HIGHER

6.4 Repeated Percentage Change: Test Pack

EDEXCEL 1MA1 · Calculator allowed · about 60 minutes

Total Marks

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 Write down the single decimal multiplier for a percentage increase of 8%.

(Total for Question 1 is 1 mark)

2 Which of these is the correct single decimal multiplier for an increase of 4.5%?

- ☐ A) 0.45
- ☐ B) 1.45
- ☐ C) 1.045
- ☐ D) 0.955

(Total for Question 2 is 1 mark)

3 A shop increases the price of a jacket by 20%. In a later sale, the new price is decreased by 20%. Explain why the sale price is not equal to the original price, and state whether the sale price is higher or lower than the original price.

(Total for Question 3 is 2 marks)

4 £2,500 is invested for 3 years at 3% per annum compound interest. Calculate the total value of the investment at the end of 3 years, to the nearest penny.

(Total for Question 4 is 2 marks)

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5 Farida has an unpaid credit card balance of £850. The credit card company charges 22% per annum compound interest on any unpaid balance, applied at the end of each year. Farida makes no payments.

(a) Work out the amount Farida owes after 2 years. Give your answer to the nearest penny. **(3)**

.....

(b) Work out the total interest charged over the 2 years. **(2)**

.....

(Total for Question 5 is 5 marks)

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6 Priya invests £600. She says: 'If I increase my investment by 10% and then decrease the new amount by 10%, I will end up back at £600.'

Show that Priya is wrong, and find the actual final amount.

(Total for Question 6 is 3 marks)

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7 The price of a ticket is increased by 20% and then the new price is decreased by 40%. Work out the overall percentage change.

(Total for Question 7 is 3 marks)

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8 £3,000 is invested at 2.5% per annum compound interest. Find the value of the investment after 4 years, to the nearest penny.

(Total for Question 8 is 2 marks)

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9 A quantity increases by r% each year, compounded annually, for n years.

(a) Write down a formula for the value V of an investment of £P after n years, growing at r% per annum compound interest. **(2)**

.....

(b) Use your formula to find the value of £3200 invested for 7 years at 1.8% per annum compound interest. Give your answer to the nearest penny. **(3)**

.....

(Total for Question 9 is 5 marks)

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10 A company's profit increased by 10% in Year 1, then decreased by 10% in Year 2.

(a) The starting profit was £180,000. Calculate the profit at the end of Year 2. **(2)**

.....

(b) State, with a calculation to support your answer, whether the profit has returned to its starting value of £180,000. **(2)**

(Total for Question 10 is 4 marks)

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11 Aisha invests £6,000 for 3 years. Option A pays simple interest at 4% per annum. Option B pays compound interest at 3.6% per annum. Determine which option gives Aisha more money after 3 years, and find the difference between the final amounts, to the nearest penny.

(Total for Question 11 is 4 marks)

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12 The population of a town is 42,000. The population is increasing by 2% each year.

(a) Show that the population after 2 years, rounded to the nearest 10, is 43,700. **(2)**

(b) The council needs to plan for when the population first exceeds 46,000. Find the number of complete years after which this happens. **(4)**

(Total for Question 12 is 6 marks)

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13 A quantity increases by x% and is then decreased by the same x%.

(a) Show algebraically that a percentage increase of x% followed by a percentage decrease of x% gives an overall multiplier of $1 - x^2/10000$, and that this is always an overall decrease of $x^2/100$ %, for any positive value of x. **(4)**

(b) Find the overall percentage decrease when x = 15. **(2)**

(Total for Question 13 is 6 marks)

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Mark scheme · 6.4 Repeated Percentage Change: Test Pack

A correct answer earns full marks unless the question asks for working, a method, proof or explanation.

Question 1

1.08 oe	**B1**

Answer: 1.08

Question 2

C (1.045) cao	**B1**

Answer: C) 1.045

Question 3

correct statement that the sale price is lower than the original price	**B1**
correct reason: the 20% decrease is applied to the increased (larger) price, not the original price, so more is taken off than was added on	**B1**

Answer: The sale price is lower than the original price, because the second percentage change (the decrease) is applied to the larger, already-increased price, not the original price.

Question 4

$2500 * 1.03^3$ oe	**M1**
awrt £2731.82	**A1**

Answer: £2,731.82

Question 5

(a) 1.22^2 (= 1.4884) oe	**M1**
(a) 850 x their 1.4884	**M1**
(a) £1265.14 cao	**A1**

(a) Answer: £1265.14

(b) their (a) - 850 (ft)	**M1**
(b) £415.14 cao	**A1**

(b) Answer: £415.14

Question 6

600 x 1.1 (= 660)	**M1**
660 x 0.9 = 594 cao	**A1**
correct conclusion that Priya is wrong, since 594 is not equal to 600 (dep on correct value)	**A1**

Answer: £594; Priya is wrong

Question 7

both multipliers identified	**M1**
1.2 x 0.6 = 0.72	**M1**
28% decrease cao	**A1**

Answer: 28% decrease

Question 8

$3000 * 1.025^4$ oe	**M1**
awrt £3311.44	**A1**

Answer: £3,311.44

Question 9

(a) multiplier 1 + r/100 (or equivalent, e.g. (100 + r)/100)	**B1**
(a) $V = P(1 + r/100)^n$ oe cao	**B1**

(a) Answer: $V = P(1 + r/100)^n$

(b) 3200×1.018^7 (oe, ft their formula from (a))	**M1**
(b) $1.018^7 = 1.133$ (awrt) seen	**M1**
(b) £3625.64 (awrt) cao	**A1**

(b) Answer: £3625.64

Question 10

(a) 180000 * 1.10 * 0.90 oe	**M1**
(a) 178200 cao	**A1**

(a) Answer: £178,200

(b) correct conclusion: profit has NOT returned to its starting value (it is lower)	**B1**
(b) correct supporting reason/calculation, e.g. overall multiplier 1.10 * 0.90 = 0.99, or difference of £1,800 (a 1% decrease), because the 10% decrease is taken from the larger, increased profit	**B1**

(b) Answer: No; the profit is £178,200, which is £1,800 (1%) lower than the original £180,000, because the 10% decrease was applied to the larger, increased profit rather than to the original profit.

Question 11

simple interest: 6000 * 0.04 * 3 (= 720), total £6,720 oe	**M1**
compound interest: $6000 * 1.036^3$ oe	**M1**
awrt £6,671.61 for Option B, and correct conclusion that Option A gives more money	**A1**
awrt £48.39 difference cao ft	**A1**

Answer: Option A (simple interest) gives more money; Option A = £6,720.00, Option B = £6,671.61, a difference of £48.39.

Question 12

(a) $42000 * 1.02^2$ oe	**M1**
(a) 43696.8 seen, rounding to 43700 (nearest 10)	**A1**

(a) Answer: 43,700 (nearest 10)

(b) systematic repeated multiplication by 1.02, continuing beyond year 2	**M1**
(b) correct value for year 4, awrt 45,462 (below 46,000)	**M1**
(b) correct value for year 5, awrt 46,371 (exceeding 46,000)	**A1**
(b) 5 (years) cao, with year 4 value shown to be below 46,000	**A1**

(b) Answer: 5 complete years

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Question 13

(a) overall multiplier = (1 + x/100) * (1 - x/100) oe **M1**

(a) correct expansion using difference of two squares: $1 - (x/100)^2$ oe **M1**

(a) $1 - x^2/10000$ cso **A1**

(a) correct conclusion that $x^2/10000 > 0$ for all x not equal to 0, so the multiplier is always less than 1, i.e. an overall decrease of $x^2/100$ % **B1**

(a) Answer: Overall multiplier = $1 - x^2/10000$, an overall decrease of $x^2/100$ %, since $x^2/10000$ is always positive for x not equal to 0.

(b) substitute x = 15 into $x^2/100$ oe **M1**

(b) 2.25% cao **A1**

(b) Answer: 2.25%

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