
Caringbah High School

2025 HIGHER SCHOOL CERTIFICATE TRIAL EXAMINATION

Mathematics Standard 2

General Instructions

- Reading time – 10 minutes
- Working time – 2 hours and 30 minutes
- Write using black pen
- Calculators approved by NESA may be used
- A reference sheet is provided at the back of this paper
- For questions in Section II, show relevant mathematical reasoning and/or calculations

Total marks: 100

Section I – 15 marks (pages 1–8)

- Attempt Questions 1–15
- Allow about 25 minutes for this section
- Record your responses on the Section I Answer Sheet

Section II – 85 marks (pages 1–20)

- Attempt Questions 16–40
- Allow about 2 hours and 5 minutes for this section
- Write your responses in the space provided in the Section II booklet

Section I	Section II	Total
/15	/85	/100

Section I – 15 marks

Attempt Questions 1 – 15
Allow about 25 minutes for this section

Use the multiple-choice answer sheet for Questions 1 – 15

1. On average, a courier delivers a parcel every three minutes.

At that rate, how long will it take the Courier to deliver 73 parcels?

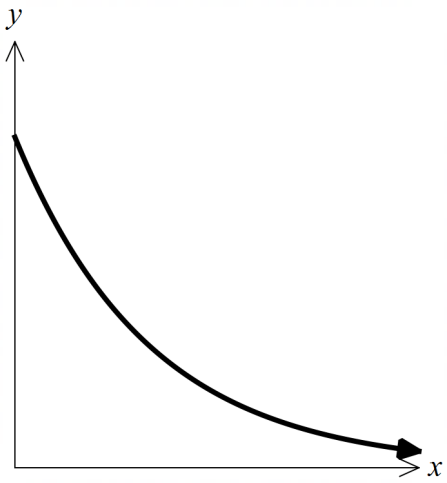
A. 1 hour 13 minutes

B. 3 hours 39 minutes

C. 24 hours 20 minutes

D. 219 hours

2. The diagram shows the graph of an equation.



Which of the following equations does the graph best represent?

A. $y = \frac{2}{x}$

B. $y = -\frac{2}{x}$

C. $y = 2^{-x}$

D. $y = 2^{x}$

3. A map of a particular city has a scale of 1 : 50 000.

If the distance between Jesse's home and the airport is 4 centimetres on this map, what is the actual distance?

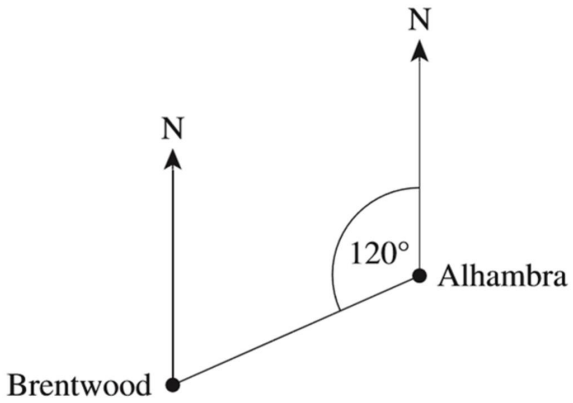
A. 200 m

B. 2 km

C. 20 km

D. 2 000 km

4. The diagram shows the locations of two towns, Alhambra and Brentwood.



What is the bearing of Brentwood from Alhambra?

A. N120°W

B. N60°E

C. S60°W

D. S120°E

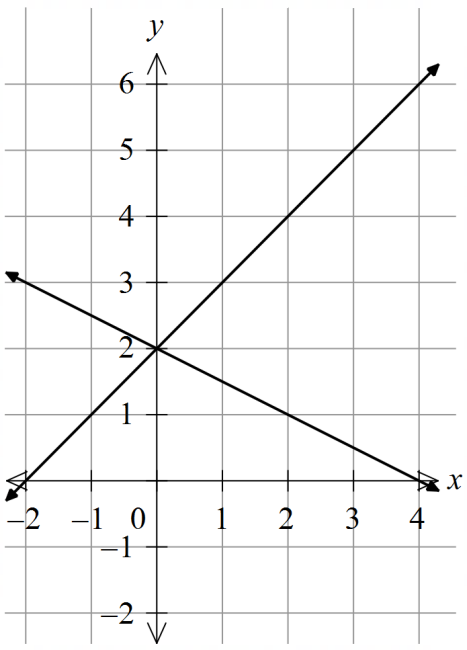
5. Consider the linear equations below.

$$y = x + 2$$

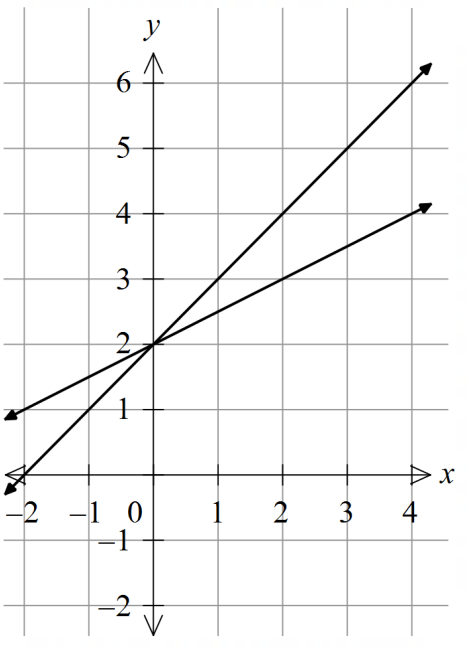
$$y = 2 - \frac{1}{2}x$$

Which diagram could be used to find the solution to these simultaneous linear equations?

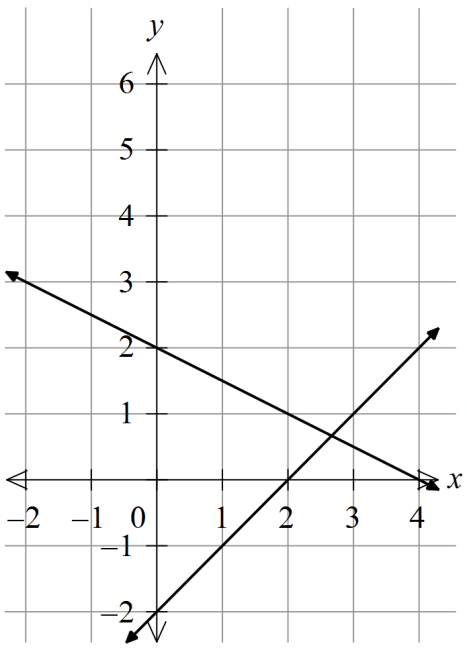
A.



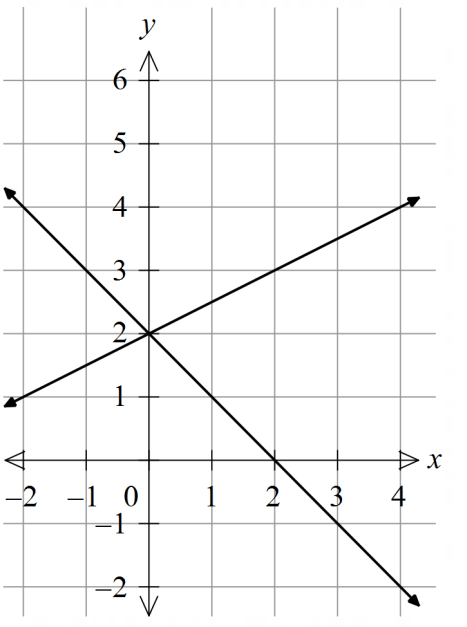
B.



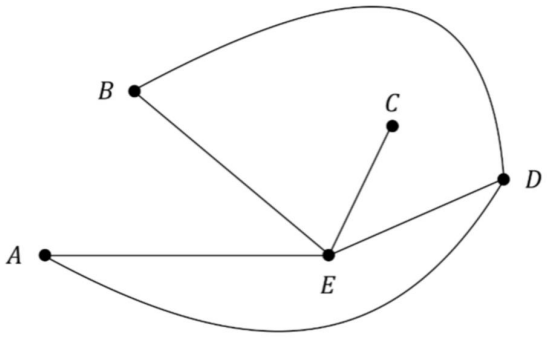
C.



D.



6. Consider the network diagram.



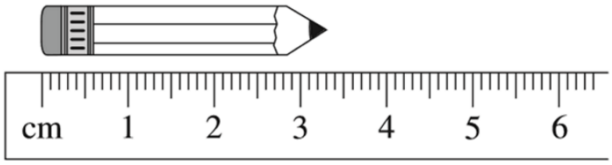
What is the sum of the degrees of all the vertices shown on the network diagram?

A. 6
B. 8
C. 10
D. 12

7. A set of bivariate data has a Pearson's correlation coefficient of –0.95.
Which expression best describes the association between the two variables?

A. There is a weak negative association
B. There is a strong negative association
C. There is a weak positive association
D. There is a strong positive association

8. A pencil is measured to be 3.3 cm long using the ruler pictured.

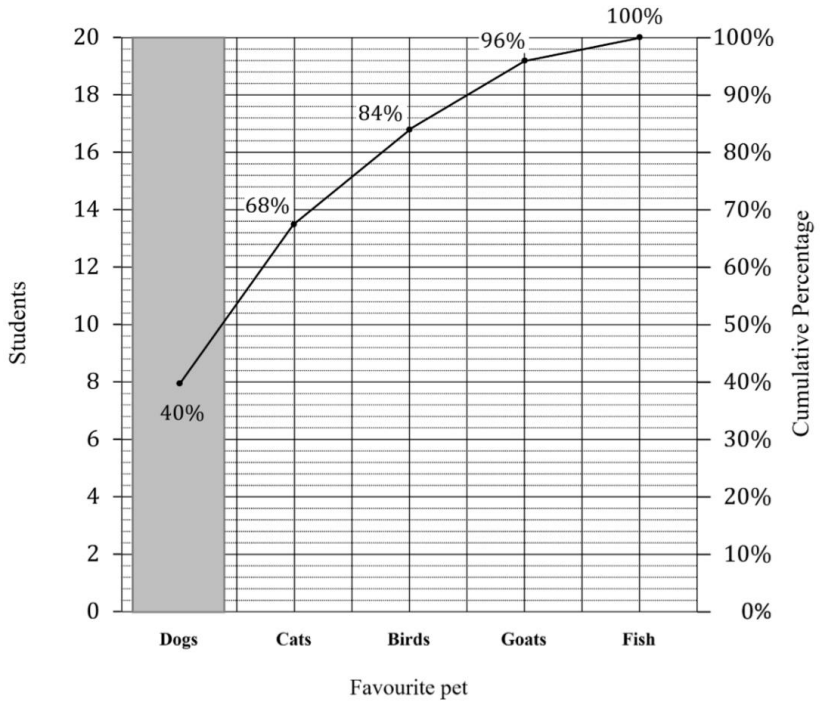


Which of the following best describes the true length of the pencil?

A. 3.3 ± 0.05 cm
B. 3.3 ± 0.1 cm
C. 3.3 ± 0.5 cm
D. 3.3 ± 0.25 cm

9. A teacher asked fifty students to identify their favourite type of pet.

A partially completed Pareto chart shows some of the data collected.



How many students chose cats as their favourite pet?

A. 12 students

B. 14 students

C. 28 students

D. 34 students

10. Adam takes out a loan of $10 000 to buy a new car. Simple interest is charged on the loan.

To repay the loan and the interest charged, Adam makes payments of $1 200 every year, over the next 10 years.

What is the simple interest rate, per annum, that is charged on the loan?

A. 2%

B. 2.5%

C. 3%

D. 4.5%

11. Savannah competed in four throwing events at the district athletics carnival.
In each event the distances recorded by the competitors was normally distributed.

	Savannah's result	Event mean	Event standard deviation
Shot put	15 m	13 m	2 m
Discus	37 m	43 m	6 m
Javelin	57 m	47 m	8 m
Hammer throw	33 m	48 m	10 m

Which was Savannah's weakest event compared with the other competitors?

A. Shot put
B. Discus
C. Javelin
D. Hammer Throw

12. Tennis players are allowed to serve the ball to their opponent up to two consecutive times. If the first serve is successful, the ball goes into play and a second serve is not performed. If the first serve is unsuccessful, the player will serve the ball a second time.
Nava is a tennis player. The probability that her first serve is successful is 50% and the probability that her second serve is successful is 90%.

What is the probability that Nava serves the ball successfully?

A. 5%
B. 45%
C. 55%
D. 95%

13. Charlotte is thinking of a number. Let the number be x. When Charlotte subtracts 6 from this number and multiplies the result by 4, the answer is 3 more than x.

Which equation can be used to find x?

A. $4(x-6) = 3x$

B. $4x - 6 = 3x$

C. $4(x-6) = x + 3$

D. $4x - 6 = x + 3$

14. Which of the following is NOT a fee or charge associated with using a credit card?

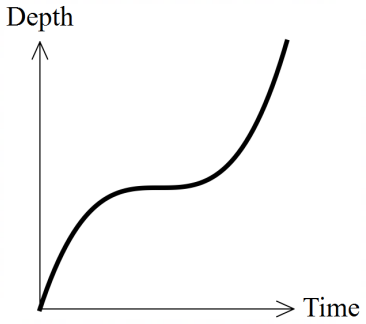
A. Interest

B. Cash advance fee

C. Late payment fee

D. Repayment fee

15. The graph shows the depth of water in a container over time, as it is being filled.



Which of the containers shown, could reflect the graph above?

A. 

B. 

C. 

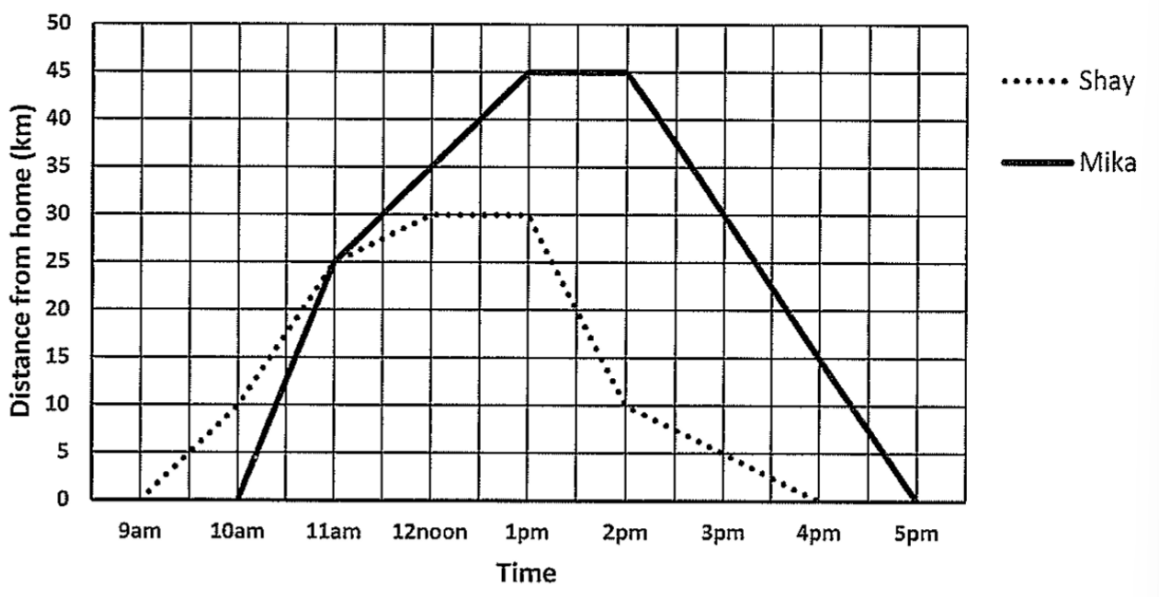
D. 

End of Section 1

Question 16 (3 marks)

Two friends left their respective homes one morning and cycled along the same road.

The graph below shows their journeys.



(a) Which of the friends made a stop first? **1**

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(b) When Mika began cycling home, how far had Shay travelled on her trip? **1**

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(c) What was Mika's average speed, to the nearest km/h, on the cycling trip? **1**

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Question 17 (2 marks)

The flight time from Sydney to Dubai is approximately 13 hours.

The Universal Coordinated Time of Dubai is +4 and Sydney is +10.

A plane departs Sydney local time at 11:00 PM Sunday for Dubai.

At what local time in Dubai is the plane expected to land? **2**

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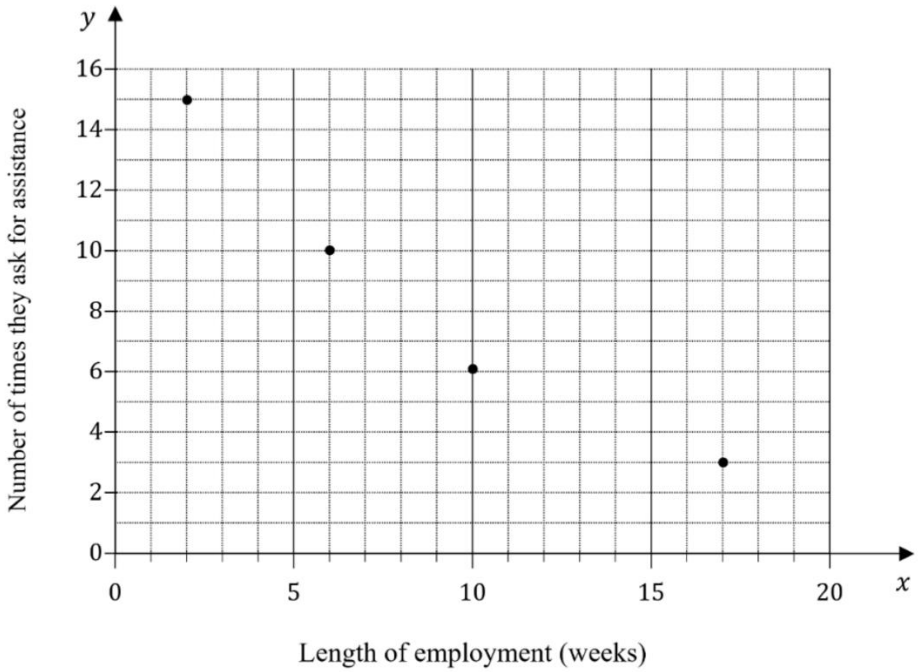
Question 18 (4 marks)

A manager oversees four teenage employees working in a fast-food restaurant.

The number of weeks they have been working at the restaurant, x, and the number of times they need to ask the manager for assistance during a four-hour shift, y, are shown on the graph below.



(a) Find the equation of the least-squares regression line for the data set, finding the gradient and y-intercept, correct to 2 decimal places. **2**

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(b) Using the least-squares regression line for these for employees as a guide, on average, how many full weeks will an employee have to be working at the restaurant before they require assistance less than 8 times during a four-hour shift? **2**

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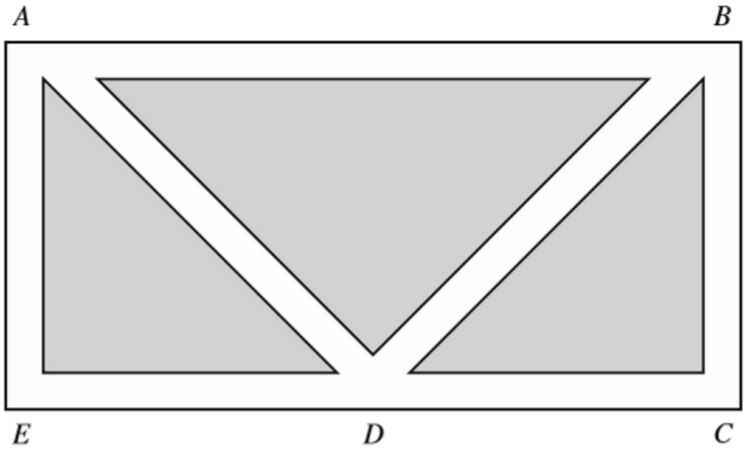
Question 19 (3 marks)

The diagram shows a rectangular park that contains 3 triangular grass areas (shaded).

There is a footpath (unshaded) around the edges of the park and between the grassed areas.



(a) Draw a network diagram to represent the possible walking paths through the park. **1**

(b) Show that the sum of the degrees of the vertices is equal to twice the number of edges. **2**

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Question 20 (3 marks)

A company purchases office furniture for $10 000.

The company accountant is considering two methods of depreciation:

- straight line depreciation with the office furniture being depreciated by $\$D$ each year
- declining-balance depreciation at a rate of 15% per year

The accountant determines that after two years, the salvage value of the office furniture will be the same using either depreciation method.

What is the value of D? **3**

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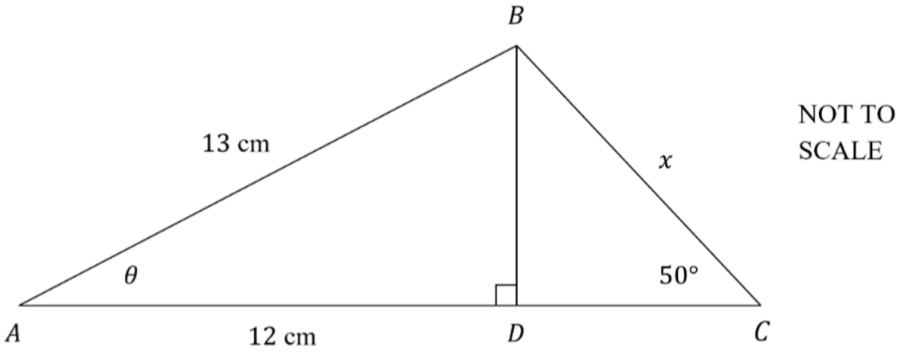
Question 21 (5 marks)

Two right-angled triangles, ABD and BCD, are shown below.



NOT TO SCALE

(a) Find the value of θ, correct to the nearest degree. **2**

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(b) Find the value of x, correct to 1 decimal place. **3**

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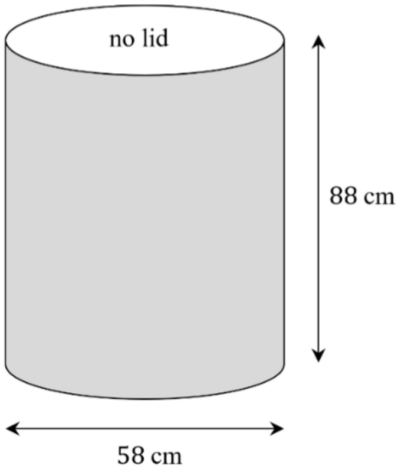
Question 22 (2 marks)

A 44-gallon drum has a base but no lid.

The drum is 88 cm in height and has a diameter of 58 cm.



NOT TO SCALE

The inside of the drum and the curved surface of the outside of the drum are to be painted.

Underneath the base of the drum is not to be painted as it is in contact with the ground.

What is the surface area to be painted, in square centimetres, correct to 1 decimal place? **2**

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Question 23 (2 marks)

The time it takes for a cupcake at a picnic to be eaten by ants (t minutes) varies inversely with the number of ants eating the cupcake (N ants). When there are 10 ants, the cupcake is eaten in 120 minutes. The equation relating t and N is:

$$t = \frac{k}{N}$$

(a) What is the value of k? **1**

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(b) Hence, or otherwise, calculate how long will it take 20 ants to eat one cupcake. **1**

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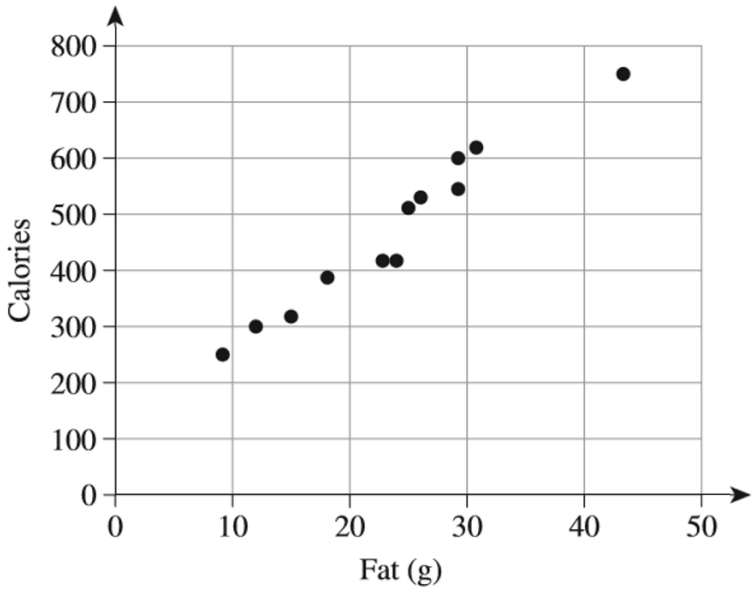
Question 24 (3 marks)

The table shows the fat and calorie content of 12 different burgers on a fast-food restaurant's menu. Two of the values are missing and are represented by the letters A and B.

Fat (g)	9	12	15	18	23	24	26	27	29	*A*	31	43
Calories	250	*B*	320	380	420	420	515	530	545	600	620	750

The bivariate data is displayed in the scatter plot below.



(a) Using the scatterplot, determine the values of A and B. **2**

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(b) Identify the dependent variable. **1**

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Question 25 (2 marks)

Anaya is paid \$38 per hour for the first 40 hours each week, with time-and-a-half for any overtime hours. In a particular week, Anaya earned \$285 in overtime.

How many hours in total did she work that week? **2**

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Question 26 (4 marks)

Takeshi is considering two payment plans offered by an online music service. The details of each plan are shown in the table below.

Plan A	Plan B
• Monthly subscription fee of \$3 • \$0.25 per song downloaded	• No monthly subscription fee • \$0.40 per song downloaded

(a) Let x be the number of songs downloaded and $\$C$ be the total cost per month.
Write an equation that represents the monthly cost of Plan A. **1**

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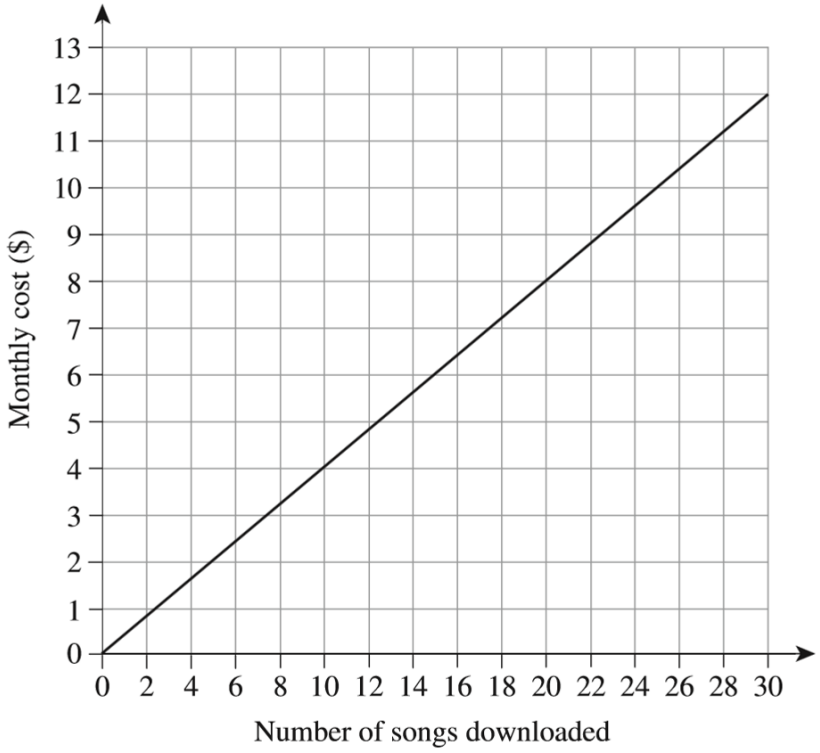
(b) The graph shows the line of the equation for the monthly cost of Plan B.
On the graph, draw the line of the equation found in part (a). **2**



(c) Using the graph from part (b), explain how Takeshi can decide which plan to select. **1**

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Question 27 (3 marks)

Roco has a credit card with the following conditions:

- There is no interest-free period.
- Interest is charged at the end of each month at 19.99% per annum, compounding daily, from the purchase date (included) to the last day of the month (included).

Roco's credit card statement for March is shown, with some figures missing.

Statement period: 1 March to 31 March

Date	Details	Amount ($)
1 March	Opening balance	0.00
19 March	Car repairs	1200.00
27 March	Trailer hire	110.00
31 March	Interest charged	***
31 March	Closing balance	***

Minimum payment: ***

The minimum payment was calculated as 2.5% of the closing balance on 31 March.

What will be the value of his minimum payment? **3**

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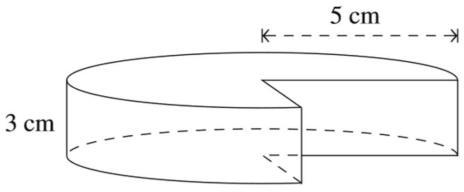
Question 28 (2 marks)

The diagram shows a wheel of cheese with a radius of 5 cm and a height of 3 cm.

A wedge representing one eighth of the cheese, has been cut and removed from the wheel.



Find the volume of the remaining cheese wheel, correct to the nearest cubic centimetre. **2**

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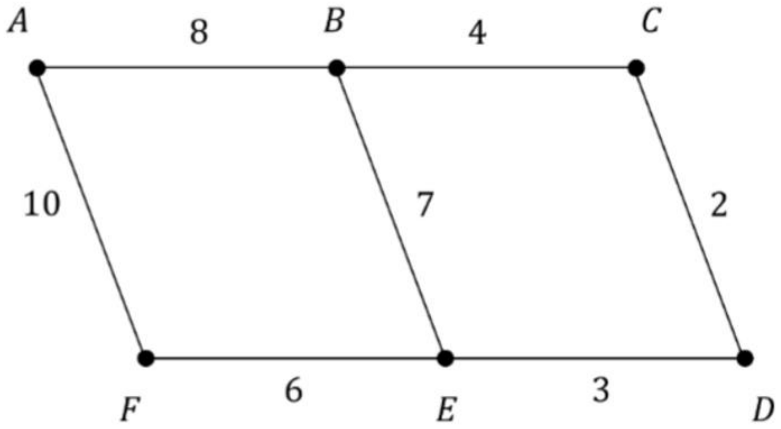
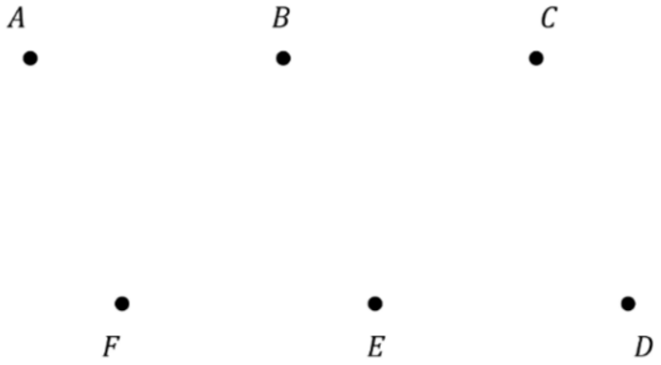
Question 29 (4 marks)

The diagram represents a network with weighted edges.



(a) Draw a minimum spanning tree for this network in the space below and determine its length. **2**



Minimum length of spanning tree = _____

(b) A new edge from B to F is added to the network diagram at the top of the page, with a weight of x, where x is a whole number.

If the shortest path from F to D uses this new edge, what is the maximum value of x? **2**

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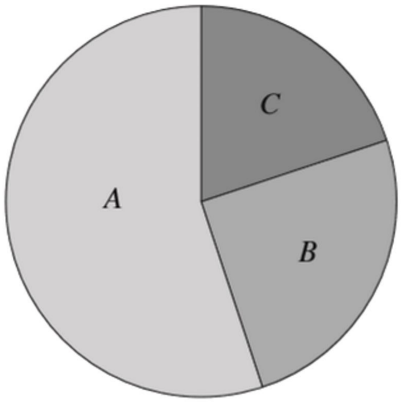
Question 30 (4 marks)

A spinner is divided into three sections A, B, and C, shown below.



Section	Size of section (degrees)
A	$7x + 10$
B	90
C	$3x$

(a) Find the value of x. **2**

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(b) If the spinner spun 60 times, how many times would it be expected to land on C? **2**

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Question 31 (3 marks)

Shareen buys a car for $29 000 and repays it over 4 years through equal monthly instalments. She pays a 10% deposit and interest is charged at 9% p.a. on the reducing balance loan.

Table of Present Value Interest Factors						
r	**0.0060**	**0.0065**	**0.0070**	**0.0075**	**0.0080**	**0.0085**
N						
45	39.33406	38.90738	38.48712	38.07318	37.66545	37.26383
46	40.09350	39.64965	39.21263	38.78231	38.35859	37.94133
47	40.84841	40.38714	39.93310	39.48617	39.04622	38.61311
48	41.59882	41.11986	40.64856	40.18478	39.72839	39.27924
49	42.34475	41.84785	41.35905	40.87820	40.40515	39.93975
50	43.08623	42.57113	42.06459	41.56645	41.07653	40.59470

Using the table of present value interest factors above, where r represents the monthly interest and N represents the number of payments, calculate the monthly repayment, $\$P$, that Shareen must pay to complete the loan after 4 years. (to the nearest dollar). **3**

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Question 32 (2 marks)

Gavin, a 72 kg male, consumes 4 bottles of beer at a party, each containing 1.4 standard drinks. Gavin started drinking his first beer at 8:20 PM and finished his 4th beer at 11:50 PM.

The blood alcohol content (BAC) for males can be estimated by:

$$\text{BAC}_{\text{Male}} = \frac{10N - 7.5H}{6.8M}$$

where N = the number of standard drinks
H = the number of hours drinking
M = mass in kilograms

Calculate Gavin's BAC when he finished his fourth beer, correct to 3 decimal places. **2**

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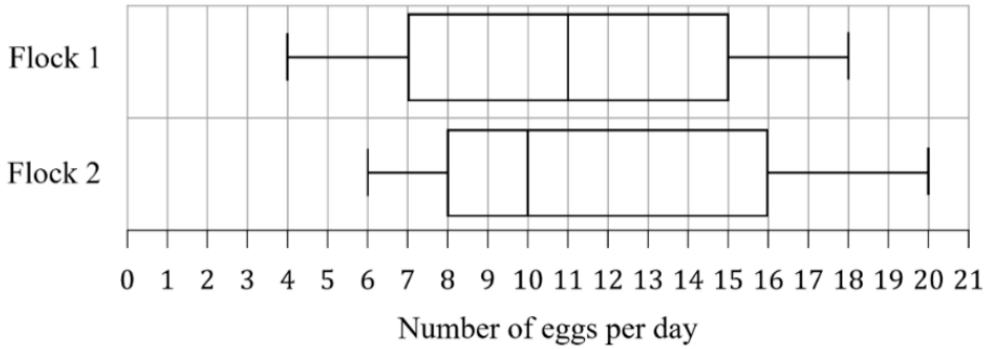
Question 33 (3 marks)

A farmer has two flocks of chickens. The number of eggs they laid each day during the year was counted, with the data shown in a parallel box-plot.



Compare the two data sets, examining the skewness of the distributions, and any relevant measures of central tendency and spread. **3**

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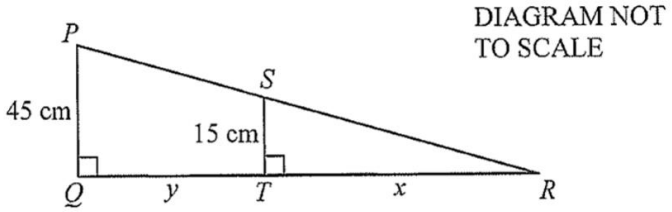
Question 34 (2 marks)

In the diagram below, ΔPQR is similar to ΔSTR, $PQ = 45$ cm, $ST = 15$ cm, $QT = y$ and $TR = x$.



Show that $y = 2x$. **2**

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Question 35 (3 marks)

The table shows the income tax rates for the 2025-2026 financial year.

Taxable income	Tax on this income
\$0 – \$18,200	Nil
\$18,201 – \$45,000	16c for each \$1 over \$18,200
\$45,001 – \$135,000	\$4,288 plus 30c for each \$1 over \$45,000
\$135,001 – \$190,000	\$31,288 plus 37c for each \$1 over \$135,000
\$190,001 and over	\$51,638 plus 45c for each \$1 over \$190,000

For the 2025-2026 financial year, Amani has a taxable income of \$126 250.

During the year she paid \$1 130 per fortnight in Pay As You Go (PAYG) tax.

Calculate Amani's tax refund, ignoring the Medicare levy. **3**

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Question 36 (2 marks)

120 people entered the first round of a crossword competition.

The times taken to complete the crossword correctly were normally distributed with a mean of 10 minutes and a standard deviation of 2.1 minutes.

(a) Approximately how many of the 120 correctly completed their crosswords in more than 12.1 minutes? **1**

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(b) If a competitor completed her crossword in 13.15 minutes, what was her z-score? **1**

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Question 37 (4 marks)

The table shows the future values of an annuity of $1.

Future values of an annuity of $1

Period (years)	*Interest rate per period*							
	0.5%	*1.0%*	*1.5%*	*2.0%*	*2.5%*	*3.0%*	*3.5%*	*4.0%*
4	4.03010	4.06040	4.09090	4.12161	4.15252	4.18363	4.21494	4.24646
8	8.14141	8.28567	8.43284	8.58297	8.73612	8.89234	9.05169	9.21423
12	12.33556	12.68250	13.04121	13.41209	13.79555	14.19203	14.60196	15.02581
16	16.61423	17.25786	17.93237	18.63929	19.38022	20.15688	20.97103	21.82453
20	20.97912	22.01900	23.12367	24.29737	25.54466	26.87037	28.27968	29.77808
24	25.43196	26.97346	28.63352	30.42186	32.34904	34.42647	36.66653	39.08260
28	29.97452	32.12910	34.48148	37.05121	39.85980	42.93092	46.29063	49.96758
32	34.60862	37.49407	40.68829	44.22703	48.15028	52.50276	57.33450	62.70147
36	39.33610	43.07688	47.27597	51.99437	57.30141	63.27594	70.00760	77.59831
40	44.15885	48.88637	54.26789	60.40198	67.40255	75.40126	84.55028	95.02552

At the end of each year, Albert deposits $6 000 into a bank account that earns interest at a rate of 4% per annum, compounding annually. He makes these contributions over a period of 20 years.

(a) How much interest will the account have earned after 20 years? **2**

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(b) Albert's bank has an account option that offers the same interest rate, compounding quarterly rather than annually. Albert decides to open a new account and make quarterly contributions over a period of 10 years.

How much would Albert need to contribute to his new bank account at the end of each quarter to achieve the same future value after 10 years as the future value of his existing account after 20 years? **2**

……

……

……

……

Question 38 (7 marks)

The profit that a company makes in one month can be modelled by the equation

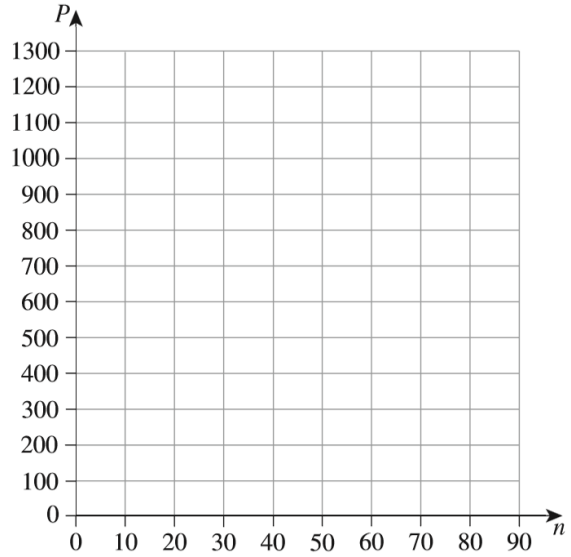
$$P = 50n - 0.5n^2$$

where P = profit and n = number of units produced.

(a) Complete the table showing the profit made based on the number of units produced. **1**

Number of units produced (thousand)	0	20	40	60	80
Profit (thousand $)	0				

(b) Graph the equation $P = 50n - 0.5n^2$ on the grid using the values from the table. **2**



(c) State the name of this type of non-linear relationship. **1**

……

(d) Find how many units should be produced to maximise the company's monthly profits. **1**

……

(e) What is the maximum profit that can be made per month? **1**

……

(f) Explain why it the company should not try to produce 100 000 units of their product, justifying your response with calculations. **1**

……

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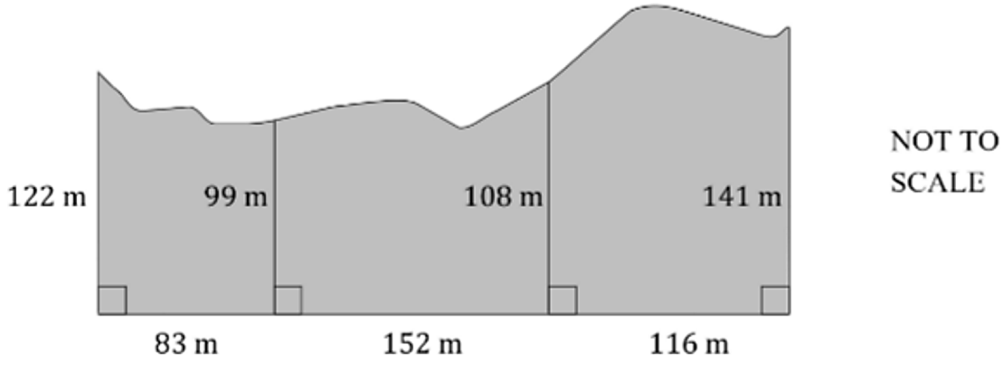
Question 39 (6 marks)

The area of a paddock is to be estimated. Due to thick spiky weeds through parts of the paddock, the surveyors are only able to find the following measurements.



(a) Use three applications of the Trapezoidal rule to estimate the area of the paddock, in hectares, correct to 1 decimal place. (One hectare = 10 000 m^2) **3**

……

……

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……

……

(b) The owner hires a crop duster to spread a mixture of herbicide and fertiliser evenly over the paddock to help control the weeds and encourage grass growth. The mixture needs to be applied at a rate of 45 litres per hectare. How many litres of herbicide are needed for the paddock? **1**

……

……

(c) A thunderstorm over the paddock sees the whole paddock receive 8 millimetres of rain. How much rain fell onto the paddock, correct to the nearest kilolitre? **2**

……

……

……

Question 40 (7 marks)

The time spent waiting for a taxi at a large International Airport is normally distributed.

The waiting time is less than 184 seconds 16% of the time and greater than 304 seconds 0.15% of the time.

(a) During the first three months of 2024, 4.16 million people visited the airport.
If 30% of these people took a taxi from the airport, find the approximate number of people whose waiting time was greater than 184 seconds. **2**

……

……

……

……

(b) Determine the mean and standard deviation for the time spent waiting for a taxi at the airport. **3**

……

……

……

……

……

(c) Is it likely that the waiting time for a taxi will be two minutes or less?
Justify your response with appropriate mathematical calculations. **2**

……

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END OF EXAM

Solutions

Caringbah High School

2025 HIGHER SCHOOL CERTIFICATE TRIAL EXAMINATION

Mathematics Standard 2

General Instructions

- Reading time – 10 minutes
- Working time – 2 hours and 30 minutes
- Write using black pen
- Calculators approved by NESA may be used
- A reference sheet is provided at the back of this paper
- For questions in Section II, show relevant mathematical reasoning and/or calculations

Total marks: 100

Section I – 15 marks (pages 1–8)

- Attempt Questions 1–15
- Allow about 25 minutes for this section
- Record your responses on the Section I Answer Sheet

Section II – 85 marks (pages 1–20)

- Attempt Questions 16–40
- Allow about 2 hours and 5 minutes for this section
- Write your responses in the space provided in the Section II booklet

Section I	Section II	Total
/15	/85	/100

Section I – 15 marks

Attempt Questions 1 – 15
Allow about 25 minutes for this section

Use the multiple-choice answer sheet for Questions 1 – 15

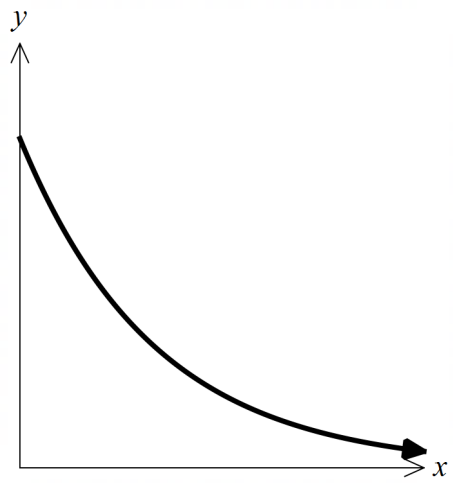
1. On average, a courier delivers a parcel every three minutes.

At that rate, how long will it take the Courier to deliver 73 parcels?

A. 1 hour 13 minutes
B. 3 hours 39 minutes
C. 24 hours 20 minutes
D. 219 hours

$73 \times 3 = 219$ min
$= 3$h 39min

2. The diagram shows the graph of an equation.



Which of the following equations does the graph best represent?

A. $y = \frac{2}{x}$ X

B. $y = -\frac{2}{x}$ X

y int

C. $y = 2^{-x}$

D. $y = 2^{x}$

going down

3. A map of a particular city has a scale of 1 : 50 000.

If the distance between Jesse's home and the airport is 4 centimetres on this map, what is the actual distance?

$4 \times 50000 = 200\,000$ cm
$= 2000$ m
$= 2$ km

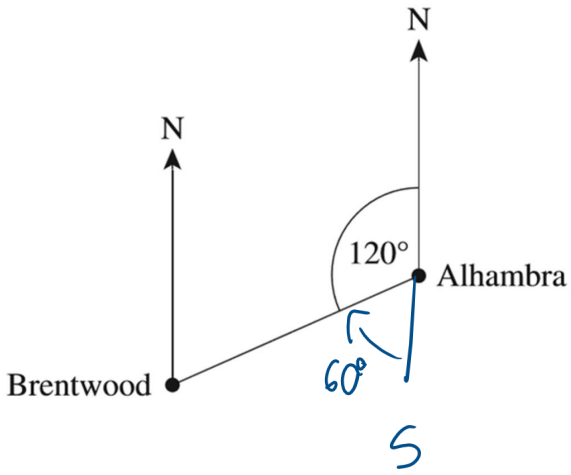
A. 200 m

B. 2 km

C. 20 km

D. 2 000 km

4. The diagram shows the locations of two towns, Alhambra and Brentwood.



What is the bearing of Brentwood from Alhambra?

A. N120°W

B. N60°E

C. S60°W

D. S120°E

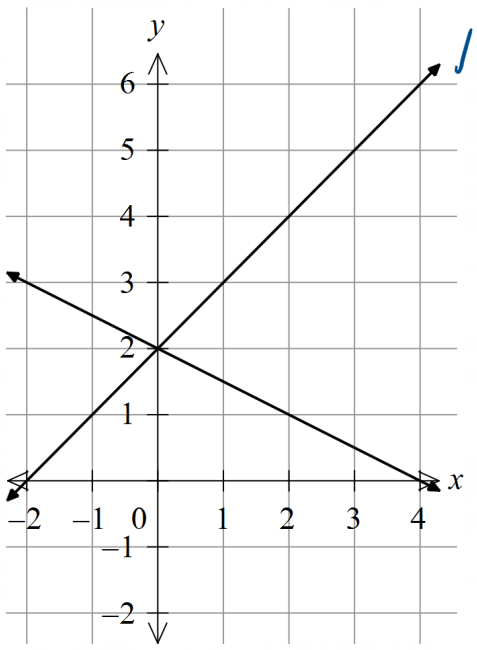
5. Consider the linear equations below.

$y = x + 2$ y int 2 $m = +1$

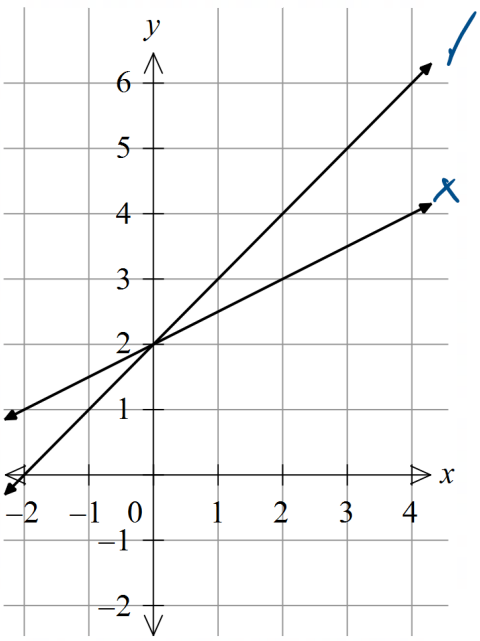
$y = 2 - \frac{1}{2}x$ y int 2 $m = -\frac{1}{2}$

Which diagram could be used to find the solution to these simultaneous linear equations?

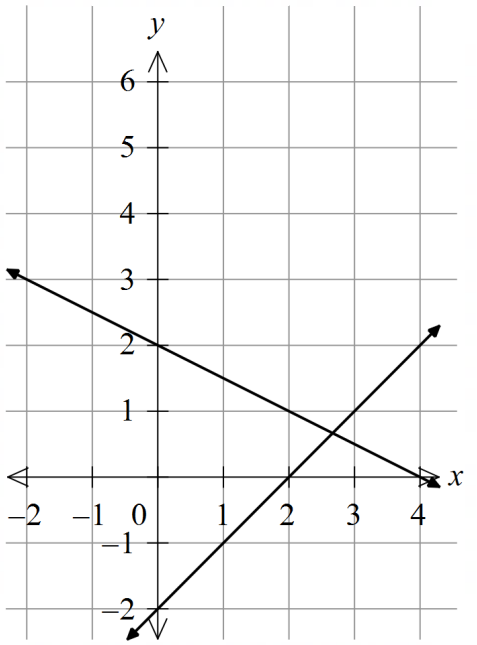
A.



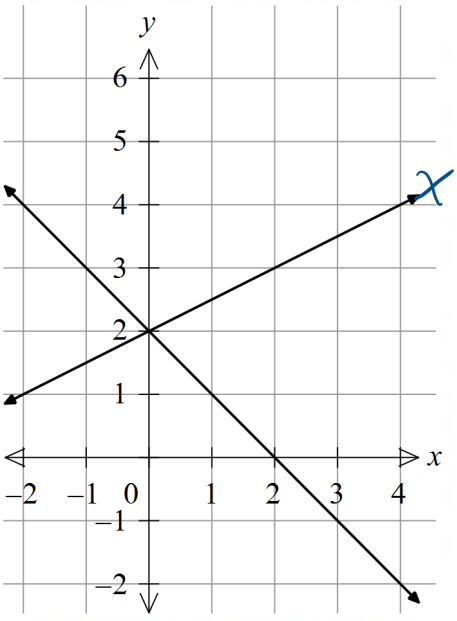
B.



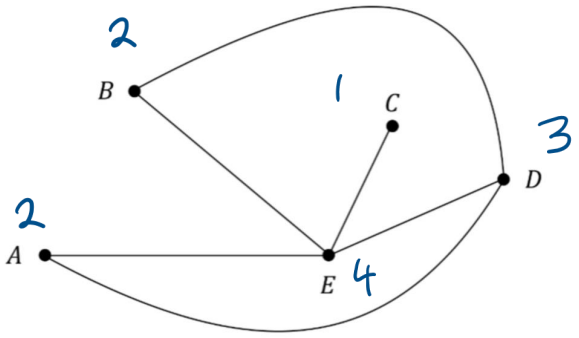
C.



D.



6. Consider the network diagram.



What is the sum of the degrees of all the vertices shown on the network diagram?

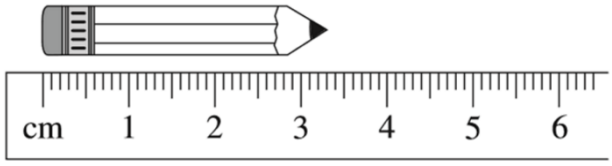
A. 6
B. 8
C. 10
D. 12

7. A set of bivariate data has a Pearson's correlation coefficient of –0.95.

Which expression best describes the association between the two variables?

A. There is a weak negative association
B. There is a strong negative association
C. There is a weak positive association
D. There is a strong positive association

8. A pencil is measured to be 3.3 cm long using the ruler pictured.

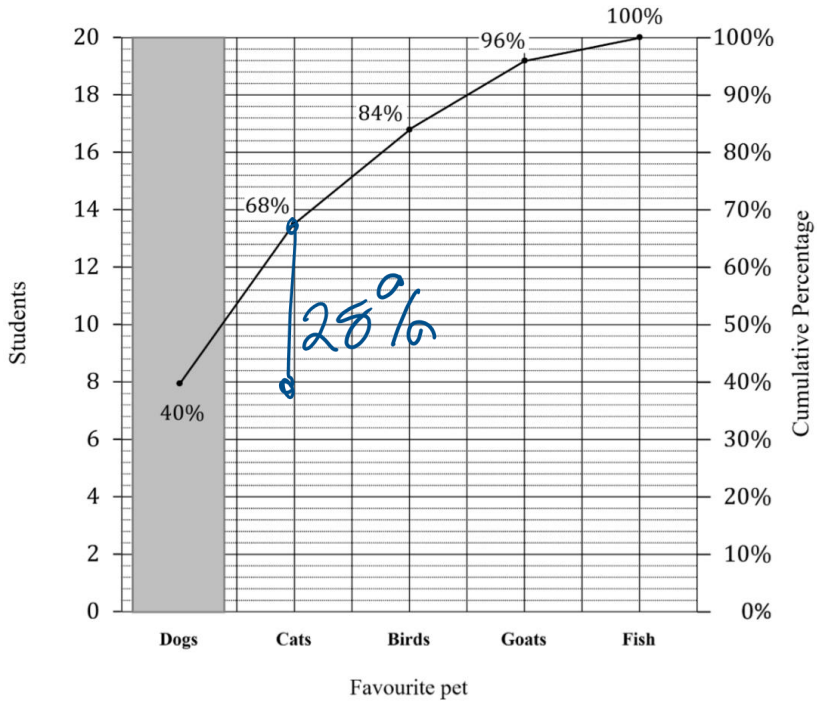


Which of the following best describes the true length of the pencil?

A. 3.3 ± 0.05 cm
B. 3.3 ± 0.1 cm
C. 3.3 ± 0.5 cm
D. 3.3 ± 0.25 cm

9. A teacher asked fifty students to identify their favourite type of pet.

A partially completed Pareto chart shows some of the data collected.



How many students chose cats as their favourite pet?

40% total = 20

total = 50

28% of 50 = 14

A. 12 students

B. 14 students

C. 28 students

D. 34 students

10. Adam takes out a loan of $10 000 to buy a new car. Simple interest is charged on the loan.

To repay the loan and the interest charged, Adam makes payments of $1 200 every year, over the next 10 years.

What is the simple interest rate, per annum, that is charged on the loan?

1200 × 10 = 12 000

Interest from 10 000 = 2000

10 000 × r × 10 = 2000

r = 0.02

= 2%

A. 2%

B. 2.5%

C. 3%

D. 4.5%

11. Savannah competed in four throwing events at the district athletics carnival.
In each event the distances recorded by the competitors was normally distributed.

	Savannah's result	Event mean	Event standard deviation
Shot put	15 m	13 m	2 m
Discus	37 m	43 m	6 m
Javelin	57 m	47 m	8 m
Hammer throw	33 m	48 m	10 m

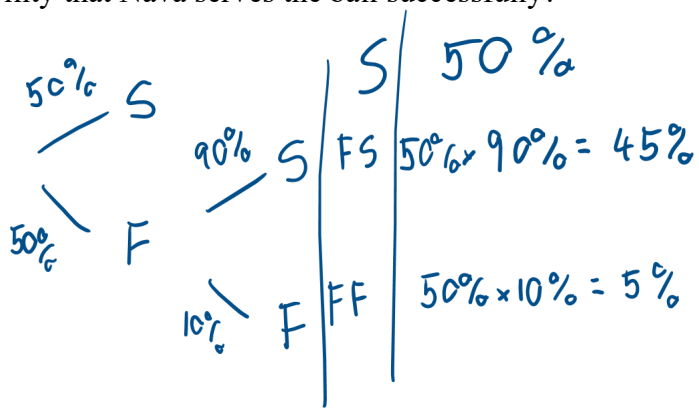
Which was Savannah's weakest event compared with the other competitors?

A. Shot put
B. Discus
C. Javelin
D. Hammer Throw

12. Tennis players are allowed to serve the ball to their opponent up to two consecutive times. If the first serve is successful, the ball goes into play and a second serve is not performed. If the first serve is unsuccessful, the player will serve the ball a second time.
Nava is a tennis player. The probability that her first serve is successful is 50% and the probability that her second serve is successful is 90%.

What is the probability that Nava serves the ball successfully?

A. 5%
B. 45%
C. 55%
D. 95%



13. Charlotte is thinking of a number. Let the number be x. When Charlotte subtracts 6 from this number and multiplies the result by 4, the answer is 3 more than x.

Which equation can be used to find x?

A. $4(x-6) = 3x$

B. $4x - 6 = 3x$

C. $4(x-6) = x + 3$

D. $4x - 6 = x + 3$

14. Which of the following is NOT a fee or charge associated with using a credit card?

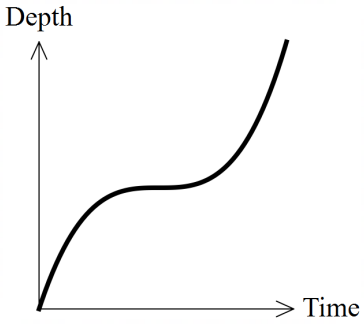
A. Interest

B. Cash advance fee

C. Late payment fee

D. Repayment fee

15. The graph shows the depth of water in a container over time, as it is being filled.



Which of the containers shown, could reflect the graph above?

A.

B.

C.

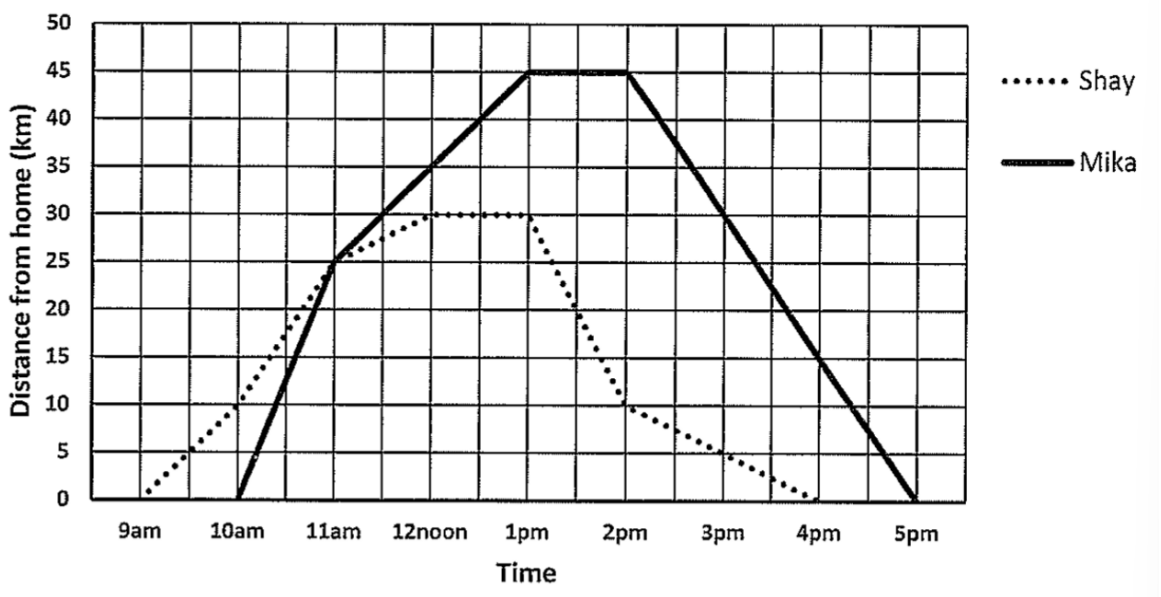
D.

End of Section 1

Question 16 (3 marks)

Two friends left their respective homes one morning and cycled along the same road.

The graph below shows their journeys.



(a) Which of the friends made a stop first? **1**

Shay

(b) When Mika began cycling home, how far had Shay travelled on her trip? **1**

30 + 20 = 50 km

(c) What was Mika's average speed, to the nearest km/h, on the cycling trip? **1**

10 am − 5 pm = 7h

45 + 45 = 90 km

$\frac{90}{7} = 13$ km/h

Question 17 (2 marks)

The flight time from Sydney to Dubai is approximately 13 hours.

The Universal Coordinated Time of Dubai is +4 and Sydney is +10.

A plane departs Sydney local time at 11:00 PM Sunday for Dubai.

At what local time in Dubai is the plane expected to land? **2**

Depart | Arrive

S 11 PM Sun | 12 pm (noon) Mon

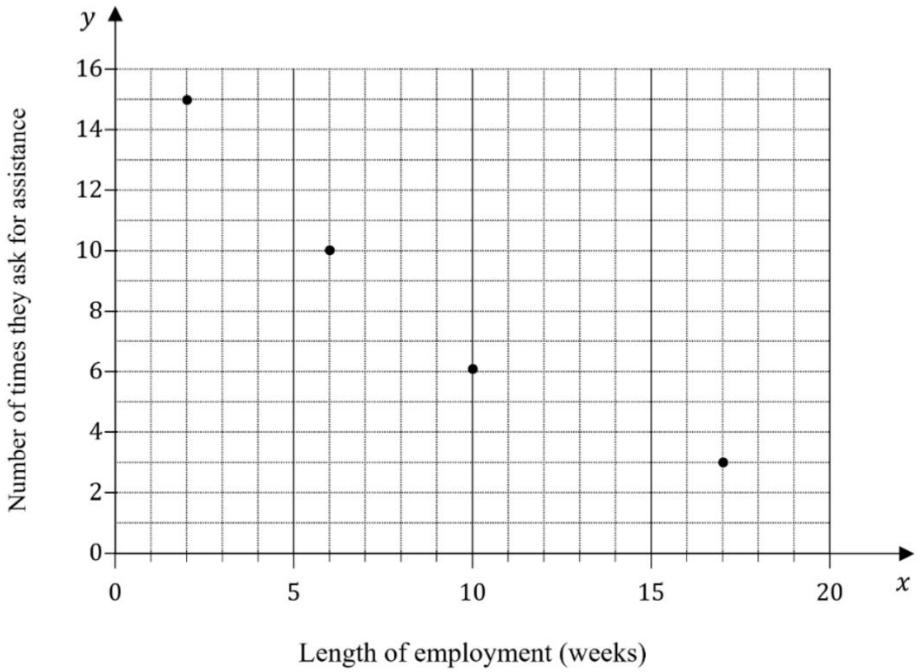
D 5 pm Sun | 6 am Mon

(1) either (2)

Question 18 (4 marks)

A manager oversees four teenage employees working in a fast-food restaurant.

The number of weeks they have been working at the restaurant, x, and the number of times they need to ask the manager for assistance during a four-hour shift, y, are shown on the graph below.



(a) Find the equation of the least-squares regression line for the data set, finding the gradient and y-intercept, correct to 2 decimal places. **2**

$y = A + Bx$

$y = 15.38 - 0.79x$

① each

(b) Using the least-squares regression line for these for employees as a guide, on average, how many full weeks will an employee have to be working at the restaurant before they require assistance less than 8 times during a four-hour shift? **2**

$8 > 15.38 - 0.79x$ ①

$\frac{8 - 15.38}{-0.79} < x$

$x > 9.38$

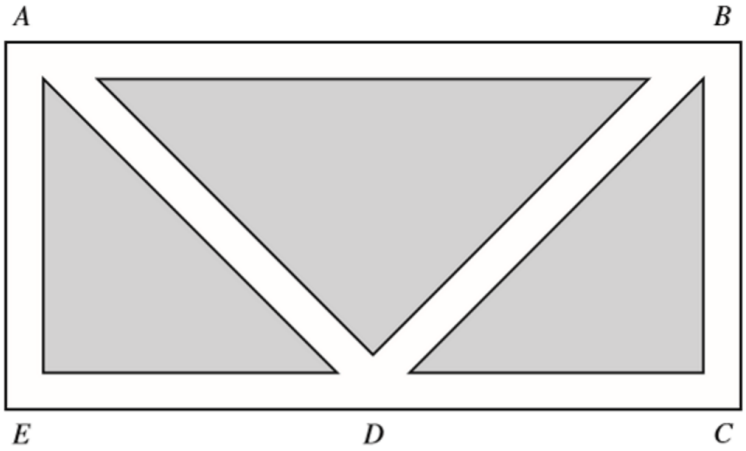
10 weeks

②

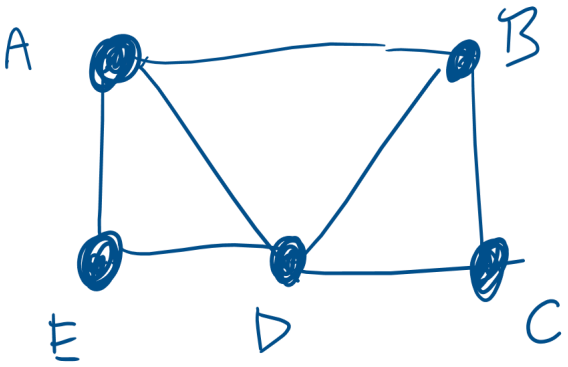
Question 19 (3 marks)

The diagram shows a rectangular park that contains 3 triangular grass areas (shaded).

There is a footpath (unshaded) around the edges of the park and between the grassed areas.



(a) Draw a network diagram to represent the possible walking paths through the park. **1**



(b) Show that the sum of the degrees of the vertices is equal to twice the number of edges. **2**

Vertex	A	B	C	D	E	Total
Degree	3	3	2	4	2	14

1

Edges = 7

$7 \times 2 = 14$

2

Question 20 (3 marks)

A company purchases office furniture for $10 000.

The company accountant is considering two methods of depreciation:

- straight line depreciation with the office furniture being depreciated by $\$D$ each year
- declining-balance depreciation at a rate of 15% per year

The accountant determines that after two years, the salvage value of the office furniture will be the same using either depreciation method.

What is the value of D? **3**

DB method

$S = 10\,000(1-0.15)^2$ (1)

$= \$7225$

Depreciated $\$2775$ (2)

either

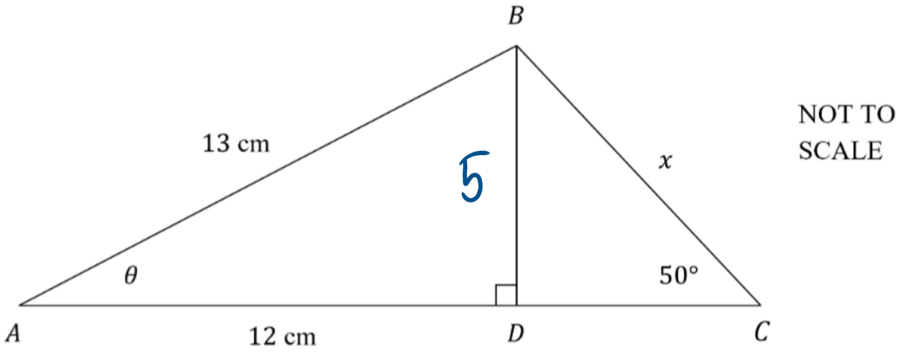
SL

$D \times 2 = 2775$

$D = \$1387.50$ (3)

Question 21 (5 marks)

Two right-angled triangles, ABD and BCD, are shown below.



NOT TO SCALE

(a) Find the value of θ, correct to the nearest degree. **2**

$\cos\theta = \frac{12}{13}$ (1)

$\theta = \cos^{-1}\frac{12}{13}$

$= 23°$ (2)

(b) Find the value of x, correct to 1 decimal place. **3**

$BD^2 = 13^2 - 12^2$

$BD^2 = 25$

$BD = 5$ (1)

$\sin(50) = \frac{5}{x}$ (+1)

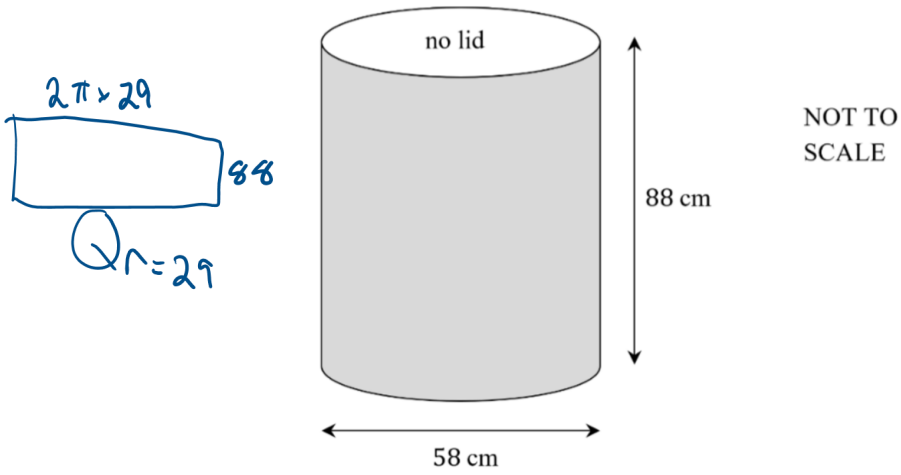
$x = \frac{5}{\sin 50}$ (+1)

≈ 6.5 cm

Question 22 (2 marks)

A 44-gallon drum has a base but no lid.

The drum is 88 cm in height and has a diameter of 58 cm.



The inside of the drum and the curved surface of the outside of the drum are to be painted.

Underneath the base of the drum is not to be painted as it is in contact with the ground.

What is the surface area to be painted, in square centimetres, correct to 1 decimal place? **2**

inside : $2\pi \times 29 \times 88$ $\pi \times 29^2$ ← ① either

Outside = $2\pi \times 29 \times 88$ ←

Total = 34711.5 cm^2 ②

Question 23 (2 marks)

The time it takes for a cupcake at a picnic to be eaten by ants (t minutes) varies inversely with the number of ants eating the cupcake (N ants). When there are 10 ants, the cupcake is eaten in 120 minutes. The equation relating t and N is:

$$t = \frac{k}{N}$$

(a) What is the value of k? **1**

$120 = \frac{k}{10}$

$k = 1200$

(b) Hence, or otherwise, calculate how long will it take 20 ants to eat one cupcake. **1**

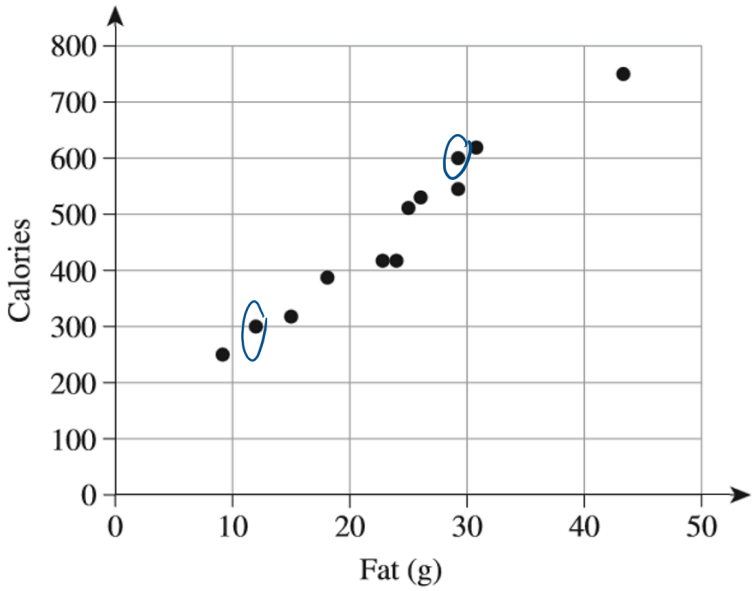
$t = \frac{1200}{20} = 60$ minutes $= 1$ hr

Question 24 (3 marks)

The table shows the fat and calorie content of 12 different burgers on a fast-food restaurant's menu. Two of the values are missing and are represented by the letters A and B.

Fat (g)	9	12	15	18	23	24	26	27	29	*A*	31	43
Calories	250	*B*	320	380	420	420	515	530	545	600	620	750

The bivariate data is displayed in the scatter plot below.



(a) Using the scatterplot, determine the values of A and B. **2**

$A = 29$

$B = 300$

(b) Identify the dependent variable. **1**

Calories

Question 25 (2 marks)

Anaya is paid \$38 per hour for the first 40 hours each week, with time-and-a-half for any overtime hours. In a particular week, Anaya earned \$285 in overtime.

How many hours in total did she work that week? **2**

$285 = 38 \times 1.5 \times h$ ← overtime hours

$h = 5$

Total h worked = 45 h

Question 26 (4 marks)

Takeshi is considering two payment plans offered by an online music service. The details of each plan are shown in the table below.

Plan A	Plan B
• Monthly subscription fee of $3 • $0.25 per song downloaded	• No monthly subscription fee • $0.40 per song downloaded

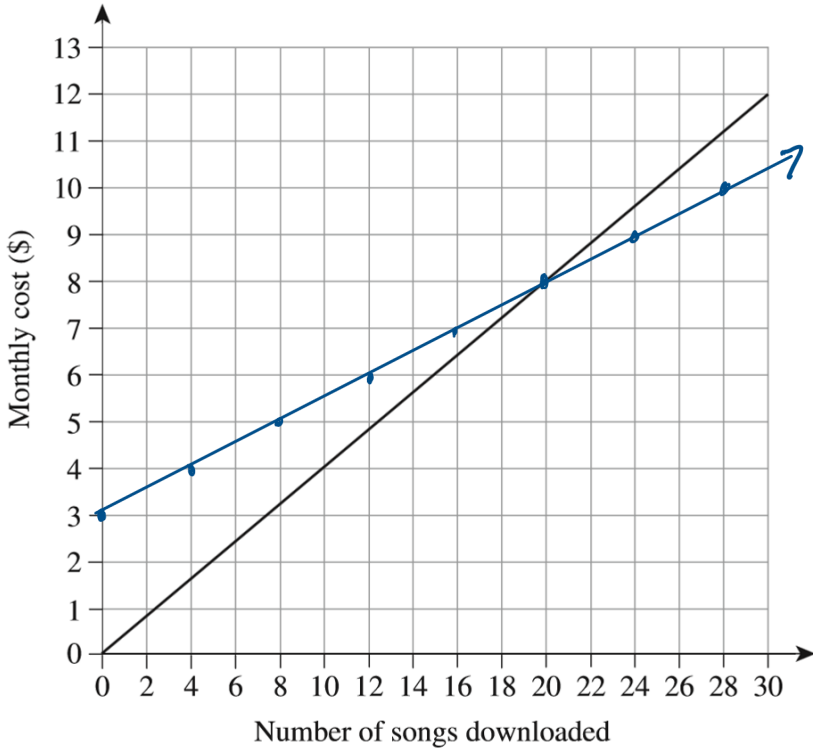
(a) Let x be the number of songs downloaded and $\$C$ be the total cost per month.

Write an equation that represents the monthly cost of Plan A. **1**

$C = 0.25x + 3$

(b) The graph shows the line of the equation for the monthly cost of Plan B.

On the graph, draw the line of the equation found in part (a). **2**



Points (1)

Straight line (+1)

(c) Using the graph from part (b), explain how Takeshi can decide which plan to select. **1**

if $x < 20$ use plan B

if $x > 20$ use Plan A

if $x = 20$ doesn't matter

Question 27 (3 marks)

Roco has a credit card with the following conditions:

- There is no interest-free period.
- Interest is charged at the end of each month at 19.99% per annum, compounding daily, from the purchase date (included) to the last day of the month (included).

Roco's credit card statement for March is shown, with some figures missing.

Statement period: 1 March to 31 March

Date	Details	Amount ($)
1 March	Opening balance	0.00
19 March	Car repairs	1200.00
27 March	Trailer hire	110.00
31 March	Interest charged	***
31 March	Closing balance	***

Minimum payment: ***

The minimum payment was calculated as 2.5% of the closing balance on 31 March.

What will be the value of his minimum payment? **3**

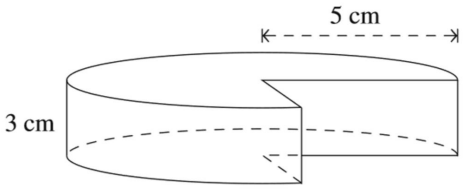
$1200 \times \left(1+\frac{0.1999}{365}\right)^{13} + 110\left(1+\frac{0.1999}{365}\right)^{5} = \$1318.87$ (2)

$2.5\% \times 1318.87 = \$32.97$ (3)

Question 28 (2 marks)

The diagram shows a wheel of cheese with a radius of 5 cm and a height of 3 cm.

A wedge representing one eighth of the cheese, has been cut and removed from the wheel.



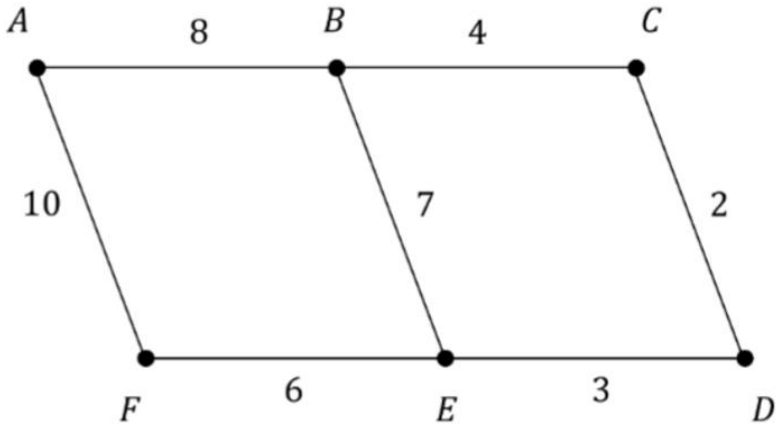
Find the volume of the remaining cheese wheel, correct to the nearest square centimetre. **2**

$\pi \times 5^2 \times 3 \times \frac{7}{8} = 206\ cm^3$ (2)

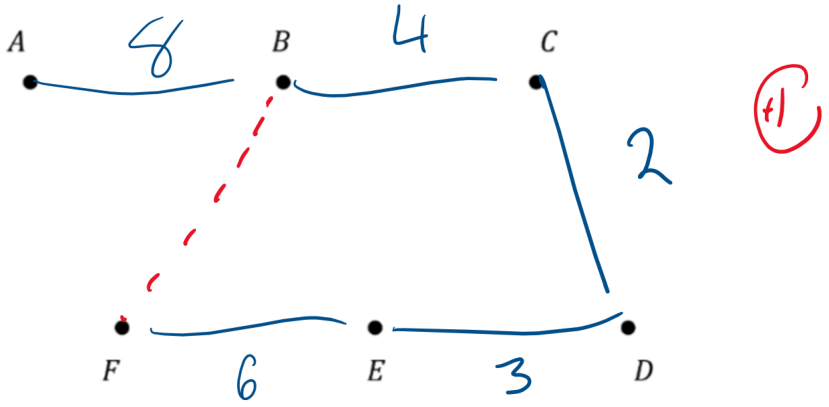
(1) either

Question 29 (4 marks)

The diagram represents a network with weighted edges.



(a) Draw a minimum spanning tree for this network in the space below and determine its length. **2**



+1

Minimum length of spanning tree = 23 +1

(b) A new edge from B to F is added to the network diagram at the top of the page, with a weight of x, where x is a whole number.

If the shortest path from F to D uses this new edge, what is the maximum value of x? **2**

$x+4+2 < 6+3$ (1)

$x+6 < 9$

$x < 3$

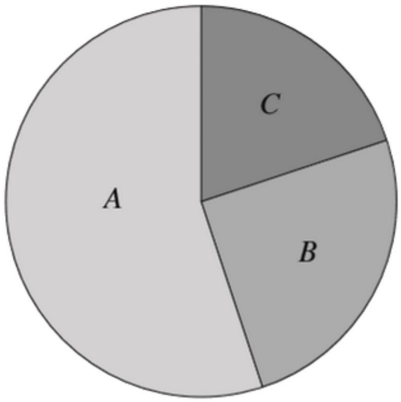
$x = 2$ ← largest (2)

Typo $x=0$ (1)

must calculate length of shortest path for (2)

Question 30 (4 marks)

A spinner is divided into three sections A, B, and C, shown below.



Section	Size of section (degrees)
A	$7x + 10$
B	90
C	$3x$

(a) Find the value of x. **2**

$7x + 10 + 90 + 3x = 360$ ← (1)

$10x + 100 = 360$

$10x = 260$

$x = 26°$ (2)

(b) If the spinner spun 60 times, how many times would it be expected to land on C? **2**

$60 \times \frac{3 \times 26}{360} = 13$ times (2)

(1)

Question 31 (3 marks)

Shareen buys a car for $29 000 and repays it over 4 years through equal monthly instalments.

She pays a 10% deposit and interest is charged at 9% p.a. on the reducing balance loan.

Table of Present Value Interest Factors						
r	**0.0060**	**0.0065**	**0.0070**	**0.0075**	**0.0080**	**0.0085**
N						
45	39.33406	38.90738	38.48712	38.07318	37.66545	37.26383
46	40.09350	39.64965	39.21263	38.78231	38.35859	37.94133
47	40.84841	40.38714	39.93310	39.48617	39.04622	38.61311
48	41.59882	41.11986	40.64856	40.18478	39.72839	39.27924
49	42.34475	41.84785	41.35905	40.87820	40.40515	39.93975
50	43.08623	42.57113	42.06459	41.56645	41.07653	40.59470

Using the table of present value interest factors above, where r represents the monthly interest and N represents the number of payments, calculate the monthly repayment, $\$P$, that Shareen must pay to complete the loan after 4 years. (to the nearest dollar). **3**

10% deposit = $2900

90% to pay = $26100

$N = 4 \times 12 = 48$ months

$r = 9 \div 12 = 0.75\% = 0.0075$

$P \times 40.18478 = 26100$

$P = \$649$

Question 32 (2 marks)

Gavin, a 72 kg male, consumes 4 bottles of beer at a party, each containing 1.4 standard drinks.

Gavin started drinking his first beer at 8:20 PM and finished his 4th beer at 11:50 PM.

The blood alcohol content (BAC) for males can be estimated by:

$$\text{BAC}_{\text{Male}} = \frac{10N - 7.5H}{6.8M}$$

where N = the number of standard drinks

H = the number of hours drinking

M = mass in kilograms

Calculate Gavin's BAC when he finished his fourth beer, correct to 3 decimal places. **2**

$N = 4 \times 1.4 = 5.6$

$H = 3.5$h

$M = 72$

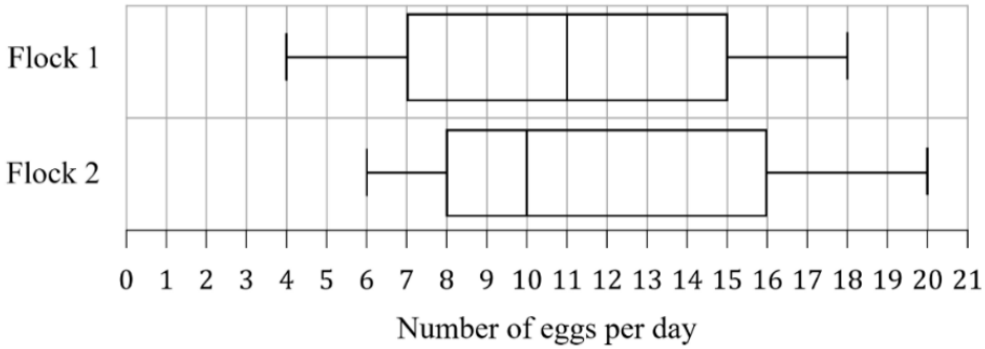
either

$$BAC = \frac{10 \times 5.6 - 7.5 \times 3.5}{6.8 \times 72}$$

$= 0.061$

Question 33 (3 marks)

A farmer has two flocks of chickens. The number of eggs they laid each day during the year was counted, with the data shown in a parallel box-plot.



Compare the two data sets, examining the skewness of the distributions, and any relevant measures of central tendency and spread. **3**

Flock 1 has a higher median (+1) — compare medians

compare shape

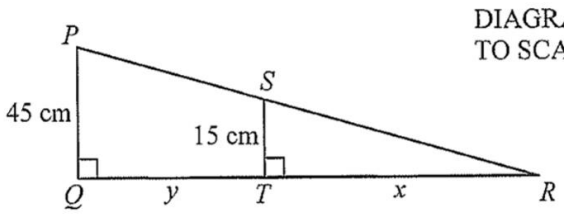
F1 is symmetrical, F2 is positively skewed (+1)

They have the same range and inter quartile range

compare either (+1)

Question 34 (2 marks)

In the diagram below, ΔPQR is similar to ΔSTR, $PQ = 45$ cm, $ST = 15$ cm, $QT = y$ and $TR = x$.



Show that $y = 2x$. **2**

$\frac{x+y}{x} = \frac{45}{15}$ ← (1)

$15(x+y) = 45x$

$15x + 15y = 45x$

$15y = 30x$

$y = 2x$

(+1) for correct algebraic manipulation

Question 35 (3 marks)

The table shows the income tax rates for the 2025-2026 financial year.

Taxable income	Tax on this income
\$0 – \$18,200	Nil
\$18,201 – \$45,000	16c for each \$1 over \$18,200
\$45,001 – \$135,000	\$4,288 plus 30c for each \$1 over \$45,000
\$135,001 – \$190,000	\$31,288 plus 37c for each \$1 over \$135,000
\$190,001 and over	\$51,638 plus 45c for each \$1 over \$190,000

For the 2025-2026 financial year, Amani has a taxable income of \$126 250.

During the year she paid \$1 130 per fortnight in Pay As You Go (PAYG) tax.

Calculate Amani's tax refund, ignoring the Medicare levy. **3**

Tax = 4288 + 0.30 (126250 − 45000)

= \$ 28 663 (1)

Tax Paid = 1130 × 26

= \$29 380 (+1)

Refund = 29 380 − 28663

= \$ 717 (+1)

Question 36 (2 marks)

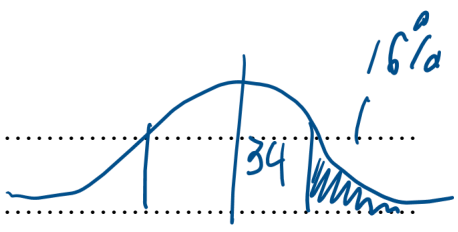
120 people entered the first round of a crossword competition.

The times taken to complete the crossword correctly were normally distributed with a mean of 10 minutes and a standard deviation of 2.1 minutes.

(a) Approximately how many of the 120 correctly completed their crosswords in more than 12.1 minutes? **1**

$z = 1 \quad P(z > 1) = 16\%$

$16\% \times 120 \approx 19$ people



(b) If a competitor completed her crossword in 13.15 minutes, what was her *z*-score? **1**

$$z = \frac{13.15 - 10}{2.1} = 1.5$$

Question 37 (4 marks)

The table shows the future values of an annuity of $1.

Future values of an annuity of $1

Period (years)	*Interest rate per period*							
	0.5%	*1.0%*	*1.5%*	*2.0%*	*2.5%*	*3.0%*	*3.5%*	*4.0%*
4	4.03010	4.06040	4.09090	4.12161	4.15252	4.18363	4.21494	4.24646
8	8.14141	8.28567	8.43284	8.58297	8.73612	8.89234	9.05169	9.21423
12	12.33556	12.68250	13.04121	13.41209	13.79555	14.19203	14.60196	15.02581
16	16.61423	17.25786	17.93237	18.63929	19.38022	20.15688	20.97103	21.82453
20	20.97912	22.01900	23.12367	24.29737	25.54466	26.87037	28.27968	29.77808
24	25.43196	26.97346	28.63352	30.42186	32.34904	34.42647	36.66653	39.08260
28	29.97452	32.12910	34.48148	37.05121	39.85980	42.93092	46.29063	49.96758
32	34.60862	37.49407	40.68829	44.22703	48.15028	52.50276	57.33450	62.70147
36	39.33610	43.07688	47.27597	51.99437	57.30141	63.27594	70.00760	77.59831
40	44.15885	48.88637	54.26789	60.40198	67.40255	75.40126	84.55028	95.02552

At the end of each year, Albert deposits $6 000 into a bank account that earns interest at a rate of 4% per annum, compounding annually. He makes these contributions over a period of 20 years.

(a) How much interest will the account have earned after 20 years? **2**

FV = 6000 × 29.77808 = $178 668.48 ..... ① for either

Paid = 6000 × 20 = $120 000 .....

Interest = $58 668.48 ②

(b) Albert's bank has an account option that offers the same interest rate, compounding quarterly rather than annually. Albert decides to open a new account and make quarterly contributions over a period of 10 years.

How much would Albert need to contribute to his new bank account at the end of each quarter to achieve the same future value after 10 years as the future value of his existing account after 20 years? **2**

$r = \frac{4\%}{4} = 1\%$ per quarter

$n = 10 \times 4 = 40$ quarters

$X = 48.88637$ ① for correct factor

$a X = FV$

$a \times 48.88637 = 178\,668.48$

$a = \$3\,654.77$ ②

Question 38 (7 marks)

The profit that a company makes in one month can be modelled by the equation

$$P = 50n - 0.5n^2$$

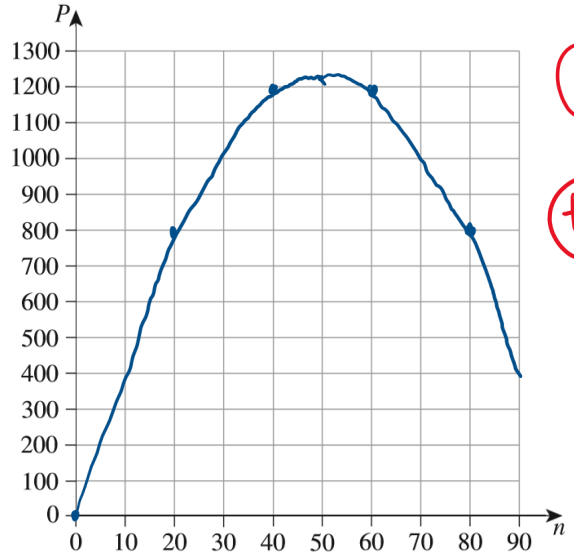
where P = profit and n = number of units produced.

all correct

(a) Complete the table showing the profit made based on the number of units produced. **1**

Number of units produced (thousand)	0	20	40	60	80
Profit (thousand $)	0	800	1 200	1200	800

(b) Graph the equation $P = 50n - 0.5n^2$ on the grid using the values from the table. **2**



(1) for points

(+1) for shape

(c) State the name of this type of non-linear relationship. **1**

Parabola / Quadratic

(d) Find how many units should be produced to maximise the company's monthly profits. **1**

$\frac{40+60}{2} = 50$ 50 000 units

(e) What is the maximum profit that can be made per month? **1**

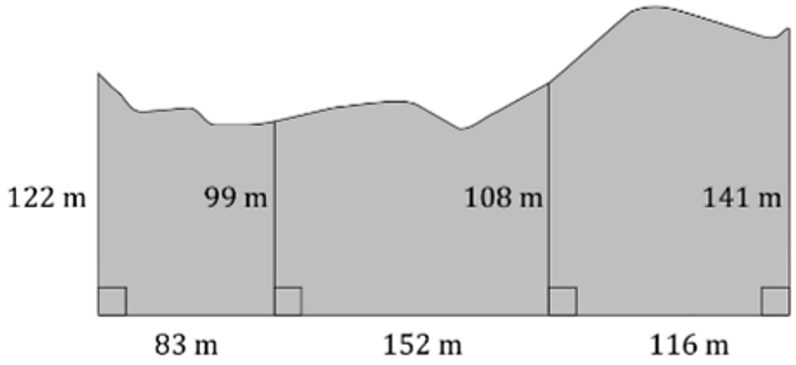
$50(50) - \frac{1}{2}(50)^2 = \$1250$

(f) Explain why it the company should not try to produce 100 000 units of their product, justifying your response with calculations. **1**

$50(100) - \frac{1}{2}(100)^2 = 0$ there will be no profit

Question 39 (6 marks)

The area of a paddock is to be estimated. Due to thick spiky weeds through parts of the paddock, the surveyors are only able to find the following measurements.



NOT TO SCALE

(a) Use three applications of the Trapezoidal rule to estimate the area of the paddock, in hectares, correct to 1 decimal place. (One hectare = 10 000 m^2) **3**

$A \approx \frac{83}{2}(122+99) + \frac{152}{2}(99+108) + \frac{116}{2}(108+141)$ — any 1 of these (1)

$\approx 39\,345.5\ m^2$ — (2) for this

≈ 3.9 ha — (+1) for ha conversion

(b) The owner hires a crop duster to spread a mixture of herbicide and fertiliser evenly over the paddock to help control the weeds and encourage grass growth. The mixture needs to be applied at a rate of 45 litres per hectare. How many litres of herbicide are needed for the paddock? **1**

$3.9 \times 45 = 175.5$ L — either

$A \times 45 = 177$ L ✓

(c) A thunderstorm over the paddock sees the whole paddock receive 8 millimetres of rain. How much rain fell onto the paddock, correct to the nearest kilolitre? **2**

$39\,345.5\ m^2 \times 0.008\ m = 315\ m^3$ (nearest whole)

(1) for volume $= 315$ kL

(+1) for capacity

Question 40 (7 marks)

The time spent waiting for a taxi at a large International Airport is normally distributed.

The waiting time is less than 184 seconds 16% of the time and greater than 304 seconds 0.15% of the time.

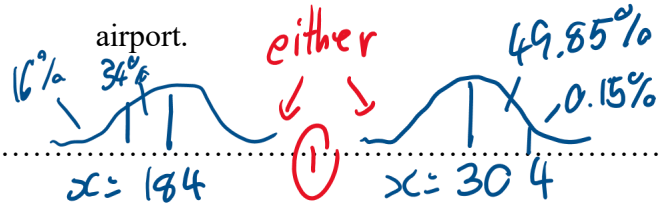
(a) During the first three months of 2024, 4.16 million people visited the airport.

If 30% of these people took a taxi from the airport, find the approximate number of people whose waiting time was greater than 184 seconds. **2**

4.16 million × 30% × 84% — (1) for 84%

≈ 1 048 320 people — (2)

(b) Determine the mean and standard deviation for the time spent waiting for a taxi at the airport. **3**



(1)

$z = -1$ $z = +3$

$304 - 184 = 4\sigma$

$\sigma = 120 \div 4$ (+1) calculate σ

$= 30s$

$184 + \sigma = \mu$

$\mu = 214s$ (+1) find μ

(c) Is it likely that the waiting time for a taxi will be two minutes or less?

Justify your response with appropriate mathematical calculations. **2**

$\frac{120 - 214}{30} = -3.13$ (1)

with a z score lower than −3, there is a less than 0.15% chance of a wait time less than 2 minutes

(+1) reasoning

END OF EXAM