4.1 Compound Interest and Depreciation: Test Pack

EDEXCEL 1MA1 · Calculator allowed · about 60 minutes

Total Marks

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 Work out 10% of £120, then add it to 120 to find the amount after a 10% increase.

(Total for Question 1 is 1 mark)

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2 Find the compound multiplier for 3% compound interest over 4 years (that is, the number you multiply the original amount by). Give your answer to 4 decimal places.

(Total for Question 2 is 1 mark)

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3 Show that a 10% compound increase for 3 years gives an overall increase of approximately 33.1%. You do not need to show every multiplication; give the multiplier and the percentage increase to 1 decimal place.

(Total for Question 3 is 2 marks)

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4 £4000 is invested at 6% compound interest per year.
After how many whole years will the investment first be worth more than £5768?

(Total for Question 4 is 3 marks)

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5 Ali invests £5000 for 2 years at 6% per year simple interest. Bea invests £5000 for 2 years at 6% per year compound interest.
How much more interest does Bea earn than Ali?

(Total for Question 5 is 4 marks)

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6 Write down the single decimal multiplier for each of the following percentage changes.

(a) an increase of 3% **(1)**

.....

(b) a decrease of 5% **(1)**

.....

(c) an increase of 12% **(1)**

.....

(d) a decrease of 40% **(1)**

.....

(Total for Question 6 is 4 marks)

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7 Calculate the value of £2000 invested for 2 years at 3% per annum, compounded monthly.
Give your answer to 2 decimal places.

(Total for Question 7 is 4 marks)

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8 A car has depreciated in value by 15% over the past year and is now worth £10200. Work out the value of the car before it depreciated.

(Total for Question 8 is 2 marks)

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9 Priya invests £1500 at compound interest. After 4 years the amount is £1893.72.

(a) Work out the annual compound interest rate. Give your answer as a percentage to 1 decimal place. **(3)**

(b) Priya withdraws £200 at the end of year 2. Work out how much she has at the end of year 4. Give your answer to 2 decimal places. **(6)**

(c) At the end of year 4 she transfers the balance from part (b) into a new account and immediately deposits an extra £500. That new account pays 4% compound interest annually. Work out the total amount in the new account after 3 years. Give your answer to 2 decimal places. **(5)**

(Total for Question 9 is 14 marks)

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10 A car is bought for £24000. It depreciates in value by r% per year for each of the first two years, and then by (r + 5)% in the third year. After 3 years, the car is worth £13872. Given that r is a positive whole number, find the value of r. You must show your working.

(Total for Question 10 is 5 marks)

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11 A sum of money, P, is invested for 2 years at r% per year compound interest, where r is not equal to 0. Prove that the total interest earned over the 2 years is not equal to twice the interest earned in the first year alone.

(Total for Question 11 is 4 marks)

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Mark scheme · 4.1 Compound Interest and Depreciation: Test Pack

Question 1

£132 cao **B1**

Answer: £132

Question 2

1.1255 cao (1.03^4 = 1.12550881 -> 1.1255 to 4 dp) **B1**

Answer:1.1255 (to 4 dp)

Working check: $(1.03)^4$ = 1.12550881 -> 1.1255 (4 dp).

Question 3

state multiplier $(1.1)^3$ = 1.331 **M1**

state increase 33.1% awrt or 33.1% cao **A1**

Answer:Multiplier = 1.331, overall increase = 33.1%

Working check: $(1.1)^3$ = 1.331 -> increase = 1.331 - 1 = 0.331 = 33.1%.

Question 4

multiplier 1.06 **M1**

calculates the value for consecutive years **M1**

7 years **A1**

Answer: 7 years

Question 5

simple interest 5000 x 6/100 x 2 **M1**

compound multiplier and power **M1**

compound interest £618.00 **A1**

£18.00 **A1**

Answer: £18.00

Question 6

(a) 1.03 oe **B1**

(a) Answer: 1.03

(b) 0.95 oe **B1**

(b) Answer: 0.95

(c) 1.12 oe **B1**

(c) Answer: 1.12

(d) 0.60 oe **B1**

(d) Answer: 0.60

Question 7

Use monthly rate 0.03/12 and n = 24: $2000*(1 + 0.03/12)^{24}$ **M1**

Calculate $(1 + 0.0025)^{24}$ or equivalent **M1**

£2123.51 awrt (intermediate correct shown) **A1**

£2123.51 cao to 2 dp **A1**

Answer: 2123.51

Question 8

10200 / 0.85 oe **M1**

12000 (pounds) cao **A1**

Answer: £12000

Question 9

(a) Form $(1 + r)^4$ = 1893.72 / 1500 **M1**

(a) Take fourth root: $1 + r = (1893.72 / 1500)^{1/4}$ **M1**

(a) r = 6.0% to 1 dp cao **A1**

(a) Answer: 6.0%

(b) Calculate amount after 2 years: $1500 * 1.06^2$ **M1**

(b) Subtract 200 at end of year 2 **M1**

(b) Grow remaining amount for 2 more years: (amount after withdrawal) $* 1.06^2$ **M1**

(b) £1669.00 awrt (intermediate seen) **A1**

(b) £1669.00 cao to 2 dp **A1**

(b) Clear multi-step working showing the sequence: grow, withdraw, grow **C1**

(b) Answer: 1669.00

(c) Add extra deposit to balance from (b): 1669.00 + 500 **M1**

(c) Use 4% compound for 3 years: (sum) $* 1.04^3$ **M1**

(c) Intermediate calculation shown correctly **A1**

(c) £2439.83 awrt to 2 dp **A1**

(c) Final answer stated with correct rounding and units **C1**

(c) Answer: 2439.83

Question 10

sets up a correct expression for the value after 3 years, e.g. 24000 x $(1 - r/100)^2$ x (1 - (r+5)/100) **M1**

sets this expression equal to 13872, or forms the equivalent ratio 13872 / 24000 = 0.578 **M1**

trials at least one value of r using a correct method, e.g. r = 10 gives 24000 x 0.9^2 x 0.85 = 16524 (too high, so r > 10) **M1**

a further correct trial narrowing the range, e.g. r = 20 gives 24000 x 0.8^2 x 0.75 = 11520 (too low, so 10 < r < 20) **A1**

r = 15 cao, with a valid check shown (24000 x 0.85^2 x 0.80 = 13872) **A1**

Answer: r = 15

Question 11

correct expression for the interest earned in year 1, e.g. P x r / 100 **M1**

correct expanded expression for the value after 2 years, e.g. $P(1 + r/100)^2 = P + 2Pr/100 + P(r/100)^2$ **M1**

correctly identifies the total interest after 2 years as $2Pr/100 + P(r/100)^2$, and compares it with 2 x (Pr/100) = 2Pr/100 **A1**

correct conclusion that the difference between the two is $P(r/100)^2$, which is non-zero whenever r is not equal to 0 (and P is not equal to 0), so the two amounts of interest can never be equal; QED oe **B1**

Answer: Proved: the interest after 2 years exceeds twice the year-1 interest by $P(r/100)^2$, which is non-zero whenever r is not equal to 0, so the two can never be equal.

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