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

Surname	Other names

Centre number | | | | | |

Candidate number | | | | |

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Interest, growth and decay

Time allowed: 1 hour 5 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.
You may use a calculator.

Total marks

/ 52

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 52 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 Nerina invests \$5400 at a rate of r% per year simple interest.
At the end of 3 years, the total interest earned is \$429.30 .

Calculate the value of r.

$r =$ ..... [2]

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1	2.65	**2**	**M1** for $\frac{5400\times3\times r}{100} = 429.3[0]$ oe or better

2 Robert buys a car for \$8000.
At the end of each year the value of the car has decreased by 10% of its value at the beginning of that year.

Calculate the value of the car at the end of 7 years.

Answer \$ ..... [2]

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2	3826 or 3826.38	**2**	**M1** for $8000 \times \left(1-\frac{10}{100}\right)^7$ oe

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3 Jo invests $500 at a rate of 2% per year compound interest.

Calculate the amount of interest earned at the end of 7 years.

$ ..... [3]

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3	74.3 or 74.34…	**3**	**B2** for 574 or 574.3… or **M2** for $500\left(1+\frac{2}{100}\right)^{7}$ - 500 oe or **M1** for $500\left(1+\frac{2}{100}\right)^{7}$ oe

4 The population of Dubai at the end of 2012 was 2.1 million.
This was predicted to increase at a rate of 6% each year.

Calculate the predicted population of Dubai at the end of 2015.

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Answer ..... million [3]

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4	2.5[0] or 2.501… nfww	**3**	**M2** for $2.1\times\left(1+\frac{6}{100}\right)^3$ oe or **M1** for $2.1\times\left(1+\frac{6}{100}\right)^n$ oe where $n\geq 2$ or for figs $21\times\left(1+\frac{6}{100}\right)^3$ oe

5 Eric invests an amount in a bank that pays compound interest at a rate of 2.16% per year.
At the end of 5 years, the value of his investment is \$6 999.31 .

Calculate the amount Eric invests.

\$..... [3]

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5	6290[.0…]	**3**	**M2** for $\dfrac{6999.31}{\left(1+\dfrac{2.16}{100}\right)^5}$ or **M1** for $[A]\left(1+\dfrac{2.16}{100}\right)^5$

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6 Sonia wants to invest \$5000 for 6 years.

Bank A pays compound interest at a rate of 3.5% per year.
Bank B increases the \$5000 by 22% at the end of 6 years.

Which bank will give Sonia the most money at the end of 6 years and by how much?
You must show all your working.

Bank A

Bank B

Bank ..... will give \$ ..... more money. [5]

Interest, growth and decay Click for more variations

6	A 46.28	**5**	**M1** for 5000×1.035^6 **A1** for 6146.27 to 6146.28 **M1** for 5000×1.22 **A1** for 6100

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7 Marcel invests \$2500 for 3 years at a rate of 1.6% per year simple interest.
Jacques invests \$2000 for 3 years at a rate of x% per year compound interest.
At the end of the 3 years Marcel and Jacques receive the same amount of interest.

Calculate the value of x correct to 3 significant figures.

$x =$ ..... [5]

Interest, growth and decay Click for more variations

7	1.96 cao	**5**	**M4** for $\left(\left(\left(\sqrt[3]{\frac{2500\times1.6\times3}{100}+2000}{2000}\right)-1\right)-1\right)$ [× 100] oe or 1.96…or [0].0196... or 101.96… or 1.0196… or **M3** for $\sqrt[3]{\frac{\frac{2500\times1.6\times3}{100}+2000}{2000}}$ or **B2** for [SI =] 120 or [CI total=] 2120 or **M1** for $\frac{2500\times3\times1.6}{100}$ and **M1** for $2000\times(k)^3$

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8 **(a)** Dina invests \$600 for 5 years at a rate of 2% per year compound interest.

Calculate the value of this investment at the end of the 5 years.

\$ ..... [2]

(b) The value of a gold ring increases exponentially at a rate of 5% per year.
The value is now \$882.

(i) Calculate the value of the ring 2 years ago.

\$ ..... [2]

(ii) Find the number of complete years it takes for the ring's value of \$882 to increase to a value greater than \$1100.

..... [2]

(a) Interest, growth and decay (b)(i) Interest, growth and decay (b)(ii) Interest, growth and decay

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8(a)	662.45	**2**	**M1** for $600 \times \left(1+\frac{2}{100}\right)^5$ oe
8(b)(i)	800	**2**	**M1** for $x\left(1+\frac{5}{100}\right)^2 = 882$ oe or **SC1** for answer 82
8(b)(ii)	5 nfww	**2**	**M1** for trial with $882 \times \left(1+\frac{5}{100}\right)^n$ with $n > 1$

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9 **(a)** **(i)** Eduardo invests \$640 at a rate of 2% per year compound interest.

Show that, at the end of 6 years, Eduardo has \$721, correct to the nearest dollar.

Answer(a)(i)

[2]

(ii) Manuela also invests \$640.
At the end of 4 years, Manuela has \$721.

Find the yearly compound interest rate.

Answer(a)(ii) ..... % [4]

(b) Carlos buys a motor scooter for \$1200.
Each year the value of the scooter decreases by 10% of its value at the beginning of that year.

Find the value of the scooter after 3 years.

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Answer(b) \$ ..... [2]

(a)(i) Interest, growth and decay (a)(ii) Interest, growth and decay (b) Interest, growth and decay

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9	**(a)**	**(i)**	640×1.02^6 oe $= 720.7\ldots$	**M1** **B1**	Must be seen
		(ii)	3.02 or 3.020 to 3.024… nfww	**4**	**M3** for $[x =]\ \sqrt[4]{721 \div 640}$ or better (implied by answer of 1.03[02…] or $r = 0.0302[4\ldots]$ or **M2** for $(\textit{their } x)^4 = 721 \div 640$ or **M1** for $640 \times (\textit{their } x)^4 = 721$ oe
	(b)		874.8[0] final answer	**2**	**M1** $1200 \times (1 - 0.1)^3$ oe

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10 **(a)** The value of Priya's car decreases by 10% every year.
The value today is \$7695.

(i) Calculate the value of the car after one year.

\$ ..... [2]

(ii) Calculate the value of the car one year ago.

\$ ..... [2]

(b) Ali invests \$600 at a rate of 2% per year simple interest.

Calculate the value of Ali's investment at the end of 5 years.

\$ ..... [3]

(c) Sara invests \$500 at a rate of r% per year compound interest.
At the end of 12 years, the value of Sara's investment is \$601.35, correct to the nearest cent.

Find the value of r.

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$r =$ ..... [3]

(d) The mass of a radioactive substance decreases exponentially at a rate of 3% each day.

(i) Find the overall percentage decrease at the end of 10 days.

..... % [2]

(ii) Find the number of whole days it takes until the mass of this substance is one half of its original amount.

..... [3]

(a)(i) Percentage increase and decrease (a)(ii) Reverse percentages (b) Interest, growth and decay
(c) Interest, growth and decay (d)(i) Percentage increase and decrease (d)(ii) Interest, growth and decay
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10(a)(i)	6925.5[0] cao	**2**	**M1** for $7695 \times \frac{100-10}{100}$ oe or **B1** for answer 769.5
10(a)(ii)	8550	**2**	**M1** for $X \times \frac{100-10}{100} = 7695$ oe

10(b)	660	**3**	**B2** for 60 or **M2** for $600 + \frac{600 \times 2 \times 5}{100}$ oe or **M1** for $\frac{600 \times 2[\times 5]}{100}$ oe
10(c)	1.55 or 1.549 to 1.550	**3**	**M2** for $\sqrt[12]{\frac{601.35}{500}}$ or **M1** for $500 \times (...)^{12} = 601.35$
10(d)(i)	26.3 or 26.25 to 26.26	**2**	**M1** for $[k]\left(\frac{100-3}{100}\right)^{10}$ oe
10(d)(ii)	23	**3**	**M2** for a correct trial evaluated with n =22 or n = 23 or **M1** for $[k]\ (0.97)^n < 0.5[k]$ oe soi or for $[k](0.97)^n = 0.5[k]$ oe soi, implied by one correct trial $n > 10$ or for $[k](0.97)^{23}$ oe seen If 0 scored **SC1** for answer 22

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