Killara High School

Student Number

2025 **Year 12 Trial Examination**

Mathematics Standard

11/08/2025

General Instructions

- Reading time – 10 minutes
- Working time – 2 hours and 30 minutes
- Write using blue or black pen
- Calculators approved by NESA may be used
- A reference sheet is provided
- For questions in Section II, show relevant mathematical reasoning and/or calculations
- No white-out may be used

Total Marks: 100

Section I - 15 marks (pages 3–9)

- Allow about 25 minutes for this section

Section II - 85 marks (pages 13–43)

- Allow about 2 hours and 5 minutes for this section

This question paper must not be removed from the examination room.

This assessment task constitutes 30% of the course.

Section I

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

Use the multiple-choice sheet for Question 1–15.

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1 Sue bought a car 3 years ago. It has a salvage value of $15200. The car has depreciated $1800 each year. How much did Sue pay for the car?

A. $17000

B. $18800

C. $20400

D. $20600

2 Victor receives an extra 8% of his gross annual salary as a bonus at the end of the year. If his salary is $68900 p.a., what will his bonus be?

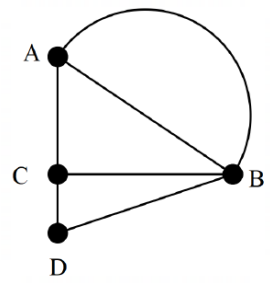
A. $4412

B. $4823

C. $5412

D. $5512

3 From the following network diagram, which vertex has the largest degree?



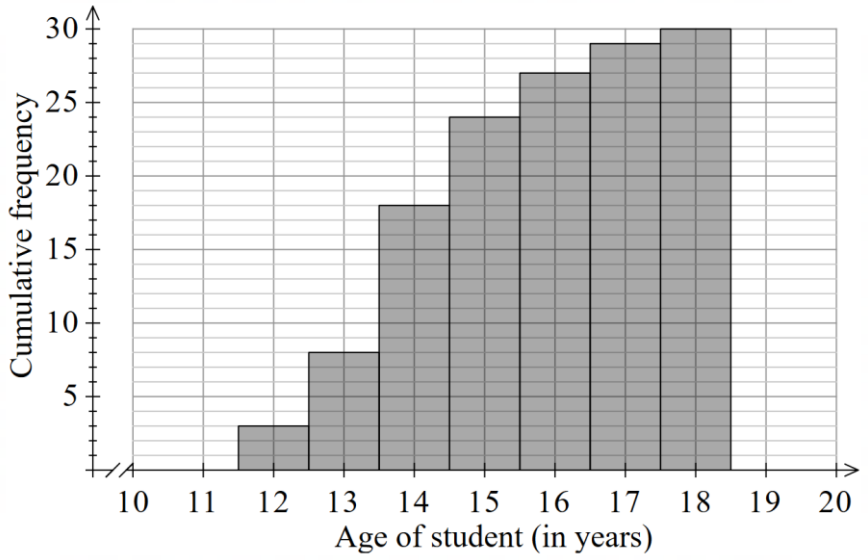
A. Vertex A

B. Vertex B

C. Vertex C

D. Vertex D

4 Below shows a cumulative frequency histogram of the ages of 30 students.



What was the median age of the students?

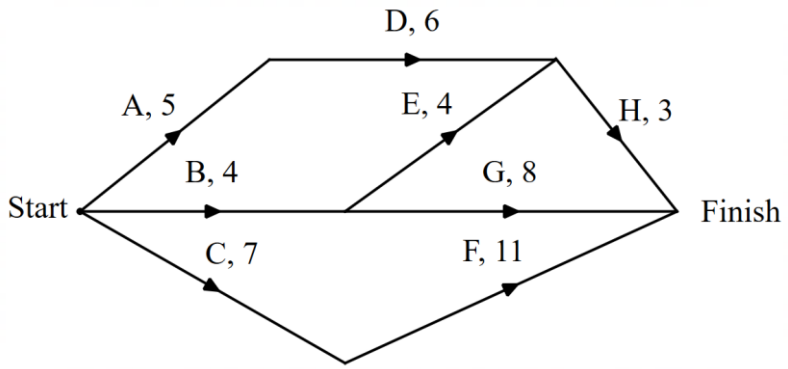
A. 14

B. 15

C. 16

D. 17

5 From the diagram below, what is the critical path?



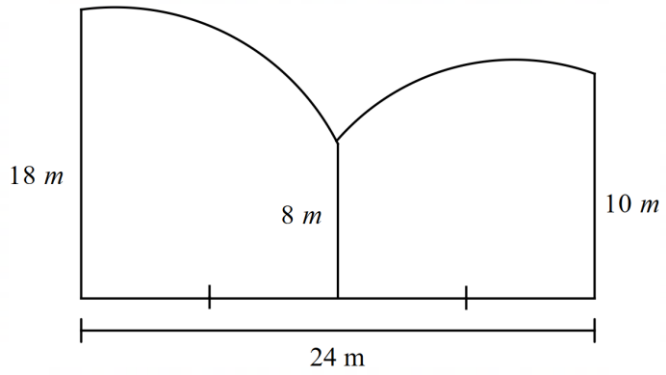
A. A – D – H

B. B – G

C. B – E - H

D. C - F

6 Using two applications of the trapezoidal rule, estimate the area of the following figure.



A. 256 m^2

B. 264 m^2

C. 336 m^2

D. 528 m^2

7 Paul bought a portfolio of 2000 shares. The value of each share is currently $7.50. Paul is paid a total dividend of $900. What is the dividend yield per share?

A. 6.0%

B. 6.25%

C. 8.3%

D. 12.5%

8 A Year 11 History class sat a test, the results were normally distributed and had a standard deviation of 6. Harrison received a raw mark of 70 which corresponds to a z-score of 2.5. What was the mean score?

A. 55

B. 60

C. 65

D. 70

9 The height of football goal is measured to be 2.44 m. What is the percentage error? Correct to one decimal place.

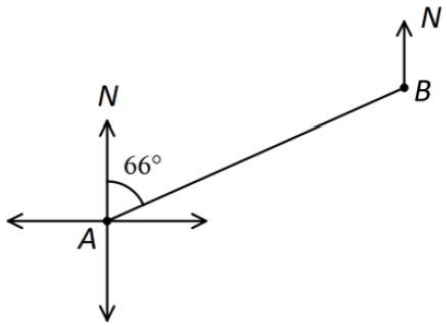
A. 0.1%

B. 0.2%

C. 0.4%

D. 1.6%

10 The bearing of point B from point A is 66°. Find the bearing of point A from point B.



A. 186°

B. 204°

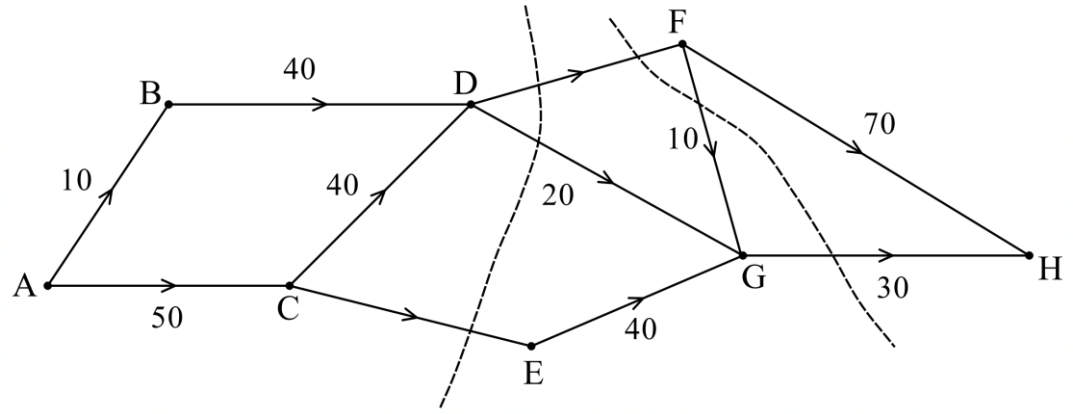
C. 226°

D. 246°

11 The network diagram below shows the capacity of various edges between a source A and a sink H. The capacity of each edge is a whole number.

Two edges, DF and CE, do not have their capacity shown.

The two cuts shown are known to be the only minimum cuts in the diagram.



What is the maximum capacity of CE?

A. 10

B. 20

C. 30

D. 40

12 When r is made the subject of

$$v = \sqrt{\frac{mr}{2\pi}}$$

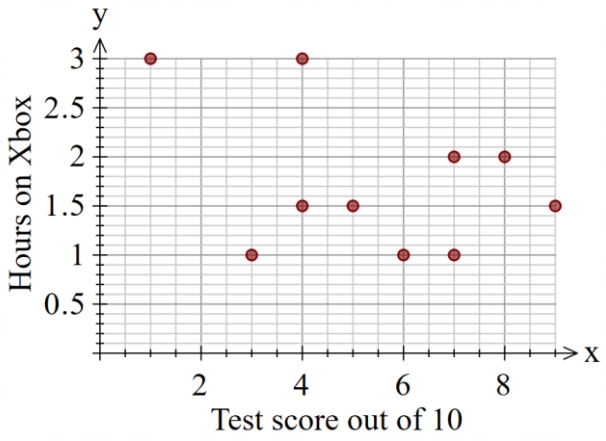
A. $r = \dfrac{4\pi^2 v^2}{m^2}$

B. $r = \dfrac{2\pi v^2}{m}$

C. $r = \dfrac{2\pi v^2}{m^2}$

D. $r = \dfrac{2\pi v}{m}$

13 A group of children who play on the gaming console Xbox sat an English test. They were asked the question "How many hours of Xbox do you play each week?".



Which Pearson's correlation coefficient value best represents the data above?

A. $r = -0.85$

B. $r = -0.35$

C. $r = 0.35$

D. $r = 0.85$

14 The hours to wait before driving after the consumption of alcohol for full licensed driver in NSW is given by the formula:

$$Time = \frac{BAC}{0.015}$$

Mia weighs 55 kg and has consumed 6 standard drinks in 4 hours. Using the formula for calculating blood alcohol content below, how long should Mia wait before driving? Correct to the nearest minute.

$$BAC_{female} = \frac{(10N - 7.5H)}{5.5M}$$

where N is the number of standard drinks consumed
H is the number of hours drinking
M is the person's weight in kilograms

A. 6 hours 6 mins

B. 6 hours 32 mins

C. 6 hours 37 mins

D. 7 hours 15 mins

15 Each student at a school plays one of four sports.

The table below represents the probability a student chosen at random plays Football, Netball, Rugby or Cricket.

Sport	Football	Netball	Rugby	Cricket
Probability	0.55	$2x$	x	0.15

If there are 600 students at the school, how many students chose netball?

A. 30

B. 60

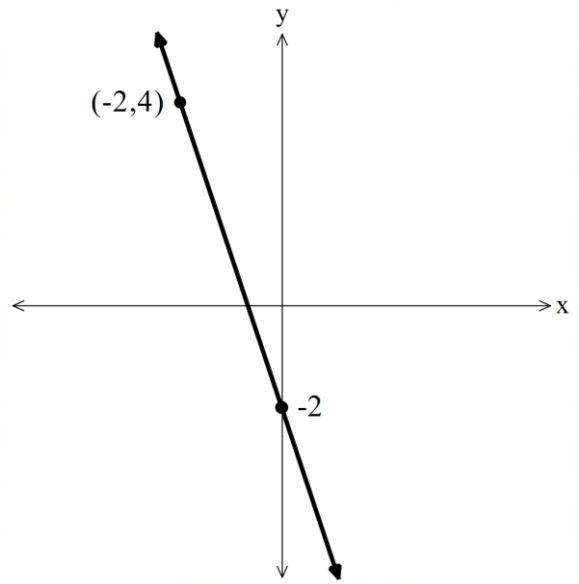
C. 120

D. 200

End of Section I

Question 16 (2 marks)

The diagram below shows the graph of a line. The line passes through a point of $(-2,4)$. **2**



Find the equation of the line, in the form of $y = mx + c$.

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Question 17 (2 marks)

A researcher captures and tags 50 fish in a lake. Later in the week, the researchers returns and catches a sample of 200 fish, of which 10 are tagged. **2**

Estimate the total number of fish in the lake using the capture-recapture method.

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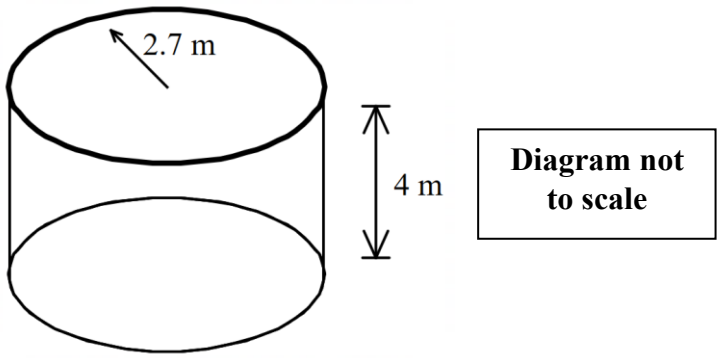
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Question 18 (2 marks)

A cylindrical water tank with a radius of 2.7 m and a height of 4 m is shown below. **2**



Calculate the surface area of the water tank? Correct to two decimal places.

Question 19 (2 marks)

The flight time from Sydney to Dubai is approximately 13 hours. **2**
The Universal Coordinated Time of Dubai is +4 and Sydney is +10.

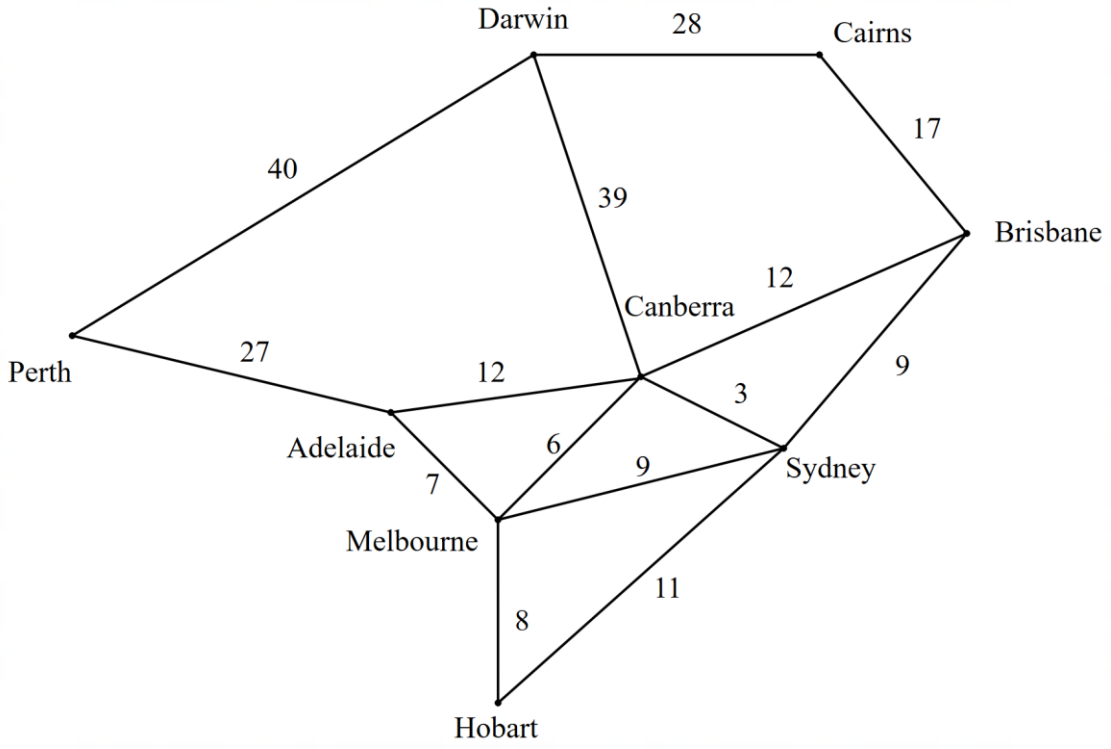
A plane departs Sydney local time at 11.00pm Sunday for Dubai.

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

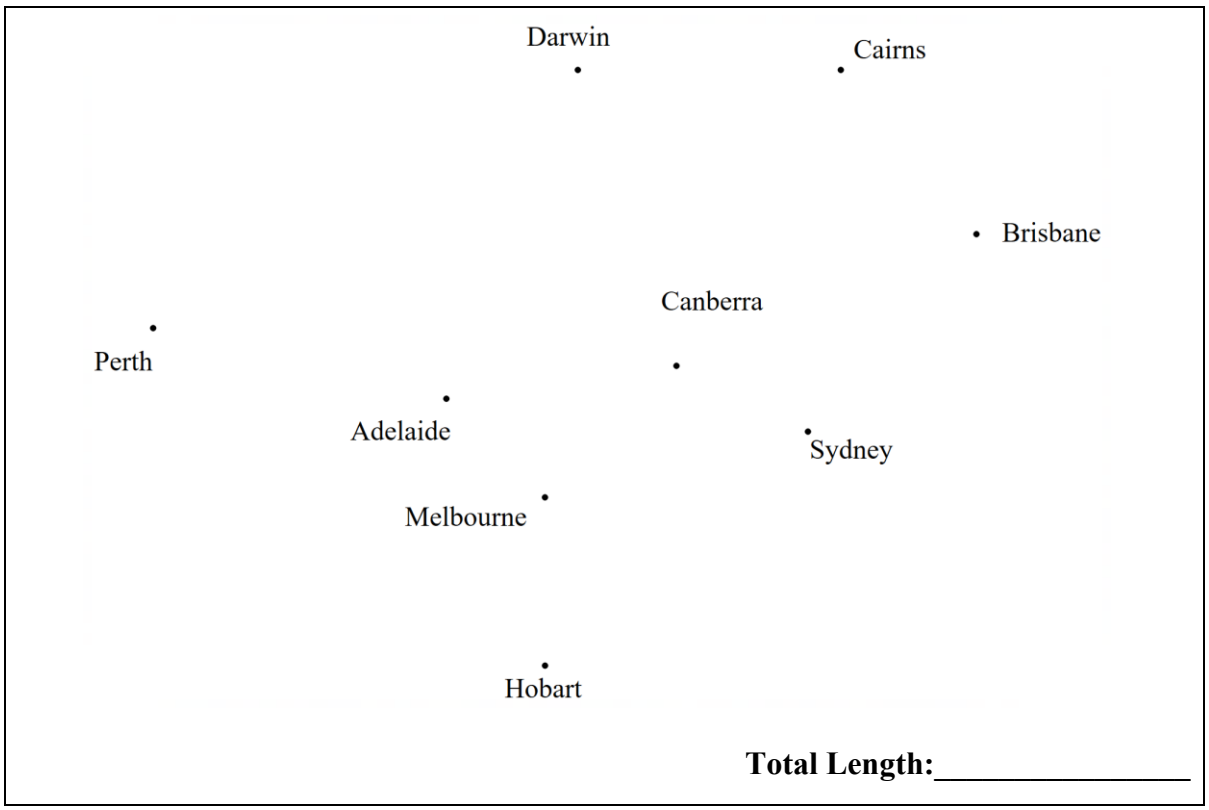
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Question 20 (3 marks)

A national delivery company in Australia aims to establish an efficient transportation network connecting its major distribution centres. The company has identified several key cities as primary hubs as shown in the diagram below. Each city is represented as a vertex in the graph, and the roads between them are edges (distance in 100's km's)



Draw a minimum spanning tree in the space below and determine the shortest total length. **3**



Total Length:_____

Do NOT write in this area.

Question 21 (3 marks)

The heights of a group of Netball players are normally distributed with a mean of 160 cm and a standard deviation of 6 cm.

(a) Lauren's height is 151 cm. Calculate Lauren's z-score. **1**

(b) What percentage of the players are between 154 cm and 172cm? **2**

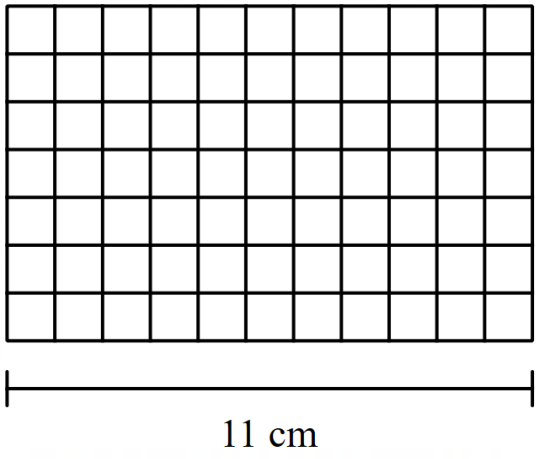
Question 22 (3 marks)

A patient is receiving 1500 mL of fluid through an intravenous drip at a constant rate of 85 drops per minute. Each millilitre of fluid is equivalent to 20 drops. **3**
How long will it take to deliver the full 1500 mL? Correct to the nearest minute.

Do NOT write in this area.

Question 23 (4 marks)

A rectangular swimming pool has been drawn on a 1-cm grid as shown. The actual length of the pool is 55 metres.



(a) What is the scale of the map? **1**

(b) A swimmer takes 4 minutes to swim around the perimeter of the pool. What was the swimmers average speed in kilometres per hour? **3**

Do NOT write in this area.

Question 24 (4 marks)

Tom is an apprentice electrician and earns a taxable income of $63200. Using the tax table below, calculate Tom's total tax payable, including the Medicare levy. **4**

Taxable Income Range	**Tax on This Income**
$0 - $18200	Nil
$18201 - $45000	19c for each $1 over $18200
$45001 - $120000	$5092 + 32.5c for each $1 over $45000
$120001 and over	$29467 + 37c for each $1 over $120000

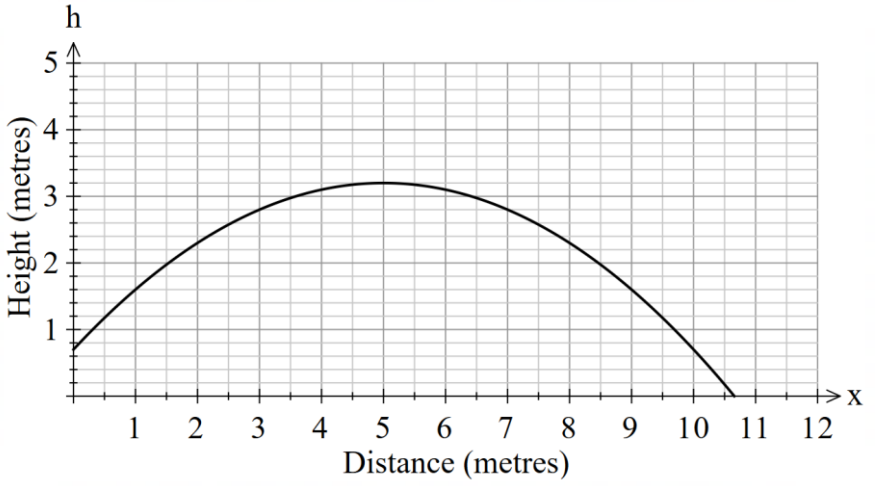
Medicare Levy: 2% of taxable income (if income is above $27000 for an individual).

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Question 25 (3 marks)

A rugby player kicks a ball. The height h (in meters) of the ball above the ground at a horizontal distance x (in meters) from the point of the kick is modelled by the equation:

$$y = -\frac{x^2}{10} + x + 0.7$$



(a) Based on the equation, what is the height of the ball when it is kicked? **1**

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(b) Based on the graph, at what distances is the ball at $\frac{5}{8}$ of its maximum height? **2**

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Question 26 (3 marks)

Liam is saving for a car. He has $4,000 to invest and is considering two different options: **3**

- **Option 1:** A savings account that pays **compound interest** at 3.5% per annum, compounded annually.
- **Option 2:** A term deposit account that pays **simple interest** at 4% per annum, with the total interest paid at the end of the term.

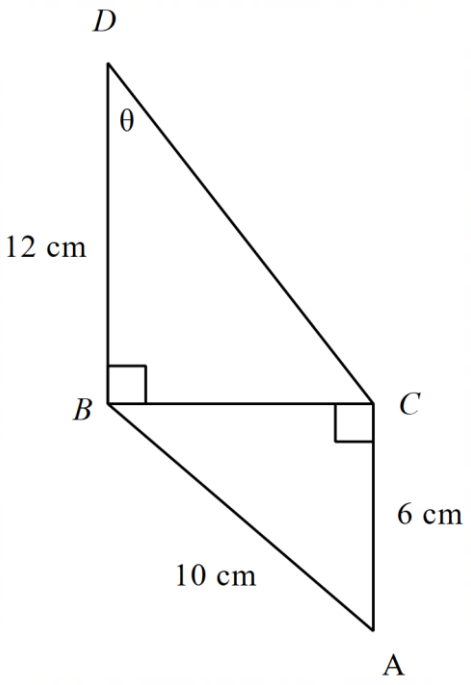
Liam plans to keep the money invested for 3 years before buying the car.

Which option should Liam choose to maximise his savings? Justify your answer with relevant calculations and working out.

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Question 27 (3 marks)

Consider the triangles ΔABC and ΔBCD. **3**

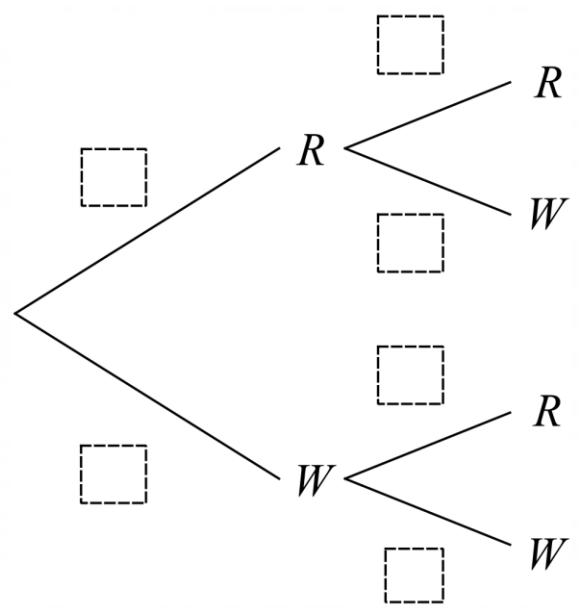


Find the value of θ, correct to the nearest minute.

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Question 28 (4 marks)

Kalyan has a bag of red and white cricket balls, the bag contains 3 red and 4 white balls. There are two games of cricket about to start. Kaylan picks one at random, then he picks another.



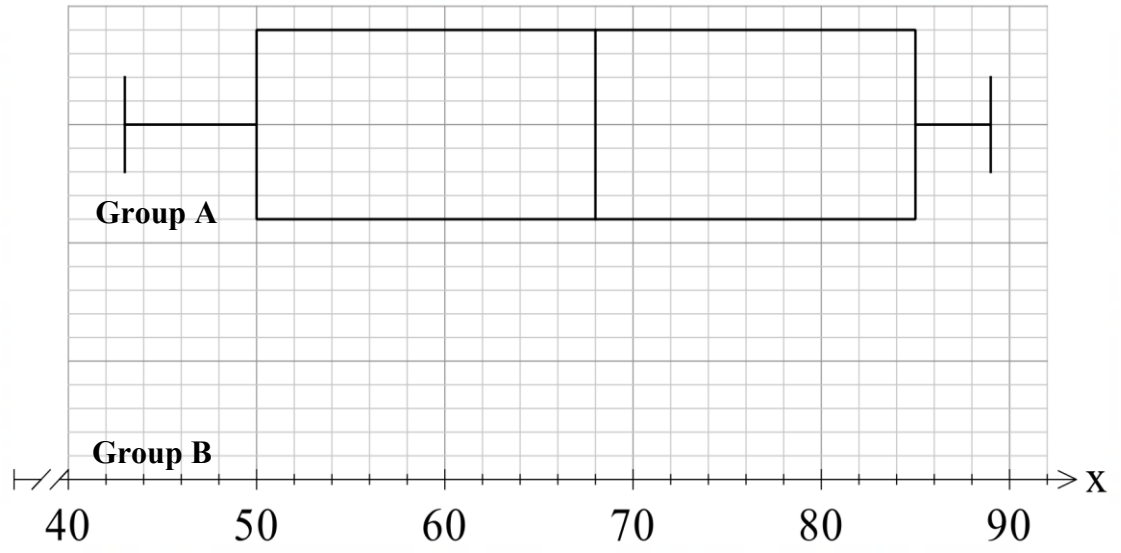
(a) Complete the tree diagram if Kalyan does not replace the ball. **2**

(b) Determine the probability that Kalyan picks at least one white balls? **2**

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Question 29 (4 marks)

The box plot below represents the scores of two groups of students, Group A and Group B, in a recent mathematics exam.



(a) Draw the box plot for Group B in the space above using the following data: **1**

- Minimum score: 52
- Lower Quartile (Q1): 62
- Median score: 76
- Upper Quartile (Q3): 86
- Maximum score: 90

(b) By comparing the two box plots, which group did better in the mathematics test? Justify your answer with reference to the skewness, measures of centre and measures of spread. **3**

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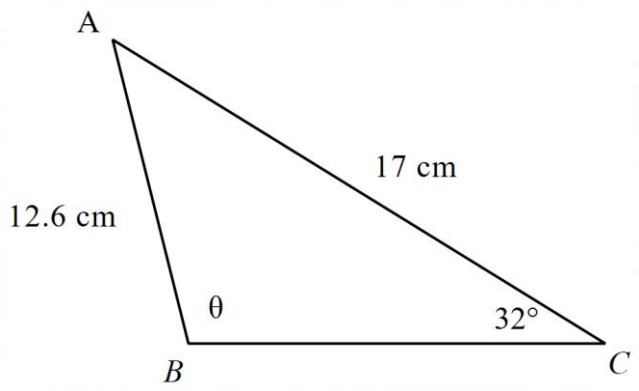
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Question 30 (3 marks)

The diagram below shows ΔABC. **3**



Find θ given it is an obtuse angle. Give your answer to the nearest minute.

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Question 31 (4 marks)

The table of interest factors below shows the future value of a $1 annuity.

Future value of an annuity of $1

Time periods	*Interest rate per period*				
	1.0%	1.5%	2.0%	2.5%	3.0%
4	4.0604	4.0909	4.1216	4.1525	4.1836
8	8.2857	8.4328	8.5830	8.7361	8.8923
12	12.6825	13.0412	13.4121	13.7956	14.1920
16	17.2579	17.9324	18.6393	19.3802	20.1569
20	22.0190	23.1237	24.2974	25.5447	26.8704
24	26.9735	28.6335	30.4219	32.3490	34.4265

(a) Archie deposits $2200 each quarter into an annuity account for 4 years. The account pays interest at a rate of 6% p.a., compounding quarterly. **2**

Calculate the future value of Archie's investment.

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(b) Katrina wants to have a future value of $20 000 at the end of 2 years. She can make monthly deposits into an account that earns 12% interest p.a., compounding monthly. **2**

What should her monthly deposit be, correct to the nearest cent?

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Question 32 (3 marks)

Sarah has a credit card. The credit card has no interest free period. Compound interest is charged daily at the rate of 18% per annum. **3**

Her credit card statement for the month of April shows the following details:

Description	**Date**	**Amount ($)**
Opening Balance	01-Apr	$1200.00
Purchase - Electronics	10-Apr	$350.00

Interest charged includes the date of purchase, and the date of payment. The date of payment is 30th April.

Calculate the total amount Sarah owes at the end of April, including the interest charged for the month.

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Question 33 (4 marks)

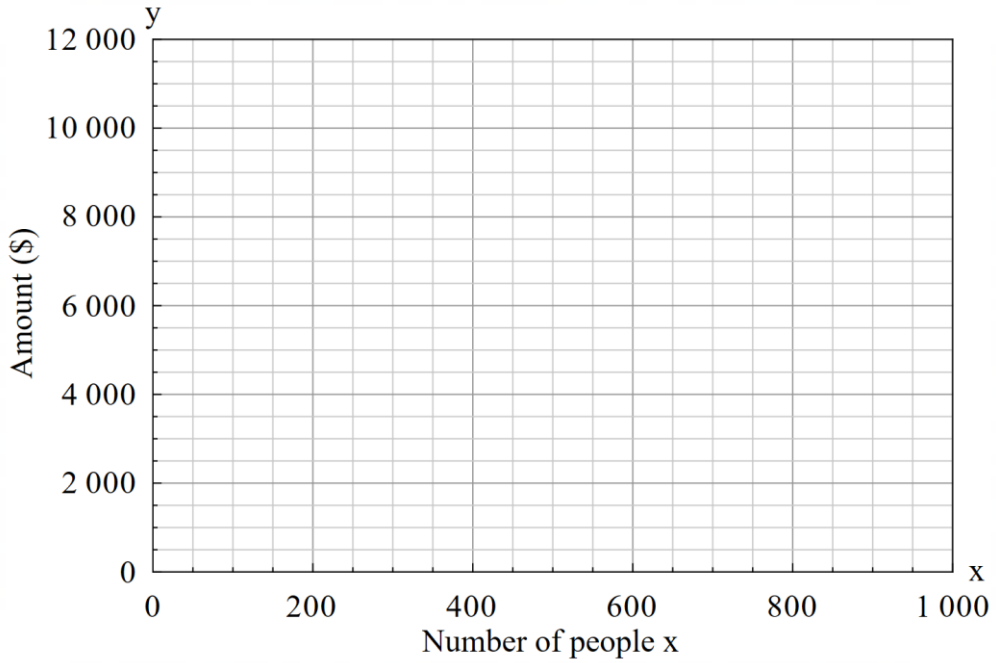
A dining hall can host an event for up to 1000 people. The cost C, in dollars, to hire the centre to host an event, where x people attend, is given by:

$$\boldsymbol{C = 2000 + 6x}$$

The centre charges \$12 per person. Its income I, in dollars, is given by:

$$\boldsymbol{I = 10x}$$

(a) Sketch the two functions on the graph below: **2**



(b) How much greater is the income of the function centre when 600 people attend an event, than its income at the break-even point? **2**

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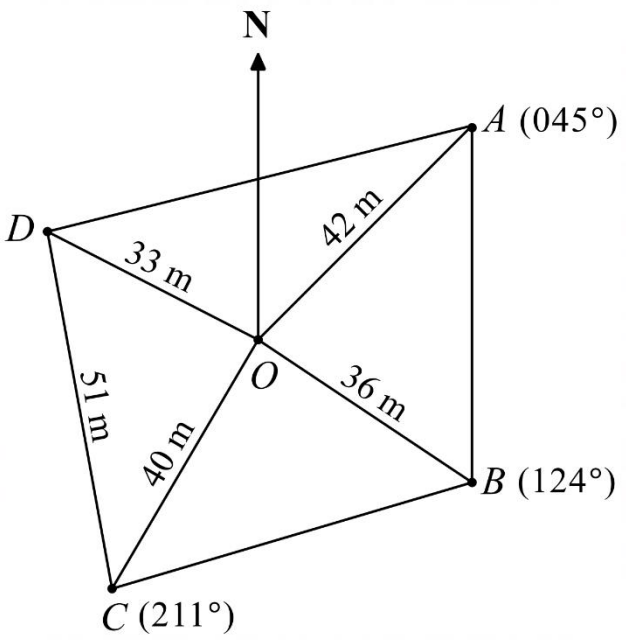
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Question 34 (4 marks)

A radial survey is shown. **4**



Find the area of ΔAOD, correct to the nearest square metre.

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Question 35 (4 marks)

Present value interest factors for an annuity of \$1 for various interest rates (r) and numbers of periods (n) are given in the table.

Table of present value interest factors

Time periods	*Interest rate per period as a decimal*			
	0.002	0.0025	0.003	0.0035
12	11.845	11.807	11.769	11.731
18	17.663	17.580	17.497	17.415
24	23.410	23.266	23.123	22.981

Myles deposits \$45 000 into a bank account which earns 3% interest per annum, compounding monthly.

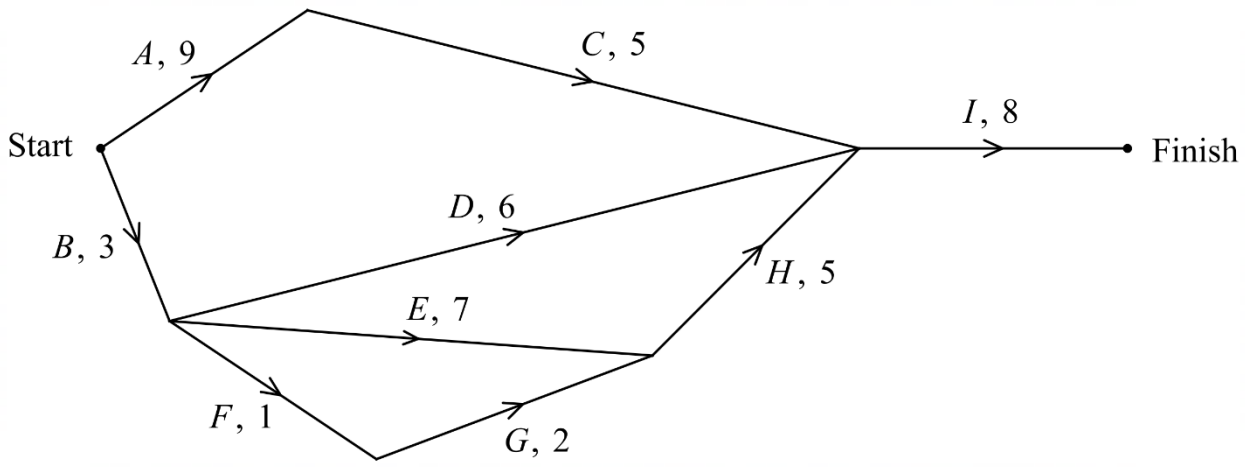
(a) Show, using suitable calculations, that Myles cannot withdraw \$2000 per month over 2 years. **2**

(b) Myles decides to let the \$45 000 sit in the account earning compound interest for the first 12 months and then make regular monthly withdrawals for 2 years. Will Myles now be able to withdraw \$2000 each month? Justify your answer with calculations. **2**

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Question 36 (4 marks)

The network diagram shows the activities needed to complete a project. The completion time for each task is in days.



(a) Find the minimum completion time to finish the project. **1**

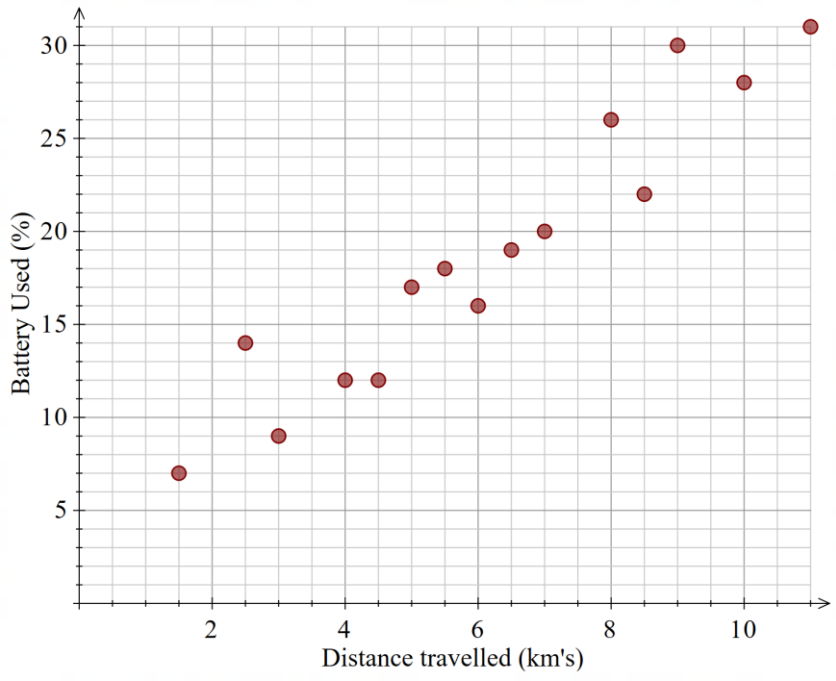
(b) What is the latest start time of activity C? **1**

(c) A new activity J needs to be added to the project. It relies on activity F being completed, and it is needed to begin activity I. **2**
What is the maximum duration of activity J given that it does not delay the project?

Do NOT write in this area.

Question 37 (5 marks)

A city bike-share company wants to explore whether distance travelled per day (in kilometres) by their electric bike riders predicts battery energy used (in % of charge). They collect data from 15 randomly selected riders over a typical weekday.



A least squares regression is fitted using the data (x, y), where x is the distance travelled by the bike rider, and y is the percentage of battery used. The equation of the line is

$$y = 3.12 + 2.54x$$

(a) The total sum of the distance travelled by the 15 riders was 91.5 km. If an electric rider was to travel the mean (μ) distance, predict the percentage of battery used by the rider over this distance. Give your answer to one decimal place. **2**

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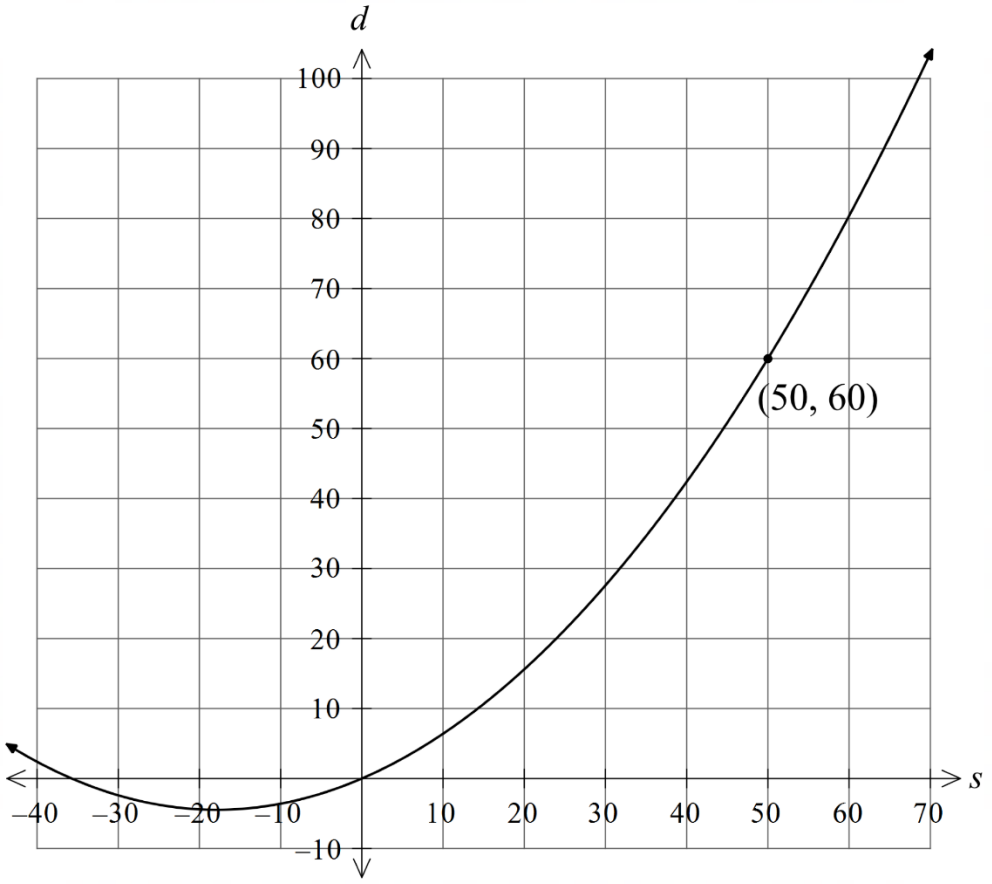
(b) Given that the correlation coefficient of the data set is $r = 0.95$. **3**

Using the least squares of regression line and the correlation coefficient, describe and interpret the data with reference to the context given.

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Question 38 (4 marks)

The graph below models the stopping distance (d) in metres for cars travelling at various speeds (s) in km/h.



(a) Explain why only a section of this graph applies to the context of stopping distances **1**

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(b) The equation of the graph is given by; **2**

$$d = 0.014s^2 + ks$$

By choosing a suitable point on the graph, find the value of k.

(c) Calculate the stopping distance of a car travelling at 80 km/h **1**

Do NOT write in this area.

Question 39 (4 marks)

The IQ scores of adults are normally distributed in various towns, with different means and standard deviations.

The table below shows the mean and standard deviation of IQ scores in two towns.

	Mean	*Standard Deviation*
Town A	100	15
Town B	104	10

(a) Lachlan's IQ is higher than the same percentage of adults in Town A and Town B. **2**

By setting up an equation, calculate Lachlan's IQ score.

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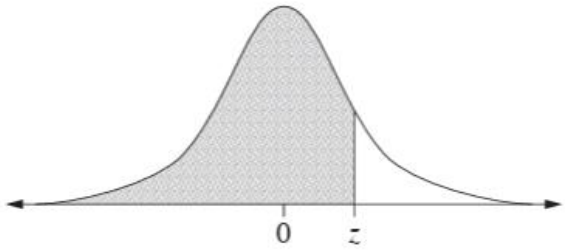
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(b) A portion of a z-score table is shown below. **2**

This table shows the probability that a score is below a given z-score. The first decimal place of the z-score is in the left column, and the second decimal place of the z-score is across the top.

z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.6	0.726	0.729	0.732	0.736	0.739	0.742	0.745	0.749	0.752	0.755
0.7	0.758	0.761	0.764	0.767	0.770	0.773	0.776	0.779	0.782	0.785
0.8	0.788	0.791	0.793	0.797	0.800	0.802	0.805	0.808	0.811	0.813

The probability values given in the table for different values of z are represented by the shaded area in the following diagram.



Lachlan knows that his IQ is greater than 8600 people in Town B.

Calculate the population of Town B, to the nearest 100 people.

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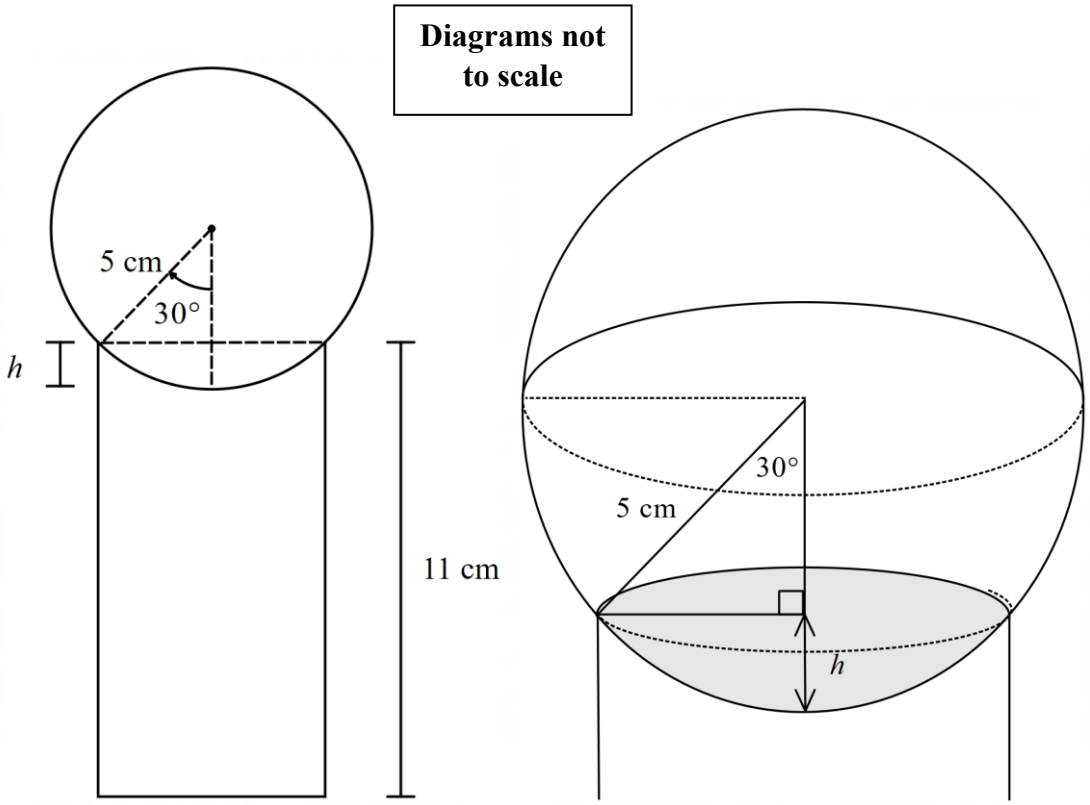
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Question 40 (4 marks)

The diagram below shows the structure of a trophy. The structure consists of a cylindrical base with a sphere placed on top.



The shaded region of the diagram represents a spherical cap. A spherical cap is a portion of a sphere cut off by a plane. The radius of the spherical cap has the same radius as the cylinder.

The volume of a spherical cap is given by the following formula:

$$V = \frac{\pi h^2}{3}(3r - h)$$

Question 40 continues the next page

Do NOT write in this area.

Calculate the volume of the trophy. Give your answer correct to the nearest cm^3. **4**

End of paper

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Killara High School

Mathematics Standard 2 Trial 2025

Solutions and feedback

General feedback

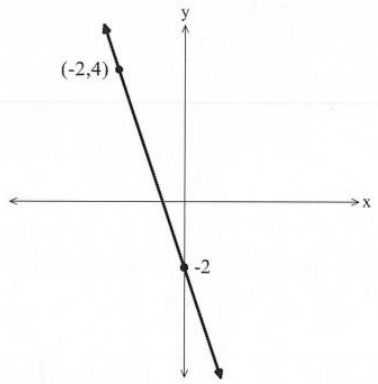
- Topics which students generally scored low in: Networks and Critical Path, Linear Relationships and Annuities.
- If a question provides a table, use the table.
- Make sure you know which measurement formulas are given on the formula sheet and which formula it applies to.

Question	Answer
1	D
2	D
3	B
4	A
5	D
6	B
7	A
8	A
9	B
10	D
11	A
12	B
13	B
14	C
15	C

Booklet 1

Question 16

The diagram below shows the graph of a line. The line passes through a point of $(-2,4)$. **2**



Find the equation of the line, in the form of $y = mx + c$.

$m = \frac{-2-4}{0--2}$ y-intercept = -2

$= \frac{-6}{2}$ ∴ $y = -3x - 2$

$= -3$

Criteria	Marks
Find the gradient	**1**
Find the correct equation	**2**

Feedback
This question was well done, but some students could not find the gradient.

Question 17

A researcher captures and tags 50 fish in a lake. Later in the week, the researchers returns and catches a sample of 200 fish, of which 10 are tagged. **2**

Estimate the total number of fish in the lake using the capture-recapture method.

$\frac{50}{N} = \frac{10}{200}$

$N = \frac{50 \times 200}{10}$

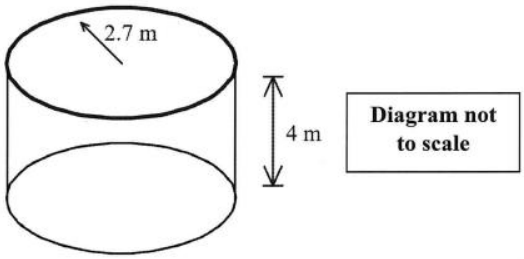
$N = 1000$ fish

Criteria	Marks
Establish an equation	**1**
Correct answer from correct working	**2**

Feedback
This question was well done.

Question 18

A cylindrical water tank with a radius of 2.7 m and a height of 4 m is shown below.



Calculate the surface area of the water tank? Correct to two decimal places.

$SA = 2\pi r^2 + 2\pi rh$

$= 2\pi (2.7)^2 + 2\pi (2.7)(4)$

$= 113.66\ m^2$

Criteria	Marks
Find either the area of the two circles or the curved surface	1
Correct answer from correct working	2

Feedback
This question was well done, but some students did not write down the unit, which was not penalised this time. In the HSC, please include appropriate units in the final step.

Question 19

The flight time from Sydney to Dubai is approximately 13 hours. 2
The Universal Coordinated Time of Dubai is +4 and Sydney is +10.

A plane departs Sydney local time at 11.00pm Sunday for Dubai.

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

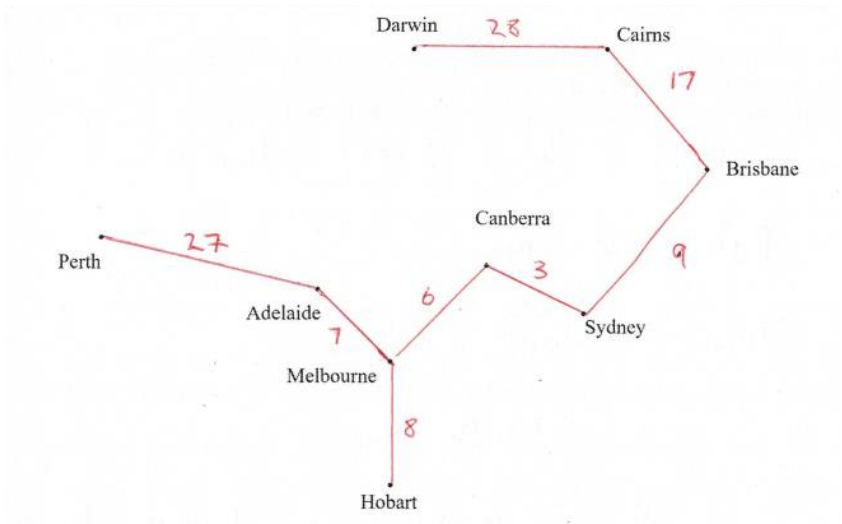
11pm + 13 = 12 Noon Sydney

12 - (10 - 4) = 6am Dubai time

Criteria	Marks
Find the landing time in Sydney or equivalent	1
Correct answer	2

Feedback This question was well done. Many wrote down the day as well, which is a good habit.

Question 20



Total length: 10,500 km

Criteria	Marks
For correct edges or labelling lengths	**1**
For correct edges and labelling the lengths	**2**
Correct solution and previous	**3**

Feedback
Small number of students didn't label the edges and lengths

Question 21 a)

(a) Lauren's height is 151 cm. Calculate Lauren's z-score. 1

$z = \frac{151 - 160}{6}$

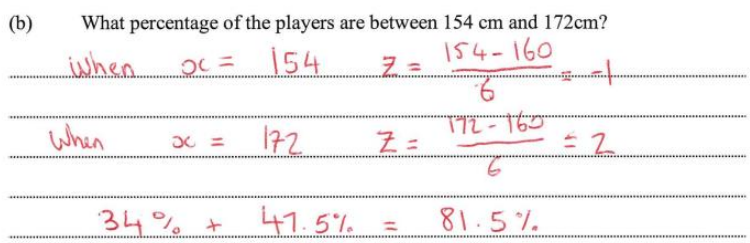
$= -1.5$

Criteria	Marks
Correct solution with relevant working	**1**

Feedback
Generally done well.

Question 21 b)

(b) What percentage of the players are between 154 cm and 172cm? **2**

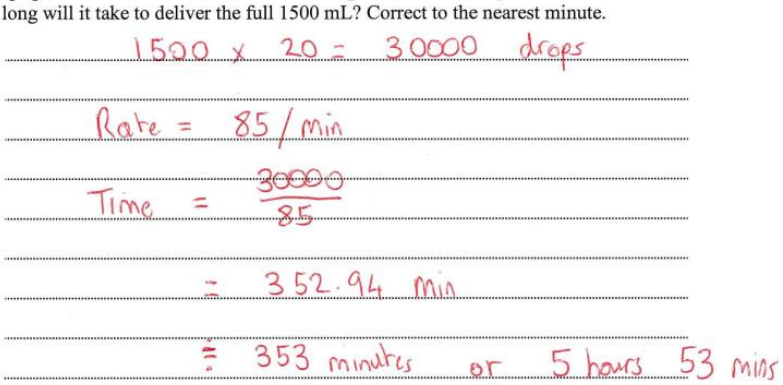


Criteria	Marks
Finding Z-score	**1**
Finding percentage of players	**2**

Feedback
Small numbers of students didn't work out the percentage of the players between 154 cm and 172 cm

Question 22

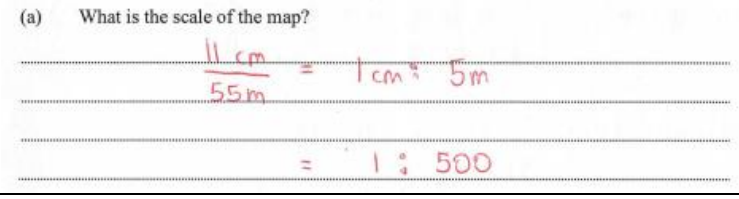
A patient is receiving 1500 mL of fluid through an intravenous drip at a constant rate of 85 drops per minute. Each millilitre of fluid is equivalent to 20 drops. How long will it take to deliver the full 1500 mL? Correct to the nearest minute. **3**



Criteria	Marks
For finding number of drops	**1**
Finding the time	**2**
For correct solution with relevant working	**3**

Feedback
Some students divided 1500 by 20 drops instead of multiplying. Most students answered this well.

Question 23 a)


(a) What is the scale of the map? 1

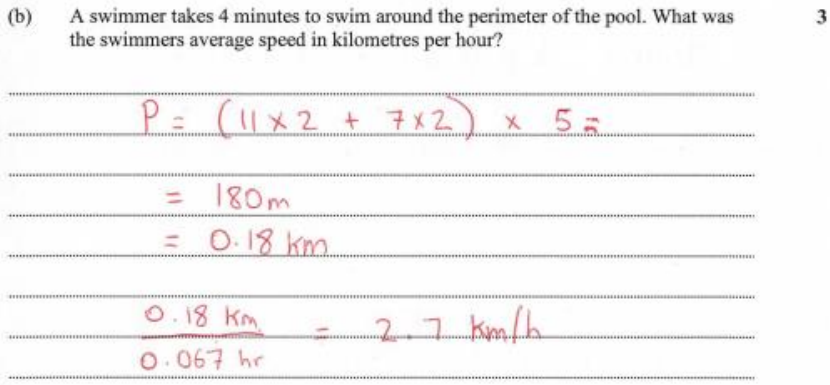
$\frac{11\text{ cm}}{55\text{m}} = 1\text{ cm} : 5\text{m}$

$= 1 : 500$

Criteria	Marks
Correct ratio	**1**

Feedback
Small number of students forgot to convert 5m to cm first.

Question 23 b)


(b) A swimmer takes 4 minutes to swim around the perimeter of the pool. What was the swimmers average speed in kilometres per hour? 3

$P = (11 \times 2 + 7 \times 2) \times 5 =$

$= 180\text{m}$

$= 0.18\text{ km}$

$\frac{0.18\text{ km}}{0.067\text{ hr}} = 2.7\text{ km/h}$

Criteria	Marks
Correct working for finding the perimeter	**1**
Converting to km per hour	**1**
Calculating speed	**1**

Feedback
Some students worked out the area instead of perimeter. The students who calculated perimeter forgot to multiply the answer by the scale factor of 5m.

Question 24

Tom is an apprentice electrician and earns a taxable income of $63200. Using the tax table below, calculate Tom's total tax payable, including the Medicare levy.

Taxable Income Range	Tax on This Income
$0 - $18200	Nil
$18201 - $45000	19c for each $1 over $18200
$45001 - $120000	$5092 + 32.5c for each $1 over $45000
$120001 and over	$29467 + 37c for each $1 over $120000

Medicare Levy: 2% of taxable income (if income is above $27000 for an individual).

Tax payable = $5092 + 0.325 x (63200 - 45000)
= $11,007

Medicare levy = 2% x 63200
= $1264

∴ Total = $11,007 + $1264

= $12271

Criteria	Marks
Using correct tax bracket	1
Finding tax payable	1
Calculating Medicare levy	1
Correct solution with relevant working	1

Feedback
Some students did not multiply taxable income by 2% to find the medicare levy. Some calculated tax payable by multiplying marginal tax rate with correct income but forgot to add the tax on the previous taxable income range.

Question 25 a)

Based on the equation, what is the height of the ball when it is kicked?

When $x = 0$

$y = 0.7$ m

Criteria	Marks
Correct solution	1

Feedback
Small number of students did not know how to find the height for the initial kick from the graph

Question 25 b)

Based on the graph, at what distances is the ball at $\frac{5}{8}$ of its maximum height?

Max height = 3.2m

$\frac{5}{8} \times 3.2 = 2m$

When $y = 2$ $x = 1.5m$ and $8.5m$

Criteria	Marks
Finding the $\frac{5}{8}$ of the max height	**1**
Both correct distances	**2**

Feedback
Small number of students did not find the distances the height after calculating maximum height.

Question 26

Liam is saving for a car. He has $4,000 to invest and is considering two different options:

- **Option 1:** A savings account that pays **compound interest** at 3.5% per annum, compounded annually.
- **Option 2:** A term deposit account that pays **simple interest** at 4% per annum, with the total interest paid at the end of the term.

Liam plans to keep the money invested for 3 years before buying the car.

Which option should Liam choose to maximise his savings? Justify your answer with relevant calculations and working out.

Option 1: $FV = 4000(1 + 0.035)^3$
$= \$4434.87$

Option 2: $I = 4000 \times 0.04 \times 3$
$= \$480$

$\therefore 4000 + 480 = \$4480$

Option 2 pays more interest, $480 instead of $434.87

Criteria	Marks
Finding Option 1	**1**
Finding Option 2	**1**
Justifying answer with calculations	**1**

Feedback
Most student answer this well but some mistakes in their justification when comparing interest and total investment.

Question 27

Find the value of θ, correct to the nearest minute.

$BC^2 = 10^2 - 6^2$

$BC^2 = 100 - 36$

$BC^2 = 64$

$BC = 8$ cm

$\tan\theta = \frac{8}{12}$

$\theta = \tan^{-1}\left(\frac{8}{12}\right)$

$\theta = 33^\circ 41'$

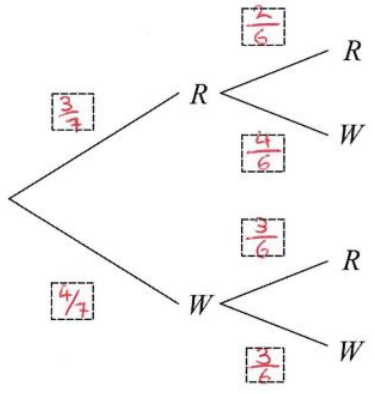
Criteria	Marks
Finding length BC	**1**
Recognising tan ratio	**1**
Correct solution with relevant working	**1**

Feedback

Small numbers of students did not use Pythagoras to find BC.

For finding θ, students did not find the reciprocal of tangent to find the angle or used the wrong ratio.

Question 28 a)



(a) Complete the tree diagram if Kalyan does not replace the ball. **2**

Criteria	Marks
At least two correct probabilities	**1**
Correct solution	**2**

Feedback

Most common mistake was not to consider that they are dependent events which impacts the probabilities.

Question 28 b)

Determine the probability that Kalyan picks at least one white balls?

$P(\text{at least one white}) = 1 - P(RR)$

$= 1 - \left(\frac{3}{7} \times \frac{2}{6}\right)$

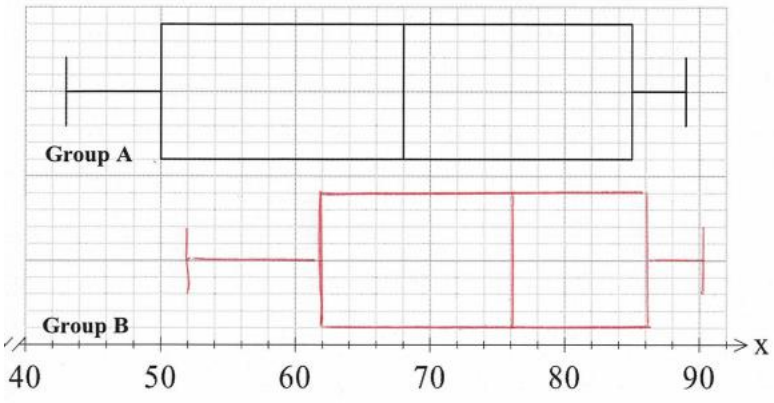
$= \frac{6}{7}$

Criteria	Marks
Finding the correct probability of (RR) or at least two of the following: (RW), (WR) and WW)	**1**
Correct solution with relevant working	**2**

Feedback

This was generally answered poorly. Some students only accounted for (White,Red)and (Red,White) without taking into (White, White) for at least one white.

Question 29 a)



Draw the box plot for Group B in the space above using the following data:

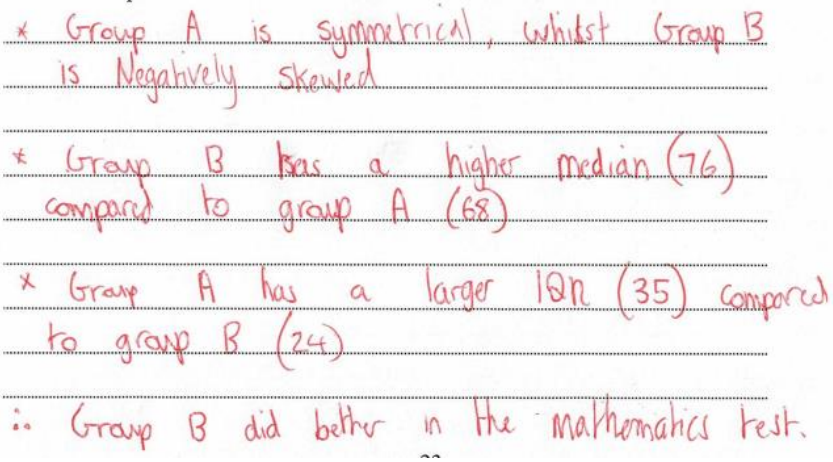
Criteria	Marks
Correct box plot	**1**

Feedback

This question was answered well. Please bring a ruler to the HSC.

Question 29b)

By comparing the two box plots, which group did better in the mathematics test? Justify your answer with reference to the skewness, measures of centre and measures of spread.



Criteria	Marks
One correct comment on either measure of spread, measure of centre or skewness	**1**
Two correct comments	**2**
Three correct comments and conclusion Group B did better	**3**

Feedback

Students typically commented on the median for measure of centre but some referred to the value incorrectly as the mean. Most common mistake was to say that Group B was positively skewed instead of negatively skewed. Also provide values to support your answer.

Booklet 2

Question 30

Find θ given it is an obtuse angle. Give your answer to the nearest minute.

$$\frac{\sin\theta}{17} = \frac{\sin 32}{12.6}$$

$$180 - \theta = \sin^{-1}\left(\frac{17 \times \sin 32}{12.6}\right)$$

$$\theta = 180 - 45.6407\ldots$$

$$= 134^\circ 22'$$

Criteria	Marks
Attempting to use the sine rule	1
Finding acute value for θ	2
Correct solution with relevant working	3

Feedback

Most students recognised they need the sine rule for find θ, however many students made errors in finding θ. Also many students did not subtract from 180 degrees to find the obtuse angle.

Question 31 a)

Time periods	*Interest rate per period*				
	1.0%	1.5%	2.0%	2.5%	3.0%
4	4.0604	4.0909	4.1216	4.1525	4.1836
8	8.2857	8.4328	8.5830	8.7361	8.8923
12	12.6825	13.0412	13.4121	13.7956	14.1920
16	17.2579	17.9324 (a)	18.6393	19.3802	20.1569
20	22.0190	23.1237	24.2974	25.5447	26.8704
24	26.9735 (b)	28.6335	30.4219	32.3490	34.4265

(a) Archie deposits \$2200 each quarter into an annuity account for 4 years. The account pays interest at a rate of 6% p.a., compounding quarterly. **2**

Calculate the future value of Archie's investment.

$$FV = 2200 \times 17.9324$$

$$= \$39451.28$$

Criteria	Marks
Finding correct value from the table	1
Correct solution with relevant working	2

Feedback

A lot of students attempted to use the compound interest formula. Always use the table if it is provided.

Question 31 b)

Katrina wants to have a future value of $20 000 at the end of 2 years. She can make monthly deposits into an account that earns 12% interest p.a., compounding monthly.

What should her monthly deposit be, correct to the nearest cent?

$20000 = 26.9735 \times M$

$M = \frac{20000}{26.9735}$

$= \$741.47$

Criteria	Marks
Finding correct value from table	1
Correct solution with relevant working	2

Feedback
Most students did not use the table to find the value of a.

Question 32

Sarah has a credit card. The credit card has no interest free period. Compound interest is charged daily at the rate of 18% per annum.

Her credit card statement for the month of April shows the following details:

Description	Date	Amount ($)
Opening Balance	01-Apr	$1200.00
Purchase - Electronics	10-Apr	$350.00

Interest charged includes the date of purchase, and the date of payment. The date of payment is 30th April.

Calculate the total amount Sarah owes at the end of April, including the interest charged for the month.

$r = \frac{18\%}{365}$

$FV = 1200\left(1 + \frac{0.18}{365}\right)^{30} + 350\left(1 + \frac{0.18}{365}\right)^{21}$

$= \$1571.52$

Criteria	Marks
Finding r **or** correct compounding periods	1
Finding r **and** correct compounding periods Or Finding r and correct method of working with a mistake in compounding period	2
Correct solution with relevant working	3

Feedback
Most students calculated r correctly but did not separate the two amounts for their compounding periods

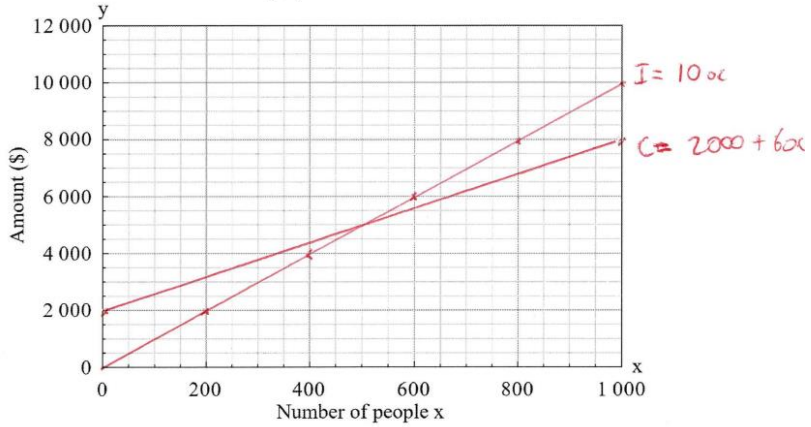
Question 33 a)

$$C = 2000 + 6x$$

The centre charges \$12 per person. Its income I, in dollars, is given by:

$$I = 10x$$

(a) Sketch the two functions on the graph below: **2**



Criteria	Marks
One correct function	**1**
Both correct functions with labels	**2**

Feedback
Some students did not label the functions and sketch using a ruler.

Question 33 b)

How much greater is the income of the function centre when 600 people attend an event, than its income at the break-even point?

Breakeven = (500, 5000)

Income at $x=600$ $I = 600 \times 10$

$= 6000$

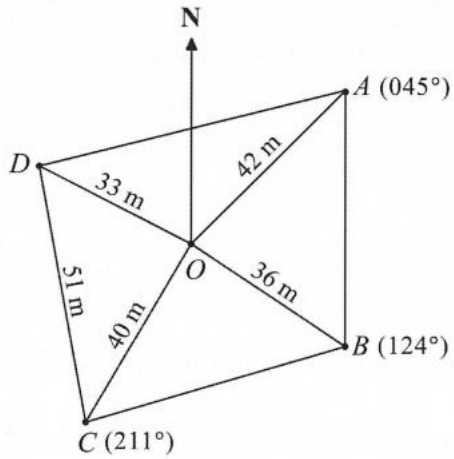
∴ \$1000 more

Criteria	Marks
For finding income at \$600 or \$500	**1**
Correct solution with relevant working	**2**

Feedback
Many students found the profit at 600 instead of the difference in income between 500 and 600.

Question 34

A radial survey is shown.



Find the area of ΔAOD, correct to the nearest square metre.

$\angle DOC$ $\cos \angle DOC = \frac{33^2 + 40^2 - 51^2}{2 \times 33 \times 40} = \frac{1}{30}$

$\angle DOC = \cos^{-1}\left(\frac{1}{30}\right)$

$\angle AOD = 360 - 211 - \cos^{-1}\left(\frac{1}{30}\right) + 45$

$= 105.9102132...^\circ$

Area of $\Delta AOD = \frac{1}{2} \times 33 \times 42 \times \sin(105.91...)$

$= 666 m^2$

Criteria	Marks
Attempt to find $\angle DOC$ or attempt to use Area of triangle formula	**1**
Finding the correct size of $\angle AOD$	**2**
Using the Area of triangle formula with values found	**3**
Correct solution with relevant working	**4**

Feedback

Many students tried to find the area of ΔAOD without first finding the angle and made incorrect assumptions about angles.

Question 35 a)

Table of present value interest factors

Time periods	*Interest rate per period as a decimal*			
	0.002	0.0025	0.003	0.0035
12	11.845	11.807	11.769	11.731
18	17.663	17.580	17.497	17.415
24	23.410	23.266	23.123	22.981

Myles deposits $45 000 into a bank account which earns 3% interest per annum, compounding monthly.

(a) Show, using suitable calculations, that Myles cannot withdraw $2000 per month over 2 years. **2**

$R = 0.03 \div 12 = 0.0025$

$n = 24$

$ax = 45000 \qquad x = 23.266$

$a = \$1934.15 < \$2000$

Criteria	**Marks**
Correct value from table	**1**
Correct solution with relevant working	**2**

Feedback
Many students did not use the table to find the value of a.

Question 35 b)

Myles decides to let the $45 000 sit in the account earning compound interest for the first 12 months and then make regular monthly withdrawals for 2 years. Will Myles now be able to withdraw $2000 each month? Justify your answer with calculations.

$a \times 23.266 = 45000(1 + 0.0025)^{12}$

$a = 1992.98$

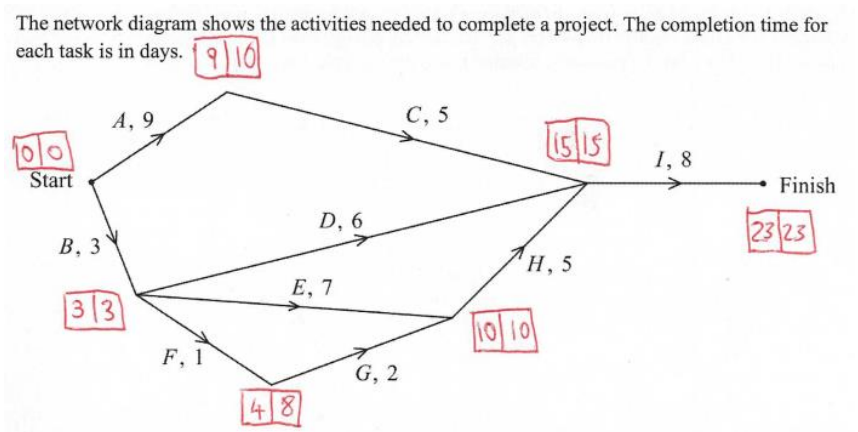
Myles cannot draw more than $1992.98

∴ Myles cannot withdraw $2000 each month

Criteria	**Marks**
Compound interest amount over first 12 months or Correct value from the table	**1**
Correct solution with relevant working	**2**

Feedback
Once again, students did not use the table. Some students were able to correctly find the compounding interest amount over the first 12 months.

Question 36 a)



(a) Find the minimum completion time to finish the project. **1**

23 days

Criteria	Marks
Finding the minimum completion time.	**1**

Feedback
This was not done as well as it should have been. Students need to know how to find the critical path, minimum completion time, and understand why they are related.

Question 36 b)

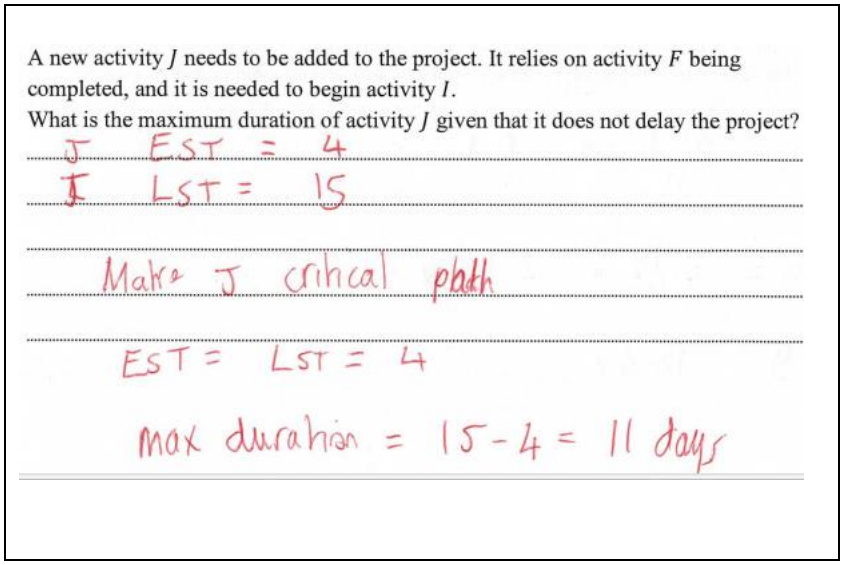
What is the latest start time of activity C?

LST = 15 - 5 = 10 day 10

Criteria	Marks
Finding the latest start time of the activity – with working or reasoning.	**1**

Feedback
Students needed some evidence on the diagram or in the working space for where their number came from.

Question 36 c)


A new activity J needs to be added to the project. It relies on activity F being completed, and it is needed to begin activity I.
What is the maximum duration of activity J given that it does not delay the project?

J EST = 4

I LST = 15

Make J critical path

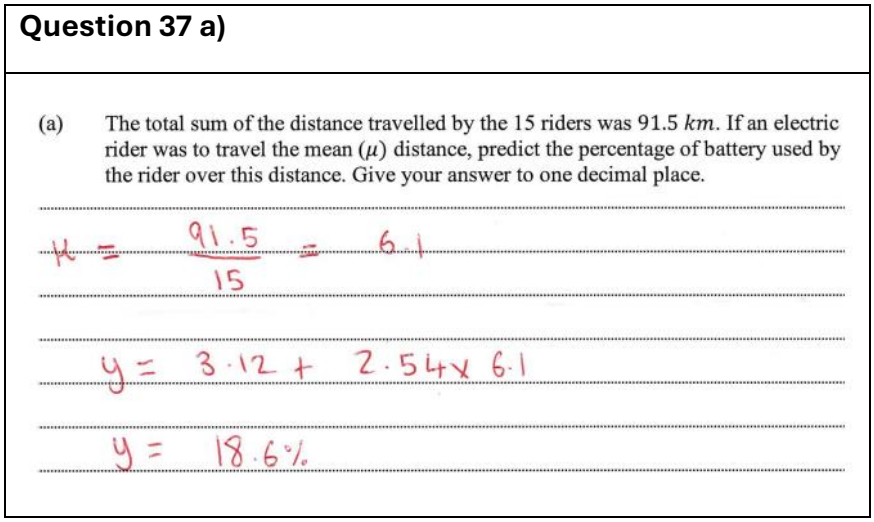
EST = LST = 4

max duration = 15 - 4 = 11 days

Criteria	Marks
Drawing activity J on the diagram and some attempt to find the duration.	**1**
Finding the duration of the activity with working.	**2**

Feedback
This was not done well. Many students found the float time of an activity, which was not relevant to this question. Drawing the activity on the diagram helped students understand what the question was asking.

Question 37 a)


(a) The total sum of the distance travelled by the 15 riders was 91.5 km. If an electric rider was to travel the mean (μ) distance, predict the percentage of battery used by the rider over this distance. Give your answer to one decimal place.

$\mu = \frac{91.5}{15} = 6.1$

$y = 3.12 + 2.54 \times 6.1$

$y = 18.6\%$

Criteria	Marks
Using the least squares regression line with 91.5 OR Finding the mean distance	**1**
Finding the mean distance as substituting into the regression line	**2**

Feedback
This was done well by many students.

Question 37 b)

(b) Given that the correlation coefficient of the data set is $r = 0.95$.

Using the least squares of regression line and the correlation coefficient, describe and interpret the data with reference to the context given.

* r = 0.95 suggests a strong positive correlation

* 3. Gradient of the least squares regression is 2.54 which means for each km travelled, the battery charge reduces by 2.54%

* y-intercept = 3.12. This suggests the battery used would be 3.12% if the rider has not travelled. This value is a limitation of the data set because you would think the battery would still be at 100%.

Criteria	Marks
Interpreting the correlation coefficient OR one number in the equation	**1**
Interpreting the correlation coefficient OR one number in the equation	**2**
Giving three different descriptions / interpretations including using the correlation coefficient and the equation.	**3**

Feedback
Many students got at least one mark here, but not many got all three. Students needed specific descriptions or interpretations and needed to refer to numbers given. Many students repeated themselves, or gave two sentences describing the same idea from the graph.

Question 38 a)

(a) Explain why only a section of this graph applies to the context of stopping distances

$s \geq 0$ and $d \geq 0$

because negative distance and negative speed is meaningless in this context

Criteria	Marks
Explaining that distance or speed can't be negative.	**1**

Feedback
The was done reasonably well.

Question 38 b)

The equation of the graph is given by;

$$d = 0.014s^2 + ks$$

By choosing a suitable point on the graph, find the value of k.

$60 = 0.014 \times 50^2 + 50k$

$k = 0.5$

Criteria	Marks
Substituting a relevant coordinate into the equation.	**1**
Substituting and solving for k.	**2**

Feedback
This was done reasonably well be many students.

Question 38 c)

Calculate the stopping distance of a car travelling at 80 km/h

$d = 0.014 \times 80^2 + \frac{1}{2} \times 80$

$d = 129.6$ m

Criteria	Marks
Finding the distance using the equation.	**1**

Feedback
This was done well for students who did the last part.

Question 39 a)

The IQ scores of adults are normally distributed in various towns, with different means and standard deviations.

The table below shows the mean and standard deviation of IQ scores in two towns.

	Mean	*Standard Deviation*
Town A	100	15
Town B	104	10

(a) Lachlan's IQ is higher than the same percentage of adults in Town A and Town B.

By setting up an equation, calculate Lachlan's IQ score.

$\frac{x-100}{15} = \frac{x-104}{10}$

$\times 30 \qquad \times 30$

$2x - 200 = 3x - 312$

$x = 112$

$z \text{ score} = \frac{12}{15} = \frac{8}{10} = 0.8$

Criteria	**Marks**
Setting up the equation using the *z*-score formula	**1**
Finding the *z*-score after setting up an equation.	**2**

Feedback

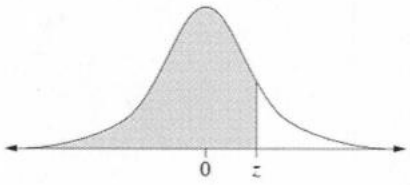
This was not well attempted by many students. Harder normal distribution questions should be an area for all students to revise.

Question 39 b)

This table shows the probability that a score is below a given z-score. The first decimal place of the z-score is in the left column, and the second decimal place of the z-score is across the top.

z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.6	0.726	0.729	0.732	0.736	0.739	0.742	0.745	0.749	0.752	0.755
0.7	0.758	0.761	0.764	0.767	0.770	0.773	0.776	0.779	0.782	0.785
0.8	0.788	0.791	0.793	0.797	0.800	0.802	0.805	0.808	0.811	0.813

The probability values given in the table for different values of z are represented by the shaded area in the following diagram.



Lachlan knows that his IQ is greater than 8600 people in Town B.

Calculate the population of Town B, to the nearest 100 people.

$\frac{8600}{P(z \leq 0.8)} = \frac{8600}{0.788} \approx 10913.70558$

≈ 10900 people

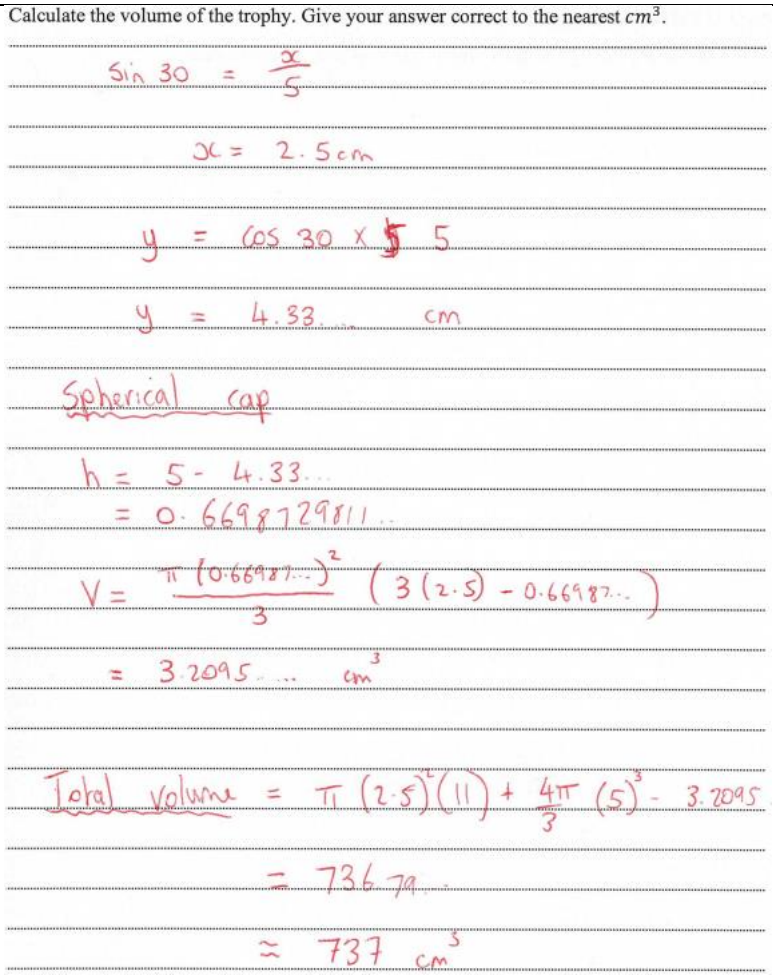
Criteria	Marks
Identifying the correct z-score from the table.	**1**
Using the z-score to find the population	**2**

Feedback

This didn't have many attempts, which was hard if part (a) was not done. Using z-score tables should be revised too.

Question 40

Calculate the volume of the trophy. Give your answer correct to the nearest cm^3.



Criteria	Marks
Finding the volume of the sphere OR finding the other side lengths of the triangle	**1**
Finding the volume of the sphere AND finding the other side lengths of the triangle	**2**
Finding the volume of the sphere AND finding the volume of the cylinder OR Finding the volume of the sphere AND finding the volume of the spherical cap	**3**
Finding the volume of the figure with clear, logical working	**4**

Feedback

Many students attempted and received some marks here. However, most students need to review different measurement and trigonometry formulas, and how approach larger, unscaffolded questions.

NOTE: the r value in the formula given wasn't clear – it was meant to be the radius of the sphere, however, if students used the radius of the cylinder, they were still awarded the marks.