
Student Number

Barker College

2024 TRIAL HIGHER SCHOOL CERTIFICATE EXAMINATION

Mathematics Standard 2

AM THURSDAY 15TH AUGUST
160 copies

Staff Involved

- RJW- R. Williams
- JAI- J. Iles
- PDJ- P. Jouliany
- BHC- B. Carruthers
- SJB- S. Byun
- GPF- G. Fitzmaurice
- ARP- A. Perkins
- RAS- R. Smith*

Topics Covered

Investments, Depreciation and Loans	Non-right-angled Trigonometry	Rates and Ratios
Simultaneous Linear Equations	Bivariate Data Analysis	Network Concepts
Non-linear Relationships	Critical Path Analysis	All Year 11 Content

General Instructions:

- Write your Student Number at the top of this page and all answer pages.
- Reading time - 10 minutes
- Working time – 2 hours and 30 minutes
- Write using black pen
- Calculators approved by NESA may be used
- A separate reference sheet is provided
- Marks may not be awarded for careless or poorly arranged working
- Diagrams are not to scale
- For questions in Section II, show relevant mathematical reasoning and / or calculations

Total marks: 100

Section I – 15 marks (pages 2 - 8)
- Attempt Questions 1 - 15
- Allow about 25 minutes for this section

Section II – 85 marks (pages 9 - 30)
- Attempt Questions 16 - 42
- Allow about 2 hours and 5 minutes for this section

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.
Choose the best response and fill in the corresponding response oval completely.

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1. What is 56 842 110.6 expressed in scientific notation, rounded to two significant figures?

A. 5.6×10^7

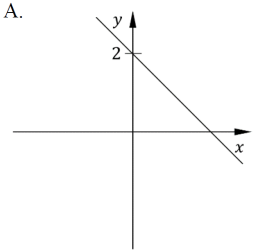
B. 5.7×10^7

C. 5.68×10^7

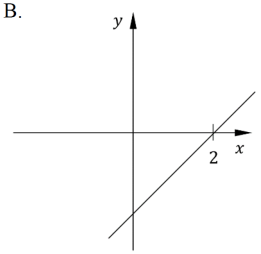
D. 5.68×10^{-7}

2. Which of the following could be the graph of $y = 2x - 1$?

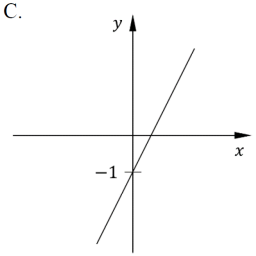
A.



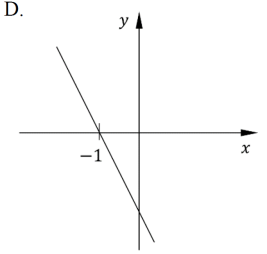
B.



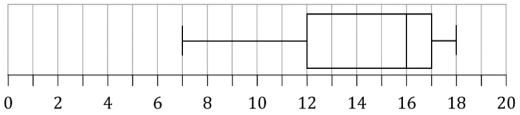
C.



D.



3. The box-plot shows the age of students attending an athletics carnival.



What is the interquartile range of this dataset?

A. 4

B. 5

C. 11

D. 16

4. Joni is on a yacht in Fiji (18°S, 178°E) and sails to Guam (13°N, 145°E).

Which of the following best describes Joni's journey from Fiji to Guam?

A. Joni sailed 5° north and 33° west

B. Joni sailed 5° north and 33° east

C. Joni sailed 31° north and 33° west

D. Joni sailed 31° north and 33° east

5. David was studying the salamander population in the local forest. He caught and marked 20 salamanders and released them back into the forest. Later, he caught 40 salamanders, of which 5 were already marked.

Based on the number he had already caught and marked, what is the most likely estimate for the salamander population in the forest?

A. 60 salamanders

B. 100 salamanders

C. 160 salamanders

D. 200 salamanders

6. Taylor bought a car for $32 000 in 2014 and sold it 10 years later in 2024. It depreciated according to the declining balance method at a rate of 6% per annum.

By how much had the car depreciated, to the nearest dollar, when Taylor sold it?

A. $14 764

B. $17 236

C. $19 200

D. $25 307

7. The weather forecast for a certain week states that there is a 35% chance that it will rain on any particular day that week.

What is the probability that it does NOT rain on the weekend?

A. 0.1225

B. 0.4225

C. 0.5775

D. 0.8775

8. Saxon attempted to solve the equation $3 - \frac{x}{5} = 7x$. After he finished, Saxon realised that the final answer that he had calculated was incorrect. His working is shown below.

$$3 - \frac{x}{5} = 7x$$

$$15 - x = 35x \quad \text{Line 1}$$

$$15 = 34x \quad \text{Line 2}$$

$$x = \frac{34}{15} \quad \text{Line 3}$$

On which line(s) did Saxon make a mistake?

A. Line 1 only

B. Line 1 and line 3

C. Line 2 only

D. Line 2 and line 3

9. Chad bought 430 shares in a biomedical company for a total cost of $5500. The dividend yield was 8.5%.

What was the value of the dividend per share?

A. $1.09

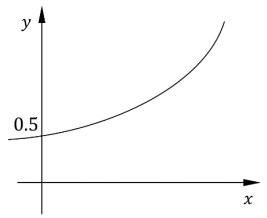
B. $1.27

C. $3.66

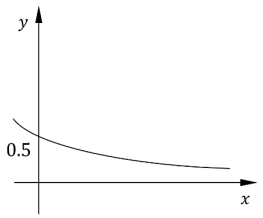
D. $4.68

10. Which of the following could be a possible graph of $y = k(a^x)$, where k is greater than 1 and a is between 0 and 1?

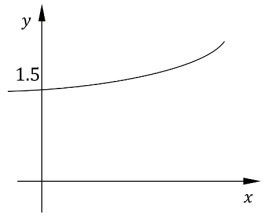
A.



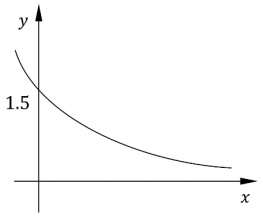
B.



C.



D.



11. Which of the following would most likely show a negative correlation?

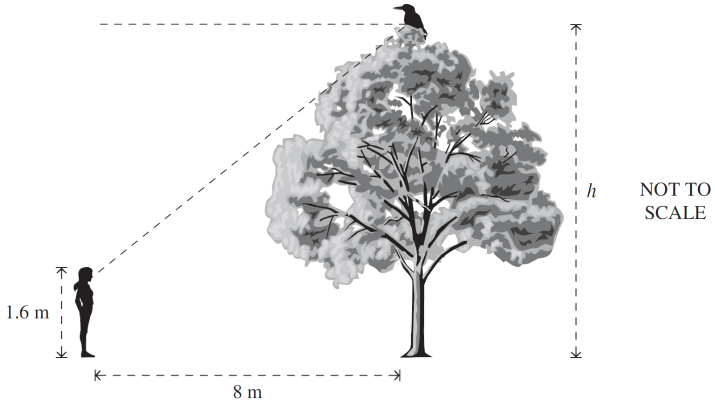
A. The hours spent training for a race and the time taken to complete the race.

B. The price of petrol and the number of people taking public transport to work.

C. The time a student spent studying for an exam and their final score.

D. The eye colour of a child and their favourite colour.

12. Karen is watching a bird at the top of a tree. Karen is 1.6 m tall and is standing 8 metres away from the tree, as shown in the diagram.



If the angle of depression from the bird to Karen is 73°, what is the height of the tree?

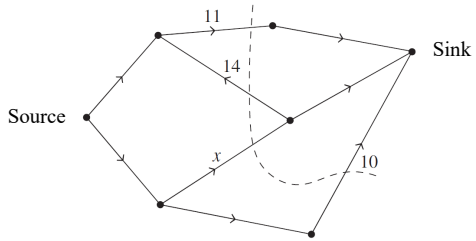
A. 2.45 m

B. 4.05 m

C. 26.17 m

D. 27.77 m

13. Consider the following network.



The capacity of the cut shown on the network is 40.
What is the value of x?

A. 5

B. 15

C. 16

D. 19

14. The student population at a school is shown in the table below.

Year Group	7	8	9	10	11	12	Total
Number of Students	118	154	161	195	140	132	900

Dr Chua, a statistician, wishes to survey 10% of the student population. He surveys an equal number of students in each year group.

How would the number of students surveyed in Years 10 and 11 change if he had chosen to use a stratified sample?

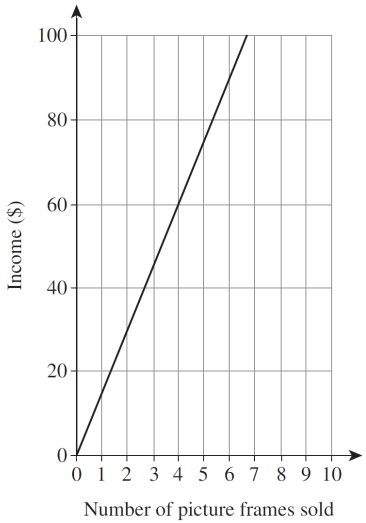
A. Increase in both Year 10 and Year 11 students

B. Decrease in both Year 10 and Year 11 students

C. Increase in Year 10 and Decrease in Year 11 students

D. Decrease in Year 10 and increase in Year 11 students

15. The graph below shows income, in dollars, for a business that makes and sells picture frames.



The cost of making the picture frames is given by the formula:

$$C = 10n + 20$$

where C is the cost and n is the number of picture frames sold.

If 6 picture frames are made and sold, which of the following statements is true?

A. There is a profit of $10.

B. There is a loss of $10.

C. There is a profit of $90.

D. There is a loss of $80.

End of Section I

Barker College

Mathematics Standard 2

Section II Answer Booklet

85 marks
Attempt Questions 16 – 42
Allow about 2 hours and 5 minutes for this section

Instructions:

- Answer the questions in the spaces provided. These spaces provide guidance for the expected length of response.
- Your responses should include relevant mathematical reasoning and/or calculations.
- Extra writing paper is available.

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Question 16 (2 marks)

The cost of a new clothes dryer is $499. The dryer uses 315 kWh of electricity per year and electricity is charged at 28.66 cents per kWh.

What is the total cost of purchasing and running the dryer over three years? **2**

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Question 17 (2 marks)

The five number summary for the dataset representing heights of Year 12 students is shown below.

Minimum	154 cm
Lower quartile (Q_1)	172 cm
Median	175 cm
Upper quartile (Q_3)	182 cm
Maximum	189 cm

Show that the shortest person must be an outlier. **2**

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Question 18 (2 marks)

Ariel invested $500 for 6 years in an account with interest of 4% p.a., compounded six-monthly.

What is the future value of this investment? Round your answer to the nearest cent. **2**

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Question 19 (2 marks)

On a set of bathroom scales, a person's weight is measured as 78.4 kg.

What are the upper and lower bounds of the person's actual weight? **2**

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Question 20 (2 marks)

Charles purchased a $560 printer for his home office five years ago. Based on the straight-line method of depreciation, the value of the printer now is $325.

By how much did the printer depreciate each year? **2**

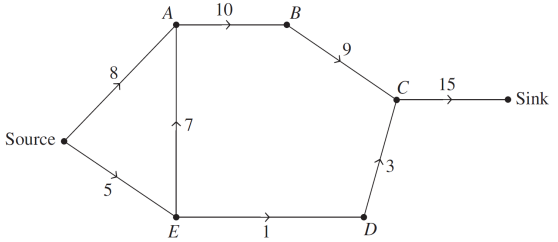
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Question 21 (2 marks)

Consider the following network diagram.



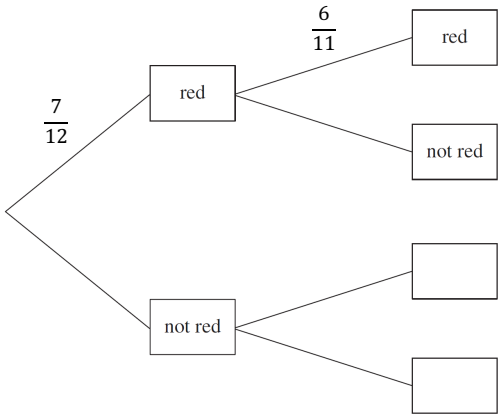
Draw the minimum cut on the network and hence determine the maximum flow. **2**

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Question 22 (4 marks)

A bag contains 3 white, 7 red and 2 purple marbles. Sally takes two marbles from the bag, without replacement, and records the outcomes in the tree diagram, as shown below.



(a) Complete the tree diagram. Include all missing **outcomes** in the boxes and all missing **probabilities** on the branches. **2**

(b) Find the probability that at least one of the marbles is red. **2**

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Question 23 (3 marks)

Jonah works as a cashier. In one week, he worked 38 hours normal time, three hours time-and-a-half and 2 hours double time.

If he was paid $999.75 for that week, what is his hourly rate of pay? **3**

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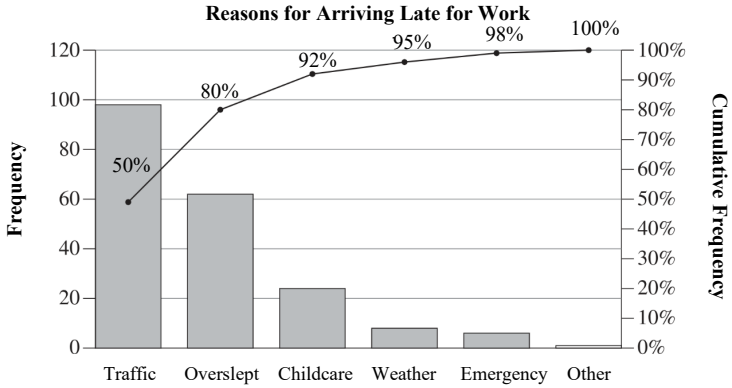
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Question 24 (2 marks)

The managers of a large company were examining the reported reasons why their employees arrived late to work. The results are shown in the Pareto chart below.



(a) What percentage of employees were late to work due to childcare issues? **1**

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(b) Using the Pareto principle, find the main reasons for employee lateness. **1**

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Question 25 (3 marks)

Solve $x + \frac{x+1}{3} = 8$. **3**

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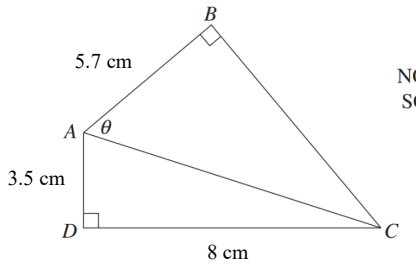
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Question 26 (3 marks)

Two right angled triangles, ABC and ADC are shown below.



NOT TO SCALE

Calculate the size of angle θ, correct to the nearest minute. **3**

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Question 27 (3 marks)

The brightness (B, in lumens) of a torch beam varies inversely with the distance (d, in metres) from the torch. The brightness of a torch beam 50 m from a torch was 16 lumens.

(a) Find the value of k, the constant of variation for this scenario. **2**

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(b) How far from the torch would the beam have a brightness of 40 lumens? **1**

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Question 28 (3 marks)

The table below shows the average energy used, in kilojoules per kilogram of body mass, by a person walking for 30 minutes at different speeds.

Walking Speed	Energy used in 30 mins
4 km/h	5.64 kJ / kg
6 km/h	7.48 kJ / kg

Steve, who weighs 75 kg, ate a cheeseburger containing 1808 kJ of energy. How long must he walk at 4 km/h to burn off the energy contained in the cheeseburger? Round to the nearest minute. **3**

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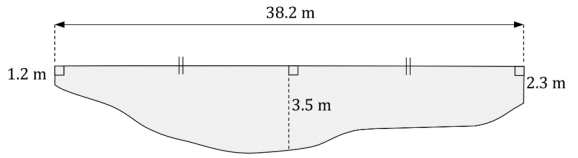
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Question 29 (3 marks)

The diagram below shows the cross-section of a river.



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Use two applications of the trapezoidal rule to estimate the area of the cross-section of the river, correct to the nearest square metre. **3**

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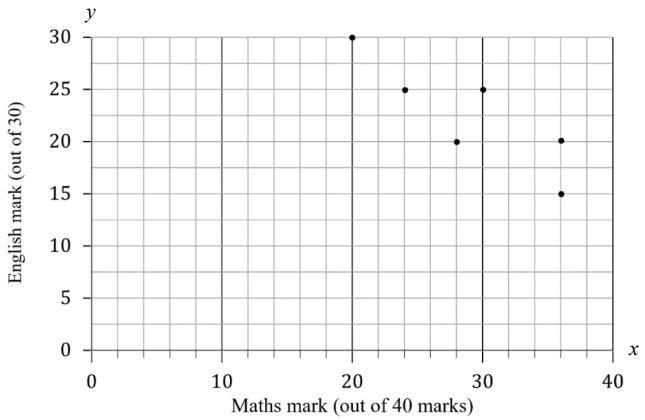
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Question 30 (5 marks)

A school collects bivariate data of students' marks in a Maths test (x) and an English essay (y). The graph below shows a scatterplot of these results.



(a) Calculate Pearson's correlation coefficient for the data, rounding to 2 decimal places. **1**

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(b) Identify the direction and strength of the relationship between the Maths marks and the English marks. **2**

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(c) Find the equation of the least squares regression line of best fit for this data. **1**

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(d) Predict the English result of a student who received a mark of 26 in their Maths test. Round your answer to the nearest whole number. **1**

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Question 31 (4 marks)

Jennifer has a credit card with the following conditions:

- There is no interest-free period.
- Interest is charged at the end of each month at 19.5% p.a., compounded daily
- The date of purchase and end of month are included in interest calculations.

Jennifer's credit card statement for October is shown below.

Credit Card Statement

Date	**Details**	**Amount ($)**
1 Oct	Opening Balance	$245.62
21 Oct	99 Bikes, Pennant Hills	$699.00
31 Oct	Closing Balance (incl interest)	***

What is Jennifer's closing balance? **4**

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Question 32 (3 marks)

The child dosage of a particular pain relief medication can be calculated using the formula:

$$C = \frac{aD}{a + 12}$$

where C is the child dosage in mL, a is the age of the child in years, and D is the adult dosage in mL.

At what age is the child's dosage exactly half of the adult dosage? **3**

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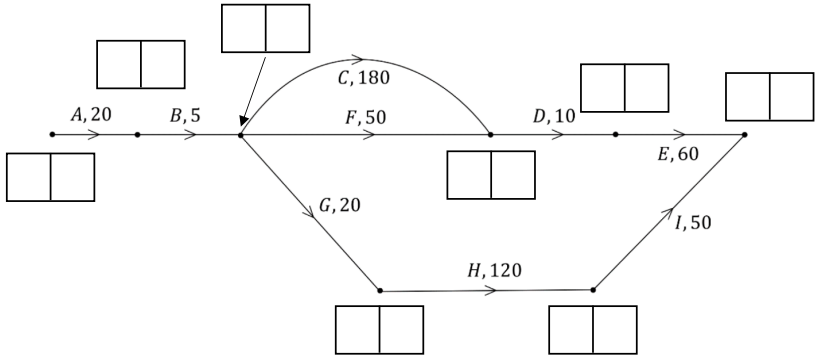
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Question 33 (5 marks)

A construction company is building new school classrooms.

A network diagram giving the completion time, in days, for each task of the construction process is shown below.



(a) By performing forward and backward scanning, fill in the EST and LST of each task on the diagram above. **2**

(b) List the critical path for this project **1**

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(c) Task *H* was delayed by 30 days due to a shortage of materials. By considering float time, or otherwise, explain why this would not affect the completion time of the project. **2**

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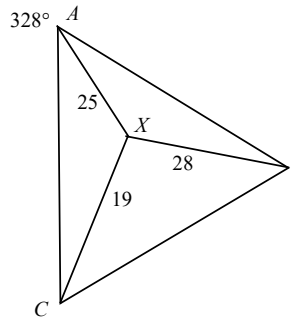
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Question 34 (4 marks)

The radial survey below shows the position of four towns: *A*, *B*, *C* and *X*. Towns *A* and *B* lie at a true bearing of 328° and 110° from town *X*, respectively. All distances are given in kilometres.



NOT TO SCALE

(a) By first finding angle *AXB*, find the distance between towns *A* and *B*. Give your answer to the nearest kilometre. **2**

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(b) If the area of triangle *XCB* is $265\,\text{km}^2$, find the true bearing of town *C* from town *X*. Round to the nearest degree. **2**

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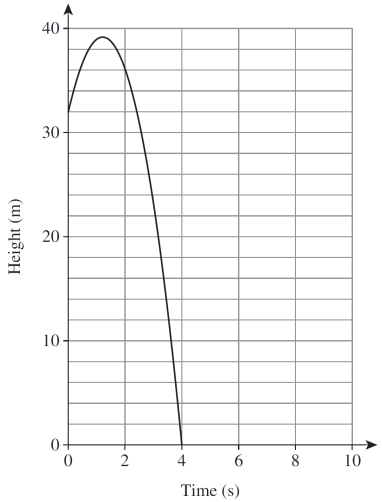
Question 35 (3 marks)

An object is thrown upwards from a cliff that overlooks the sea. The object's motion can be modelled using the function:

$$h = 32 + 12t - 5t^2$$

where h is the object's height above the sea in metres and t is the time in seconds.

The graph of this function is shown below.



(a) What is the height of the cliff? **1**

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(b) What is the height of the ball after 2 seconds? **1**

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(c) Given that the axis of symmetry of the parabola shown is $t = 1.2\ s$, find the maximum height that the object reaches after being thrown. **1**

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Question 36 (3 marks)

Kieran is travelling by aeroplane from Sydney (UTC +10) to Paris (UTC +1). His flight departs at 5am Monday, Sydney time, and arrives 3pm Monday, Paris time. Ignore daylight saving time.

If his plane stopped for 2 hours in Singapore, what was the total flying time for the journey? **3**

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Question 37 (3 marks)

A car uses 24 L of petrol on a trip of 210 km.

(a) Express this fuel consumption in L/100km. Round to one decimal place. **1**

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(b) Determine the cost of taking a 325 km trip if petrol was priced at 179.5 cents/L **2**

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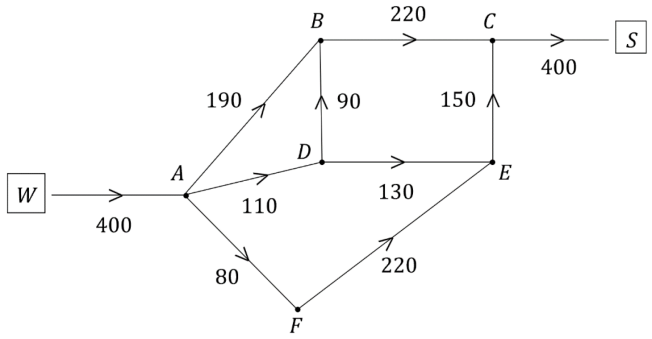
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Question 38 (3 marks)

The Sydney Water is planning the supply of water to a new subdivision.

Water starts at the water treatment plant (W) and passes through the existing network of water pipes to arrive at the new subdivision (S). The capacity of each pipe is labelled in kilolitres per hour (kL/h) on the network diagram.



(a) What is the maximum flow of water that can currently reach the subdivision S? **1**

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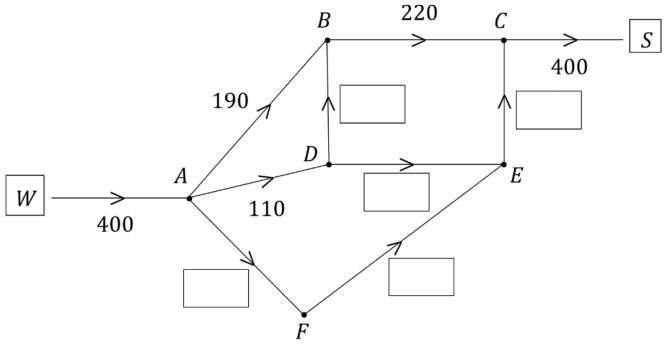
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Question 38 continues on the next page

Question 38 (continued)

(b) Sydney Water engineers determine that if the capacity of pipe *AF* is increased to 100 kL/h and the capacity of pipe *EC* is increased to 180 kL/h, then the flow of water to the subdivision can reach 400 kL/h. (You do not need to prove this)

On the network diagram below, write the flow rate through pipes AF, FE, DE, BD and EC that will allow water to reach the subdivision at 400 kL/h. **2**



End of Question 38

Question 39 (3 marks)

Amanda's taxable income for a particular year was $44 321.

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

(a) Use the tax table to find Amanda's income tax payable. **1**

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The amount of income tax her friend Hallie pays is exactly twice the amount that Amanda pays.

(b) Using the tax table above, find Hallie's taxable income. **2**

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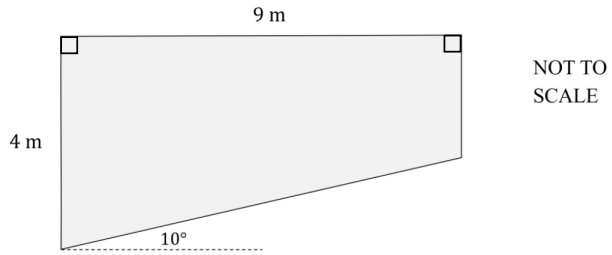
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Question 40 (4 marks)

A painter needs to paint a wall on one side of a home movie theatre. The wall is a trapezium, as shown in the shaded region of the diagram.



The wall is 9 metres long, has a height of 4 metres and the bottom edge has an angle of elevation of 10°.

(a) What is the area of the wall, correct to the nearest square metre? **3**

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(b) If a 5L tin of paint costs \$98 and covers 10 m^2, how much will it cost to paint the wall? **1**

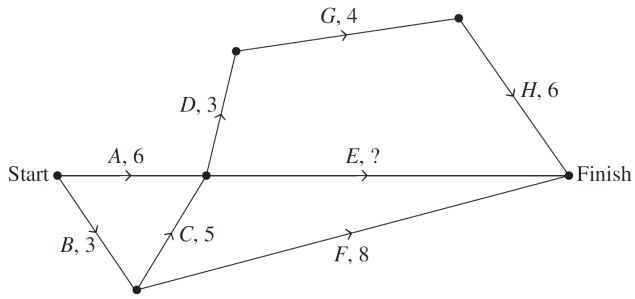
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Question 41 (6 marks)

The network diagram below shows the activities needed to be completed for a local council roadwork project and their duration in weeks. The duration of activity *E* is unknown.



The council has determined that activities *E* and *H* are critical.

(a) Determine the duration of activity *E*. **2**

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(b) List the critical path(s) for this project. **1**

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Question 41 continues on the next page

Question 41 (continued)

(c) It is possible to reduce the duration of certain activities. However, doing so will incur additional costs.

The table below shows the cost per week to reduce the duration of four activities.

Activity	Cost per Week
A	\$30 000
C	\$40 000
E	\$90 000
H	\$120 000

For example, to reduce the duration of activity *A* by two weeks, it will cost \$60 000.

The duration of each of these activities can be reduced by a **maximum of three weeks**.

What will be the **minimum cost** to reduce the total duration of the roadworks to 18 weeks?

In your answer state the activities that need to be reduced and the new durations of these activities. **3**

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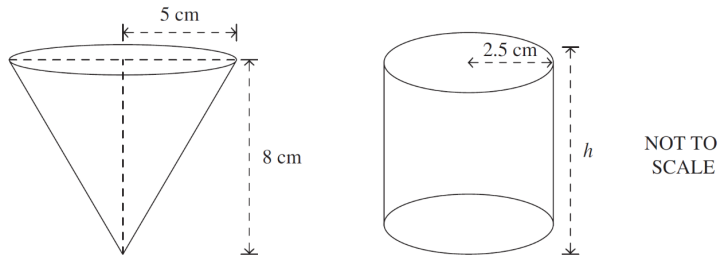
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End of Question 41

Question 42 (3 marks)

Jordan was investigating the capacities of different glass tumblers found in her parents' liquor cabinet. She used two tumblers, one in the shape of a cone and another in the shape of a cylinder, as shown below.



When Jordan completely filled the conical tumbler with water then poured it into the cylindrical tumbler, she found it only half filled the cylinder.

What is the height (h) of the cylindrical tumbler, correct to two decimal places? **3**

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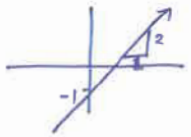
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End of Paper

Student Solutions
2024 Mathematics Standard 2 Trial

1. (B) 5.7×10^7

2. (C) $y = 2x - 1$
$m = 2$, $c = -1$
$\therefore$ 

3. (B) $IQR = 17 - 12 = 5$

4. $18°S \rightarrow 13°N = 31°N$
$178°E \rightarrow 145°E = 33°W$
$\therefore$ (C)

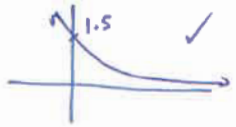
5. $\frac{20}{x} = \frac{5}{40}$
$\frac{20}{x} = \frac{1}{8}$
$\therefore x = 160$ (C)

6. $S = V_0(1-r)^n$
$\therefore S = 32000(1 - 6\%)^{10}$
$S \doteq \$17236$
$\therefore$ Depreciation $= 32000 - 17236$
$\doteq \$14764$ (A)

7. $0.65 \times 0.65 = 0.4225$
$\therefore$ (B)

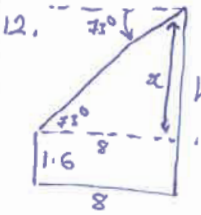
8. $3 - \frac{x}{5} = 7x$
$15 - x = 35x$ ✓ Multiply throughout by 5
$15 = 34x$ ✗ Should be $+x$, not $-x$. $(15 = 36x)$
$x = \frac{34}{15}$ ✗ Should divide by 34 $\left(x = \frac{15}{34}\right)$
$\therefore$ Errors in lines 2 & 3. (D)

9. $\$5500 \times 8.5\% \doteq \$467.50$
$\$467.50 \div 430$ shares
$\doteq \$1.09$ per share $\therefore$ (A)

10. (D) $y = k(a^x)$
$k > 1$ means the y-intercept is bigger than 1.
$0 < a < 1$ means the graph will be decreasing.


✓

11. (A) Hours spent on training increases leads to time taken to complete the race to decrease.

12. 

$\tan 73 = \frac{x}{8}$
$\therefore x = 8\tan 73$
$\therefore h = 1.6 + 8\tan 73$
$\doteq 27.77$m
(D)

13. $11 + x + 10 = 40$
$\therefore x = 19$ (D)

14. 10% of $900 = 90$
$90 \div 6$ year groups $= 15$ students each year group
If stratified:
$\frac{140 \text{ Year 11}}{900} \times 90 = 14$ in Year 11
$\frac{195 \text{ Year 10}}{900} \times 90 = 19.5$ in Year 10
$\therefore$ Increase Year 10 & decrease Year 11.
(C)

15. When $x = 6$, $C = 80$
$I = 90$
$\therefore$ Profit $= 90 - 80 = 10$
$\therefore$ Profit of \$10 (A)

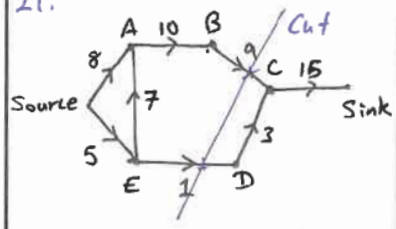
16.
315 kWh $\times \$0.2866 \times 3$ years
$+ \$499 \doteq \$769.84$

17. $IQR = 182 - 172 = 10$cm
$Q_1 - 1.5 \times IQR = 172 - 1.5 \times 10$
$= 157$cm
154cm < 157cm
$\therefore$ 154cm is an outlier.

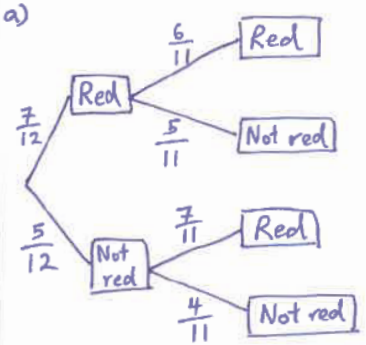
18.
$FV = 500(1 + 2\%)^{12}$ $r = 2\%$ per 6 months, $n = 12$ half years
$\doteq \$634.12$

19. Precision $= 0.05$kg
$\therefore$ Upper bound $= 78.45$kg
Lower bound $= 78.35$kg

20.
$S = V_0 - Dn$
$\therefore 325 = 560 - 5D$
$5D = 235$
$\therefore D = \$47$
$\therefore$ Depreciates \$47/year

21.


$\therefore$ Max flow $= 9 + 1 = 10$

22.
a)


b) $P(\text{at least one red}) = 1 - P(\text{no reds})$
$= 1 - \frac{5}{12} \times \frac{4}{11} = \frac{28}{33}$

23.

Let x be the hourly rate & pay.

$\therefore 38x + 3\times1.5x + 2\times2x = \$999.75$

$46.5x = 999.75$

$\therefore x = \$21.50/hr$

24.

a) $92\% - 80\% = 12\%$

b) Traffic, Overslept

25.

$x + \frac{x+1}{3} = 8$

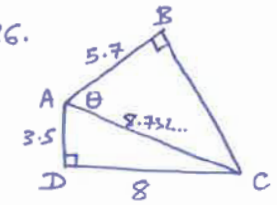
$3x + x + 1 = 24$

$4x + 1 = 24$

$4x = 23$

$x = \frac{23}{4}$

26.



$AC^2 = 3.5^2 + 8^2$

$AC^2 = 76.25$

$AC \doteq 8.732...$

$\therefore \cos\theta = \frac{5.7}{AC}$

$\theta = \cos^{-1}\left(\frac{5.7}{8.732...}\right) \doteq 49°15'$

27.

a) $B = \frac{k}{d}$

$\therefore 16 = \frac{k}{50}$

$k = 800$

b) $B = 40$ & $k = 800$

$\therefore 40 = \frac{800}{d}$

$\therefore d = 20m$

28.

$75kg \times 5.64\ kJ/kg$

$= 423\ kJ/30minutes$

$423 \div 30 = 14.1\ kJ/minute$

$\therefore 1808 \div 14.1 \doteq 128\ minutes$

29.

$Area \doteq \frac{19.1}{2}(1.2+3.5) + \frac{19.1}{2}(3.5+2.3)$

$= 44.885 + 55.39$

$\doteq 100\ m^2$

30.

a) $r = -0.86$

b) Strong negative correlation

c) $y = -0.70x + 42.91$

d) Let $x = 26$

$\therefore y = -0.70 \times 26 + 42.91$

$\doteq 25$ (nearest whole)

31.

$r = \frac{0.195}{365}$ per day

$\therefore$ Closing balance $= 245.62\left(1+\frac{0.195}{365}\right)^{31}$

$+ 699\left(1+\frac{0.195}{365}\right)^{11}$

$\doteq \$249.72 + \$703.12$

$\doteq \$952.84$

32.

Let $C = \frac{D}{2}$

$\therefore \frac{D}{2} = \frac{aD}{a+12}$

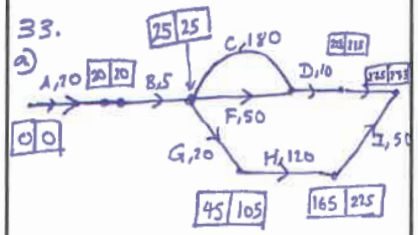
$D(a+12) = 2aD$

$a + 12 = 2a$

$\therefore a = 12$

33.

a)



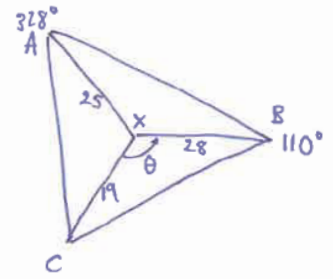
b) Critical path:

A-B-C-D-E

c) H is not on the critical path and has a float time of $225 - 120 - 45 = 60$ days.

$\therefore$ A delay of 30 days for H will not affect the completion time for the project.

34.



a) Angle $AXB = (360-328)+110$

$= 142°$

$\therefore AB^2 = 25^2 + 28^2 - 2\times25\times28\times\cos142$

$\therefore AB \doteq 50\ km$

b) $Area = \frac{1}{2}ab\sin C$

$\therefore 265 = \frac{1}{2}\times19\times28\times\sin\theta$

$\sin\theta = \frac{265\times2}{19\times28}$

$\therefore \theta = \sin^{-1}\left(\frac{265\times2}{19\times28}\right) \doteq 85°$

$\therefore$ Bearing of C from X is:

$110 + 85 = 195°T$

35.

a) 32m

b) 36m

c) Max height when $t = 1.2$.

$\therefore h = 32 + 12\times1.2 - 5\times1.2^2$

$= 39.2m$

36.



∴ 9 hr time difference.

∴ 3pm Monday in Paris time is 1500 + 0900 = 12am Tuesday Sydney time

∴ 2400 − 0500 = 19 hrs

However, since the flight stopped for 2hrs, the actual flying time is 19 − 2 = 17 hrs

37.

a) $24\,L \div 210\,km \times 100\,km$

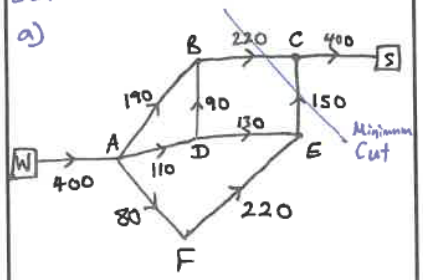
$\fallingdotseq 11.4\,L/100\,km$

b) $11.4\,L/100km \times \frac{325\,km}{100\,km} \times \$1.795$

$\fallingdotseq \$66.50$

38.

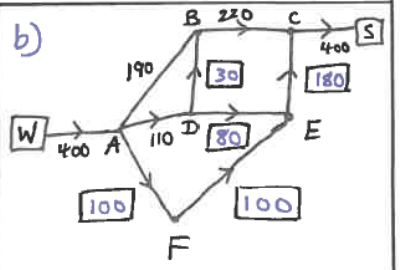
a)



∴ Max Flow = 220 + 150

= 370 kL/hr

b)



39.

a) $(44321 - 18200) \times 0.19$

$\fallingdotseq \$4962.99$

b) Hallie pays 4962.99×2

$= \$9925.98$

∴ $(9925.98 - 5092) \div 0.325$

$= \$14873.78$

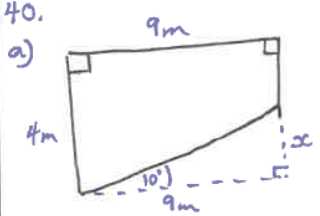
∴ Hallie's taxable Income

$= 14873.78 + 45000$

$= \$59873.78$

40.

a)



$\tan 10° = \frac{x}{9}$

$\therefore x = 9\tan 10°$

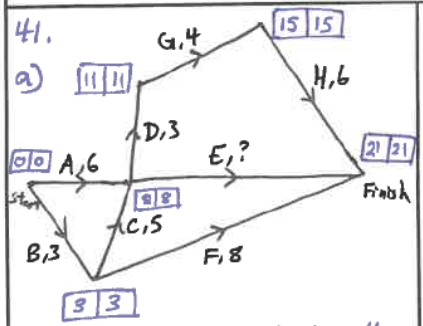
$\therefore$ Area $= 9 \times 4 - \frac{1}{2} \times 9 \times 9\tan 10°$

$\fallingdotseq 29\,m^2$

b) $3 \times \$98 = \$294$

41.

a)



If H is on the critical path, then the earliest completion time is 21 weeks.

∴ For E to be critical, it must have no float time.

∴ $E = 21 - 8 = 13$ weeks

b) Critical paths:

- B-C-D-G-H
- B-C-E

c) To reduce completion time, need to target activities that are on the critical paths.

Option 1:
Reduce E & H by 3 weeks each.
Cost = 90000×3 + 120000×3
= $630 000

Option 2:
Reduce C by 3.
If we reduce C by 3, a new critical path is created with A-D-G-H & A-E that has completion time of 19 weeks.

∴ To reduce to 18 weeks, we also need to reduce A by 1:

Cost = 30000×1 + 40000×3

= $150 000

∴ Minimum cost of $150000 is achieved by reducing C by 3 weeks, making the new duration of C = 2 weeks, and by reducing A by 1 week, making the new duration of A = 5 weeks.

42.

Volume of cone $= \frac{1}{3} \times \pi \times 5^2 \times 8$

$\fallingdotseq 209.44\,cm^3$

Volume of cylinder $= \pi \times 2.5^2 \times h$

$\therefore \frac{1}{2} \times \pi \times 2.5^2 \times h = \frac{1}{3} \times \pi \times 5^2 \times 8$

$\div \pi \qquad \div \pi$

$\therefore \frac{1}{2} \times 2.5^2 \times h = \frac{1}{3} \times 5^2 \times 8$

$\div 2.5^2 \times 2 \qquad \div 2.5^2 \times 2$

$\therefore h = \frac{1}{3} \times \frac{5^2 \times 8 \times 2}{2.5^2}$

$h \fallingdotseq 21.33\,cm$

END of Paper

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