1.

Write 25 g as a percentage of 125 g.

Percentage $= \dfrac{25}{125} \times 100\%$

$= 20\%$

.... 20 .... % [1]

2.

(a) $\quad = \quad \boxed{\neq} \quad \boxed{>} \quad <$

Put a ring around each of the symbols that make this statement correct.

$50\% > 5\%$

$0.5 \underline{\quad > \quad} 5\%$

$0.5 \times 100\% = 50\%$

$50\% \neq 5\%$

[1]

(b) Insert one pair of parentheses to make this statement correct.

Using BODMAS

$(3-1) = 2 \quad 7-2+2 = 7$

$7 - (3 - 1) + 2 = 7$

$(7+2) - 2$

$9 - 2 = 7$

[1]

3.

$$11 \quad 13 \quad 15 \quad 17 \quad 19$$

From this list, write down the number that is both a prime number and a factor of 78.

Prime number is divisible by 1 and Itself.

$78 \div 13 = 6$

.... 13 .... [1]

4.

Nina changes 350 euros into dollars when the exchange rate is 1 euro = $1.10 .

Work out the amount Nina receives.

1 euro = $1.10

350 euros = ?

$$\frac{350 \times 1.10}{1} = 385$$

$ .... 385 .... [1]

5.

Marek buys a computer for $400.
He sells it at a loss of 15%.

Work out the selling price of this computer.

Buying Price = 400

Selling Price = 15% Loss
(100% − 15%) = 85%

Buying Price is 100%.

100% → 400
85% → ?

$$\frac{85 \times 400}{100} = 340$$

$ .... 340 .... [2]

2

6.

Beatrice walks 8 km at a speed of 4 km/h and then 9 km at a speed of 3 km/h.

Work out Beatrice's average speed for the whole journey.

Time for 8km walk.

Time = $\frac{D}{S}$

$= \frac{8 km}{4 km/hr}$

$= 2$ hours

Time for 9km $= \frac{9km}{3 km/hr}$

$= 3$ hrs

Total distance $= 8km + 9km$
$\approx 17km$

Average speed $= \frac{17km}{5 hours}$

$= 3.4 km/hr$

.... 3.4 .... km/h [3]

7.

Simplify $\sqrt{50}$.

$\sqrt{50} = \sqrt{25 \times 2}$

$= \sqrt{25} \times \sqrt{2}$

$= 5\sqrt{2}$

.... $5\sqrt{2}$ .... [1]

3

Work out $\dfrac{11}{12} + \dfrac{3}{4}$.

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

Find LCM of 12 and 4

$$
\begin{array}{c|cc}
2 & 12 & 4 \\
2 & 6 & 2 \\
3 & 3 & 1 \\
\hline
 & 1 & 1
\end{array}
$$

$LCM = 2 \times 2 \times 3$
$= 12$

$$\dfrac{11}{12} + \dfrac{3}{4}$$

$$\dfrac{11 + 9}{12} = \dfrac{20}{12}$$

$$\dfrac{20 \div 4}{12 \div 4}$$

$$= \dfrac{5}{3} = 1\dfrac{2}{3}$$

.... $1\dfrac{2}{3}$ .... [3]

Work out 0.04^2.

Give your answer in scientific notation.

$$0.04^2 = 0.04 \times 0.04$$

$$= 0.0016$$

$$= 1.6 \times 10^{-3}$$

.... 1.6×10^{-3} .... [2]

10.

(a) Evaluate 3^4.

$3^4 = 3 \times 3 \times 3 \times 3$
$= 81$

.... 81 .... [1]

(b) $\left(4+\sqrt{5}\right)^2 = p + q\sqrt{5}$

Find the value of p and the value of q.

$\left(4+\sqrt{5}\right)^2 = \left(4+\sqrt{5}\right)\left(4+\sqrt{5}\right)$

$= 4\left(4+\sqrt{5}\right) + \sqrt{5}\left(4+\sqrt{5}\right)$

$= 16 + 4\sqrt{5} + 4\sqrt{5} + 5$

$= 21 + 8\sqrt{5}$

$p =$ .... 21 ....

$q =$ .... 8 .... [2]

11.

The cost of a train journey is increased by 20% to a new cost of \$84.

Work out the original cost of the train journey.

Increased Price $= 100\% + 20\%$
$= 120\%$

$120\% \rightarrow 84$
$100\% \rightarrow ?$

$\dfrac{100 \times 84}{120} = 70$

\$ .... 70 .... [2]

12.

Jo and Mo share $26.
Jo receives $10 more than Mo.

Find the ratio   Jo's money : Mo's money.
Give your answer in its simplest form.

Jo receives $= x+10$

MO receives $= x$

$$x+10+x = 26$$

$$2x+10 = 26$$

$$2x = 26-10$$

$$\frac{2x}{2} = \frac{16}{2}$$

$$x = 8$$

$$Jo = 8+10$$
$$= 18$$

$$MO = 8$$

$$\frac{+8}{8}\frac{9}{4}$$

Jo : MO

18 : 8

..................9........ : ......4........... [3]

13.

x varies inversely as the square root of u.
When $u = 9$, $x = 2$.

Find u when $x = 12$.

equation Connecting

$x \propto \frac{1}{\sqrt{u}}$

x and $u = x \propto \frac{6}{\sqrt{u}}$

$x = \frac{k}{\sqrt{u}}$

$\sqrt{u} \times 12 = \frac{6}{\sqrt{u}} \times \sqrt{u}$

$2 = \frac{k}{\sqrt{9}}$

$\sqrt{u} \cdot 12 = 6$

$3 \times 2 = \frac{k \times \cancel{3}}{\cancel{3}}$ $\frac{\cancel{12}\sqrt{u}}{\cancel{12}} = \frac{6}{12}$

$K = 6$

square both sides

$\left(\sqrt{u}\right)^2 = \left(\frac{1}{2}\right)^2$

$u = \frac{1}{4}$ or $\underline{\underline{0.25}}$

$u =$ ....0.25........... [3]

6

(a) $500 is invested at a rate of 3% per year.

Calculate the total interest earned at the end of 7 years when

(i) simple interest is paid,

$$I = P \times \frac{R}{100} \times T$$

$$= 500 \times \frac{3}{100} \times 7$$

$$= \underline{\underline{105}}$$

$ .... $\underline{105}$ .... [2]

(ii) compound interest is paid.

$$A = P\left(1 + \frac{r}{100}\right)^n$$

$$= 500\left(1 + \frac{3}{100}\right)^7$$

$$= 500 (1.03)^7$$

$$= 500 (1.22987)$$

$$= \underline{\underline{614.94}}$$

Interest $= 614.94 - 500$
$= \underline{114.94}$

$ .... 114.94 .... [3]

(b) Each year the value of a car decreases by 10% of its value at the beginning of the year.
The value now is $6269.40 .

Calculate the value of the car 3 years ago.

(Depreciation Loss of Value)

$$A = P\left(1 - \frac{r}{100}\right)^t$$

$$6269.40 = P\left(1 - \frac{10}{100}\right)^3$$

$$6269.40 = P(0.9)^3$$

$$\frac{6269.40}{0.729} = \frac{0.729\,P}{0.729}$$

$$8600 = P$$

$ .... 8600 .... [3]

15.

The distance between two towns is 300 km.

(a) Calculate the average speed of a car that takes 4 hours to travel this distance.

$$\text{Speed} = \frac{D}{T}, \quad S = \frac{300}{4} = 75$$

.... **75** .... km/h [1]

(b) Calculate the time taken by another car that travels at an average speed of 90 km/h.
Give your answer in hours and minutes.

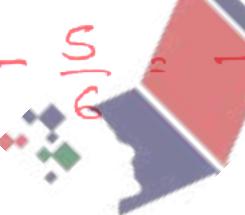$$\text{Time} = \frac{\text{Distance}}{\text{speed}}, \quad T = \frac{300}{90}$$

.... **3** ...... h .... **20** ...... min [2]

16.

Work out $1\frac{3}{8} - \frac{5}{6}$.

Give your answer as a fraction in its simplest form.

$$\frac{11}{8} - \frac{5}{6} = \frac{33 - 20}{24} = \frac{13}{24}$$

$$= \frac{13}{24}$$

.... $^{13}/_{24}$ .... [3]

Annie invests $8000 at a rate of 1% per year compound interest.

Work out the value of her investment at the end of 2 years.

$$A = P\left(1+\frac{R}{100}\right)^n$$

$$A = 8000\left(1+\frac{1}{100}\right)^2$$

$$A = 8000\left(1+0.01\right)^2$$

$$A = 8000\left(1.01\right)^2$$

$$A = 8160.8$$

$ ....8160.8.......... [2]

On a map, a lake has an area of 32 cm^2.
The scale of the map is 1 cm represents 0.2 km.

Calculate the actual area of the lake.
Give your answer in km^2.

1 cm represents 0.2 km., 1 cm = 20,000 cm^2

1 cm^2 → 0.04 km^2 1 cm^2 =

32 cm^2 = ?

$$\frac{32 \times 0.04}{1} = 1.28$$

............1.28............ km^2 [2]

9

y varies directly as the square root of $(x-3)$.
When $x = 28$, $y = 20$.

Find y when $x = 39$.

$$y \propto \sqrt{x-3}$$

$$y = K\sqrt{x-3}$$

$$20 = K\sqrt{25}$$
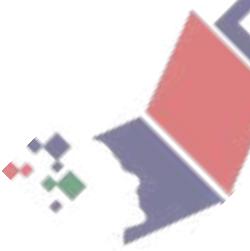
$$20 = K \times 5$$

$$K = \frac{20}{5}$$

$$K = 4$$

$$y = 4\sqrt{x-3}$$

$$y = 4\sqrt{39-3}$$

$$y = 4\sqrt{36}$$

$$y = 4 \times 6$$

$y =$ .... 24 .... [3]

(a) The total cost of a taxi journey is calculated as

• $0.50 per kilometer

plus

• $0.40 per minute.

(i) Calculate the total cost of a journey of 32 km that takes 30 minutes.

Total Cost = 32 × 0.5 + 0.4 × 30

= 16 + 12 = 28 $ _____28_____ [2]

(ii) The total cost of a journey of 100 km is $98.

Show that the time taken is 2 hours.

Let time be x in hours

TC = $0.50 × 100 + 0.40$x$

TC = 50 + 0.4x

$98 = $50 + 0.4$x$

x = 120 minute / 2 hrs.

0.4x = 48

x = 48/0.4

[3]

(b) Three taxi drivers travel a total of 8190 km in the ratio 5 : 2 : 7.

Calculate the distance each driver travels.

5 + 2 + 7 = 14

$\frac{5}{14}$ × 8190 = 2925

$\frac{2}{14}$ × 8190 = 1170

$\frac{7}{14}$ × 8190 = 4095

Driver 1 _____2925_____ km

Driver 2 _____1170_____ km

Driver 3 _____4095_____ km [3]

(c) After midnight, the cost of any taxi journey increases by 45%.
One journey costs $84.10 after midnight.

Calculate the cost of the same journey before midnight.

100% = before mid

100 + 45% = $84.10 After midnight.

145% = 84

100% = ?

$\frac{100 × 84}{145}$ = 57.93 $ _____58_____ [2]

11

21.

(a) The exchange rate is 1 euro = $1.142 .

   (i) Johann changes $500 into euros.

      Calculate the number of euros Johann receives.
      Give your answer correct to the nearest euro.

$$1 \text{ euro} = \$ 1.142$$
$$? = 500$$
$$\frac{500 \times 1}{1.142} = 437.83 \qquad 438$$

.... euros [2]

   (ii) Johann buys a computer for $329.
      The same computer costs 275 euros.

      Calculate the difference in cost in dollars.

$$1 \text{ euro} = \$ 1.142$$
$$275 = ?$$
$$275 \times 1.142 = 314.05$$
$$329 - 314.05 = 14.95$$

$ .... 14.95 .... [2]

(b) Lucy spends $\frac{3}{8}$ of the money she has saved this month on a book that costs $5.25 .

Calculate how much money Lucy has saved this month.

$$\frac{3}{8} = 5.25 \qquad \frac{8 \times 5.25}{3} = 14$$
$$3 = 5.25$$
$$8 = ?$$

$ .... 14 .... [2]

(c) Kamal invests $6130 at a rate of r% per year compound interest.
The value of his investment at the end of 5 years is $6669.

Calculate the value of r.

$$A = P\left(1 + \frac{R}{100}\right)^n = 6669$$

$$6669 = 6130\left(1 + \frac{r}{100}\right)^5$$

$$\frac{6669}{6130} = \left(1 + \frac{r}{100}\right)^5$$

$$1.088 = \left(1 + \frac{r}{100}\right)^5$$

$$\sqrt[5]{1.088} - 1 = \frac{r}{100}$$

$$0.01699 = \frac{r}{100}$$

$$r = 1.699$$

$r = ... 1.699 .... [3]

(a) (i) Write 0.00307 in scientific notation.

0.00307

3.07×10^{-3} [1]

(ii) Work out $7.8 \times 10^{200} + 7.8 \times 10^{201}$, giving your answer in scientific notation.

7.8×10^{201}
$+ \quad 78 \times 10^{200}$
85.8×10^{200}
8.58×10^{201}

8.58×10^{201} [2]

(b) Find the least common multiple (LCM) of 48 and 90.

2	48	90
2	24	45
2	12	45
2	6	45
3	3	45
3	1	15
5	1	5

$= 2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 5$
$2^4 \times 3^2 \times 5$

720 [2]

(c) Expand and simplify.
$$(a\sqrt{3} + 3\sqrt{2})^2$$

$a\sqrt{3}(a\sqrt{3} + 3\sqrt{2}) + 3\sqrt{2}(a\sqrt{3} + 3\sqrt{2})$
$3a^2 + 3a\sqrt{6} + 3a\sqrt{6} + 9 \times 4$
$3a^2 + 6a\sqrt{6} + 36$

$3a^2 + 6a\sqrt{6} + 36$ [3]

(d) Simplify $\sqrt{175} + \sqrt{700}$.
You must show all your work.

$\sqrt{175} = \sqrt{25 \times 7} = 5\sqrt{7}$
$\sqrt{700} = \sqrt{100 \times 7} = 10\sqrt{7}$

$5\sqrt{7} + 10\sqrt{7}$
$= 15\sqrt{7}$

$15\sqrt{7}$ [2]