REVERSE PERCENTAGES (11)

1 28 chocolate fondants were sold in a restaurant.
This was 40% of the total number of chocolate fondants sold.
Work out the total number of chocolate fondants sold.

100% = original amount

40% = 28 f
÷2 ↓ ↓ ÷2
20% = 14 f
× 5 ↓ ↓ × 5
100% = 70 f

70 fondants

(Total for Question 1 is 2 marks)

2 In a sale, the normal price of a book is reduced by 30%

100% − 30% = 70%

The sale price of the book is £4.20

Work out the price of the book before the discount.

100% = original amount

70% = £4.20
÷7 ↓ ↓ ÷7
10% = £0.60
× 10 ↓ ↓ × 10
100% = £6.00

£6.00

(Total for Question 2 is 2 marks)

100% + 3% = 103%

3 The value of a house increased by 3%. The house then had a value of £320,000.

Work out the value of the house before the increase to the nearest pound.

Method 1

103% = £320,000
$\times \frac{100}{103}$ ↓ ↓ $\times \frac{100}{103}$
100% = £310,679.61…

Method 2

320,000 ÷ 1.03 = 310,697.61…

£310,680

(Total for Question 3 is 2 marks)

PERCENTAGE MULTIPLIERS (12)

1 Some people were asked if they wanted new headphones.

85% of the people said yes.
72% of the people who said yes wanted wireless headphones.

What percentage of the people asked said they wanted wireless headphones?
Give your answer to the nearest percent.

$0.85 \times 0.72 = 0.612$

61.2%

61%

(Total for Question 1 is 2 marks)

2 Here are three rectangles.

The area of rectangle **R** is 5% greater than the area of rectangle **Q.**
The area of rectangle **S** is 30% greater than the area of rectangle **R.**

By what percentage is the area of rectangle **S** greater than the area of rectangle **Q**?

Let x = area of Q

$Q \rightarrow x$

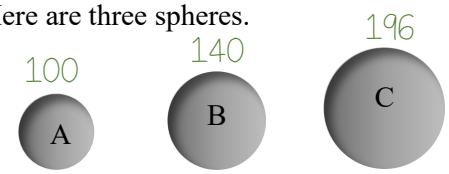
$R \rightarrow x \times 1.05 = 1.05x$

$S \rightarrow 1.05x \times 1.3 = 1.365x$

36.5%

(Total for Question 2 is 3 marks)

3 Here are three spheres.



Let 100 = area of A

The volume of sphere **B** is 40% more than the volume of sphere **A.**
The volume of sphere **C** is 40% more than the volume of sphere **B.**

Find the volume of sphere **A** as a fraction of the volume of sphere **C.**
Give your answer in its simplest form.

$A \rightarrow 100$

$B \rightarrow 100 \times 1.4 = 140$

$C \rightarrow 140 \times 1.4 = 196$

$\frac{A}{C} = \frac{100}{196} = \frac{25}{49}$ (÷4 ÷4)

$\frac{25}{49}$

(Total for Question 3 is 3 marks)

PERCENTAGES (WORDED QUESTIONS) (13)

1 Tim wants to know how much coffee he will need for 650 people at a meeting.

Each person who drinks coffee will drink 2 cups of coffee.
9.8g of coffee is needed for each cup of coffee.

Tim assumes that 72% of the people will drink coffee.

(a) Using this assumption, work out the amount of coffee Tim needs.
Give your answer correct to the nearest gram.

Coffee needed → 2 × 9.8 = 19.6 g

People drinking coffee → 650 × 0.72 = 468 ppl

468 × 19.6 = 9172.8

9173 g

(4)

(b) Tim's assumption is incorrect.
65% of the people will drink coffee.

How does this affect your answer to part (a)?

He will need less coffee

(1)

(Total for Question 1 is 5 marks)

2 A company's profit of £156,000 is shared by 3 directors and 90 employees.

$\frac{1}{4}$ of the profit is shared equally between the 3 directors of the company.

The rest of the profit is shared equally between the 90 employees of the company.

The amount each director gets = n × the amount each employee gets.

Work out the value of n.
You must show how you get your answer.

Profit that all 3 directors get:

156,000 ÷ 4 = 39,000

Amount that each director gets:

39,000 ÷ 3 = 13,000

Profit that each employee gets:

156,000 − 39000 = 117,000

117,000 ÷ 90 = 1,300

Work out the value of n:

director = n × employee

13,000 = n × 1300

13,000 ÷ 1300 = n

10 = n

n = 10

(Total for Question 2 is 4 marks)

3 Joan puts jars into small boxes and into large boxes.

She puts 5 jars into each small box.
She puts 16 jars into each large box.

Joan puts a total of 4400 jars into the boxes so that

number of jars in small boxes : number of jars in large boxes = 4 : 7 11 parts

Joan says that more than 60% of the boxes filled with jars are small boxes.

Is Joan correct?
You must show all your working.

4400 = 11 parts

÷11 ( ) ÷11

400 = 1 part

1600 = 4 parts

2800 = 7 parts

Jars (small boxes) : Jars (large boxes)

4 : 7

1600 : 2800

Small boxes → 1600 ÷ 5 = 320

Large boxes → 2800 ÷ 16 = 175

Total boxes → 320 + 175 = 495

$$\% \text{ of boxes} \rightarrow \frac{320}{495} \times 100 = 64.6\% \text{ (1dp)}$$

∴ Joan is correct, as 64.6% > 60%

(Total for Question 3 is 5 marks)

PERCENTAGE CHANGE (14)

1 Elina pays £12 for 48 water bottles.

She sells all 48 water bottles for £1 each.

Work out Elina's percentage profit.

Sells → $48 \times 1 = £48$

Original cost → £12

$$\% \text{ change} = \frac{\text{difference}}{\text{original}} \times 100$$

$$= \frac{48 - 12}{12} \times 100$$

$$= \frac{36}{12} \times 100$$

$$= 3 \times 100$$

$$= 300$$

300 ..... %

(Total for Question 1 is 3 marks)

2 Oscar is organising a bake sale for charity.

He spends
£84 on ingredients
£27.50 on napkins and cake boxes
£30 on a trestle table

Original cost → $84 + 27.50 + 30 = £141.50$

Oscar sells 105 cakes.
30 of the cakes cost £2.00 each.
48 of the cakes cost £3.00 each.
27 of the cakes cost £3.50 each.

Sells → $(30 \times 2) + (48 \times 3) + (27 \times 3.50)$
$= 60 + 144 + 94.50$
$= 298.50$

Work out the percentage profit Oscar makes for the charity.
Give your answer to the nearest integer.

$$\% \text{ change} = \frac{\text{difference}}{\text{original}} \times 100$$

$$= \frac{298.50 - 141.50}{141.50} \times 100$$

$$= 110.954\ldots$$

111% .....

(Total for Question 2 is 3 marks)

3 Samir buys a total of 630 rulers and rubbers, where

number of rulers : number of rubbers = 7 : 2

Samir pays 13p for each ruler.
He sells each ruler for 20p.

Samir pays 4p for each rubber.
He sells each rubber for 10p.

Work out Samir's percentage profit.
Give your answer correct to 1 decimal place.
You must show all your working.

A)

630 = 9 parts

÷9 ( ) ÷9

70 = 1 part

140 = 2 parts

490 = 7 parts

B) rulers : rubbers

7 : 2

490 : 140

C) Original cost:

Rulers → 13 × 490 = 6370p

Rubbers → 4 × 140 = 560p

Total → 6370 + 560 = 6930p

D) Sells for:

Rulers → 20 × 490 = 9800p

Rubbers → 10 × 140 = 1400p

Total → 9800 + 1400 = 11200p

E) % change

$$= \frac{\text{difference}}{\text{original}} \times 100$$

$$= \frac{11200 - 6930}{6930} \times 100$$

$$= 61.6161\ldots$$

61.6%

(Total for Question 3 is 5 marks)

COMPOUND INTEREST (15)

1 (a) A new car costs £35 000

The value of the car decreases at a rate of 21% per year. → 100% − 21% = 79%

Work out the value of the car at the end of 3 years.

$35000 \times 0.79^3 = 17256.365$

£17256.37

(2)

(b) Chris invests £4800 in a savings account for 2 years.

The account pays compound interest at a rate of 2.75% per year. → 100% + 2.75% = 102.75%

Calculate how much Chris has in this savings account at the end of the 2 years.
Give your answer to the nearest £.

$4800 \times 1.0275^2 = 5067.63$

£5068

(2)

(c) Lily invests £8500 for 2 years in an account paying compound interest.

In the first year, the rate of interest is 3.6% → 100% + 3.6% = 103.6%
In the second year, the rate of interest is 1.1% → 100% + 1.1% = 101.1%

Work out the value of Lily's investment at the end of 2 years.

$8500 \times 1.036 \times 1.011 = 8902.866$

£8902.87

(3)

(d) Karla invests £4000 in a savings account.

The savings account pays compound interest at a rate of

1.6% for the first year → 100% + 1.6% = 101.6%
0.95% for each extra year. → 100% + 0.95% = 100.95%

Work out the value of Karla's investment at the end of 3 years.

$4000 \times 1.016 \times 1.0095^2 = 4141.582776$

£4141.58

(3)

(Total for Question 1 is 10 marks)

2 Nina invests £y in Prosperity Bank for 2 years.
Ollie invests £y in Capital Investments for 4 years.

Prosperity Bank
Compound Interest
2.8% per annum

Capital Investments
Compound Interest
2% per annum for the first two years
3.4% per annum for each extra year

At the end of the 2 years, the value of Nina's investment is £264 196

Work out the value of Ollie's investment at the end of the 4 years.

Nina:

$y \times 1.028^2 = 264{,}196$

$y = \dfrac{264196}{1.028^2}$

$y = 250{,}000$

Ollie:

$250{,}000 \times 1.02^2 \times 1.034^2$

$= 278087.4756$

£278,087.48

(Total for Question 2 is 4 marks)

3 James invested £3200 in a savings account for 3 years.

He was paid 4.5% per annum compound interest for the first year.
He was paid B% interest for each of the second and third years.

James had £3956 in his savings account at the end of 3 years.

Work out the value of B. Give your answer correct to 1 decimal place.

$3200 \times 1.045 \times x^2 = 3956$

$3344 \times x^2 = 3956$

$x^2 = \dfrac{3956}{3344}$

$x = \sqrt{\dfrac{3956}{3344}}$

$x = 1.08766\ldots$

8.8%

(Total for Question 3 is 3 marks)

RECURRING DECIMALS (16)

1 Prove algebraically that $0.2\dot{1}\dot{8}$ can be written as $\frac{12}{55}$

$$x = 0.2181818\ldots$$

$$10x = 2.181818\ldots$$

$$100x = 21.818181\ldots$$

$$1000x = 218.181818\ldots$$

$$990x = 216$$

$$x = \frac{216}{990} = \frac{12}{55} \quad (\div 18)$$

(Total for Question 1 is 3 marks)

2 Express $0.0\dot{1}5\dot{3}$ as a fraction.
You must show all your working.

$$x = 0.0153153\ldots$$

$$10x = 0.153153\ldots$$

$$100x = 1.531531\ldots$$

$$1000x = 15.315315\ldots$$

$$10{,}000x = 153.153153\ldots$$

$$9900x = 153$$

$$x = \frac{153}{9900} = \frac{17}{1110} \quad (\div 9)$$

$\frac{17}{1110}$ ....

(Total for Question 2 is 3 marks)

3 (a) $m = 0.\dot{2}\dot{7}$ $n = 0.1\dot{3}$

Work out the value of mn.
Give your answer as a fraction in its simplest form.

Find m

$m = 0.272727\ldots$

$10m = 2.727272\ldots$

$100m = 27.272727\ldots$

$99m = 27$

$\div 9$

$m = \frac{27}{99} = \frac{3}{11}$

$\div 9$

Find n

$n = 0.13333\ldots$

$10n = 1.3333\ldots$

$100n = 13.3333\ldots$

$90n = 12$

$\div 6$

$n = \frac{12}{90} = \frac{2}{15}$

$\div 6$

Find mn

$\frac{3}{11} \times \frac{2}{15} = \frac{6}{165} = \frac{2}{55}$

$\frac{2}{55}$

(5)

(b) $x = 0.3\dot{1}$ $y = 2.4\dot{6}$

Work out the value of $x + y$.

Give your answer as a mixed number in its simplest form.

Find x

$x = 0.31111\ldots$

$10x = 3.1111\ldots$

$100x = 31.1111\ldots$

$99x = 28$

$x = \frac{28}{99} = \frac{14}{45}$ (÷2)

Find y

$y = 2.46666\ldots$

$10y = 24.6666\ldots$

$100y = 246.6666\ldots$

$90y = 222$

$y = \frac{222}{90} = \frac{111}{45}$ (÷2)

Find x + y

$\frac{14}{45} + \frac{111}{45} = \frac{125}{45} = 2\frac{35}{45} = 2\frac{7}{9}$

$2\frac{7}{9}$

.....

(5)

(Total for Question 3 is 10 marks)