - 4ac)}}{2a}$

Sine rule:

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

Cosine rule:

$a^2 = b^2 + c^2 - 2bc \cos A$ or $\cos A = \dfrac{b^2 + c^2 - a^2}{2bc}$

Area of a triangle:

$A = \frac{1}{2} ab \sin C$

Volume of a sphere:

$V = \frac{4}{3} \pi r^3$

Volume of a cone:

$V = \frac{1}{3} \pi r^2 h$

Volume of a pyramid:

$V = \frac{1}{3} Ah$

Standard deviation:

$s = \sqrt{\dfrac{\Sigma(x - \bar{x})^2}{n-1}} = \sqrt{\dfrac{\Sigma x^2 - (\Sigma x)^2/n}{n-1}}$, where n is the sample size.

1. Beth normally cycles a total distance of 56 miles per week.

    She increases her distance by 15% each week for the next three weeks.

    How many miles will she cycle in the third week?   **3**

2. There are 3×10^5 platelets per millilitre of blood.

    On average, a person has 5·5 litres of blood.

    On average, how many platelets does a person have in their blood?

    Give your answer in scientific notation.   **2**

3. In the diagram, OABCDE is a regular hexagon with centre M.

Vectors **a** and **b** are represented by $\overrightarrow{OA}$ and $\overrightarrow{OB}$ respectively.
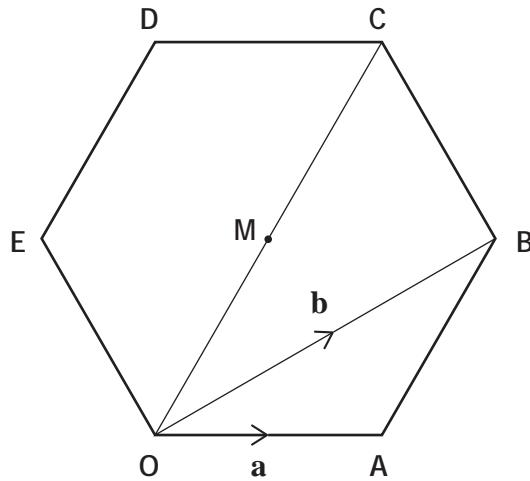
(a) Express $\overrightarrow{AB}$ in terms of **a** and **b**. 1

(b) Express $\overrightarrow{OC}$ in terms of **a** and **b**. 1

Total marks 2

4. The graph with equation $y = kx^2$ is shown below.

(2, −16)
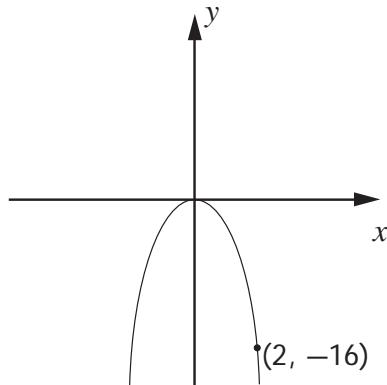
The point (2, −16) lies on the graph.

Determine the value of k.   2

5. In triangle PQR, PQ = 8 centimetres, QR = 3 centimetres and angle PQR = 120°.
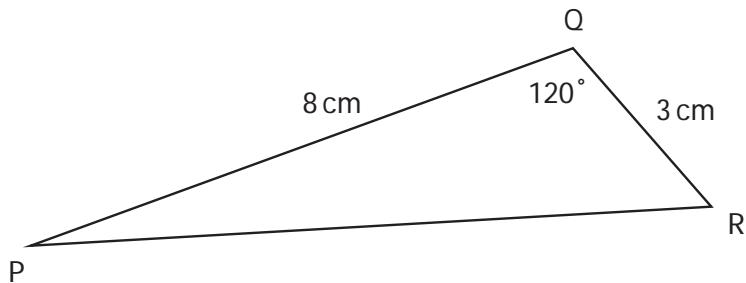
Calculate the length of PR.   3

6. A child's toy is in the shape of a hemisphere with a cone on top, as shown in the diagram.
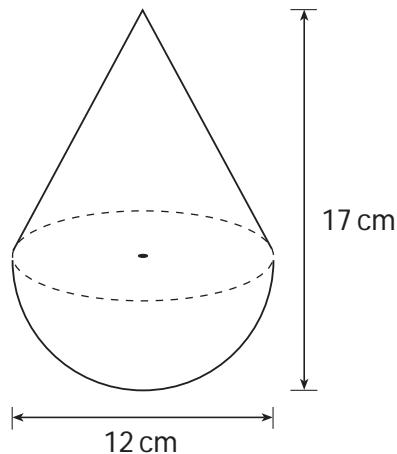
The toy is 12 centimetres wide and 17 centimetres high.

Calculate the volume of the toy.

Give your answer correct to 2 significant figures.

5

7. This year Adèle paid £465 for her car insurance.

   This is an increase of 20% on last year's payment.

   How much did Adèle pay last year?   **3**

8. A frozen food company uses machines to pack sprouts into bags.

   A sample of six bags is taken from Machine A and the number of sprouts in each bag is counted.

   The results are shown below.

23	19	21	20	19	24

   (a) Calculate the mean and standard deviation of this sample.   **3**

   (b) Another sample of six bags is taken from Machine B.

   This sample has a mean of 19 and a standard deviation of 2·3.

   Write down two valid comparisons between the samples.   **2**

   Total marks   **5**

9. Screenwash is available in two different sized bottles, 'Mini' and 'Maxi'.

   The bottles are mathematically similar.
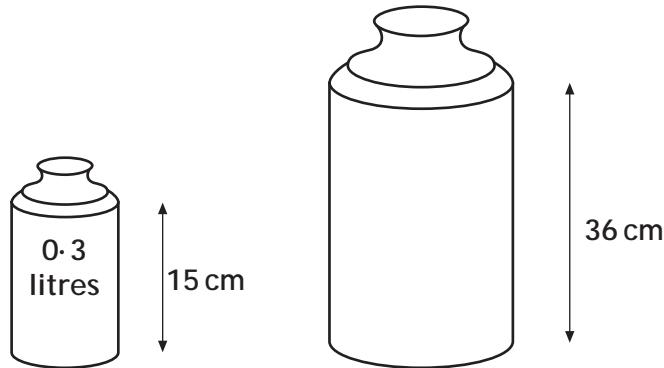
   Calculate the volume of the 'Maxi' bottle.   3

10. Part of the graph of $y = a\cos x° + b$ is shown below.
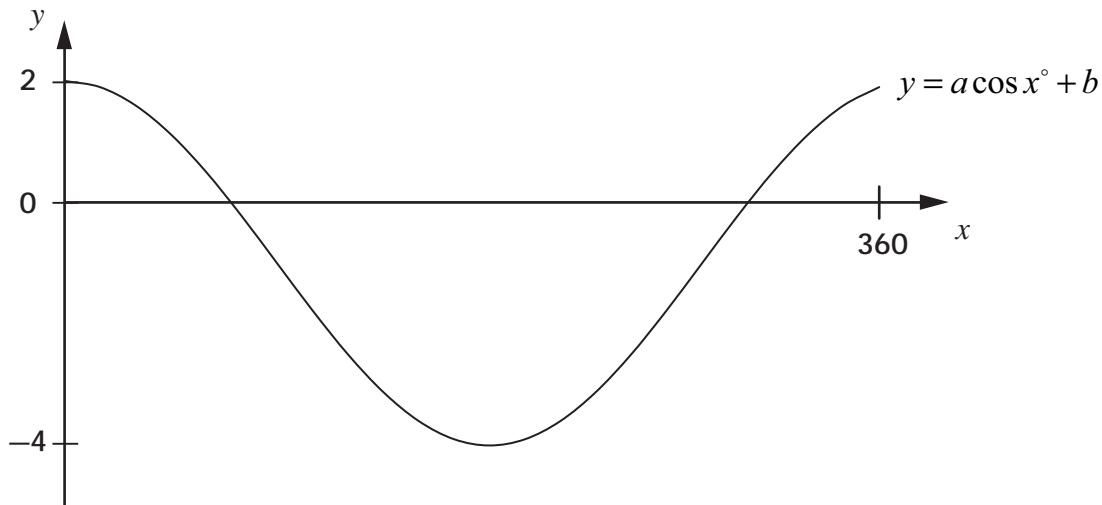

(a) Explain how you can tell from the graph that $a = 3$ and $b = -1$. **2**

(b) Calculate the x-coordinates of the points where the graph cuts the x-axis. **4**

Total marks **6**

11. A cone is formed from a paper circle with a sector removed as shown.

The radius of the paper circle is 40 centimetres.

Angle AOB is 110°.
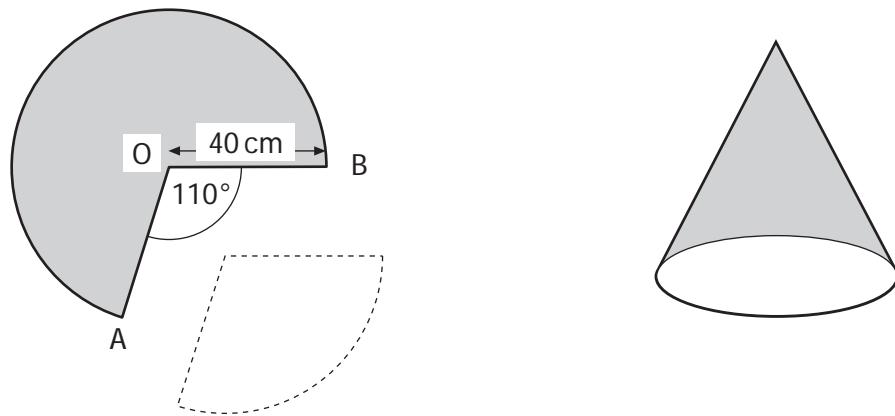
(a) Calculate the area of the sector removed from the circle. 3

(b) Calculate the circumference of the base of the cone. 3

Total marks 6

12. Find the range of values of p such that the equation $px^2 - 2x + 3 = 0$, $p \neq 0$, has no real roots.

4

13. A yacht sails from a harbour H to a point C, then to a point D as shown below.
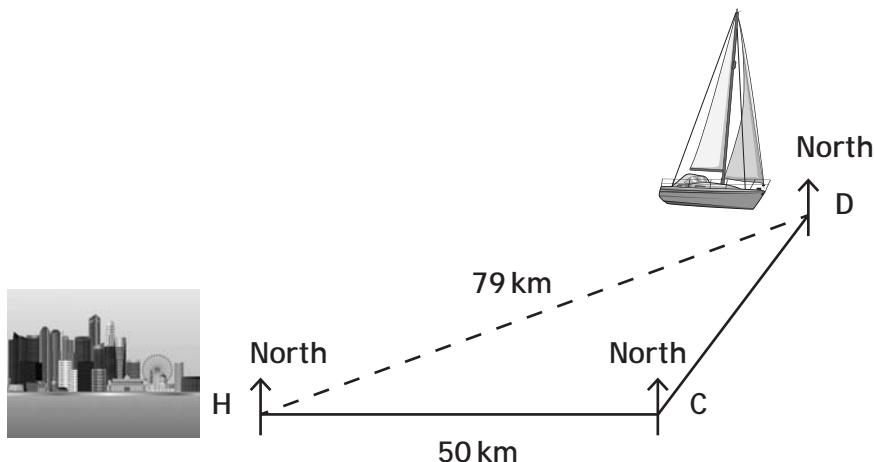
C is 50 kilometres due east of H.

D is on a bearing of 040° from C and is 79 kilometres from H.

(a) Calculate the size of angle CDH. **4**

(b) Hence, calculate the bearing on which the yacht must sail to return directly to the harbour. **2**

Total Marks 6

[END OF SPECIMEN QUESTION PAPER]

ADDITIONAL SPACE FOR ANSWERS

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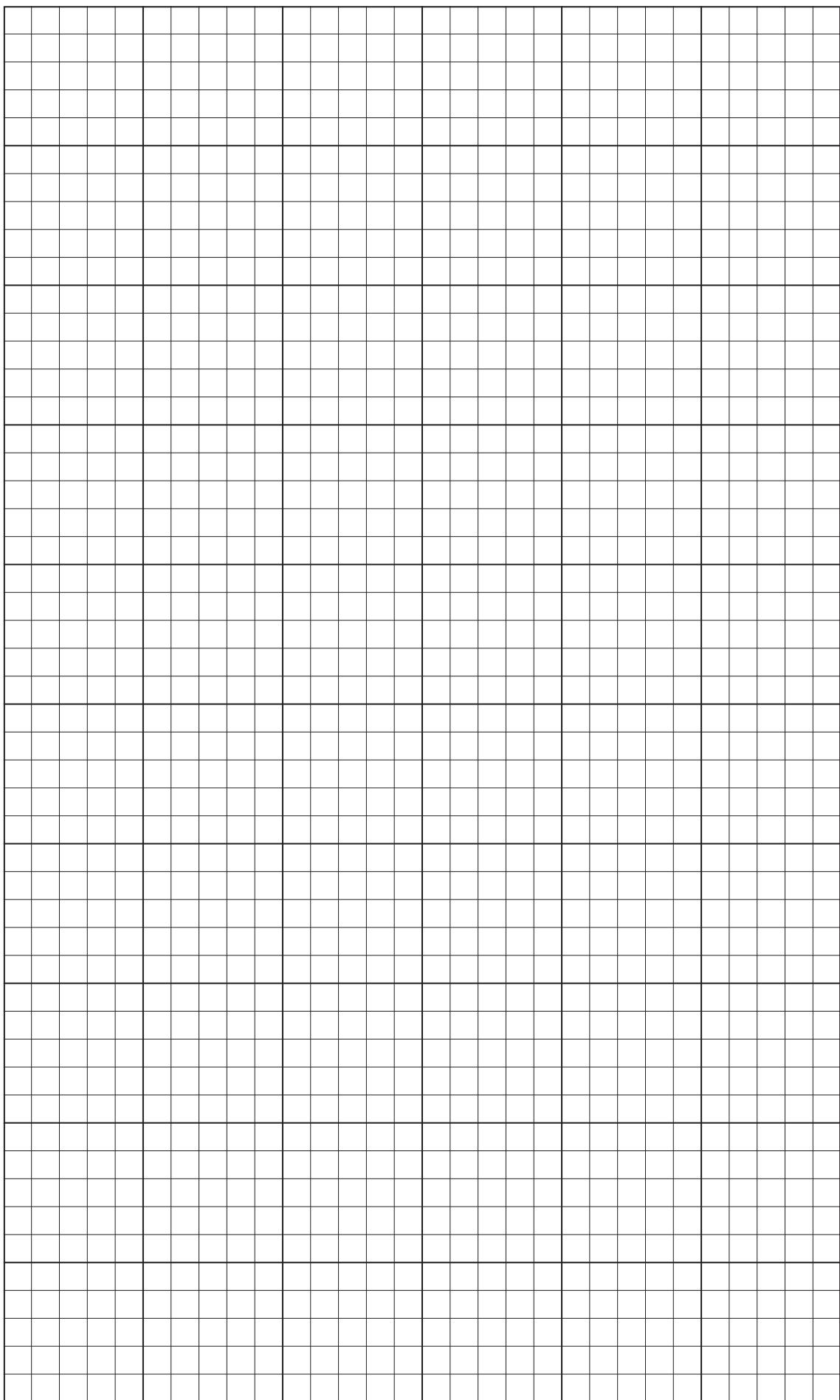
National Qualifications SPECIMEN ONLY

SQ29/N5/01

Mathematics Paper 2

Marking Instructions

These Marking Instructions have been provided to show how SQA would mark this Specimen Question Paper.

✕ SQA ©

Part One: General Marking Principles for National 5 Mathematics

This information is provided to help you understand the general principles you must apply when marking candidate responses to questions in this Paper. These principles must be read in conjunction with the specific Marking Instructions for each question. The marking schemes are written to assist in determining the 'minimal acceptable answer' rather than listing every possible correct and incorrect answer.

(a) Marks for each candidate response must <u>always</u> be assigned in line with these general marking principles and the specific Marking Instructions for the relevant question.

(b) Marking should always be positive, ie marks should be awarded for what is correct and not deducted for errors or omissions.

(c) Credit must be assigned in accordance with the specific assessment guidelines.

(d) Candidates may use any mathematically correct method to answer questions except in cases where a particular method is specified or excluded.

(e) Working subsequent to an error must be followed through, with possible credit for the subsequent working, provided that the level of difficulty involved is approximately similar. Where, subsequent to an error, the working is easier, candidates lose the opportunity to gain credit.

(f) Where transcription errors occur, candidates would normally lose the opportunity to gain a processing mark.

(g) Scored out or erased working which has not been replaced should be marked where still legible. However, if the scored out or erased working has been replaced, only the work which has not been scored out should be judged.

(h) Unless specifically mentioned in the specific assessment guidelines, do not penalise:

- Working subsequent to a correct answer
- Correct working in the wrong part of a question
- Legitimate variations in solutions
- Bad form
- Repeated error within a question

Part Two: Specific Marking Instructions for each question

Question			Marking scheme Give one mark for each •	Max mark	Illustrations of evidence for awarding a mark at each •
1			**Ans: 85·169 miles** •¹ multiplying factor •² power of 3 •³ answer	3	•¹ 1·15 •² $1·15^3$ •³ 85·169 or 85·17 or 85·2 or 85
2			**Ans: $1·65 \times 10^9$** •¹ correct method •² answer	2	•¹ $3 \times 10^5 \times 5·5 \times 1000$ •² $1·65 \times 10^9$
3	a		**Ans: b − a** •¹ answer	1	•¹ **b − a**
3	b		**Ans: 2(b − a)** •¹ answer	1	•¹ 2(**b − a**)
4			**Ans: − 4** •¹ correct substitution into equation •² state value of k	2	•¹ $-16 = k \times 2^2$ •² − 4
5			**Ans: 9·8 cm** •¹ correct application of cosine rule for PR² •² correct value for PR² •³ answer	3	•¹ $8^2 + 3^2 - 2 \times 8 \times 3 \times \cos120°$ •² 97 •³ 9·8(488.....)

6			Ans: 870 cm³	5	
			•¹ know how to calculate volume of toy		•¹ add volume of cone and volume of hemisphere
			•² substitute correctly into formula for volume of hemisphere		•² $\frac{1}{2}\times\frac{4}{3}\times\pi\times6^3$ $(= 452\cdot389...)$
			•³ substitute correctly into formula for volume of cone		•³ $\frac{1}{3}\times\pi\times6^2\times11$ $(= 414\cdot690....)$
			•⁴ calculate volume correctly		•⁴ $867\cdot079...$
			•⁵ round to 2 significant figures		•⁵ 870
7			Ans: £387·50	3	
			•¹ know that 120% = 465		•¹ 120% = 465
			•² know to divide 465 by 1·2		•² 100% = 465 ÷ 1·2
			•³ answer		•³ 387·50
8	a		Ans: mean = 21 standard deviation = 2.1	3	
			•¹ calculate mean		•¹ 21
			•² start to calculate standard deviation		•² as far as $\Sigma(x-\overline{x})^2 = 22$ or $\Sigma x^2 = 2668$
			•³ answer		•³ $2\cdot0976$
8	b		Ans: two valid statements	2	
			•¹ compare means		•¹ Machine A, on average, packs more sprouts into a bag
			•² compare standard deviations		•² The number of sprouts packed in a bag by Machine A is more consistent

9			Ans: 4·1472 litres	3	
			$\bullet^1$ find linear scale factor		$\bullet^1$ $\dfrac{36}{15}$ (= 2·4)
			$\bullet^2$ find volume scale factor		$\bullet^2$ $\left(\dfrac{36}{15}\right)^3$ (= 2·4^3 = 13·824)
			$\bullet^3$ calculate volume		$\bullet^3$ 4·1 or 4·15 or 4·147 or 4·1472
10	a		Ans: half of [2 – (–4)] graph moved down 1	2	
			$\bullet^1$ correct explanation of 3		$\bullet^1$ half of [2 – (–4)] , or equivalent
			$\bullet^2$ correct explanation of –1		$\bullet^2$ graph of $y = \cos x°$ moved down 1, or equivalent
10	b		Ans: 70·5°, 289·5°	4	
			$\bullet^1$ form equation		$\bullet^1$ $3\cos x° - 1 = 0$
			$\bullet^2$ rearrange equation		$\bullet^2$ as far as $\cos x° = \dfrac{1}{3}$
			$\bullet^3$ find one value		$\bullet^3$ 70·5
			$\bullet^4$ find second value		$\bullet^4$ 289·5
11	a		Ans: 1536 cm^2	3	
			$\bullet^1$ correct fraction of area		$\bullet^1$ $\dfrac{110}{360}$
			$\bullet^2$ correct formula		$\bullet^2$ $\dfrac{110}{360} \times \pi \times 40^2$
			$\bullet^3$ all calculations correct		$\bullet^3$ 1535·8…
11	b		Ans: 175 cm	3	
			$\bullet^1$ correct fraction of circumference		$\bullet^1$ $\dfrac{250}{360}$
			$\bullet^2$ correct formula		$\bullet^2$ $\dfrac{250}{360} \times \pi \times 80$
			$\bullet^3$ all calculations correct		$\bullet^3$ 174·5…

12			Ans: $p > \frac{1}{3}$	4	
			$\bullet^1$ know to use discriminant		$\bullet^1$ $b^2 - 4ac$
			$\bullet^2$ correct values of *a*, *b* and *c*		$\bullet^2$ $a = p, b = -2, c = 3$
			$\bullet^3$ form correct inequation		$\bullet^3$ $4 - 12p < 0$
			$\bullet^4$ solve inequation		$\bullet^4$ $p > \frac{1}{3}$
13	a		Ans: $29°$	4	
			$\bullet^1$ calculate angle CDH		$\bullet^1$ $130°$
			$\bullet^2$ correct use of sine rule		$\bullet^2$ $\dfrac{50}{\sin \text{CDH}} = \dfrac{79}{\sin 130°}$
			$\bullet^3$ rearrange equation		$\bullet^3$ $\sin \text{CDH} = \dfrac{50 \sin 130°}{79}$
			$\bullet^4$ find angle CDH		$\bullet^4$ $29°$
13	b		Ans: $249°$	2	
			$\bullet^1$ use alternate angle		$\bullet^1$ angle alternate to given bearing $= 40°$
			$\bullet^2$ find correct bearing		$\bullet^2$ $249°$

Total Marks for Paper 2 — 50

[END OF SPECIMEN MARKING INSTRUCTIONS]