FOUNDATION & HIGHER

HIGHER EXTENDS

Name ..... Class .....

R16: Growth and decay

Reason with compound growth and decay and iterative processes

20 marks · 25 minutes · Calculator allowed

1) Show that £2000 invested at 3% compound interest is worth £2121.80 after 2 years.

[Question 1: 2 marks]

2) Explain why compound interest earns more than simple interest over several years at the same rate.

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[Question 2: 2 marks]

3) A car loses 20% of its value each year. Kim says after 5 years it is worth nothing. Explain her mistake.

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[Question 3: 2 marks]

4) Show that the multiplier for a 4% decrease is 0.96

[Question 4: 1 marks]

5) A population of 5000 grows by 10% each year. Show that it is 6655 after 3 years.

[Question 5: 2 marks]

6) Ben thinks that two years of 10% growth is a 20% increase. Show that it is a 21% increase.

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[Question 6: 2 marks]

7) Bacteria double every hour. Explain why after 10 hours there are more than 1000 times as many.

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[Question 7: 2 marks]

8) A substance halves every 3 days. Show that 64 g becomes 8 g after 9 days.

[Question 8: 2 marks]

9) $P_{n+1} = 0.9P_n + 20$ and $P_0 = 100$. Show that $P_2 = 119$

[Question 9: 2 marks]

10) $V = 400 \times 1.05^n$. Explain what 1.05^n represents.

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[Question 10: 1 marks]

11) £1000 is invested at 5% compound interest. Show that it takes 6 whole years to be worth more than £1300.

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[Question 11: 2 marks]

End of paper – 20 marks in total

Answers and brief mark scheme

Q	Answer	Method / notes
1	Shown	2000×1.03^2 (M1); C1.
2	Explanation	Interest is earned on previous interest (C2).
3	Explanation	Each year it keeps 80% of a value, so never 0 (C1); $0.8^5 = 0.328$ of the value remains (C1).
4	Shown	$1 - 0.04$ (C1).
5	Shown	5000×1.1^3 (M1); C1.
6	Shown	$1.1^2 = 1.21$ (M1); C1.
7	Explanation	$2^{10} = 1024$ (M1); > 1000 (C1).
8	Shown	3 halvings (M1); $64 \div 8$ (C1).
9	Shown	$P_1 = 110$ (M1); $P_2 = 99 + 20$ (C1).
10	Explanation	Growth of 5% each year for n years (C1).
11	Shown	$1.05^5 = 1.276$ (M1); $1.05^6 = 1.340$ (C1).