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

Surname	Other names

Centre number | | | | | |

Candidate number | | | | |

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Squares, roots and surds

Time allowed: 35 minutes

Subject code **0580**

Mathematics

Questions from Paper 1, Paper 2, Paper 3 and Paper 4

You must have: a ruler marked in centimetres and millimetres, a protractor, compasses, a pen, an HB pencil and an eraser.
Questions 2, 4, 6, 8 (Paper 1): calculator allowed.
Questions 7, 9-10 (Paper 2): no calculator.
Questions 1, 3 (Paper 3): calculator allowed.
Question 5 (Paper 4): calculator allowed.

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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Turn over ►

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

1 Find the value of $\sqrt{1.96}$.

..... [1]

Powers and roots Click for more variations

1	1.4	**1**	

2 Find the value of

(a) $\sqrt[3]{2744}$,

Answer(a) ..... [1]

(b) 6^4.

Answer(b) ..... [1]

(a) Powers and roots (b) Powers and roots Click for more variations

2	**(a)**	14	**1**	
	(b)	1296	**1**	

3 Find the value of 8^5.

Give your answer correct to 3 significant figures.

..... [2]

Significant figures Click for more variations

3	32 800 cao	**2**	**B1** for 32 768 or *their* answer of more than 3 figures correctly rounded to 3 sf

4 Work out $\dfrac{\sqrt[3]{512}}{6^2}$.

Write your answer as a fraction in its lowest terms.

..... [2]

Powers and roots Click for more variations

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4	$\frac{2}{9}$	**2**	**B1** for $\frac{8}{36}$ or $\frac{4}{18}$

5

$\frac{2}{5}$	$\sqrt{15}$	23	$\sqrt{144}$	-2	0.8

From this list, write down

(a) a natural number

..... [1]

(b) an irrational number.

..... [1]

(a) Types of number (b) Irrational numbers Click for more variations

5(a)	23 or $\sqrt{144}$	**1**	Accept 12 for $\sqrt{144}$
5(b)	$\sqrt{15}$	**1**	

6 A circle has radius 7 cm.
A square has side x cm.
The circumference of the circle is the same length as the perimeter of the square.

Find the value of x.
Give your answer in terms of π.

$x =$ ..... [3]

Area and circumference of circles Click for more variations

6	$\frac{7\pi}{2}$ or 3.5π	**3**	**M2** for $2\pi\times7=4x$ oe or **M1** for $2\pi\times7$ or 14π or $4x$

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7 Rationalise the denominator and simplify.

$$\frac{20}{4+\sqrt{6}}$$

..... [3]

Surds Click for more variations

7	$2(4-\sqrt{6})$ or $8-2\sqrt{6}$	**3**	**M2** for $\frac{20\left(4-\sqrt{6}\right)}{16+4\sqrt{6}-4\sqrt{6}-6}$ oe or better or **M1** for $\frac{20}{4+\sqrt{6}}\times\frac{4-\sqrt{6}}{4-\sqrt{6}}$ oe

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8 **(a)** Kat has a method for finding the difference between two square numbers, $a^2 - b^2$.
Her method is

(the sum of a and b) $\times$ (the difference between a and b) .

She shows her method for $17^2 - 13^2$.

$17^2 - 13^2$

$= (17 + 13) \times (17 - 13)$

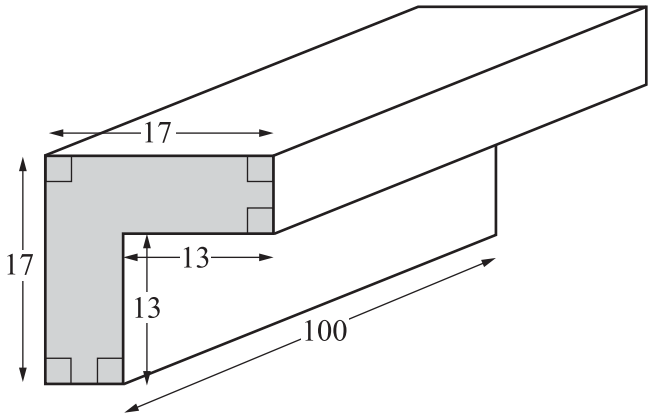
$= 30 \times 4$

$= 120$

Work out $29^2 - 21^2$ using Kat's method.

..... [2]

(b) In this part, all lengths are in centimetres.



NOT TO SCALE

The diagram shows a prism.

Work out the volume of the prism.

..... cm^3 [2]

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(a) Powers and roots (b) Volume Click for more variations

8(a)	$(29+21)\times(29-21)$ $=50\times8$	**M1**	
	400	**A1**	
8(b)	12000	**2**	**M1** for $(17^2-13^2)[\times100]$ oe

9 **(a)** $\dfrac{9}{\sqrt{3}}$

Rationalise the denominator.
Give your answer in its simplest form.

..... [2]

(b) $(5-\sqrt{2})(1+3\sqrt{2}) = c+k\sqrt{2}$

Find the value of c and the value of k.

$c =$ .....

$k =$ .....

[2]

(a) Surds (b) Surds Click for more variations

9(a)	$3\sqrt{3}$ cao	**2**	**M1** for $\dfrac{9}{\sqrt{3}} \times \dfrac{\sqrt{3}}{\sqrt{3}}$ oe
9(b)	[c =] –1 [k =] 14	**2**	**B1** for each or for 3 correct terms from $5+15\sqrt{2}-\sqrt{2}-3\sqrt{2}\sqrt{2}$ oe

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10 **(a)** Simplify.

$$\sqrt{27}+\sqrt{12}$$

..... [2]

(b) $\dfrac{40\sqrt{8}}{5\sqrt{2}} = k$, where k is an integer.

Find the value of k.

$k =$ ..... [2]

(c) Rationalise the denominator.

$$\frac{1}{3-\sqrt{5}}$$

..... [2]

(a) Surds (b) Surds (c) Surds Click for more variations

10(a)	$5\sqrt{3}$	**2**	**B1** for $3\sqrt{3}$ or $2\sqrt{3}$
10(b)	16	**2**	**M1** for $40\times 2\sqrt{2}$, $8\times 2\sqrt{2}$, $\dfrac{8\sqrt{4}\sqrt{2}}{\sqrt{2}}$ or $\dfrac{40\sqrt{8}\sqrt{2}}{5\sqrt{2}\sqrt{2}}$ or better or **B1** for $8\sqrt{4}$ or $\sqrt{256}$
10(c)	$\dfrac{3+\sqrt{5}}{4}$	**2**	**M1** for $\dfrac{1}{3-\sqrt{5}}\times\dfrac{3+\sqrt{5}}{3+\sqrt{5}}$ oe

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