RATIO

1 **(a)** Kolyan buys water for $2.60 .
He also buys biscuits.

(i) The ratio cost of biscuits : cost of water = 3 : 2.

Find the cost of the biscuits.

Answer(a)(i) $..... [2]

(ii) Kolyan has $9 to spend.

Work out the total amount Kolyan spends on water and biscuits as a fraction of the $9.
Give your answer in its lowest terms.

Answer(a)(ii) ..... [2]

(iii) The $9 is 62.5% less than the amount Kolyan had to spend last week.

Calculate the amount Kolyan had to spend last week.

Answer(a)(iii) $..... [3]

(b) Priya buys a bicycle for $250.
Each year the value of the bicycle decreases by 8% of its value at the beginning of that year.

Calculate the value of Priya's bicycle after 10 years.
Give your answer correct to the nearest dollar.

Answer(b) $..... [3]

MARKING SCHEME:

(a) (i)	3.9[0]	**2**	**M1** for $2.6 \div 2$
(ii)	$\frac{13}{18}$ cao	**2**	**B1** for any correct unsimplified fraction
(iii)	24	**3**	**M2** for $9 \div 0.375$ oe or **M1** for associating 9 with $(100 - 62.5)\%$
(b)	109 cao	**3**	**B2** for 108.5 to 108.6 or **M1** for $250 \times \left(1 - \frac{8}{100}\right)^{10}$ oe

(a) **(i)** Divide \$105 in the ratio 4 : 3.

\$ ..... and \$ ..... [2]

(ii) Increase \$105 by 12%.

\$ ..... [2]

(iii) In a sale the original price of a jacket is reduced by 16% to \$105.

Calculate the original price of the jacket.

\$ ..... [3]

(b) Jakob invests \$500 at a rate of 2% per year compound interest.
Claudia invests \$500 at a rate of 2.5% per year simple interest.

Calculate the difference between these two investments after 30 years.
Give your answer in dollars correct to the nearest cent.

\$ ..... [6]

2 (c) Michel invests \$$P$ at a rate of 3.8% per year compound interest.
After 30 years the value of this investment is \$1469.

Calculate the value of P.

P = ... [3]

(d) The population of a city increases exponentially at a rate of x% **every 5 years**.
In 1960 the population was 60 100.
In 2015 the population was 120 150.

Calculate the value of x.

x = ... [3]

MARKING SCHEME:

(a) (i)	60 and 45	**2**	**M1** for $105 \div (4 + 3)$
(ii)	117.6[0] final answer	**2**	**M1** for 105×1.12 oe
(iii)	125	**3**	**M2** for $105 \div (1 - \frac{16}{100})$ oe or **M1** for 105 seen associated with 84%
(b)	30.68 final answer	**6**	**B5** for 30.7[0] or 30.68… or **B4** for 905 to 906 **and** 875 or 405 to 406… **and** 375 **OR** **M1** for $500 \times \left(1+\frac{2}{100}\right)^{30}$ [– 500] oe **M1** for [500 +] $\frac{500 \times 2.5 \times 30}{100}$ **B1** for 905 to 906 or 875 or 405 to 406 or 375
(c)	480 or 479.8 to 479.9…	**3**	**M2** for $1469 \div \left(1+\frac{3.8}{100}\right)^{30}$ oe or **M1** for $P \times \left(1+\frac{3.8}{100}\right)^{30} = 1469$ oe
(d)	6.5[0] or 6.500…	**3**	**M2** for $\sqrt[11]{\frac{120150}{60100}}$ [×100 – 100] oe or **M1** for $60100 \times (\ )^n = 120150$ oe where $n = 5$ or 11 or 55

3 **(a)** A jigsaw puzzle has edge pieces and inside pieces.
The ratio edge pieces : inside pieces = 3 : 22.

(i) There are 924 inside pieces.

Calculate the total number of pieces in the puzzle.

..... [2]

(ii) Find the percentage of the total number of pieces that are edge pieces.

.....% [1]

(iii) Anjum and Betty spent a total of 9 hours completing the puzzle.
The ratio Anjum's time : Betty's time = 7 : 5.

Work out how much time Anjum spent on the puzzle.

..... hours [2]

(b) The price of the puzzle was $15.99 in a sale.
This was 35% less than the original price.

Calculate the original price of the puzzle.

$..... [3]

(c) Betty takes a photograph of the completed puzzle.
The photograph and the completed puzzle are mathematically similar.

The area of the photograph is 875 cm^2 and the area of the puzzle is 2835 cm^2.
The length of the photograph is 35 cm.

Work out the length of the puzzle.

..... cm [3]

(d) **(i)** The area of another puzzle is 6610 cm^2.

Change 6610 cm^2 into m^2.

.....m^2 [1]

(ii) The cost price of this puzzle is $12.50 .
The selling price is $18.50 .

Calculate the percentage profit.

.....% [3]

MARKING SCHEME:

Question	Answer	Mark	Part marks
(a) (i)	1050	2	**M1** for $924 \div 22$ oe or $924 \div 0.88$ oe If zero scored, **SC1** for 126 seen
(ii)	12	1	
(iii)	5 ¼ hrs or 5.25 hrs	2	**M1** for $9 \div (7 + 5)$ or $540 \div (7 + 5)$ If zero scored, **SC1** for answer 3.75h or 3h 45 mins
(b)	24.6[0]	3	**M2** for $15.99 \div \left(1 - \frac{35}{100}\right)$ oe or **M1** for 65% associated with 15.99
(c)	63	3	**M2** for $35 \times \sqrt{\frac{2835}{875}}$ oe or **M1** for $\sqrt{\frac{2835}{875}}$ or $\sqrt{\frac{875}{2835}}$ or better or $\frac{\sqrt{2835}}{?} = \frac{\sqrt{875}}{35}$ oe OR **M2** for $\sqrt{2835 \times \frac{35}{their(875 \div 35)}}$ oe or **M1** for $\frac{35}{their(875 \div 35)}$ or $\frac{their(875 \div 35)}{35}$
(d) (i)	0.661[0]	1	
(ii)	48	3	**M2** for $\frac{18.50 - 12.50}{12.50} \times 100$ or **M1** for $\frac{18.50 - 12.50}{12.50}$ or $\frac{18.50}{12.50} \times 100$

4 **(a)** A library has a total of 10494 fiction and non-fiction books.
The ratio fiction books : non-fiction books = 13 : 5.

Find the number of non-fiction books the library has.

..... [2]

(b) The library has DVDs on crime, adventure and science fiction.
The ratio crime : adventure : science fiction = 11 : 6 : 10.
The library has 384 **more** science fiction DVDs than adventure DVDs.

Calculate the number of crime DVDs the library has.

..... [2]

Q1 **(c)** Every Monday, Sima travels by car to the library.
The distance is 20 km and the journey takes 23 minutes.

(i) Calculate the average speed for the journey in kilometres per hour.

..... km/h [2]

(ii) One Monday, she is delayed and her average speed is reduced to 32 km/h.

Calculate the percentage increase in the journey time.

..... % [5]

(d) In Spain, the price of a book is 11.99 euros.
In the USA, the price of the same book is $12.99 .
The exchange rate is $1 = 0.9276 euros.

Calculate the difference between these prices.
Give your answer in dollars, correct to the nearest cent.

$..... [3]

(e) 7605 books were borrowed from the library in 2016.
This was 22% less than in 2015.

Calculate the number of books borrowed in 2015.

..... [3]

MARKING SCHEME:

Question	Answer	Marks	Partial marks
(a)	2915	**2**	**M1** for 10 494 ÷ (13 + 5) oe
(b)	1056	**2**	**M1** for 384 ÷ (10 – 6) oe
(c)(i)	52.2 or 52.17…	**2**	**M1** for 20 ÷ 23 or 20 × 60 or 23 ÷ 60 isw If zero scored, **SC1** for answer 52.6 (from use of 0.38)
(c)(ii)	63[.0] or 63.03 to 63.05…	**5**	**M4** for $\frac{\textit{their } 52.17... - 32}{32} \times 100$ oe or **M3** for $\frac{\textit{their } 52.17... - 32}{32}$ oe or $\frac{\textit{their } 52.17...}{32} \times 100$ oe OR **B2** for $\frac{5}{8}$ [hours] oe or 37.5 [minutes] or **M1** for 20 ÷ 32 or better and **M2** for $\frac{\textit{their } 37.5 - 23}{23} \times 100$ oe or **M1** for $\frac{\textit{their } 37.5 - 23}{23}$ or $\frac{\textit{their } 37.5}{23} \times 100$
(d)	0.06 final answer nfww	**3**	**M1** for 11.99 ÷ 0.9276 or 12.99 × 0.9276 **A1** for 12.93 or 12.925 to 12.926
(e)	9750	**3**	**M2** for $7605 \div \left(1 - \frac{22}{100}\right)$ oe or **M1** for (100 – 22)[%] correctly associated with 7605 seen

5 **(a)** Alex has \$20 and Bobbie has \$25.

(i) Write down the ratio Alex's money : Bobbie's money in its simplest form.

..... : ..... [1]

(ii) Alex and Bobbie each spend $\frac{1}{5}$ of their money.

Find the ratio Alex's remaining money : Bobbie's remaining money in its simplest form.

..... : ..... [1]

(iii) Alex and Bobbie **then** each spend \$4.

Find the new ratio Alex's remaining money : Bobbie's remaining money in its simplest form.

..... : ..... [2]

(b) **(i)** The population of a town in the year 1990 was 15 600.
The population is now 11 420.

Calculate the percentage decrease in the population.

.....% [3]

(ii) The population of 15 600 was 2.5% less than the population in the year 1980.

Calculate the population in the year 1980.

..... [3]

(c) Chris invests \$200 at a rate of x% per year simple interest.
At the end of 15 years the total interest received is \$48.

Find the value of x.

$x =$ ..... [2]

(d) Dani invests \$200 at a rate of y% per year compound interest.
At the end of 10 years the value of her investment is \$256.

Calculate the value of y, correct to 1 decimal place.

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

MARKING SCHEME:

Question	Answer	Marks	Partial marks
(a)(i)	4 : 5	**1**	
(a)(ii)	4 : 5	**1**	
(a)(iii)	3 : 4	**2**	**B1** for 12 : 16 or answer 4 : 3
(b)(i)	26.8 or 26.79…	**3**	**M2** for $\frac{15600-11420}{15600}[\times 100]$ or $\frac{11420}{15600}\times 100$ or **M1** for $\frac{11420}{15600}$
(b)(ii)	16000 nfww	**3**	**M2** for $15600\times\frac{100}{100-2.5}$ oe or **M1** for 15600 associated with 97.5[%] seen
(c)	1.6 or $\frac{8}{5}$	**2**	**M1** for $\frac{200\times x\times 15}{100}=48$ oe or **M1** for figs 16
(d)	2.5 or $\frac{5}{2}$ cao nfww	**3**	**B2** for 2.49[9…] or 102.4[99…] or 1.024[99…] or 2.50 or 102.5 or 1.025 or **M2** for $\sqrt[10]{\frac{256}{200}}$ oe or **M1** for $256=200(x)^{10}$ seen