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Write your **student number** in the boxes above. **Letter**

Foundation Mathematics

Question and Answer Book

VCE Examination – Tuesday 19 November 2024

- Reading time is **15 minutes**: 11.45 am to 12 noon
- Writing time is **2 hours**: 12 noon to 2.00 pm

Approved materials

- One bound reference that may be annotated
- One scientific calculator

Materials supplied

- Question and Answer Book of 36 pages
- Formula Sheet
- Multiple-Choice Answer Sheet

Instructions

- Follow the instructions on your Multiple-Choice Answer Sheet.
- At the end of the examination, place your Multiple-Choice Answer Sheet inside the front cover of this book.

Students are **not** permitted to bring mobile phones and/or any unauthorised electronic devices into the examination room.

Contents

VICTORIAN CURRICULUM AND ASSESSMENT AUTHORITY

VICTORIA State Government

Section A – Multiple-choice questions

Instructions

- Answer **all** questions in pencil on the Multiple-Choice Answer Sheet.
- Choose the response that is **correct** for the question.
- A correct answer scores 1; an incorrect answer scores 0.
- Marks will **not** be deducted for incorrect answers.
- No marks will be given if more than one answer is completed for any question.
- Unless otherwise indicated, the diagrams in this book are **not** drawn to scale.

Question 1

A shade of turquoise is made by mixing blue and green paint in the ratio two parts blue to one part green.

A painter has 250 mL of green paint. The quantity of blue paint required to make turquoise paint is

A. 125 mL

B. 250 mL

C. 500 mL

D. 750 mL

Question 2

A company purchases eight printers.

Each printer costs $92.

A total cost is calculated using leading-digit approximations.

The percentage error, correct to two decimal places, is

A. 2.17

B. 2.22

C. 8.70

D. 35.87

Question 3

A refrigerator operates continuously and each hour uses 0.24 kilowatt hours (kWh) of electricity.

The average electricity rate is $0.18 per kWh.

What is the average total cost of running the refrigerator for 365 days?

A. $1.04

B. $15.77

C. $189.22

D. $378.43

Question 4

The *cooking time*, in minutes, for a chicken is often determined by its *weight*, in grams.

A commonly used formula for calculating the *cooking time* in minutes is:

$$cooking\ time = 15 + \frac{weight}{20}$$

The *weight* of a chicken is 1.6 kg.

The *cooking time* for this chicken is

A. 16 minutes

B. 80 minutes

C. 95 minutes

D. 105 minutes

Question 5

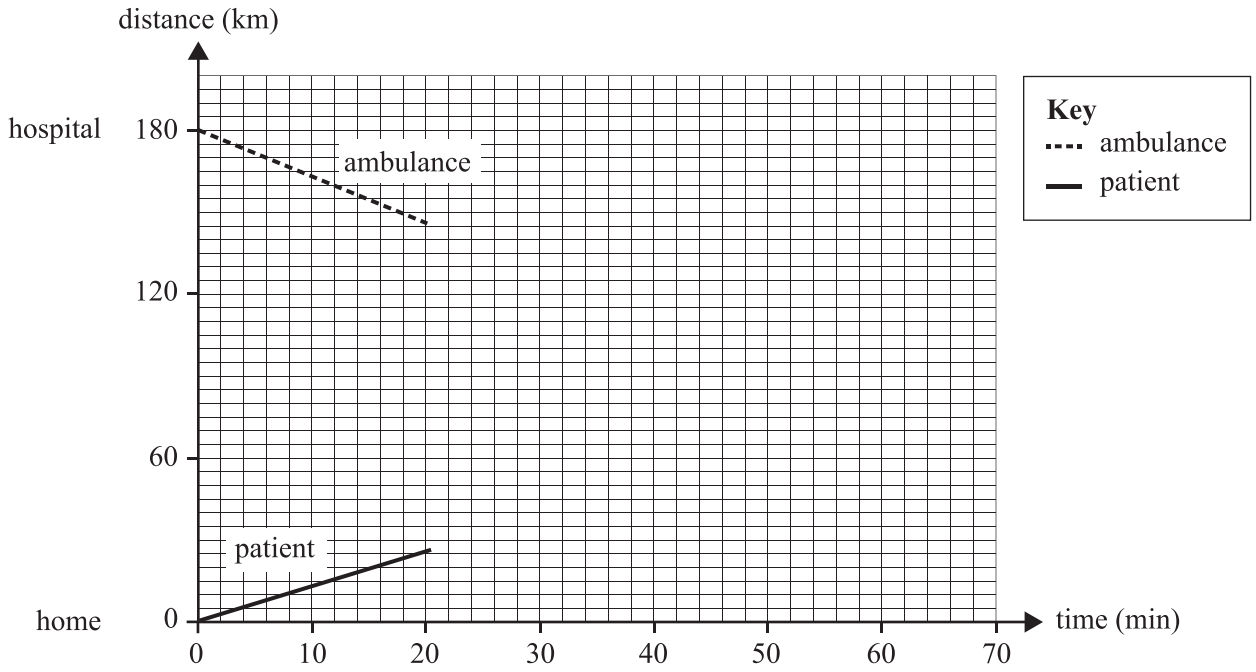
A patient is being driven from their home to the nearest hospital at an average speed of 80 km/h.

An ambulance is dispatched from the hospital at the same time to meet the patient on the way.

The ambulance travels at an average speed of 100 km/h.

The hospital is 180 km, by road, from the patient's home.

This information is shown in the graph below.



The distance travelled by the ambulance to where the two vehicles meet is

A. 60 km

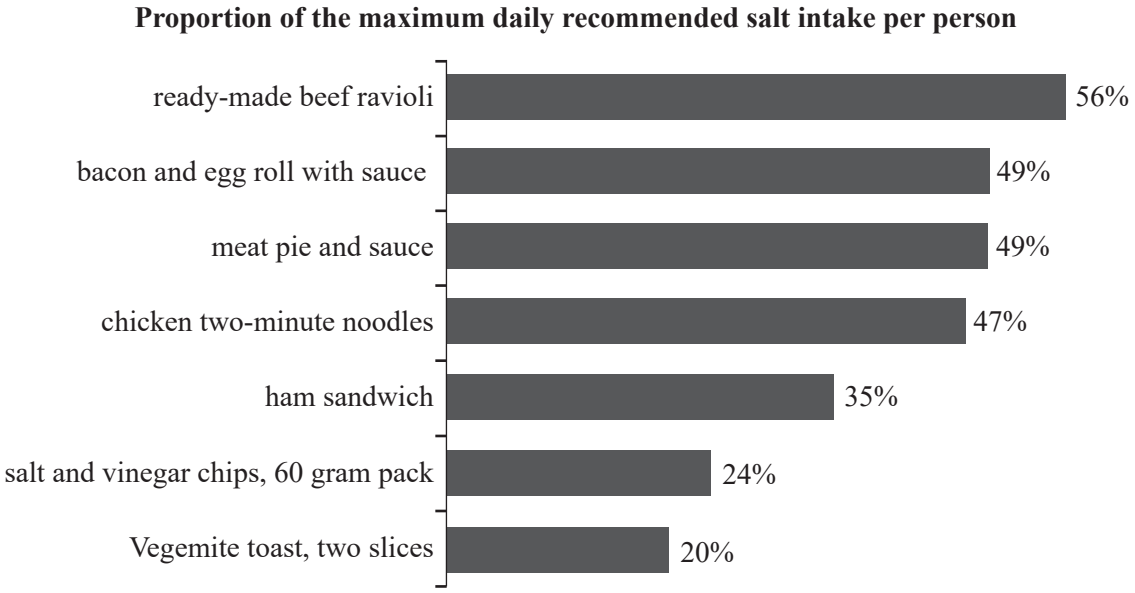
B. 80 km

C. 100 km

D. 120 km

Question 6

The following graph shows the *proportion of the maximum daily recommended salt intake per person* for a selection of foods.



Adapted from Breadon, P. and Fox, L. 'Sneaky salt: how Australia can shake its salt habit', Figure 4.1, 29 October 2023, Grattan Institute <https://grattan.edu.au/report/sneaky-salt> licensed CC-BY 4.0 <http://creativecommons.org/licenses/by/4.0/>

On a particular day, a person consumes:

- one slice of Vegemite toast
- a 60 gram pack of salt and vinegar chips
- a packet of chicken two-minute noodles
- a bacon and egg roll with sauce

On this particular day, the proportion of the person's salt intake exceeds the recommended maximum by

A. 30%

B. 40%

C. 130%

D. 140%

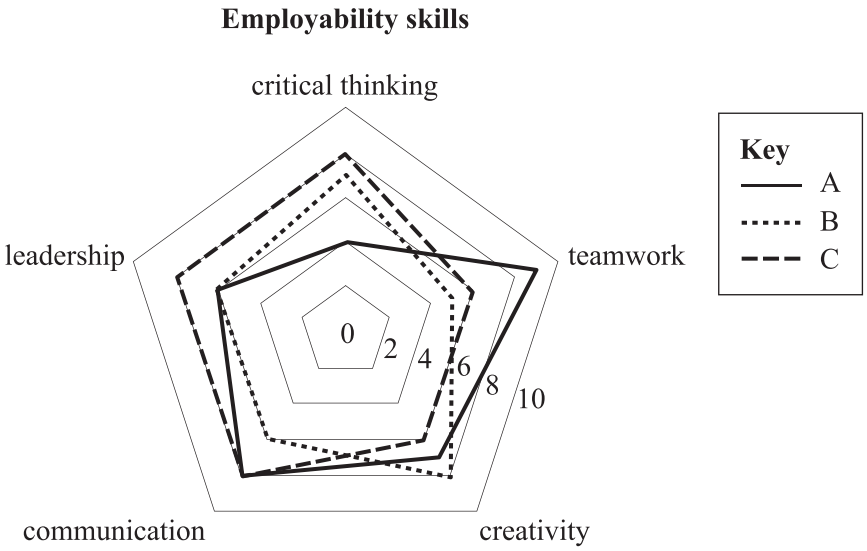
Question 7

Three employees, A, B and C, apply for the same management position.

They are rated from 1 to 10 on the following employability skills:

- critical thinking
- teamwork
- creativity
- communication
- leadership

The radar graph below shows the results:



From these results, which one of the following statements is **true**?

A. Employee B has the lowest rating for creativity and critical thinking.

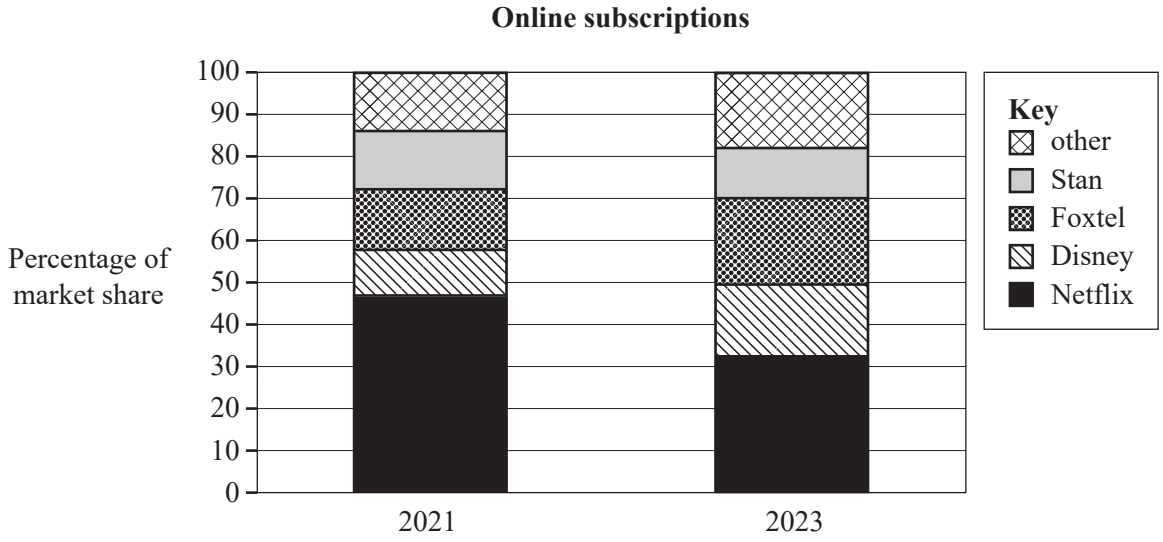
B. Employee C has the highest rating for teamwork.

C. Employees A and B both have the same rating for communication.

D. Employee C has a higher rating for leadership than employees A and B.

Question 8

The graph below shows the estimated percentage of market share by revenue of online television subscriptions for 2021 and 2023.



The companies that showed a decrease in their percentage of market share from 2021 to 2023 were

A. Disney and Foxtel.

B. Foxtel and Stan.

C. Netflix and Stan.

D. Disney and Netflix.

Question 9

The mean score of the fourth-placed basketball team in a 10-game season is 28.

The table below shows the points scored by the first-placed basketball team competing in the same 10-game season:

67	25	19	14	38	29	27	39	24	54

The difference between the mean score of the first-placed team and the mean score of the fourth-placed team is

A. 4.6

B. 5.6

C. 6.6

D. 33.6

Question 10

A survey question asked 1064 teenagers and children from Australia to select the news sources they interacted with on the previous day. The responses are summarised below:

News sources

When asked about news activities they did 'yesterday'

50% got news stories from their family

29% got news stories from friends

27% got news stories from social media

27% got news stories from live television

24% got news stories from a teacher

17% got news stories from radio

9% read news stories online or via apps

8% watched news stories online or via apps

5% got news from on-demand streaming television

4% listened to news stories on podcasts

3% got news stories from a newspaper

Source: Adapted from T Notley, S Chambers, HF Zhong et al. 'News and young Australians in 2023: How children and teens access, perceive and are affected by news media', Research Direct, Western Sydney University, <https://researchdirect.westernsydney.edu.au/islandora/object/uws:72608/>, licensed CC-BY-NC-ND 4.0 <http://creativecommons.org/licenses/by-nc-nd/4.0>

The number of news sources that were selected by fewer than 260 teenagers and children is

A. 6

B. 7

C. 8

D. 9

Question 11

A real estate agent earns a commission on the houses they sell.

The commission is 4% on the first $200 000, 2% on the next $400 000 and 1.5% on the remainder.

If a house is sold for $1 000 000, the commission earned is

A. $22 000

B. $21 000

C. $20 000

D. $19 000

Question 12

A home hairdressing business sells hair products.

The wholesale price paid for a bottle of styling gel is $4.50

The hairdresser marks up the wholesale price by 40%.

The selling price will be the marked up price plus GST.

The selling price of the styling gel, including GST, is

A. $6.30

B. $6.93

C. $7.20

D. $7.92

Question 13

An investment of $10 000 is deposited into a bank account for a period of 5 years.

At the end of the 5 years, the investment has grown to $11 937.50

Using a simple interest model, the interest rate per year applied to the investment is

A. 2.775%

B. 3.0%

C. 3.5%

D. 3.875%

Question 14

The Higher Education Loan Program (HELP) assists eligible students with their university or other higher education provider fees.

These fees are repaid over time after paid employment begins. The repayment is calculated as a percentage of annual income. The repayment rates for a range of annual incomes are given in the table below.

2023–2024 annual income thresholds and repayment rates	
Annual income	**Repayment rate**
$51 550–$59 518	1.0%
$59 519–$63 089	2.0%
$63 090–$66 875	2.5%
$66 876–$70 888	3.0%
$70 889–$75 140	3.5%
$75 141–$79 649	4.0%

Source: Adapted from <www.ato.gov.au>

In the 2023–2024 financial year, a graduate generated an annual income of $67 450 from paid employment.

The amount to repay, correct to the nearest dollar, for that financial year is

A. $520

B. $675

C. $1560

D. $2024

Question 15

A student is buying a new $1200 smart TV using a 'buy now and pay later' arrangement.

The payment schedule is:

- pay $300 immediately when the smart TV is purchased
- make three more fortnightly payments of $300 each

The late fee payment conditions are:

- an initial $10 late fee
- a further $7 late fee every seven days after the due date
- a maximum of $68 in late fees, at which time the product is repossessed

If the student is 21 days late in meeting this payment schedule, the late fee will be

A. $68

B. $31

C. $28

D. $10

Question 16

For every 1600 litres (L) of water added to a pool, the water level rises by 4 cm. If the water level in the pool increased by 0.64 m, how many litres of water were added to the pool?

A. 256 L

B. 2560 L

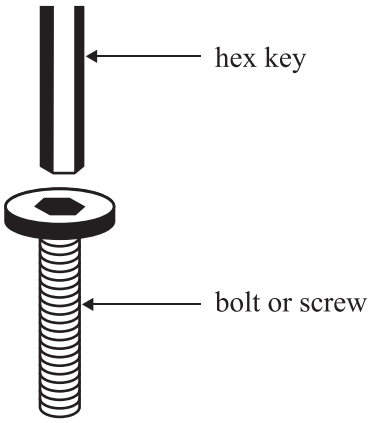
C. 25 600 L

D. 256 000 L

Question 17

A hex key, as shown in the diagram, is used to tighten bolts or screws that have an internal hexagonal recess.

Hex keys are available in imperial and metric sizes.



Source: vectorisland/Shutterstock.com

A builder has an eight-piece **imperial** hex key set, with key sizes of:
1/16", 5/64", 3/32", 1/8", 5/32", 3/16", 7/32" and 1/4".

The conversion between imperial and metric length units is 1 inch (1") = 2.54 cm.

A 4 mm **metric** hex key is needed for a job. The closest imperial hex key size is

A. 5/64"

B. 3/32"

C. 1/8"

D. 5/32"

Question 18

A biscuit company produces 200 g packets of biscuits.

Quality control settings accept all packet weights to a tolerance of 4%.

The range of accepted weights possible for these biscuit packets is

A. 192–208 g

B. 196–204 g

C. 198–202 g

D. 195–205 g

Question 19

Time zones in Australia are calibrated against Coordinated Universal Time (UTC).

When the time is 6.45 pm in Melbourne (UTC+10), the time in Perth (UTC+8) is

A. 8.45 pm

B. 4.15 pm

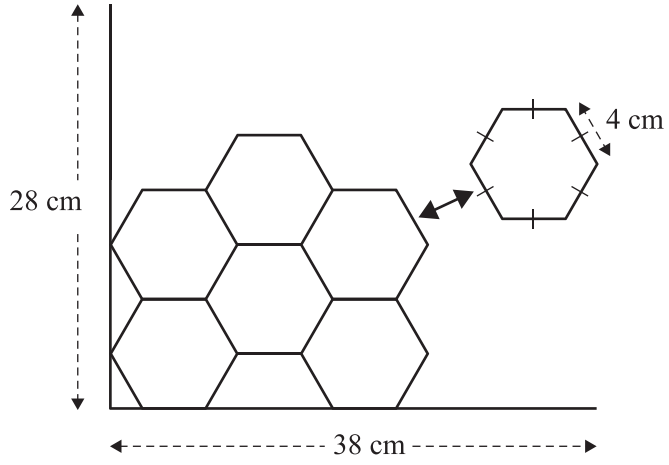
C. 4.45 pm

D. 5.15 pm

Question 20

The regular hexagonal shape pattern shown in the diagram below will be used as a design for a rectangular table mat. The dimensions of the table mat are 38 cm × 28 cm.

The hexagonal shape has a side length of 4 cm and a vertical height of 6.92 cm.



The total number of whole hexagons, without cutting, needed to cover as much of the table mat as possible, is

A. 15

B. 21

C. 24

D. 41

End of Section A

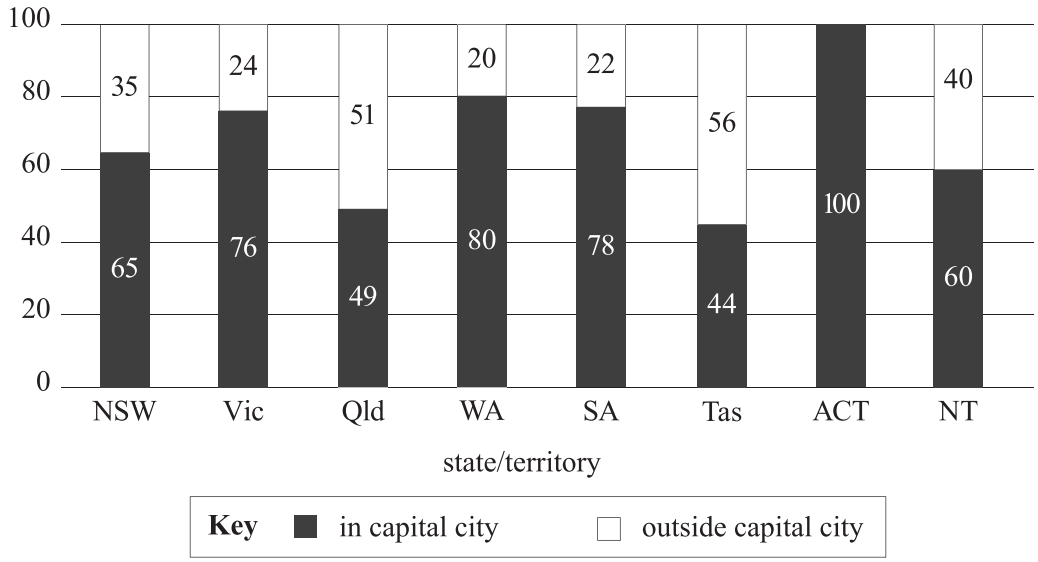
Section B

Instructions

- Answer **all** questions in the spaces provided.
- Write your responses in English.
- In all questions where a numerical answer is required, you should only round your answer when instructed to do so.
- In questions where more than one mark is available, appropriate working **must** be shown.
- Unless otherwise indicated, the diagrams in this book are **not** drawn to scale.

Question 1 (5 marks)

The graph below shows, for each state and territory, the percentage of the population living in and outside each capital city in 2021.



Source: Percentage of population in capital cities vs rest of state/territory in 2021, Australian Bureau of Statistics, 2022

Use the graph above to answer parts a–c.

a. Identify the state or territory with the largest percentage of its population living in its capital city. 1 mark

b. Calculate the difference in the percentage of the state population living in the capital cities of Victoria and Tasmania. 1 mark

c. For the Northern Territory, write the simplest ratio for the percentage of the population living in the capital city to the percentage **not** living in the capital city. 1 mark

d. The equation for population density is

$$\text{Population density} = \frac{\text{Estimated resident population}}{\text{Residential land area}}$$

In 2023, the estimated resident population of Greater Melbourne was 5 207 145.

If the population density of Greater Melbourne is 521.5 persons per square kilometre, find the residential land area of Greater Melbourne. Round your answer to the nearest square kilometre. 2 marks

Question 2 (5 marks)

A famous singer is coming to Melbourne.

The prices of tickets for the venue sections are shown below:

- A reserve: $379.90
- B reserve: $309.90
- C reserve: $239.90
- D reserve: $199.90
- E reserve: $159.90

a. Calculate the maximum a customer would pay for the purchase of three tickets. 1 mark

b. Tickets are authorised to be re-sold if the asking price is less than 10% above the original price.

Two C reserve tickets are advertised to be re-sold for a total of $530.00

Show, with calculation and reasoning, that this is not an authorised sale. 2 marks

c. A group booking for 42 customers is made for tickets in the B reserve and D reserve sections.

The total cost for the tickets is $10 265.80

Calculate the number of B reserve and D reserve tickets that are included in this group booking. 2 marks

Question 3 (5 marks)

The ingredients list for a jam tart recipe is given below:

- 250 g flour
- 125 g butter
- 1 medium egg
- 1 vanilla pod
- 100 g jam

Source: Adapted from <www.bbcgoodfood.com>

This recipe makes 12 tarts.

The weight of a medium egg is 43 g and the weight of a vanilla pod is 2 g.

a. Calculate the total weight of ingredients, in kilograms, for this recipe. 1 mark

b. The ingredients are purchased at the local market at the costs listed below:

- 1 kg flour: $1.40
- 375 g butter: $4.80
- 6 medium eggs: $5.40
- 1 vanilla pod: $3.20
- 375 g jam: $2.80

Calculate, to the nearest cent, the cost of the ingredients per tart. 2 marks

c. The median daily intake of fibre for boys and girls of different ages is listed in the table below:

	Intake per age			
	1–3 years	4–8 years	9–13 years	14–18 years
Boys	14 g/day	18 g/day	24 g/day	28 g/day
Girls	14 g/day	18 g/day	20 g/day	22 g/day

Source: Adapted from <www.eatforhealth.gov.au>

The nutrition information for one jam tart is given in the table below:

Nutrition: per one jam tart							
kcal	fat	saturates	carbs	sugars	fibre	protein	salt
183	9 g	6 g	22 g	6 g	1.3 g	3 g	0.2 g

Source: Adapted from <www.bbcgoodfood.com>

A 17-year-old boy eats two jam tarts at lunchtime.

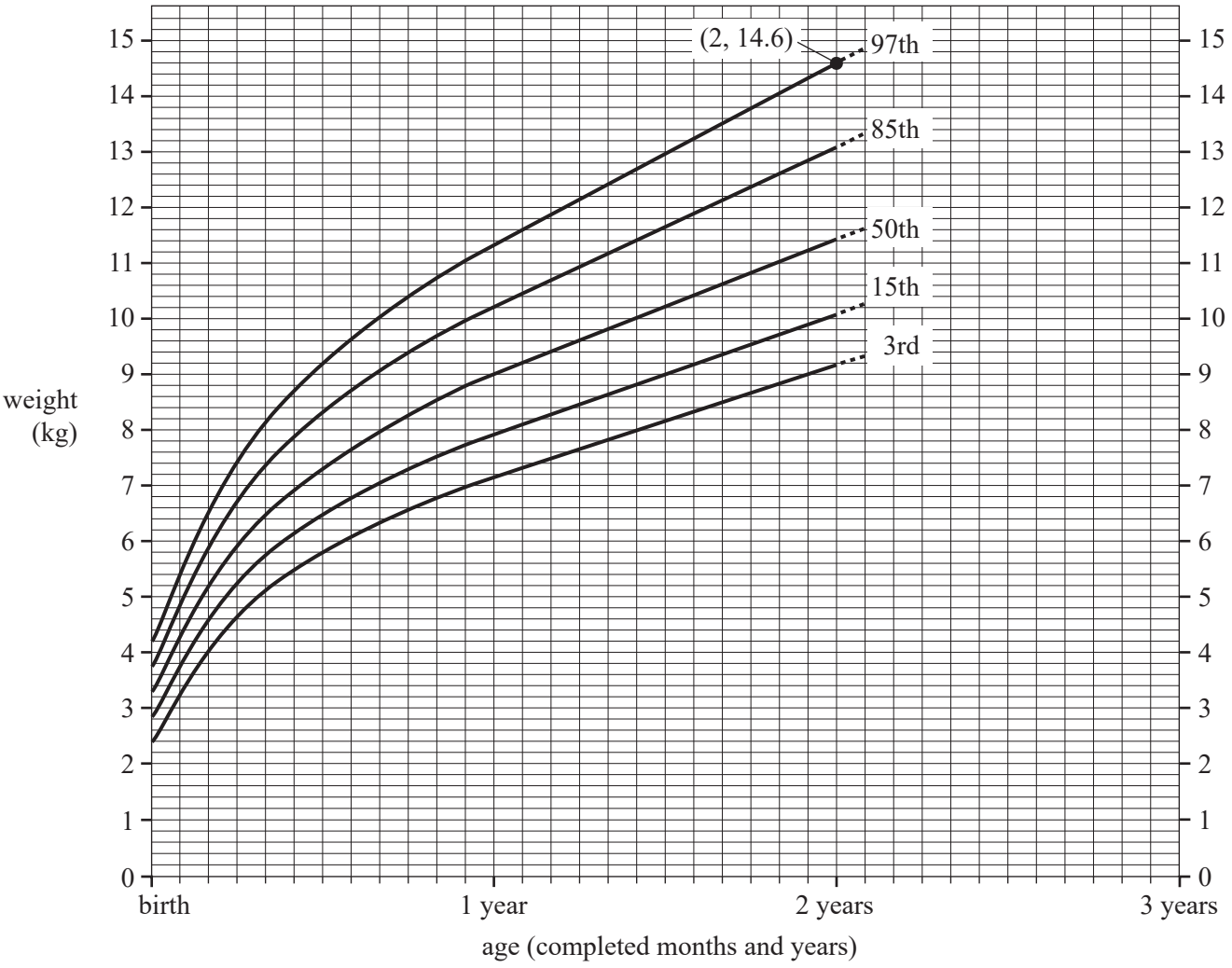
Calculate the percentage of the median daily intake of fibre this represents, correct to one decimal place. 2 marks

Question 4 (5 marks)

The graph below shows the weight, in kilograms, of children aged from birth to 2 years for a selection of percentiles.

The point labelled as (2, 14.6) on the graph below indicates that 97% of 2-year-old children have weights less than 14.6 kg.

The curves included in this graph represent the 3rd, 15th, 50th, 85th and 97th percentiles.



Source: Adapted from WHO Child Growth Standards, licensed CC-BY-NC-SA 3.0 IGO <http://creativecommons.org/licenses/by-nc-sa/3.0/igo/>

a. Calculate the percentage of 18-month-old children who weigh **more** than 9 kg. 1 mark

Do not write in this area.

b. A 6-month-old baby weighs 6.8 kg. Identify the **two** nearby percentile curves for children of this age, and describe how this weight compares with other children of the same age. 2 marks

c. Assume the growth observed in a child's second year of life continues to be approximately linear throughout the third year of life.

i. On the graph (on page 20) extrapolate the 50th percentile curve to include the predicted weight of a 3-year-old child. 1 mark

(answer on graph)

ii. State this predicted value. 1 mark

Question 5 (5 marks)

A survey asked 2500 people about their use and awareness of artificial intelligence (AI) technologies.

The graph below displays the survey results as the percentage of respondents who use technology and the percentage of respondents who are unaware of the use of AI in common technologies.

Due to copyright restrictions, this material is not supplied.

Source: Adapted from <www.forbes.com>

a. Write down the technology that shows the largest absolute difference between the percentage of respondents who use the technology and the percentage of respondents unaware that the technology uses AI. 1 mark

b. For the technologies where the percentage of respondents unaware of the use of AI in the technology is **greater than** the percentage who use the technology:

i. State the technology with the smallest difference in percentage values. 1 mark

ii. Calculate the number of respondents that represent this smallest difference in percentage. 1 mark

c. The graph below shows the levels of concern expressed by consumers about the use of AI.

Due to copyright restrictions, this material is not supplied.

Source: Haan, K., 22 Top AI Statistics and Trends in 2024, Forbes Advisor <https://www.forbes.com/advisor/business/ai-statistics>

Describe **one** feature of the levels of concern shown in the graph above. Support your description with a specific example. 2 marks

Question 6 (5 marks)

The table below shows the *selling price* of 10 houses sold in a particular suburb during January 2024.

$950 000	$1 050 000	$1 100 000	$1 234 500	$1 264 000
$1 318 000	$1 322 000	$1 350 000	$1 355 500	$1 404 000

a. **i.** Calculate the median *selling price* for January 2024. 1 mark

ii. The January 2023 median *selling price* for this particular suburb was $1 220 000. Calculate the percentage difference between the January 2023 median *selling price* and the January 2024 median *selling price*. Give your answer correct to one decimal place. 2 marks

b. The real estate agent responsible for the sale of the houses in this suburb predicts that the mean *selling price* during 2024 will increase.

Calculate the *selling price* needed from the next house sale in 2024 to ensure that the mean *selling price* of all 11 houses is $1 300 000. 2 marks

Question 7 (5 marks)

A new car can be purchased with an upfront payment of $29 000.

The car dealership offers a finance package requiring a deposit of $5000 and then payments of $646 per month for 4 years.

a. Calculate the total interest paid. 2 marks

b. The car loses value over time due to usage and age.

Each year it loses a flat rate of 15% of the upfront payment.

It also loses 3.0 cents in value for each kilometre travelled.

Assume that this car travels 15 000 kilometres each year.

i. Show that the loss in value of the car in one year is $4800. 2 marks

ii. Hence, calculate the minimum number of years for the car to reach a value less than 10% of the upfront payment. 1 mark

Question 8 (5 marks)

A carpenter earned a gross income of $84 000 in the 2023–2024 financial year, and will claim the following deductions in their tax return:

- $2400 for tools
- $150 for boots
- $260 for a pair of overalls
- $150 for union fees
- $150 for work-related mobile usage per month

Assume that there are 52 weeks in the financial year.

a. Show that the carpenter's taxable income after deductions was $79 240. 1 mark

b. The tax table for the 2023–2024 financial year is shown below.

Taxable income	Tax on this income
$0–$18 200	Nil
$18 201–$45 000	19 cents for each $1 over $18 200
$45 001–$120 000	$5092 plus 32.5 cents for each $1 over $45 000
$120 001–$180 000	$29 467 plus 37 cents for each $1 over $120 000
$180 001 and over	$51 667 plus 45 cents for each $1 over $180 000

Source: Adapted from <www.ato.gov.au>

Calculate the tax payable on the taxable income after deductions by the carpenter for the 2023–2024 financial year. 2 marks

Do not write in this area.

c. The carpenter makes a personal contribution to their superannuation account of $100 per week.

The superannuation guarantee for the 2023–2024 financial year is 11% of gross income.

Calculate the total contributions made to the carpenter's superannuation account for the 2023–2024 financial year. 2 marks

Question 9 (5 marks)

The table below shows the schedule of repayments on a loan of $500 000, with monthly repayments, and the outstanding amount owing.

Payment date	Payment	Principal	Interest	Total interest	Outstanding amount
Jan-2023	$2533.43	$658.43	$1875.00	$1875.00	$499 341.57
Feb-2023	$2533.43	$660.90	$1872.53	$3747.53	$498 680.67
Mar-2023	$2533.43	$663.38	$1870.05	$5617.58	$498 017.29
Apr-2023	$2533.43	$665.86	$1867.57	$7485.15	$497 351.43
May-2023	$2533.43	$668.36	$1865.07	$9350.22	$496 683.07
Jun-2023	$2533.43	$670.87	$1862.56	$11 212.78	$496 012.20

Source: Adapted from <www.amortization.org>

a. Use the Jan-2023 interest value of $1875.00 in the first row of the table to show that the monthly interest rate is 0.375% 1 mark

b. Calculate the difference in the interest paid in the first three months of 2023 compared to the interest paid in the next three months of 2023.

Provide a reason for this difference. 2 marks

Do not write in this area.

c. After nine years, a customer has the outstanding amount of $412 531.59

They switch to an interest-only repayment schedule for the next 12 months.

The monthly interest rate for this repayment schedule is 0.5%

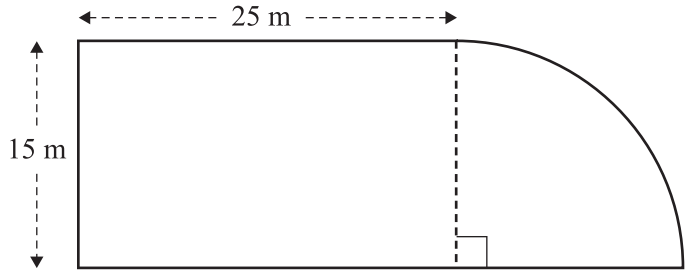
Show that the total repayments for this one year, correct to the nearest 10 cents, will be $24 751.90 2 marks

Question 10 (5 marks)

A hotel is building a new recreational pool.

The recreational pool is a 25 m long and 15 m wide rectangular lap pool joined to a wading pool in the shape of a quarter circle.

The diagram below shows a top-down view of a pool cover for this recreational pool.

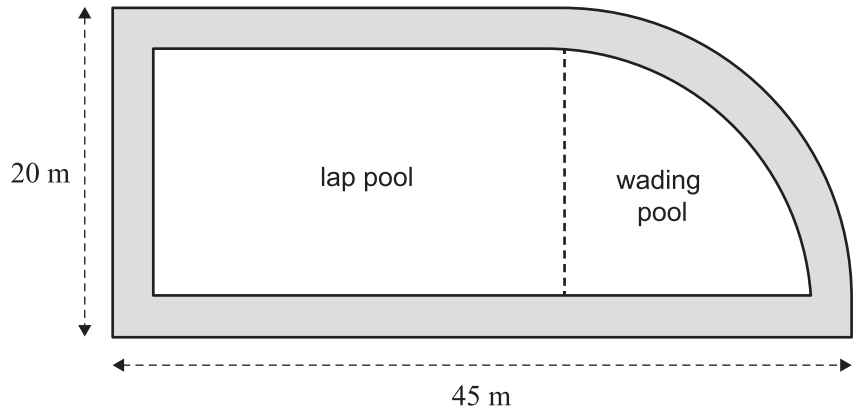


a. Calculate the area of this pool cover.

Give your answer in square metres, rounded to the nearest integer. 1 mark

b. The pool is surrounded by a 2.5 m wide path, as shown in the diagram below.

The path is made of a non-slip rubber mixture filled to a depth of 15 cm.



i. Calculate the volume of the non-slip rubber mixture required for the path.
Give your answer in cubic metres, rounded up to the nearest 5 cubic metres. 2 marks

ii. The cost of the non-slip rubber mixture is $1.50 per litre.
The conversion from cubic metres to litres is 1 m^3 = 1000 L.

Using the rounded-up answer from **part b.i**, calculate the cost of the non-slip rubber mixture required for the path. 1 mark

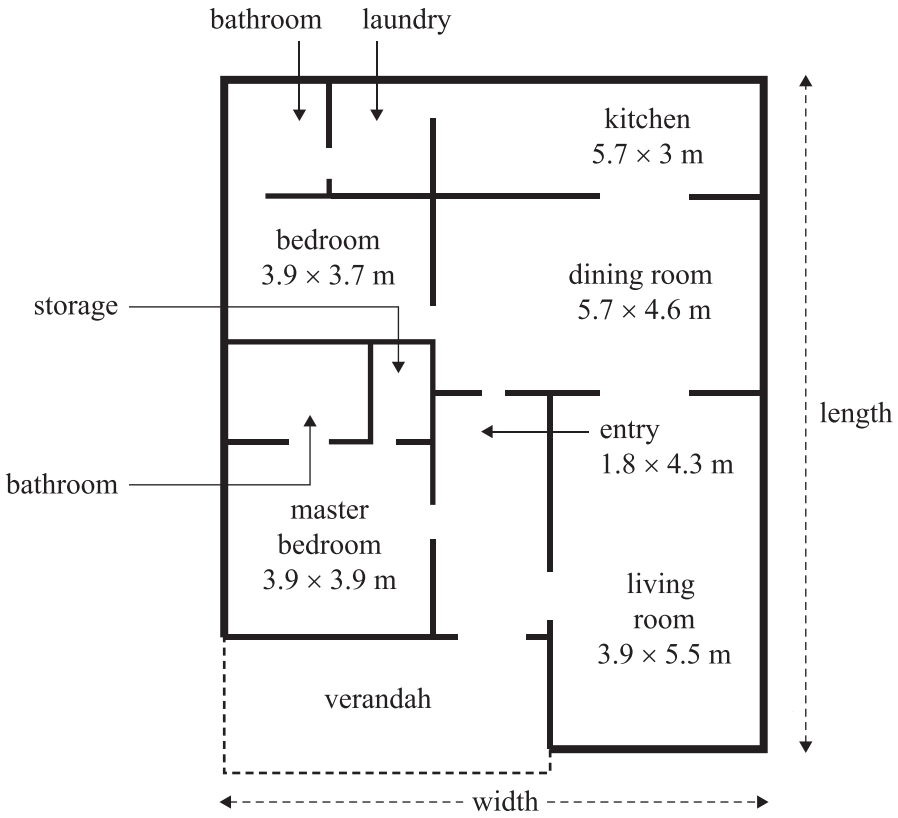
c. Water is being pumped into the recreational pool, which is initially empty, at the rate of 20 L every second. The capacity of the recreational pool is 628 872 L.

Calculate the time it will take to fill the recreational pool to its capacity.

Give your answer to the nearest hour. 1 mark

Question 11 (5 marks)

Consider the floor plan below.



a. Calculate the length and width dimensions of the house, excluding the verandah.

Express your dimensions in metres correct to one decimal place. 2 marks

Do not write in this area.

b. The home owners want to install carpet in the living room. The cost of the carpets ranges from $20 per square metre to $200 per square metre.

Estimate the cost range of the carpet for the living room.

Record your answers in the boxes below. 2 marks

Lowest cost		Cost ($)		Highest cost
	≤		≤	

c. To prepare the living room for the laying of the carpet, the floor must be treated with a levelling compound. The costs for varying amounts of the compound are given in the table below.

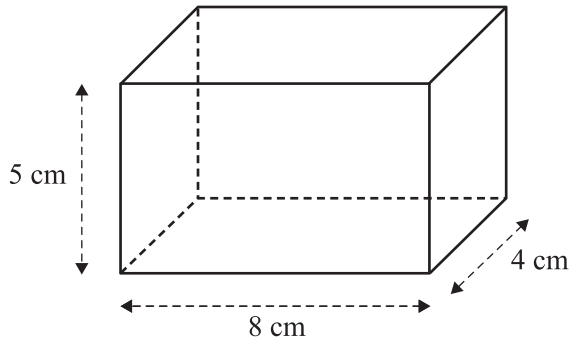
Levelling compound costs

Tin size (L)	4	8	12
Cost ($)	91.90	179.80	274.30
Coverage	3 m² per litre		

Determine which single tin size gives the best value for money. 1 mark

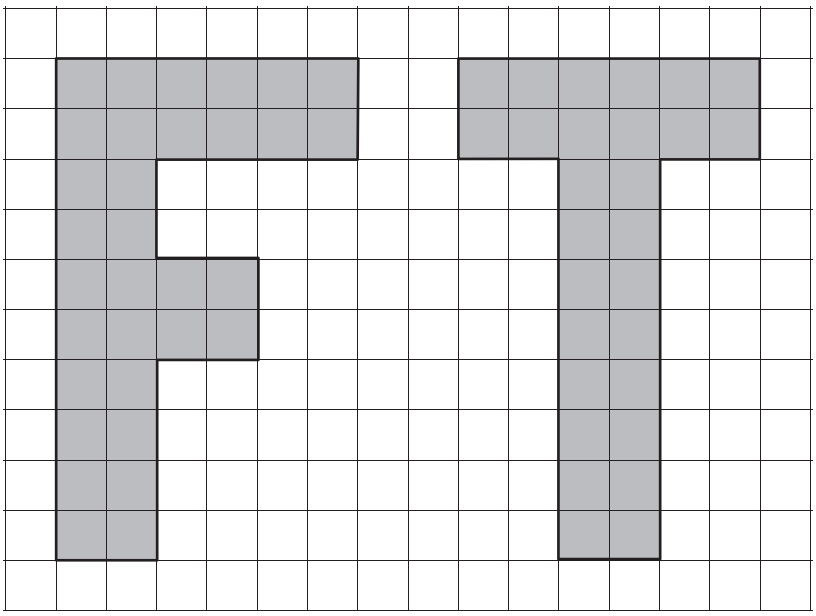
Question 12 (5 marks)

A model diagram, shown below, of a fish tank has a scale of 1:10.



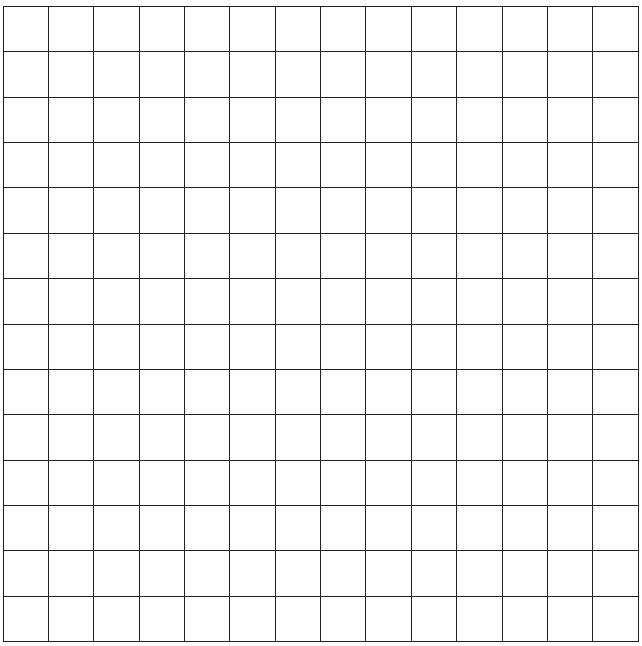
a. Write down the dimensions of the full-sized fish tank represented by this model diagram. 1 mark

b. The letters below will be stencilled onto the fish tank.



To be correctly aligned, the letters need to be reduced in size by a scale factor of $\frac{1}{2}$ and rotated 90° in an anti-clockwise direction.

Redraw the correctly aligned letters on the grid below. 2 marks



c. The volume of the full-sized fish tank is 0.16 m^3.

The local aquarium recommends that each fish has at least 11.4 L of water.

The conversion from cubic metres to litres is 1 m^3 = 1000 L.

Calculate the maximum number of fish recommended for the fish tank. 2 marks

End of Question and Answer Book

Foundation Mathematics

2024 Formula Sheet

You may keep this Formula Sheet.

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Algebra, number and structure

distributive law	$a(b+c)=ab+ac$
square roots and squares	$b=\sqrt{a} \Rightarrow a=b^2$
ratios	$a:b=c:d \rightleftharpoons \frac{a}{b}=\frac{c}{d}$
percentage error	$\frac{\lvert\text{measured}-\text{actual}\rvert}{\text{actual}}\times 100\%$
a varies directly with b, where k is a constant	$a=kb$
a varies inversely with b, where k is a constant	$a=\frac{k}{b}$

Data analysis, probability and statistics

measures of centre	mean	$\frac{\text{sum of data values}}{\text{number of data values}}$
	median position in an ordered set of sample size, n	$\frac{n+1}{2}$
measures of spread	range	max − min
	interquartile range	IQR = $Q_3 - Q_1$
percentage relative frequency formula		$\frac{\text{frequency of an event occurring}}{\text{total number of trials}}\times 100\%$
long term data trends		experimental probability ≈ theoretical probability
probability for a large number of trials of event A		$\Pr(A) \approx \frac{\text{number of times event } A \text{ occurs}}{\text{total number of trials}}$

Space and measurement

Pythagoras' theorem	$c^2 = a^2 + b^2$
area of a triangle	$\frac{1}{2}bh$
area of a trapezium	$\frac{1}{2}(a+b)h$
Heron's formula	$\sqrt{s(s-a)(s-b)(s-c)}$, where $s = \frac{a+b+c}{2}$
circumference of a circle	$\pi d = 2\pi r$
length of an arc	$\pi d \times \frac{\theta^\circ}{360}$
area of a circle	πr^2
area of a sector	$\pi r^2 \times \frac{\theta^\circ}{360}$
volume of a sphere	$\frac{4}{3}\pi r^3$
surface area of a sphere	$4\pi r^2$
volume of a cone	$\frac{1}{3}\pi r^2 h$
volume of a prism	area of base × height
volume of a pyramid	$\frac{1}{3} \times$ area of base $\times$ height

Financial and consumer mathematics

simple interest	$I = \frac{\Pr t}{100}$
compound interest	$A = PR^n$, where $R = 1 + \frac{r}{100}$
GST	10%
Medicare levy	2%
percentage increase	$\frac{\text{final} - \text{initial}}{\text{initial}} \times 100\%$
percentage decrease	$\frac{\text{initial} - \text{final}}{\text{initial}} \times 100\%$
profit	income – expenditure

End of Formula Sheet