

RATIO

- 1** (a) Here is a list of ingredients to make 20 biscuits.

260g of butter 500g of sugar 650g of flour 425g of rice
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- (i) Find the mass of rice as a percentage of the mass of sugar.

..... % [1]

- (ii) Find the mass of butter needed to make 35 of these biscuits.

..... g [2]

- (iii) Michel has 2 kg of each ingredient.

Work out the greatest number of these biscuits that he can make.

..... [3]

- (b) A company makes these biscuits at a cost of \$1.35 per packet.
These biscuits are sold for \$1.89 per packet.

- (i) Calculate the percentage profit the company makes on each packet.

..... % [3]

- (ii) The selling price of \$1.89 has increased by 8% from last year.

Calculate the selling price last year.

\$ [3]

- (c) Over a period of 3 years, the company's sales of biscuits increased from 15.6 million packets to 20.8 million packets.

The sales increased exponentially by the same percentage each year.

Calculate the percentage increase **each year**.

..... % [3]

- (d) The people who work for the company are in the following age groups.

Group A	Group B	Group C
Under 30 years	30 to 50 years	Over 50 years

The ratio of the number in group A to the number in group B is 7 : 10.

The ratio of the number in group B to the number in group C is 4 : 3.

- (i) Find the ratio of the number in group A to the number in group C.
Give your answer in its simplest form.

..... : [3]

- (ii) There are 45 people in group C.

Find the total number of people who work for the company.

..... [3]

MARKING SCHEME:

(a)(i)	85	1	
(a)(ii)	455	2	M1 for $260 \div 20 \times 35$ oe
(a)(iii)	61	3	B2 for 61.5... seen or M1 for $2000 \div 650$ soi or for $\frac{x}{2000} = \frac{20}{650}$ oe or other attempt at scaling up with 650 or for $650 \div 20$ oe
(b)(i)	40	3	M2 for $\frac{1.89 - 1.35}{1.35} [\times 100]$ oe or $\frac{1.89}{1.35} \times 100$ oe or M1 for oe $\frac{1.89}{1.35} [\times 100]$ soi
(b)(ii)	1.75 nfw	3	M2 for $1.89 \div \left(\frac{100+8}{100}\right)$ or better or M1 for 1.89 associated with 108 [%]
(c)	10.1 or 10.06...	3	M2 for $\sqrt[3]{\frac{20.8}{15.6}}$ oe or M1 for $15.6 \times k^3 = 20.8$ oe
(d)(i)	14:15	3	B2 for correct unsimplified 3 term ratio A: B: C or correct unsimplified two term ratio A : C or M1 for attempt to find common multiple of 4 and 10 or other common value for B or for $7 \times \frac{4}{10}$ oe or $3 \times \frac{10}{4}$ oe
(d)(ii)	147	3	M2 for $\frac{45}{15}(14 + 20 [+15])$ oe or $45 \div 3 \times 4 + (45 \div 3 \times 4) \div 10 \times 7 [+ 45]$ or M1 for $45 \div 3$ oe or $45 \div$ <i>their</i> (d)(i) value for C shown

2

- (a) The price of a newspaper increased from \$0.97 to \$1.13 .

Calculate the percentage increase.

..... % [3]

- (b) One day, the newspaper had 60 pages of news and advertisements.

The ratio number of pages of news : number of pages of advertisements = 5 : 7.

- (i) Calculate the number of pages of advertisements.

..... [2]

- (ii) Write the number of pages of advertisements as a percentage of the number of pages of news.

..... % [1]

- (c) On holiday Maria paid 2.25 euros for the newspaper when the exchange rate was \$1 = 0.9416 euros.
At home Maria paid \$1.13 for the newspaper.

Calculate the difference in price.

Give your answer in dollars, correct to the nearest cent.

\$ [3]

- (d) The number of newspapers sold decreases exponentially by $x\%$ each year.
Over a period of 21 years the number of newspapers sold decreases from 1 763 000 to 58 000.

Calculate the value of x .

$$x = \dots\dots\dots [3]$$

- (e) Every page of the newspaper is a rectangle measuring 43 cm by 28 cm, both correct to the nearest centimetre.

Calculate the upper bound of the area of a page.

$$\dots\dots\dots \text{ cm}^2 [2]$$

MARKING SCHEME:

(a)	16.5 or 16.49...	3	M2 for $\frac{1.13 - 0.97}{0.97} [\times 100]$ oe or $\frac{1.13}{0.97} \times 100$ oe or M1 for $\frac{1.13}{0.97}$ oe
(b)(i)	35	2	M1 for $60 \div (5 + 7)$
(b)(ii)	140	1	
(c)	\$1.26 final answer	3	B2 for 1.259... or 1.26 but not as final answer or M1 for $2.25 \div 0.9416$ If 0 scored, SC1 for 1.13×0.9416
(d)	15[.0...]	3	M2 for $\sqrt[21]{\frac{58000}{1763000}}$ oe or M1 for $58000 = 1763000 (k)^{21}$
(e)	1239.75	2	B1 for $43 + 0.5$ or $28 + 0.5$ oe seen

3

Here is part of a train timetable for a journey from London to Marseille.
All times given are in local time.
The local time in Marseille is 1 hour ahead of the local time in London.

London	07 19
Ashford	07 55
Lyon	13 00
Avignon	14 08
Marseille	14 46

- (a) (i) Work out the total journey time from London to Marseille.
Give your answer in hours and minutes.

..... h min [2]

- (ii) The distance from London to Ashford is 90 km.
The local time in London is the same as the local time in Ashford.

Work out the average speed, in km/h, of the train between London and Ashford.

..... km/h [3]

- (iii) During the journey, the train takes 35 seconds to completely cross a bridge.
The average speed of the train during this crossing is 90 km/h.
The length of the train is 95 metres.

Calculate the length, in metres, of this bridge.

..... m [4]

(b) The fares for the train journey are shown in the table below.

From London to Marseille	Standard fare	Premier fare
Adult	\$84	\$140
Child	\$60	\$96

(i) For the **standard fare**, write the ratio adult fare : child fare in its simplest form.

..... : [1]

(ii) For an **adult**, find the percentage increase in the cost of the standard fare to the premier fare.

..... % [3]

(iii) For one journey from London to Marseille, the ratio

$$\text{number of adults} : \text{number of children} = 11 : 2.$$

There were 220 adults in total on this journey.

All of the children and 70% of the adults paid the standard fare.

The remaining adults paid the premier fare.

Calculate the total of the fares paid by the adults and the children.

\$ [5]

(c) There were 3.08×10^5 passengers that made this journey in 2018.

This was a 12% decrease in the number of passengers that made this journey in 2017.

Find the number of passengers that made this journey in 2017.

Give your answer in standard form.

..... [3]

MARKING SCHEME:

(a)(i)	6h 27 mins	2	B1 for answerh 27 mins
(a)(ii)	150 km/h	3	M2 for $\frac{90}{36} \times 60$ or M1 for $\frac{90}{\text{their time}}$ or B1 for 36 [mins] seen
(a)(iii)	780	4	M3 for $\left(90 \times \frac{35}{3600}\right) \times 1000 - 95$ oe or M2 for $\left(90 \times \frac{35}{3600}\right) \times 1000$ oe or B1 for figs 875 or M1 for $90 \times \frac{35}{3600}$ seen or for $90 \times \frac{1000}{3600}$ oe If 0 scored, SC1 for <i>their</i> distance (> 95) – 95
(b)(i)	7 : 5	1	
(b)(ii)	66.7 or 66.66 to 66.67	3	M2 for $\frac{140-84}{84} [\times 100]$ oe or for $\frac{140}{84} \times 100$ oe or M1 for $\frac{140}{84}$ oe
(b)(iii)	24 576	5	M4 for complete method, $40 \times 60 + 0.7 \times 220 \times 84 + 0.3 \times 220 \times 140$ oe OR B1 for 40 [children] M1 for $0.7 \times 220 \times 84$ oe M1 for $0.3 \times 220 \times 140$ oe B1 for 2400 or 12936 or 9240 nfw
(c)	3.5×10^5 nfw	3	M2 for $3.08 \times 10^5 \div \left(\frac{100-12}{100}\right)$ oe or M1 for $3.08 [\times 10^5]$ associated with (100–12)%

4

A factory produces bird food made with sunflower seed, millet and maize.

(a) The amounts of sunflower seed, millet and maize are in the ratio

$$\text{sunflower seed : millet : maize} = 5 : 3 : 1 .$$

(i) How much millet is there in 15 kg of bird food?

Answer(a)(i) kg [2]

(ii) In a small bag of bird food there is 60 g of sunflower seed.

What is the mass of bird food in a small bag?

Answer(a)(ii) g [2]

(b) Sunflower seeds cost \$204.50 for 30 kg from Jon's farm or €96.40 for 20 kg from Ann's farm. The exchange rate is \$1 = €0.718.

Which farm has the cheapest price per kilogram?

You must show clearly all your working.

Answer(b) [4]

(c) Bags are filled with bird food at a rate of 420 grams per second.

How many 20 kg bags can be **completely** filled in 4 hours?

Answer(c) [3]

(d) Brian buys bags of bird food from the factory and sells them in his shop for \$15.30 each. He makes 12.5% profit on each bag.

How much does Brian pay for each bag of bird food?

Answer(d) \$ [3]

(e) Brian orders 600 bags of bird food.

The probability that a bag is damaged is $\frac{1}{50}$.

How many bags would Brian expect to be damaged?

Answer(e) [1]

MARKING SCHEME;

<p>(a) (i) 5</p>	<p>2</p>	<p>M1 for $\frac{3 \times 15}{(5 + 3 + 1)}$</p>
<p>(ii) 108</p>	<p>2</p>	<p>M1 for $60 \times \frac{9}{5}$ oe</p>
<p>(b) Correct conversion of money $J \times 0.718$ or $A \div 0.718$</p> <p>Correct equalising of weights e.g. $J \times \frac{2[0]}{3[0]}$ or $A \times \frac{3[0]}{2[0]}$ or $J \div 3$ and $A \div 2$ or $J \div 30$ and $A \div 20$</p> <p>97 to 98 or 201[.39...] and Ann <u>48.9[4..]</u> and 48.2[0] and Ann or 68[.16] to 68.[2] and <u>67[.13]</u> and Ann <u>4.88... to 4.9</u> and 4.82 and Ann or 6.8[1..] to 6.82 and <u>6.7[1...]</u> and Ann</p> <p style="text-align: right;">www</p>	<p>M1</p> <p>M1</p> <p>A2</p>	<p>Correct conversion of money soi by 146.83[1] rounded or truncated to 3sf or 134.26[1...] rounded or truncated to 3 sf if done 1st</p> <p>Correct equalising of weights or money Accept other methods that give a pair of comparable values for method and accuracy marks This mark can be implied by values seen correct to 3 sf or better</p> <p>The underlined values imply M1 for the money conversion</p> <p>Or A1 for 97 to 98 or 201[.39...] or a correct pair of values with wrong/no conclusion</p>
<p>(c) 302 Final answer</p>	<p>3</p>	<p>M1 for $60 \times 60 \times 4$ soi by 14400 or figs 6048 or figs 3024 and M1 for $\div (1000 \times 20)$ soi Answer 302.4 implies M2</p>
<p>(d) 13.6[0]</p>	<p>3</p>	<p>M2 for $\frac{15.3[0]}{1.125}$ oe or M1 for 15.3[0] associated with 112.5%</p>
<p>(e) 12</p>	<p>1</p>	

5

Noma flies from Johannesburg to Hong Kong.
Her plane leaves Johannesburg at 1845 and arrives in Hong Kong 13 hours and 25 minutes later.
The local time in Hong Kong is 6 hours ahead of the time in Johannesburg.

(a) At what time does Noma arrive in Hong Kong?

Answer(a) [2]

(b) Noma sleeps for part of the journey.
The time that she spends sleeping is given by the ratio

$$\text{sleeping : awake} = 3 : 4 .$$

Calculate how long Noma sleeps during the journey.
Give your answer in hours and minutes.

Answer(b) h min [2]

- (c) (i) The distance from Hong Kong to Johannesburg is 10 712 km.
The time taken for the journey is 13 hours and 25 minutes.

Calculate the average speed of the plane for this journey.

Answer(c)(i) km/h [2]

- (ii) The plane uses fuel at the rate of 1 litre for every 59 metres travelled.

Calculate the number of litres of fuel used for the journey from Johannesburg to Hong Kong.
Give your answer in standard form.

Answer(c)(ii) litres [4]

- (d) The cost of Noma's journey is 10 148 South African Rand (R).
This is an increase of 18% on the cost of the journey one year ago.

Calculate the cost of the same journey one year ago.

Answer(d) R [3]

MARKING SCHEME:

	<p>(a) 14 10 or 2 10 pm final answer</p>	<p>2</p>	<p>M1 for (0)8 10 oe or answer 14 hours and 10 minutes or answer 2 10 [am]</p>
	<p>(b) 5 hours 45 minutes cao</p>	<p>2</p>	<p>M1 for 345 [mins] seen or for $805 / 7 \times 3$ oe or 5.75 seen</p>
	<p>(c) (i) 798 or 798.2 to 798.4....</p>	<p>2</p>	<p>M1 for $10712 / 13 \frac{25}{60}$ or $10712 \div 13.4...$</p>
	<p>(ii) 1.82×10^5 or 1.815×10^5 to 1.816×10^5</p>	<p>4</p>	<p>B3 for 182000 or 181500 to 181600 seen or M2 for 10712000/59 oe or M1 for figs 10712/figs 59 soi by figs 182 or figs 1815 to 1816 and B1 FT for their number of litres correctly converted to standard form rounded to 3sf or better</p>
	<p>(d) 8600</p>	<p>3</p>	<p>M2 for $10148 \div 1.18$ oe or M1 for 10148 associated with 118[%]</p>