Write your name, centre number and candidate number in the boxes below.

Surname	Other names

Centre number | | | | | |

Candidate number | | | | |

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Upper and lower bounds

Time allowed: 35 minutes

Subject code **0580**

Mathematics

Questions from Paper 1, Paper 2 and Paper 4

You must have: a ruler marked in centimetres and millimetres, a protractor, compasses, a pen, an HB pencil and an eraser.
You may use a calculator.

Total marks

/ 29

Instructions

- Answer every question in the space provided on this paper.
- Write in black or dark blue ink. Pencil may be used for diagrams and graphs.
- Fill in your name, centre number and candidate number above.
- Show your working: a correct method can earn marks even if the answer is wrong.
- Unless a question says otherwise, give answers that are not exact to 3 significant figures, and angles in degrees to 1 decimal place.

Information

- This paper has 10 questions worth 29 marks in total.
- The marks for each question or part are shown in brackets, for example [3].

Advice

- Read every question through once before you write anything.
- Use the marks in brackets to judge how long to spend on each part.
- If you finish early, go back and check your working.

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Print at 100% (Actual size) so diagrams keep their real measurements.

1 The width, w cm, of a carpet is 455 cm, correct to the nearest centimetre.

Complete the statement about the value of w.

Answer ..... $\leqslant w <$ ..... [2]

Upper and lower bounds Click for more variations

1		454.5 455.5	**1, 1**	**SC1** for both correct but reversed

2 **(a)** The mass, m kilograms, of object A is 350 kg, correct to the nearest 10 kg.

Complete this statement about the value of m.

..... $\leqslant m <$ ..... [2]

(b) The mass of object B is 348 kg, correct to the nearest kilogram.

Show that the mass of object B may be more than the mass of object A.

..... [1]

(a) Upper and lower bounds (b) Upper and lower bounds Click for more variations

2(a)	345 355	**2**	**B1** for one correct and in the correct position If 0 scored, **SC1** for both correct but reversed
2(b)	Any correct response e.g. A could be 345	**1**	Dependent on 345 given as a limit in part **(a)**

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3 Violet and Wilfred recorded their times to run 200 m, correct to the nearest second.
Violet took 36 seconds and Wilfred took 39 seconds.

Work out the upper bound of the difference between their times.

..... s [2]

Upper and lower bounds Click for more variations

3	4 nfww	**2**	**M1** for 39 + 0.5 or 36 – 0.5 or better seen 39 – 0.5 or 36 + 0.5

4 **(a)** The length of the side of a square is 12 cm, correct to the nearest centimetre.

Calculate the upper bound for the perimeter of the square.

..... cm [2]

(b) Jo measures the length of a rope and records her measurement correct to the nearest ten centimetres.
The upper bound for her measurement is 12.35 m.

Write down the measurement she records.

..... m [1]

(a) Upper and lower bounds (b) Upper and lower bounds Click for more variations

4(a)	50 cao nfww	**2**	**B1** 12.5 seen or **M1** for 12 + 0.5 or better
4(b)	12.3	**1**	

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5 A rectangular photograph measures 23.3 cm by 19.7 cm, each correct to 1 decimal place. Calculate the lower bound for

(a) the perimeter,

Answer(a) ..... cm [2]

(b) the area.

Answer(b) ..... cm^2 [1]

(a) Upper and lower bounds (b) Upper and lower bounds Click for more variations

5	**(a)** 85.8 **(b)** 456.8625 cao	**2** **1**	**M1** for 23.25 and 19.65 seen

6 The sides of an isosceles triangle are measured correct to the nearest millimetre. One side has a length of 8.2 cm and another has a length of 9.4 cm.

Find the largest possible value of the perimeter of this triangle.

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..... cm [3]

Upper and lower bounds Click for more variations

6	27.15 cao	**3**	**M2** for (9.4 + 0.05) × 2 + 8.2 + 0.05 or better or **M1** for 8.2 + 0.05 or 9.4 + 0.05 or better seen OR **SC2** for answer 25.95 or **SC1** for answer 26.85

7 A circle has a radius of 8.5 cm correct to the nearest 0.1 cm.
The lower bound for the area of the circle is $p\pi$ cm^2.
The upper bound for the area of the circle is $q\pi$ cm^2.

Find the value of p and the value of q.

Answer p = ...

q = ... [3]

Upper and lower bounds Click for more variations

7	$p = 71.4025$ cao $q = 73.1025$ cao	**3**	**B1** for 8.45 and 8.55 seen **M1** for *their* LB^2 [π] or *their* UB^2 [π] If 0 scored, **SC1** for one correct.

8 The distance between two towns is 600 km, correct to the nearest 10 km.
A car takes 8 hours 40 minutes, correct to the nearest 10 minutes, to travel this distance.

Calculate the lower bound for the average speed of the car in km/h.

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..... km/h [3]

Upper and lower bounds Click for more variations

8	68 nfww	**3**	**M2** for $\frac{600-5}{8\text{h}40 \text{ to} 8\text{h}50}$ or $\frac{590 \text{ to } 600}{8\text{h}40 + 5[\text{m}]}$ oe or **M1** for $600 - 5$ oe or 8h 40 + 5[m] oe or 520 + 5 oe[m] seen

9 $I = \frac{V}{R}$

V is 50, correct to the nearest 10.
R is 13, correct to the nearest integer.

Calculate the upper bound of I.

..... [3]

Upper and lower bounds Click for more variations

9	4.4 nfww	**3**	**M2** for $\frac{50 \text{ to } 60}{13 - 0.5}$ or $\frac{50 + 5}{12 \text{ to } 13}$ oe or **M1** for 50 + 5, 50 – 5, 13 + 0.5 or 13 – 0.5 seen

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10 A metal cube has mass 14.2 g, correct to 1 decimal place.

(a) Find the lower bound of the mass of the cube.

..... g [1]

(b) The side length of the cube is 1.3 cm, correct to 1 decimal place.

Calculate the upper bound of the density of the metal.
[Density = mass ÷ volume]

..... g/cm^3 [3]

(a) Upper and lower bounds (b) Upper and lower bounds Click for more variations

10(a)	14.15 cao	**1**	
10(b)	7.296 cao nfww	**3**	**M2** for $\frac{14.2 \text{ to } 14.3}{(1.3-0.05)^3}$ or $\frac{14.3-0.05}{(1.2 \text{ to } 1.3)^3}$ or **M1** for 14.25 or 1.35 or 1.25 seen

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