EXAM PAPERS PRACTICE

GCSE Edexcel Math 1MA1

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.

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

KEEP MULTIPLYING

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

TOTAL AFTER 3 YRS = $6200 \times 1.025 \times 1.025 \times 1.025$

$= 6200 \times 1.025^3$

$= £\,6676.72$

Answer 2

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 £15 000   → $\times \frac{1}{2}$ = £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

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

$= £7766.22$

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)

Answer 3

Derek invests £154 500 for 2 years at 4% per year compound interest. "KEEP MULTIPLYING"

(b) Work out the value of the investment at the end of 2 years.

PERCENTAGE INCREASES (THE BEST WAY!)

TO INCREASE BY, SAY, 3%.   4%

THINK: WE WANT 103%.   SO WE 104%.

MULTIPLY BY $\frac{103}{100}$ (=1.03)   MULTIPLIER = 1.04

VALUE AFTER 2 YEARS = 154500 × 1.04 × 1.04

1ˢᵀ YEAR   2ᴺᴰ YEAR

= £167107.20

Answer 4

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.

$P_{2016} = 1560000 \times 1.052$

$= 1641120$

$P_{2017} = 1641120 \times 1.052$

$= 1726458 \quad = 1730000$

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 5

Peter has £20 000 to invest in a savings account for 2 years.

He finds information about two savings accounts.

KEEP MULTIPLYING

Bonus Saver
Compound interest
4% for the first year then 1.5% each year

Fixed Rate
Compound interest
2.5% each year

Peter wants to have as much money as possible in his savings account at the end of 2 years.

Which of these savings accounts should he choose?

PERCENTAGE INCREASES (THE BEST WAY!)

TO INCREASE BY, SAY, 3%

THINK: WE WANT 103%. SO WE

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

BONUS SAVER

$\frac{104}{100}$ $\frac{101.5}{100}$

FINAL AMOUNT = 20000 × 1.04 × 1.015

= £21112

FIXED SAVER

$\frac{1025}{100}$

FINAL AMOUNT = 20000 × 1.025 × 1.025

= £21012.50

Answer 6

Derek buys a house for £150 000
He sells the house for £154 500

(a) Work out Derek's percentage profit.

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

$$\text{PERCENTAGE PROFIT} = \left(\frac{154500 - 150000}{150000}\right) \times 100$$

$$= \underline{3\%}$$

Answer 7

Anil wants to invest £25 000 for 3 years in a bank.

"KEEP MULTIPLYING"

Personal Bank	**Secure Bank**
Compound Interest	Compound Interest
2% for each year	4.3% for the first year 0.9% for each extra year

Which bank will give Anil the most interest at the end of 3 years?
You must show all your working.

PERCENTAGE INCREASES (THE BEST WAY!)

TO INCREASE BY, SAY, 3%.   2%.   4.3%.   0.9%.
THINK: WE WANT 103%.   SO WE   102% 104.3% 100.9%
MULTIPLY BY $\frac{103}{100}$ (=1.03)   MULTIPLIER→ 1.02   1.043   1.009

PB   TOTAL = 25000 × 1.02 × 1.02 × 1.02

= £26530.20

SB   TOTAL = 25000 × 1.043 × 1.009 × 1.009

= £26546.46

SINCE £26546.46 > £26530.20
THE SECURE BANK GIVES ANIL
MORE INTEREST.

Answer 8

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

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

$= £2100.80$

FRIENDLY

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

$= £2110.50$

VIV SHOULD INVEST IN THE

FRIENDLY BANK.

Answer 9

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"

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

$\dfrac{225}{1.125} = \dfrac{1.125 \times OLD}{1.125}$

OLD $= \dfrac{225}{1.125}$

$=$ £200

DIFF $= 225 - 200 =$ £25

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

$\dfrac{535.50}{1.05} = \dfrac{1.05 \times OLD}{1.05}$

OLD $= \dfrac{535.50}{1.05}$

$=$ £510

DIFF $=$ £25.50

SO THE INCREASES ARE COMPARABLE.

Answer 10

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

→ "KEEP ON MULTIPLYING"
→ "year"

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

Work out the value of x.

PERCENTAGE INCREASES (THE BEST WAY!)

TO INCREASE BY, SAY, 3%. x%.
THINK: WE WANT 103%.   So WE $10x$%.
MULTIPLY BY $\frac{103}{100}$ $(=1.03)$ $\longrightarrow 1.0x$

↳ "MULTIPLIER"   CALL THIS
                        m

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

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

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

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

$$= 1.0599999...$$

$$m = 1.06 \longleftrightarrow \text{"} 1.0x \text{"}$$

SO $x = 6$

Answer 11

At the beginning of 2009 the value of a different company was £250 000
In 6 years the value of this company increased to £325 000

This is equivalent to an increase of $x\%$ each year.

(b) Find the value of x.
    Give your answer correct to 2 significant figures.

MULTIPLY BY "$1.0x$"
EACH YEAR
CALL THIS
m

$$\frac{325000}{250000} = \frac{250000 \times m^6}{250000}$$

$$\frac{325000}{250000} = m^6$$

$$m = \sqrt[6]{\frac{325000}{250000}}$$

$$m = 1.0446975...$$

So $x = 4.46975\%$

$= 4.5\% \ (2SF)$

Answer 12

A savings account pays interest at a rate of $R\%$ per year.
Jack invests £5500 in the account for one year.

At the end of the year, Jack pays tax on the interest at a rate of 40%.
After paying tax, he gets £79.20 $\longrightarrow$ 60% OF INTEREST

(b) Work out the value of R.

WRITE DOWN A STATEMENT:

79·20 IS 60% OF $R\%$ OF 5500

$\times 100 \times 100$ $79·20 = \dfrac{60}{100} \times \dfrac{R}{100} \times 5500$ $\times 100 \times 100$

$\dfrac{79·20 \times 100 \times 100}{60 \times 5500} = \dfrac{60 \times R \times 5500}{60 \times 5500}$

$R = \dfrac{79·20 \times 100 \times 100}{60 \times 5500} = 2·4\%$

Answer 13

In 2003, Jerry bought a house.

In 2007, Jerry sold the house to Mia.
He made a profit of 20%

In 2012, Mia sold the house for £162 000 ⟶ V_{2012}
She made a loss of 10%

Work out how much Jerry paid for the house in 2003 ⟶ V_{2003}

$V_{2007} = 1.2 \times V_{2003}$

$V_{2012} = 0.9 \times V_{2007}$

So $V_{2012} = 0.9 \times 1.2 \times V_{2003}$

$$\frac{162000}{0.9 \times 1.2} = \frac{0.9 \times 1.2 \times V_{2003}}{0.9 \times 1.2}$$

$$V_{2003} = \frac{162000}{0.9 \times 1.2}$$

$$V_{2003} = £150\,000$$

PERCENTAGE INCREASES (THE BEST WAY!)

TO INCREASE BY, SAY, 3%.   20%.
THINK: WE WANT 103%.   SO WE 120%.
MULTIPLY BY $\frac{103}{100}$ (=1.03) $\frac{120}{100} = 1.2$

PERCENTAGE DECREASES (THE BEST WAY!)

TO DECREASE BY, SAY, 3%.   10%.
THINK: WE WANT 97%.   SO WE 90%.
MULTIPLY BY $\frac{97}{100}$ (=0.97) $\frac{90}{100} = 0.9$

Answer 14

Noah has an amount of money to invest for five years.

Saver Account	Investment Account
4% per annum compound interest.	21% interest paid at the end of 5 years.

Noah wants to get the most interest possible.

(b) Which account is best?
    You must show how you got your answer.

SAVER | INVESTMENT

AFTER 5 YRS $= ? \times 1.04^5$ | 21% INCREASE

$\qquad = ? \times 1.2166...$

So 21.66% INCREASE

SINCE 21.66 > 21, THE SAVER IS BETTER

Answer 15

The value of Ibrar's house increases by $x\%$ in the third year.
At the end of the third year the value of Ibrar's house is £140 000

(b) Work out the value of x.
   Give your answer correct to 3 significant figures.

(MULTIPLIER = m)

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

VALUE AFTER 3 YEARS = VALUE AFTER 2 YEARS × m

$$\frac{140000}{145000 \times 0.936} = \frac{145000 \times 0.936 \times m}{145000 \times 0.936}$$

$$1.0315\ldots = m$$

$\rightarrow$ 103.15%.   SO   3.15% INCREASE

$$x = 3.15$$