

Name: \_\_\_\_\_

## GCSE (1 – 9)

# Repeated Percentage Change

### Instructions

- Use **black** ink or ball-point pen.
- Answer all questions.
- Answer the questions in the spaces provided  
– *there may be more space than you need.*
- Diagrams are **NOT** accurately drawn, unless otherwise indicated.
- You must **show all your working out.**

### Information

- The marks for each question are shown in brackets  
– *use this as a guide as to how much time to spend on each question.*

### Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end

- 1 A population of bacteria is increasing by 10% each hour.

Find the percentage increase in the population every 3 hours.

Increase by 10%  $\rightarrow \times 1.1$

$$1.1 \times 1.1 \times 1.1 = 1.331$$

$$(\text{Ans} - 1) \times 100 = 33.1$$

33.1%

(Total for question 1 is 2 marks)

- 2 A shop decreases prices by 10% and then by a further 20%.

Rachel says: "Prices have now decreased by 30%".

Is Rachel correct?

You must show your working.

No.

$$0.9 \times 0.8 = 0.72$$

$$(1 - \text{Ans}) \times 100 = 28$$

Prices have decreased by 28%

(Total for question 2 is 2 marks)

- 3 Alex invests some money for 3 years in a savings account.  
She gets 4% per annum compound interest.

Alex has £5680.56 at the end of 3 years, work how much she invested.

$$x \times 1.04^3 = 5680.56$$

$$x = \frac{5680.56}{1.04^3}$$

$$= \underline{\underline{£5050}}$$

£5050

(Total for question 3 is 3 marks)

- 4 Bailey invests some money for 5 years in a savings account.  
She gets 3% per annum compound interest.

Bailey has £3593.75 at the end of 5 years, work how much she invested.

$$x \times 1.03^5 = 3593.75$$

$$x = \frac{3593.75}{1.03^5}$$

$$= £3100$$

£3100

(Total for question 4 is 3 marks)

- 5 Charlie invests £2500 for 3 years in a savings account.  
She gets 3% per annum compound interest in the first year, then  $x\%$  for 2 years.

$$\times 1.03$$

Charlie has £2705.36 at the end of 3 years, work out the value of  $x$ .

Let multiplier =  $y$

$$2500 \times 1.03 \times y^2 = 2705.36$$

$$y^2 = \frac{2705.36}{2500 \times 1.03}$$

$$y^2 = 1.0506\dots$$

$$y = \sqrt{\text{Ans}} \\ = 1.025$$

$$x = (\text{Ans} - 1) \times 100 \\ = 2.5\%$$

.....  
2.5%

(Total for question 5 is 4 marks)

- 6 Dana invests £5000 for 4 years in a savings account.  
She gets 2% per annum compound interest in the first year, then  $x\%$  for 3 years.

Dana has £5508.23 at the end of 4 years, work out the value of  $x$ .

$$5000 \times 1.02 \times y^3 = 5508.23$$

$$y^3 = \frac{5508.23}{5000 \times 1.02}$$

$$= 1.080045$$

$$y = 1.026$$

$$x = (\text{Ans} - 1) \times 100 \\ = 2.6\%$$

.....  
2.6%

(Total for question 6 is 4 marks)

7 A population model assumes that the number of people living in Stoverton is increasing by  $x\%$  each year.

The population is expected to increase by 60% in 6 years, work out the value of  $x$ .  
Give your answer to 1 decimal place.

$$y^6 = 1.6$$

$$y = \sqrt[6]{1.6}$$

$$y = 1.0814$$

$$\begin{aligned} x &= (\text{Ans} - 1) \times 100 \\ &= 8.1\% \end{aligned}$$

8.1%

(Total for question 7 is 3 marks)

8 A car's value is decreasing by  $x\%$  each year.

The car will half in value in 5 years, work out the value of  $x$ .  
Give your answer to 1 decimal place.

$$y^5 = 0.5$$

$$y = \sqrt[5]{0.5}$$

$$y = 0.87055$$

$$\begin{aligned} x &= (1 - \text{Ans}) \times 100 \\ &= 12.9\% \end{aligned}$$

12.9%

(Total for question 8 is 3 marks)

9 The number of rabbits in a field is increasing by  $x\%$  each year.

The population is expected to double in 5 years, work out the value of  $x$ .  
Give your answer to 1 decimal place.

$$y^5 = 2$$
$$y = \sqrt[5]{2}$$
$$= 1.148698\dots$$

$$x = (\text{Ans} - 1) \times 100$$
$$= 14.9\%$$

.....  
14.9%

(Total for question 9 is 3 marks)

10 A car's value is decreasing by  $x\%$  each year.

The car's value will decrease by 60% in 6 years, work out the value of  $x$ .  
Give your answer to 2 decimal places.

$$y^6 = 0.4$$
$$y = \sqrt[6]{0.4}$$
$$= 0.85837$$

$$x = (1 - \text{Ans}) \times 100$$
$$= 14.16\%$$

.....  
14.16%

(Total for question 10 is 3 marks)

- 11 A circle's radius is increased by 8%.  
Find the increase in the circle's area.

$$A = \pi r^2$$

New circle :

$$A = \pi (1.08r)^2$$
$$= 1.1664 \pi r^2$$

$$(1.1664 - 1) \times 100 = \underline{16.64\%}$$

16.64%

(Total for question 11 is 4 marks)

- 12 A circle's area is increased by 5%.  
Find the increase in the circle's radius.

Give your answer to 1 decimal place.

$$A = \pi r^2$$

$$1.05A = \pi (xr)^2$$

$$1.05A = x^2 \pi r^2$$

$$1.05 = x^2$$

$$x = 1.024695\dots$$

$$(Ans - 1) \times 100 = 2.5\%$$

2.5%

(Total for question 12 is 4 marks)

- 13 A cube's length is increased by 12%.  
Find the increase in the cube's volume.

Give your answer to 3 significant figures.

$$V = l^3$$

New cube:  $V = (1.12l)^3$   
 $= 1.404928l^3$

$$(1.404928 - 1) \times 100 = 40.5\% \quad (3 \text{ sf})$$

40.5%

(Total for question 13 is 4 marks)

- 14 A cube's volume is increased by 25%.  
Find the increase in the cube's length.

Give your answer to 3 significant figures.

$$1.25V = (x l)^3$$

$$1.25V = x^3 l^3$$

$$1.25 = x^3$$

$$x = 1.077217\dots$$

$$(Ans - 1) \times 100 = 7.72\% \quad (3 \text{ sf})$$

7.72%

(Total for question 14 is 4 marks)