

聖嬰中學

HOLY INNOCENTS' HIGH SCHOOL

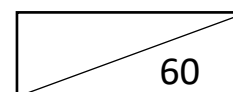


Candidate Name

Class

Index Number

END OF YEAR EXAMINATION 2022
SECONDARY 2
MATHEMATICS PAPER 2



4052/02

Date: 28 Sep 2022

Duration: 1 h 30 min

Candidates answer on the Question Paper.
No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your name, class and index number on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use paper clips, glue or correction tape/fluid.

Answer **ALL** questions.

The number of marks is given in brackets [] at the end of each question or part question.

If working is needed for any question it must be shown with the answer.

Omission of essential working will result in loss of marks.

The total of the marks for this paper is **60**.

The use of an approved scientific calculator is expected, where appropriate.

If the degree of accuracy is not specified in the question and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.

For π , use either your calculator value or 3.142.

For Examiner's use

You need to improve on your:

• **PRESENTATION**

• **ACCURACY**

Marks (max 5%)

Set by: Miss Jolene Koh

Vetted by: Mr Shahrom

Mathematical Formulae*Mensuration*

Curved surface area of a cone = πrl

Surface area of a sphere = $4\pi r^2$

Volume of a cone = $\frac{1}{3}\pi r^2 h$

Volume of a sphere = $\frac{4}{3}\pi r^3$

Answer **all** the questions.

- 1 (a) By rounding off each number to 1 significant figure, **estimate** the value of $\frac{60145 \times 0.51}{421 - 99}$.

Answer..... [2]

- (b) Find the value of $\sqrt[3]{512}$ using prime factorisation.

Answer..... [2]

2 Express each of the following as a single fraction in its simplest form.

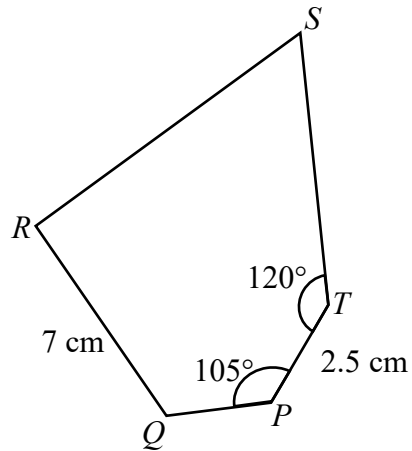
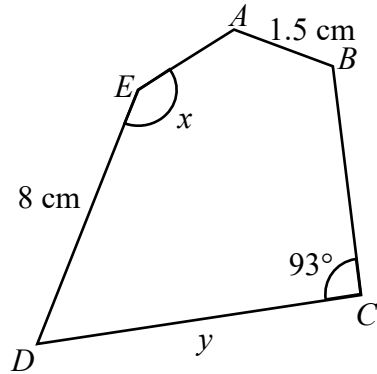
(a) $\frac{4}{2y+7} \times \frac{4y^2-49}{2}$

Answer [2]

(b) $\frac{7}{9-2p} + \frac{8p+3}{(9-2p)(5p+3)}$

Answer [3]

- 3 (a) In the figure below, $ABCDE$ is congruent to $PQRST$.
 $AB = 1.5$ cm, $DE = 8$ cm, $TP = 2.5$ cm, $RQ = 7$ cm, angle $BCD = 93^\circ$,
angle $TPQ = 105^\circ$ and angle $STP = 120^\circ$.
The perimeter of $ABCDE$ is 30 cm.



Find

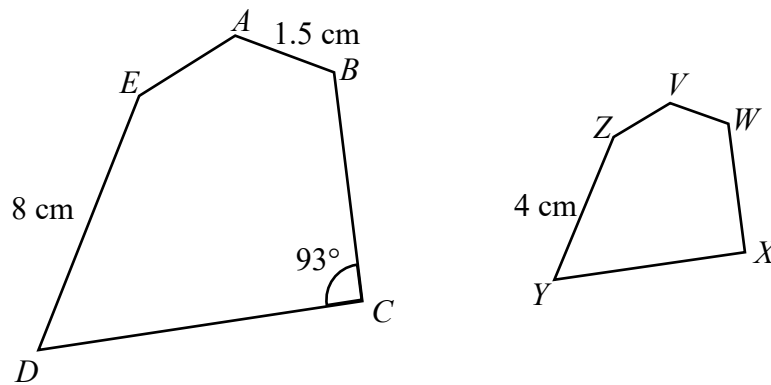
- (i) the value of x ,

- (ii) the value of y .

Answer $x = \dots\dots\dots^\circ$ [1]

Answer $y = \dots\dots\dots$ cm [2]

(b) In the figure below, $ABCDE$ is reduced to $VWXYZ$.



(i) Find the scale factor of the reduction,

Answer [1]

(ii) Find the length of VW ,

Answercm [1]

(iii) Find the perimeter of $VWXYZ$.

Answercm [1]

- 4 The variable y , is directly proportional to the square of x .
It is given that the difference between the values of y when $x = 2$ and $x = 4$ is 1500.

(a) Show that $y = 125x^2$. [3]

(b) Calculate the values of x when $y = 540$.

Answer $x = \dots\dots\dots$ or $x = \dots\dots\dots$ [2]

(c) Find the change in the value of y when the value of x becomes 6 times its original value.

Answer
.....
..... [2]

- 5** The selling price of prawns in Singapore is \$ x per kg during the regular season.
The price increases by \$4 per kg during the festive season.
Mrs Lim bought \$40 worth of prawns during regular season.

(a) Write down an expression, in terms of x , for the mass of the prawns she bought.

Answerkg [1]

(b) Write down an expression, in terms of x , for the mass of the prawns she would receive if she had bought the prawns during the festive season instead.

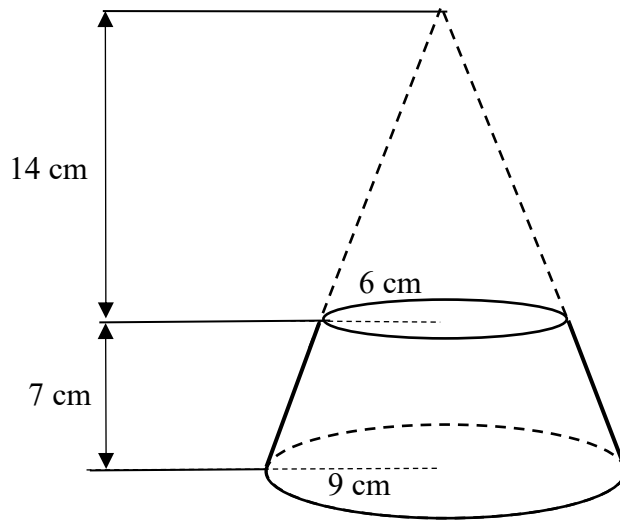
Answerkg [1]

(c) Given that the difference in the mass in **(a)** and **(b)** is 500g, form an equation in x and show that it reduces to $x^2 + 4x - 320 = 0$. [3]

- (d) Solve the equation $x^2 + 4x - 320 = 0$ and find the mass of prawns Mrs Lim would receive if she bought the prawns during the festive season.

Answerkg [2]

- 6 (a) In the diagram, a frustum is obtained by removing a smaller cone of base radius 6 cm and height 14 cm from the top of a cone. The frustum has a height of 7 cm and a base radius of 9 cm.



Find the volume of the frustum, leave your answer in terms of π .

Answercm³ [2]

- (b) The frustum is melted and recast into 3 equally sized spheres.

Find

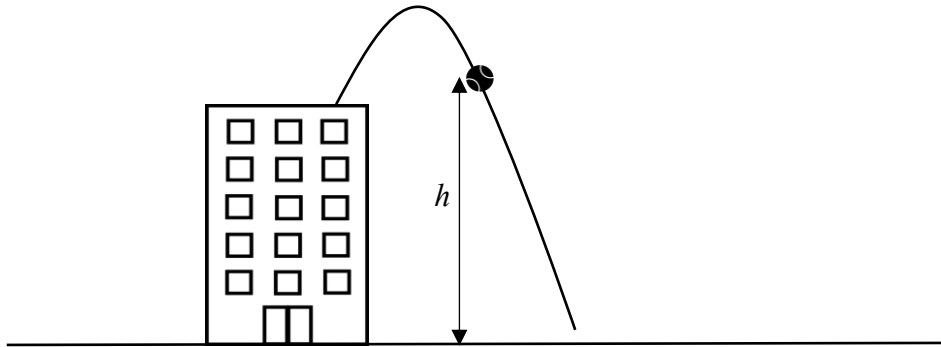
- (i) the radius of one sphere,

Answercm [3]

- (ii) the total surface area of all 3 spheres.

Answercm² [2]

- 7 A ball was thrown from the top of a building. Its vertical height h , in metres, above the ground at time t seconds during the flight is represented by the equation $h = 25 + 5t - t^2$ for $0 \leq t \leq T$.



Some of the corresponding values of h and t are given in the table below.

t	0	1	2	3	4	5	6	7	8	8.5
h	25	29	31	31	p	25	19	11	1	-4.75

- (a) Calculate the value of p .

Answer $p = \dots\dots\dots$ [1]

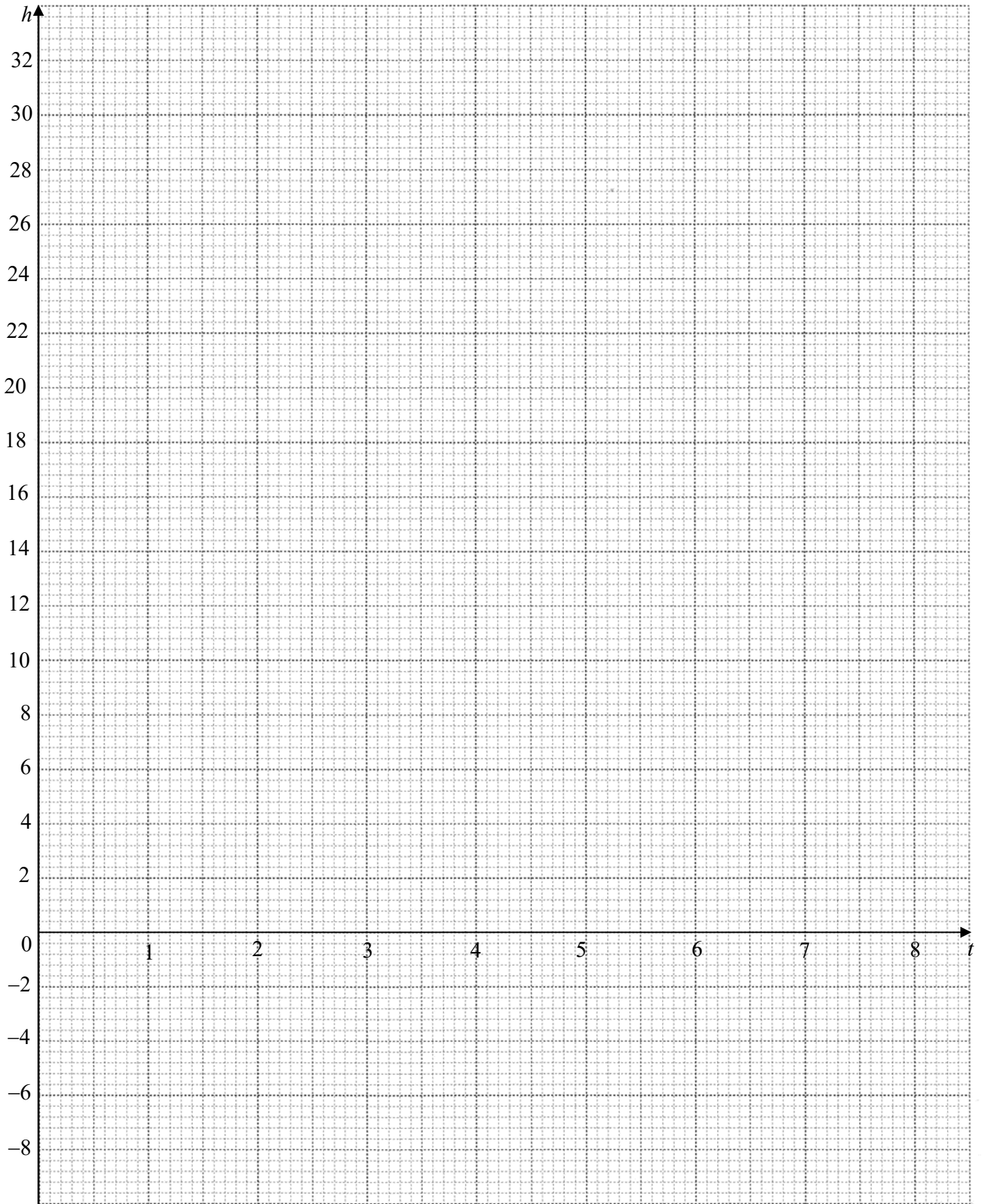
- (b) On the grid in the next page, plot the points given in the above table and join them with a smooth curve. [3]

- (c) Use your graph to estimate the maximum height of the ball from the ground.

Answer $\dots\dots\dots$ m [1]

- (d) By drawing a suitable straight line in your graph, find the times at which the ball is 26 m above the ground.

Answer $t = \dots\dots\dots$ or $\dots\dots\dots$ [2]



- 8** The frequency table below shows the distribution of the ages of 65 residents in a retirement home.
Residents aged 70 years and older receive government subsidy and pay less fees for their stay at the home.

Ages, x years	Number of residents
$60 \leq x < 65$	3
$65 \leq x < 70$	$2a$
$70 \leq x < 75$	22
$75 \leq x < 80$	$5a$
$80 \leq x < 85$	a
$85 \leq x < 90$	8

- (a)** Calculate the value of a .

Answer $a = \dots\dots\dots$ [2]

- (b)** State the age range with the highest frequency.

Answer $\dots\dots\dots \leq x < \dots\dots\dots$ [1]

- (c)** Find the probability that a resident, chosen at random, is at least 80 years old.

Answer $\dots\dots\dots$ [1]

- (d)** Find the percentage of residents who receive government subsidy.

Answer $\dots\dots\dots\%$ [1]

- (e) Calculate an estimate of the mean age of the residents.

Answeryears old [2]

- (f) A pie chart is used to represent the data in the table.

- (i) Find the angle of the sector that represents the number of residents who are aged 75 and above.

Answer.....° [1]

- (ii) Explain why a histogram is preferred to a pie chart to represent this data.

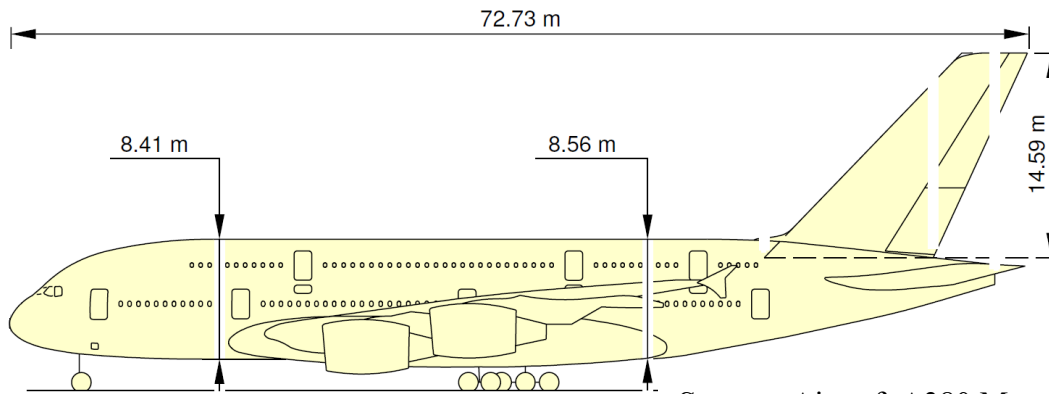
Answer

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..... [1]

- 9 The Airbus A380 is the world's largest passenger aircraft. Some of the specifications of the aircraft is shown below.



Source: Aircraft A380 Manual

The table below shows the characteristics of the A380 aircraft.

Maximum fuel capacity	323 546 litres
Maximum distance flown with maximum fuel capacity	15 700 km

- (a) An aircraft with maximum fuel capacity flew a distance of 13 060 km from Singapore to Canada.
Find the amount of fuel used by the aircraft rounded off to the nearest litre.

Answerl [2]

- (b) A commercial airline plans to board 700 passengers into their A380 plane for a direct flight from Singapore to Canada.
The flight consists of 20 passengers in first class cabin, 80 passengers in business class cabin and 600 passengers in economy class cabin.

The table below shows the maximum allowable weight of luggage per passenger.

Cabin	Carry-on (kg)	Check-in (kg)
First Class	14	100
Business Class		50
Economy Class	7	40

*Carry-on luggage refers to luggage carried by passengers in the cabin.

*Check-in luggage refers to luggage stored in the cargo compartment of the A380 plane.

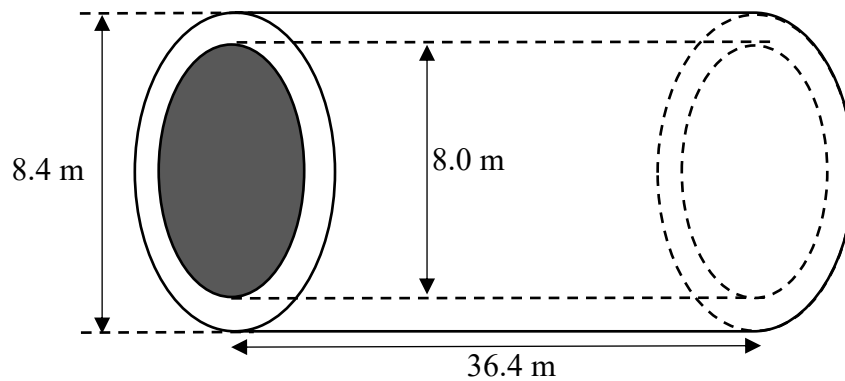
- (i) Find the total maximum allowable carry-on luggage weight for the aircraft.

Answerkg [1]

- (ii) Find the total maximum allowable check-in luggage weight for the aircraft.

Answerkg [1]

- (iii) The middle section of the A380 plane can be modelled by a cylindrical shape shown below.



*As required under airline regulations

$$\text{* Density} = \frac{\text{Mass}}{\text{Volume}}$$

Cost of aluminium alloy per kg	Density of aluminium alloy
\$2.50	2700 kg/m ³

Explain whether a million dollar budget is enough for the commercial airline to manufacture the aluminium alloy for the middle section of the A380 plane. Provide detailed calculations and explanations.

Answer

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..... [4]

End of paper

2022 Secondary 2 Express End of Year Examinations P2 Answer Sheet

Qn	Solution	Qn	
1a	$\frac{60145 \times 0.51}{421 - 99} \approx \frac{60000 \times 0.5}{400 - 100}$ $= \frac{30000}{300}$ $= 100$	5c	$\frac{40}{x} - \frac{40}{x+4} = 0.5$ $\frac{40(x+4) - 40x}{x(x+4)} = 0.5$ $40(x+4) - 40x = 0.5x(x+4)$ $40x + 160 - 40x = 0.5x^2 + 2x$ $0.5x^2 + 2x - 160 = 0$ $x^2 + 4x - 320 = 0 \text{ (shown)}$
1b	$\sqrt[3]{512} = \sqrt[3]{2^9}$ $= \sqrt[3]{(2 \times 2 \times 2)^3}$ $= 2 \times 2 \times 2$ $= 8$		
2a	$2(2y - 7) \text{ or } 4y - 14$	5d	2 kg
2b	$\frac{43p + 24}{(9 - 2p)(5p + 3)}$	6a	$399\pi \text{ cm}^3$
3ai	120	6bi	4.64 cm
3aii	11 cm	6bii	811 cm^2
3bi	$\frac{1}{2} \text{ or } 0.5$	7a	29
3bii	0.75 cm	7c	Accept answers between 31.2 and 31.6 (depending on graph drawn)
3biii	15 cm	7d	$t = 0.2 \text{ and } t = 4.8$ Accept answers $0.1 \leq t \leq 0.3$ and $4.7 \leq t \leq 4.9$ (Depending on graph drawn)
4b	2.08 or -2.08	8a	4
4c	$y_0 = 125x_0^2$ $x_n = 6x_0$ $y_n = 125x_n^2$ $= 125(6x_0)^2$ $= 36(125x_0)^2$ $= 36y_0$ The value of y will be 36 times the original value of y.	8b	$70 \leq x < 75$
		8c	$\frac{12}{65}$
		8d	83.1% or $83\frac{1}{13}\%$
		8e	75.4 years old
		8fi	177.2°
		8fii	It is easier to see or compare the differences between any two intervals.
5a	$\frac{40}{x} \text{ kg}$	9a	269141 l
5b	$\frac{40}{x+4} \text{ kg}$	9bi	5600 kg
		9bii	30000 kg
		9biii	Refer to teacher marking scheme

