



EXAM PAPERS PRACTICE

GCSE OCR Math J560

Compound Interest

Answers

*"We will help you to
achieve A Star "*



Answer 1

Liam invests £6200 for 3 years in a savings account.

He gets 2.5% per ~~annum~~ ^{year} compound interest.

KEEP MULTIPLYING

How much money will Liam have in his savings account at the end of 3 years?

PERCENTAGE INCREASES (THE BEST WAY!)

TO INCREASE BY, SAY, 3% 2.5%

THINK: WE WANT 103%. SO WE 102.5%

MULTIPLY BY $\frac{103}{100}$ (= 1.03) 1.025

↑
MULTIPLIER

$$\begin{aligned} \text{TOTAL AFTER 3 YEARS} &= 6200 \times 1.025 \times 1.025 \times 1.025 \\ &= 6200 \times 1.025^3 \\ &= \underline{\underline{£6676.72}} \end{aligned}$$

Answer 2

Derek buys a house for £150 000

He sells the house for £154 500

(a) Work out Derek's percentage profit.

$$\text{PERCENTAGE CHANGE} = \frac{\text{ACTUAL CHANGE}}{\text{ORIGINAL VALUE}} \times 100$$

$$\begin{aligned} \text{PERCENTAGE PROFIT} &= \left(\frac{154500 - 150000}{150000} \right) \times 100 \\ &= \underline{\underline{3\%}} \end{aligned}$$



Answer 5

The population of a city increased by 5.2% for the year 2014

At the beginning of 2015 the population of the city was 1 560 000

Lin assumes that the population will continue to increase at a constant rate of 5.2% each year.

- (a) Use Lin's assumption to estimate the population of the city at the beginning of 2017
Give your answer correct to 3 significant figures.

$$P_{2016} = 1560000 \times 1.052$$
$$= 1641120$$

$$P_{2017} = 1641120 \times 1.052$$
$$= 1726458 = \underline{\underline{1730000}}$$

PERCENTAGE INCREASES (THE BEST WAY!)
TO INCREASE BY, SAY, 3% 5.2%
THINK: WE WANT 103% ~~105.2%~~
MULTIPLY BY $\frac{103}{100}$ (=1.03) 1.052

Answer 6

- (b) (i) Use Lin's assumption to work out the year in which the population of the city will reach 2 000 000

$$P_{2018} = 1726458 \times 1.052$$
$$= \underline{1816234}$$

$$P_{2019} = 1816234 \times 1.052$$
$$= \underline{1910678}$$

$$P_{2020} = 1910678 \times 1.052$$
$$= \underline{2010033}$$

BY BEGINNING OF 2020

- (ii) If Lin's assumption about the rate of increase of the population is too low, how might this affect your answer to (b)(i)?

INCREASING FASTER THAN LIN THOUGHT

SO IT MAY REACH 2000000 EARLIER



Answer 7

This notice was in a car magazine.

Most new cars lose more than half of their value in the first three years

Paul bought a new car.

The value of the car was £15000 $\rightarrow \times \frac{1}{2} = \pounds 7500$

In the first year, the value of the car depreciated by 23%.

After the first year, the value of the car depreciated by 18% each year.

Work out if Paul's car lost more than half of its value by the end of three years.

VALUE AFTER 3 YRS

$$= 15000 \times 0.77 \times 0.82$$

$$= \pounds 7766.22$$

THIS IS MORE THAN £7500.

So NO IT DIDN'T

LOSE MORE THAN HALF ITS VALUE.

PERCENTAGE DECREASES (THE BEST WAY!)

TO DECREASE BY, SAY, 3%.

THINK: WE WANT 97%. SO WE

MULTIPLY BY $\frac{97}{100}$ (=0.97)

TO DECREASE BY 23%.

WE WANT 77%.

SO MULTIPLY BY $\frac{77}{100}$ (=0.77)

TO DECREASE BY 18%.

WE WANT 82%.

SO MULTIPLY BY $\frac{82}{100}$ (=0.82)



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Answer 8

Naoby invests £6000 for 5 years.
The investment gets compound interest of $x\%$ per annum.

At the end of 5 years the investment is worth £8029.35

Work out the value of x .

→ "KEEP ON MULTIPLYING"
→ "year"

PERCENTAGE INCREASES (THE BEST WAY!)
TO INCREASE BY, SAY, 3%. $x\%$
THINK: WE WANT 103%. SO WE 10 $x\%$.
MULTIPLY BY $\frac{103}{100}$ (= 1.03) → 1.0 x

↓
"MULTIPLIER"

↓
CALL THIS
 m

FINAL VALUE = INITIAL VALUE $\times m \times m \times m \times m \times m$

$$\frac{8029.35}{6000} = \frac{6000}{6000} \times m^5$$

$$m^5 = \frac{8029.35}{6000}$$

$$m = \sqrt[5]{\frac{8029.35}{6000}}$$

$$= 1.0599999\dots$$

$$m = 1.06 \quad \longleftrightarrow \quad "1.0x"$$

So $x = 6$



Answer 9

Viv wants to invest £2000 for 2 years in the same bank.

The International Bank

Compound Interest

4% for the first year
1% for each extra year

The Friendly Bank

Compound Interest

5% for the first year
0.5% for each extra year

At the end of 2 years, Viv wants to have as much money as possible.

Which bank should she invest her £2000 in?

PERCENTAGE INCREASES (THE BEST WAY!)

TO INCREASE BY, SAY, 3%.

THINK: WE WANT 103%. SO WE

MULTIPLY BY $\frac{103}{100}$ (=1.03)

INTERNATIONAL

$$2000 \times \frac{104}{100} \times \frac{101}{100}$$

$$= \pounds 2100.80$$

FRIENDLY

$$2000 \times \frac{105}{100} \times \frac{100.5}{100}$$

$$= \pounds \underline{\underline{2110.50}}$$

VIV SHOULD INVEST IN THE
FRIENDLY BANK.



Answer 10

Katie travels to work by train.

The cost of her weekly train ticket increases by 12.5% to £225

Katie's weekly pay increases by 5% to £535.50

*(b) Compare the increase in the amount of money Katie has to pay for her weekly train ticket with the increase in her weekly pay.

"NEW VALUE = %AGE OF OLD VALUE"

$$\text{TRAIN: } \text{NEW} = \frac{112.5}{100} \times \text{OLD}$$

$$\frac{225}{1.125} = \frac{1.125}{1.125} \times \text{OLD}$$

$$\text{OLD} = \frac{225}{1.125}$$

$$= \text{£}200$$

$$\text{DIFF} = 225 - 200 = \text{£}25$$

$$\text{PAY: } \text{NEW} = \frac{105}{100} \times \text{OLD}$$

$$\frac{535.50}{1.05} = \frac{1.05}{1.05} \times \text{OLD}$$

$$\text{OLD} = \frac{535.50}{1.05}$$

$$= \text{£}510$$

$$\text{DIFF} = \text{£}25.50$$

SO THE INCREASES ARE COMPARABLE.



Answer 11

At the beginning of 2009, Mr Veale bought a company.
The value of the company was £50 000

Each year the value of the company increased by 2%.

“COMPOUND INTEREST”
“KEEP MULTIPLYING”

- (a) Calculate the value of the company at the beginning of 2017
Give your answer correct to the nearest £100

2017-2009 = 8 YEARS SO
MULTIPLY BY 1.02 8 TIMES

PERCENTAGE INCREASES (THE BEST WAY!)
TO INCREASE BY, SAY, 3%. 2%
THINK: WE WANT 103%. SO WE 102%
MULTIPLY BY $\frac{103}{100}$ (= 1.03) MULTIPLY BY 1.02

$$V = 50000 \times 1.02 \times 1.02 \times \dots \times 1.02$$
$$= 50000 \times 1.02^8$$
$$= 58582.969\dots$$
$$= \underline{\underline{£58600}}$$

Answer 12

Jack bought a new boat for £12 500

The value, £V, of Jack’s boat at the end of n years is given by the formula

$$V = 12500 \times (0.85)^n$$

- (a) At the end of how many years was the value of Jack’s boat first less than 50% of the value of the boat when it was new?

$$V_0 = 12500 \rightarrow \text{ANS} \quad \underline{\underline{£6250}}$$
$$V_1 = 12500 \times 0.85 = 10625$$
$$V_2 = \text{Ans} \times 0.85 = 9081.25$$
$$V_3 = \text{Ans} \times 0.85 = 7676.56$$
$$V_4 = \text{Ans} \times 0.85 = 6525.08$$
$$V_5 = \text{Ans} \times 0.85 = \underline{\underline{£5546.32}}$$

So $V < 50\%$. AFTER 5 YRS



Answer 13

Jean invests £12000 in an account paying compound interest for 2 years.

In the first year the rate of interest is $x\%$

At the end of the first year the value of Jean's investment is £12336

In the second year the rate of interest is $\frac{x}{2}\%$

What is the value of Jean's investment at the end of 2 years?

$$V_1 = m \times V_0$$

$$\frac{12336}{12000} = \frac{m \times 12000}{12000}$$

PERCENTAGE INCREASES (THE BEST WAY!)
TO INCREASE BY, SAY, 3% $x\%$
THINK: WE WANT 103%. SO WE 103%
MULTIPLY BY $\frac{103}{100}$ (=1.03) $1.0x$

$$m = 1.028 \rightarrow x = 2.8\%$$

$$\downarrow$$
$$\frac{x}{2} = 1.4\%$$

$$V_2 = 1.014 \times 12336$$

$$V_2 = \underline{\underline{£12508.70}}$$

MULTIPLIER, m



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Answer 14

Ian invested an amount of money at 3% per ^{year}~~annum~~ compound interest.
At the end of 2 years the value of the investment was £2652.25

"KEEP MULTIPLYING"

(a) Work out the amount of money Ian invested.

$$\text{MONEY AFTER} = \text{MONEY BEFORE} \times 1.03 \times 1.03$$

$$\frac{2652.55}{1.03^2} = \frac{\text{BEFORE} \times 1.03^2}{1.03^2}$$

$$\text{BEFORE} = \frac{2652.55}{1.03^2} = \underline{\underline{£ 2500}}$$

PERCENTAGE INCREASES (THE BEST WAY!)

TO INCREASE BY, SAY, 3%.

THINK: WE WANT 103%. SO WE

MULTIPLY BY $\frac{103}{100}$ (=1.03)

PERCENTAGES

WRITE DOWN A

STATEMENT

CONNECTING THE

'BEFORE' AND 'AFTER'



Answer 15

Katie invests £200 in a savings account for 2 years.

The account pays compound interest at an annual rate of

3.3% for the first year

1.5% for the second year

(a) Work out the total amount of money in Katie's account at the end of 2 years.

PERCENTAGE INCREASES (THE BEST WAY!)

TO INCREASE BY, SAY, 3%.

THINK: WE WANT 103%. SO WE

MULTIPLY BY $\frac{103}{100}$ (=1.03)

$$\begin{aligned} \text{TOTAL AFTER 2 YRS} &= 200 \times \frac{103.3}{100} \times \frac{101.5}{100} \\ &= \underline{\underline{£209.70}} \end{aligned}$$