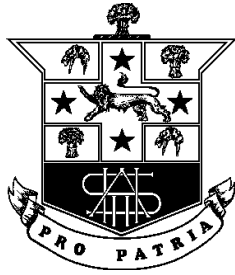


STUDENT'S NAME: _____

TEACHER'S NAME: _____



HURLSTONE AGRICULTURAL HIGH SCHOOL

2020

TRIAL
HIGHER
SCHOOL
CERTIFICATE
EXAMINATION

Mathematics Standard 2

Assessment Task 4

Examiner

- Mr. S. Faulds

**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 your use during the examination.
- For questions in Section II, show relevant mathematical reasoning and/or calculations

**Total marks:
100****Section I – 15 marks (pages 2 – 9)**

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

Section II – 85 marks (pages 10 – 37)

- Attempt Questions 15 – 43
- Allow about 2 hours and 5 minutes for this section

Section I

15 marks

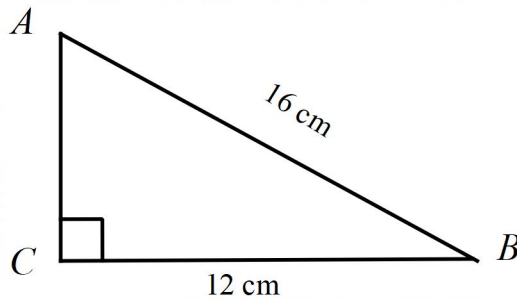
Attempt Questions 1 – 15

Allow about 25 minutes for this section

Use the multiple-choice answer sheet for Questions 1 – 15. This answer sheet is attached to the back of your examination paper. It may be removed and handed in with your answer booklet for Section 2.

1. In triangle ABC , $AB = 16$ cm and $BC = 12$ cm.

The triangle is right angled at C .

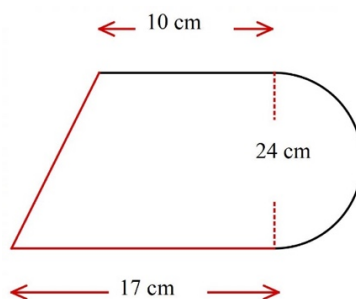


NOT TO
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Find the size of angle ABC , correct to the nearest degree.

- A. 37°
- B. 41°
- C. 49°
- D. 73°

2. Calculate the perimeter of the shape below, rounded to 3 significant figures.



NOT TO
SCALE

- A. 51.0 cm
B. 81.7 cm
C. 89.7 cm
D. 127.4 cm
3. Lenore invests \$4 200 at 4% p.a. compounding annually.
What will be the value of the investment at the end of three years?
- A. \$504.00
B. \$524.43
C. \$4 704.00
D. \$4 724.43
4. Mitchell is going to buy a car and downloads data on fuel efficiency for three models.

<i>Model</i>	<i>Fuel Consumption (City)</i>	<i>Fuel Consumption (Country)</i>
<i>Tacoma</i>	15.8 L/100km	11.5 L/100km
<i>Firenze</i>	14.4 L/100km	11.4 L/100km
<i>Vortex</i>	15.6 L/100km	11.0 L/100km

In a test drive, he drives all three cars for 40 km on city roads and 120 km on country roads.

Based on the data, which car would use the least fuel on the test drive?

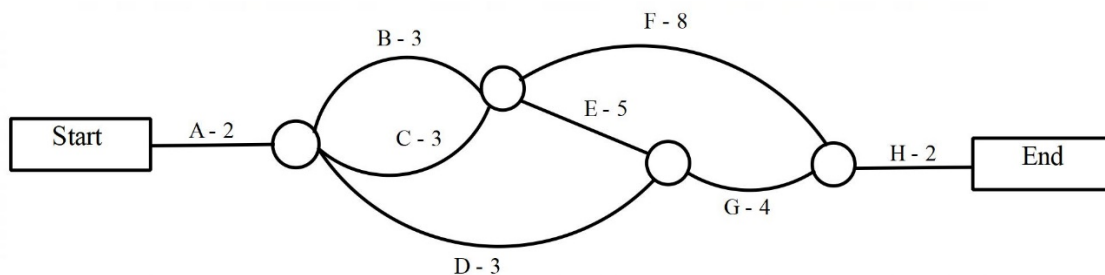
- A. The Firenze would use the least fuel
B. The Firenze and the Tacoma are equal in using the least amount of fuel
C. The Firenze and the Vortex are equal in using the least amount of fuel
D. The Tacoma would use the least fuel

5. The activity chart below shows the immediate prerequisite(s) and duration for each activity in a project.

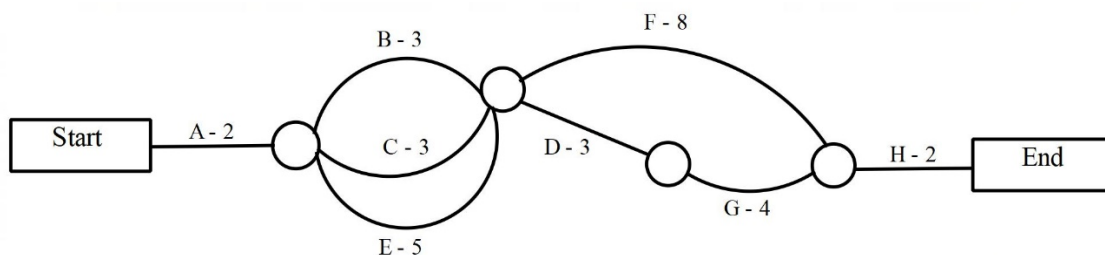
Activity	Immediate Prerequisites	Time (days)
A	-	2
B	A	3
C	A	3
D	B, C	3
E	A	5
F	B, C	8
G	D, E	4
H	F, G	2

Which network could be drawn from the activity chart?

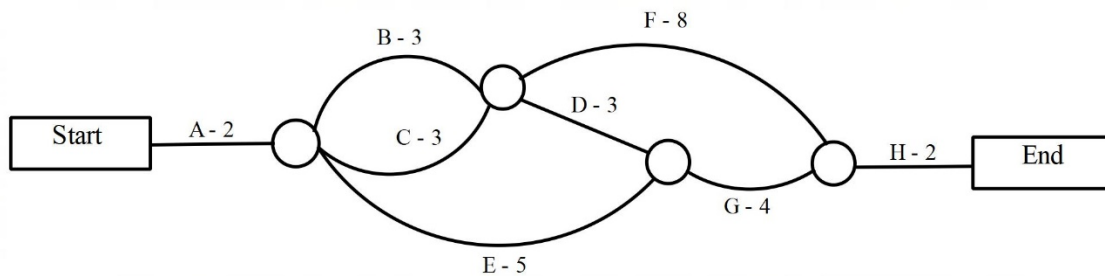
A.



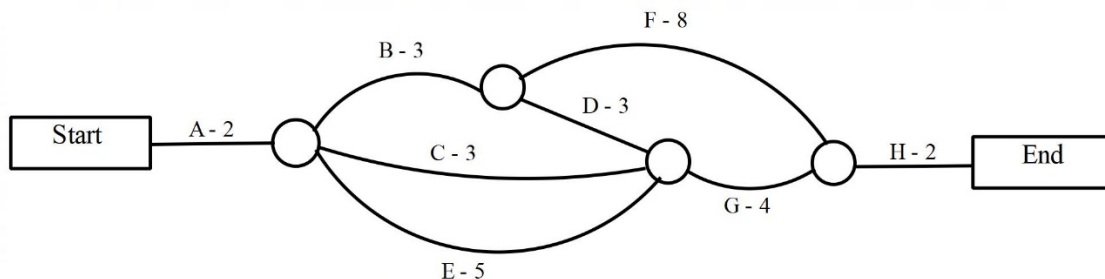
B.



C.



D.



6. Sofia starts a new job on a salary of \$54 080 p.a.
She has a deduction of \$54.00 per week for her health fund and income tax deducted at 19% of her gross salary.
What is her take home pay each week?
- A. \$787.56
 - B. \$788.40
 - C. \$798.66
 - D. \$986.00
7. Elizabeth lives in New York, USA (UTC -5) and Margaret lives in Sydney, NSW (UTC +10).
Margaret makes a call to Elizabeth at 12:30 pm on Monday 24th February.
February is a month when NSW has daylight saving time and the USA doesn't.
What is the time in New York when Elizabeth receives the call?
- A. 8:30 pm Sunday 23rd February
 - B. 10:30 pm Sunday 23rd February
 - C. 2:30 am Tuesday 25th February
 - D. 4:30 am Tuesday 25th February
8. Nick bought a portfolio of 2000 MNRA shares with his retrenchment payout.
The value of each share is currently \$12.50, and Nick is paid an annual dividend of \$0.75 per share.
What is the dividend yield on the shares?
- A. 6.0%
 - B. 6.25%
 - C. 7.5%
 - D. 12.5%

9. Molly is concerned about the parrot population in her town. She gathers 170 parrots and tags them.

A couple of months later she gathers 32 parrots and finds 10 of them tagged.

What is Molly's estimate of the parrot population using the capture-recapture method?

- A. 524
 - B. 544
 - C. 572
 - D. 588
10. Alex measures the number of seconds that it takes his pulse rate to return to normal after exercising.

The time taken is shown below on the timer app that he has on his phone.

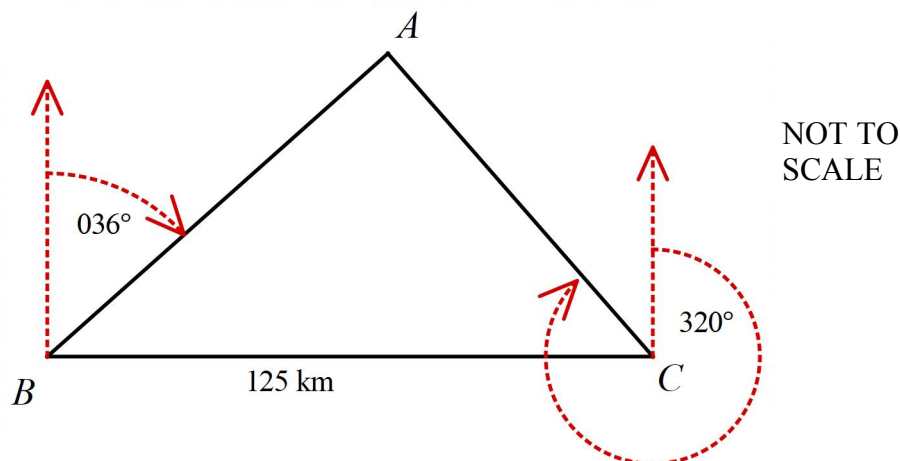


What is the percentage error in the measurement of this time?

- A. 0.004%
- B. 0.4%
- C. 0.49%
- D. 2.5%

11. Town B is 125 km due west of town C .

Town A is on a bearing 036° from B and on a bearing 320° from C .



Which calculation could be used to find the distance from A to B ?

- A. $AB = \frac{125 \sin 36^\circ}{\sin 320^\circ}$
- B. $AB = \frac{125 \sin 50^\circ}{\sin 54^\circ}$
- C. $AB = \frac{125 \sin 54^\circ}{\sin 76^\circ}$
- D. $AB = \frac{125 \sin 50^\circ}{\sin 76^\circ}$

12. The formula below gives the blood alcohol concentration for a male.

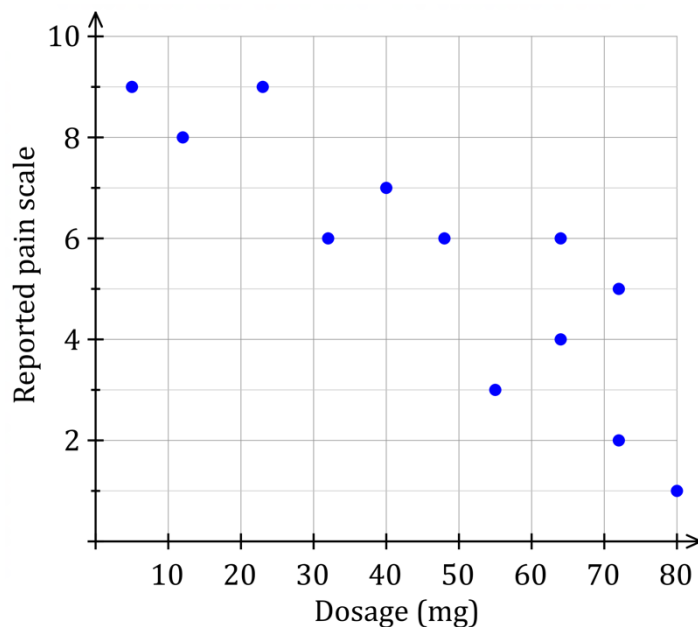
$$BAC_{Male} = \frac{10N - 7.5H}{6.8M}$$

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

Charles weighs 80 kg and consumes 6 standard drinks in 3 hours.
What is his BAC , correct to 1 significant figure?

- A. 0.04
- B. 0.05
- C. 0.06
- D. 0.07

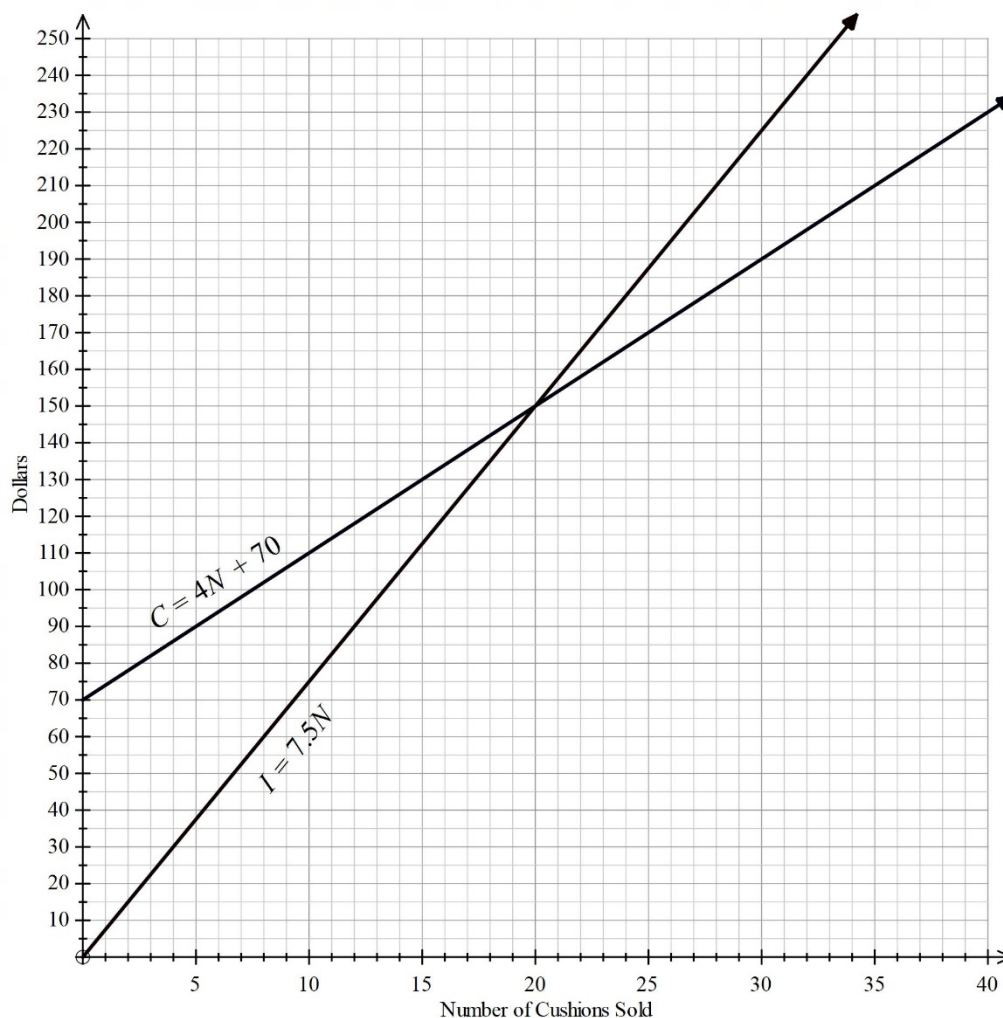
13. A scatterplot of pain (as reported by patients) compared to the dosage (in mg) of a drug is shown below.



How could you describe the correlation between the pain and the dosage?

- A. A moderate negative correlation
 - B. A moderate positive correlation
 - C. A weak positive correlation.
 - D. No correlation.
14. What is the least amount (to the nearest dollar) that must be invested now at 3.6% per annum, compounded monthly, so that in three years it will have grown to \$48 000?
- A. \$42 997
 - B. \$43 079
 - C. \$43 093
 - D. \$43 930

15. An online retailer of cushions draws the graph below to analyse sales. The lines representing the equations for daily cost (C) and daily income (I) are shown.



What is the result on a day where 30 cushions were sold?

- A. A loss of \$190.00
- B. A loss of \$35.00
- C. A profit of \$190.00
- D. A profit of \$35.00

End of Section I

Section II

85 marks

Attempt Questions 16 – 43

Allow about 2 hours and 5 minutes for this section

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.

Question 16 (2 marks)

A car is sold for \$19 990. It will depreciate at 18% per annum.

Using the straight-line method, what is the salvage value of the car after four years, correct to the nearest dollar?

2

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Question 17 (2 marks)

A water tank collects water from the rectangular roof of a house that has a length of 26 metres and a width of 15 metres.

What is the volume of water collected by the water tank after 15 mm of rain? Give your answer correct to the nearest litre.

2

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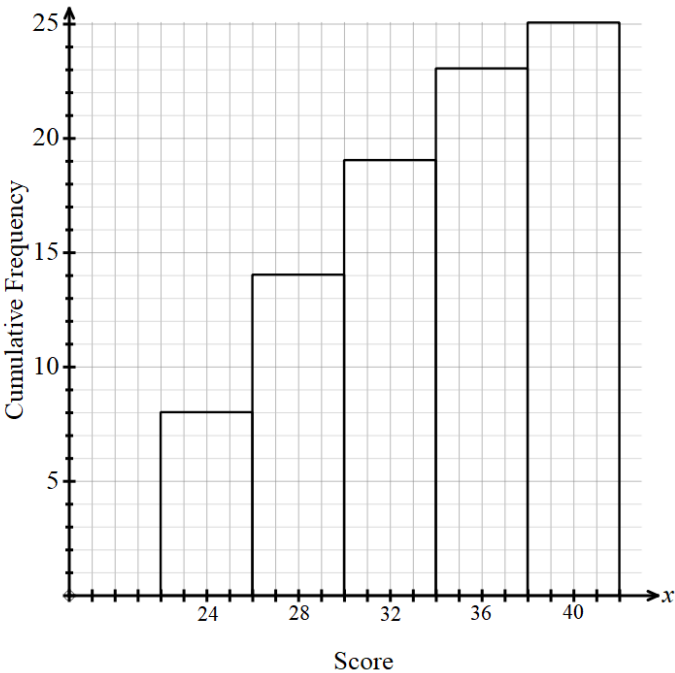
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Question 18 (4 marks)

Sam recorded the scores of 25 footballers who each took 50 shots at goal.

The grouped cumulative frequency graph displays the results with class centres of 24, 28, 32, 36, and 40.



- (a) Use the graph to estimate the median number of goals scored.

1

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- (b) Calculate the mean number of goals scored. (Answer to 1 decimal place.)

1

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- (c) What percentage of players scored 37 goals or more?

1

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- (d) Only players with scores in the top 76% of all scores go through to the next round of shots.

1

What score was needed to go through to the next round?

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Question 19 (4 marks)

- (a)

Angela buys a packet of 24 lollies that contains only Mints and Eclairs.
She finds that the ratio of the number of Mints to Eclairs is 3 : 5.
How many Mints and how many Eclairs are there in the packet?

2

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- (b)

A second pack of lollies contains only Snakes and Caramels.
The ratio of Snakes to Caramels 1 : 3.
If there were 24 Snakes, how many lollies were in the pack altogether?

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Question 20 (2 marks)

There are 36 vehicles parked in the teachers’ car park. Fifteen of the vehicles are white, six are red, four are blue, two are yellow and the remainder are grey.
Margie places a free car wash coupon on the windscreen of one vehicle, chosen at random.

- (a)

What is the probability that it is placed on a grey vehicle?

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- (b)

What is the probability that it is not placed on a blue vehicle?

1

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Question 21 (2 marks)

Angel sets up this spreadsheet to track the progress of her loan on a monthly basis.

Principal (P) \$45 000
Annual Interest rate (r) 8% This table assumes each month
Monthly repayment (R) \$500 is one twelfth of a year.

N	Principal (P)	Interest (I)	$P + I$	$P + I - R$
1	\$45,000.00	\$300.00	\$45,300.00	\$44,800.00
2	\$44,800.00	\$298.67	\$45,098.67	\$44,598.67
3	\$44,598.67	\$297.32	\$44,895.99	\$44,395.99
4	\$44,395.99	\$295.97	\$44,691.96	\$44,191.96
5	\$44,191.96			Y

Calculate the value that would appear at **Y**.

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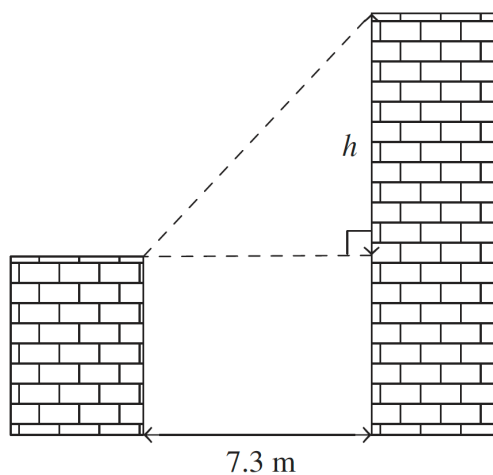
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Question 22 (2 marks)

The following two buildings are standing on level ground. The horizontal distance between the buildings is 7.3 metres and the angle of elevation between the buildings is 49° .



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What is the difference in height between the buildings, correct to one decimal place?

2

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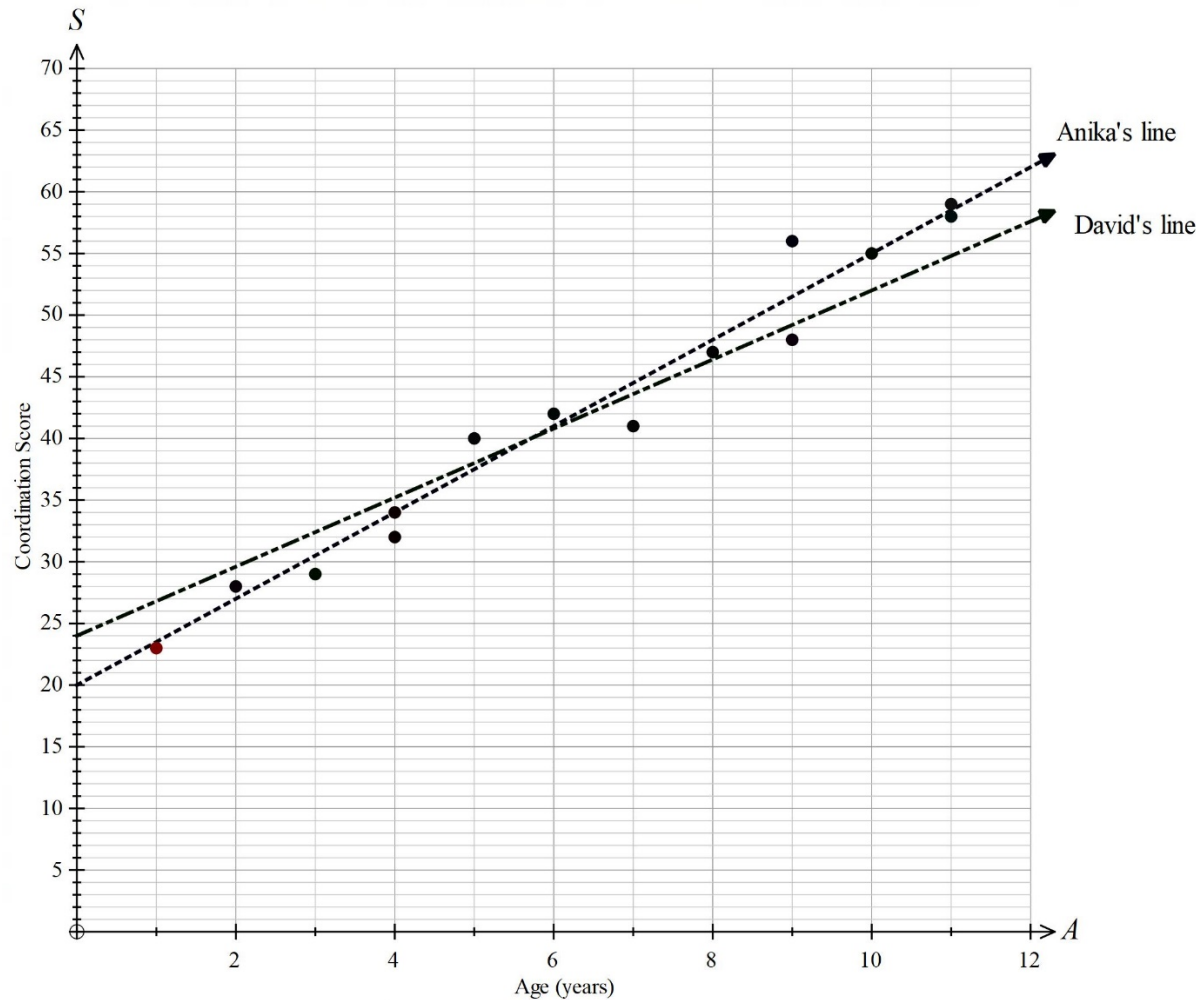
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Question 23 (3 marks)

A group of 14 children were tested on their co-ordination skills and the results are shown on the scatter-plot below.



Two researchers, Anika and David, each draw a line of best fit on the graph.

- (a) Explain why Anika's line is a better line of best fit. 1

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- (b) Give the equation of Anika's line. 2

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Question 24 (3 marks)

Lily buys an LCD television which is rated at 80 watts when being used for viewing.

When in stand-by mode it is rated at 4 watts.

Lily and her family use the TV for viewing for 8 hours a day on average and leave it on standby for the remaining time.

- (a) Show that the TV uses 0.704 kilowatt hours of energy on an average day. 1

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- (b) Lily pays 30 cents per kWh for electricity. How much money would she save in a year if she turned the TV off when it wasn't being viewed, rather than leaving it on stand-by? 2

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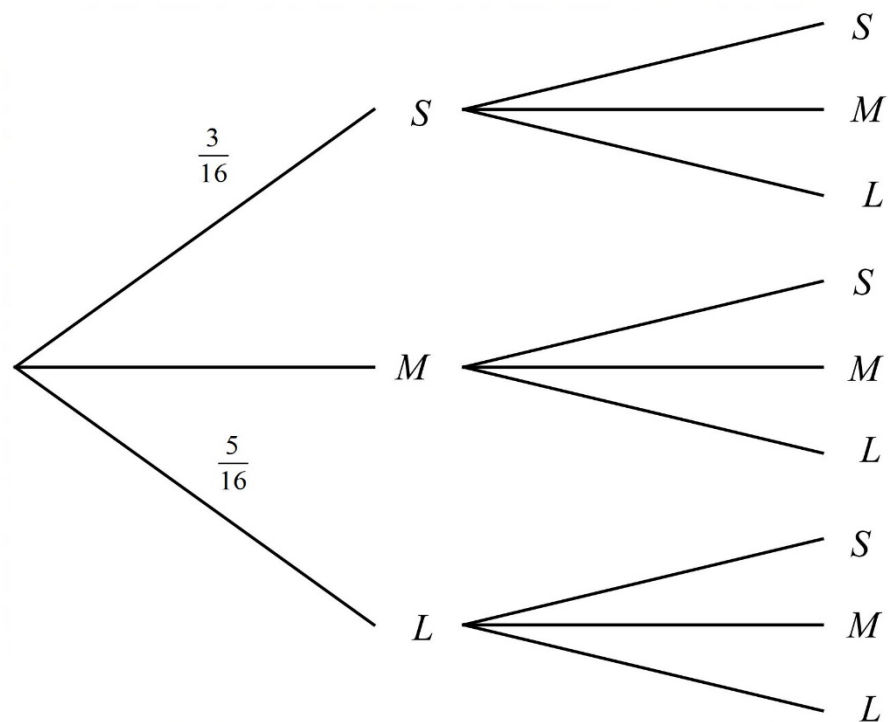
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Question 25 (3 marks)

In a laundry basket there are shirts in three sizes, 3 are small, 5 are large and 8 are medium.
Ed takes two shirts from the basket at random.

The tree diagram below has been started to show the probabilities of different combinations.



- (a) Complete the tree diagram by writing the probabilities on the remaining branches. **2**
- (b) Find the probability that Ed chooses two shirts of the same size. **1**

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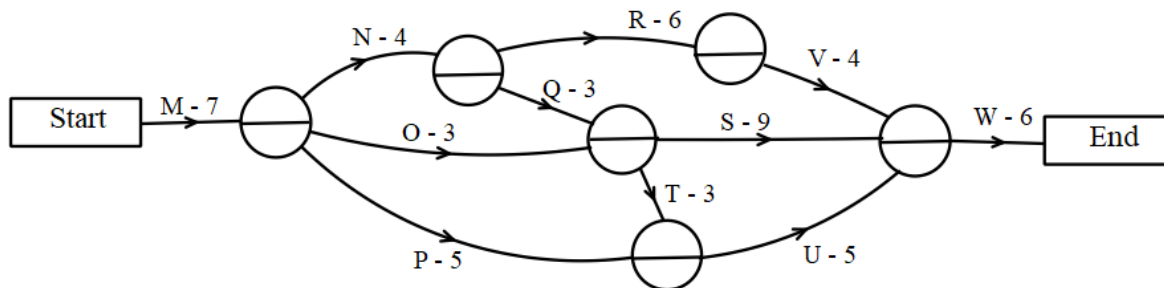
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Question 26 (4 marks)

The network below is used to represent the activities in a project.



The time for each activity is given in days.

- (a) Complete a forward scan to determine the minimum time required to complete the project. 2

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- (b) Complete a backward scan on the chart and give the float time on activity R. 2

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Question 27 (3 marks)

The transactions for Donna’s credit card are shown below for the month of August.

	Credit Card Ms D M Snow		
	Opening Balance	\$0.00	
Date	Detail	Transaction	Balance
4-Aug-20	Woolworths DUBBO	-\$17.15	-\$17.15
16-Aug-20	SMITHS PHARMACY PARKES	-\$21.28	-\$38.43
16-Aug-20	Ampol Petroleum Parkes	-\$28.98	-\$67.41
20-Aug-20	COLES BATHURST	-\$14.90	-\$82.31
20-Aug-20	SUBWAY BATHURST	-\$22.65	-\$104.96
20-Aug-20	CHARLES STURT UNIVER BATHURST	-\$20.00	-\$124.96
20-Aug-20	Ampol Petroleum Orange	-\$34.53	-\$159.49
31-Aug-20	Officeworks ORANGE	-\$180.00	-\$339.49
31-Aug-20	NETFLIX.COM Melbourne	-\$13.99	-\$353.48
31-Aug-20	INTEREST DEBIT		

The bank charges 0.041% per day simple interest on the maximum daily balance on the card.

- (a) Show that, in the first 15 days of the month, 8 cents in interest is charged.
- 1

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- (b) How much interest is charged on the card for August?
- 2

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Question 28 (2 marks)

Use the formula $G = \frac{PD}{V_1 + V_2}$ to find the value of P when $G = 21$, $D = 7.0$, $V_1 = 12.5$ and $V_2 = 7.5$.

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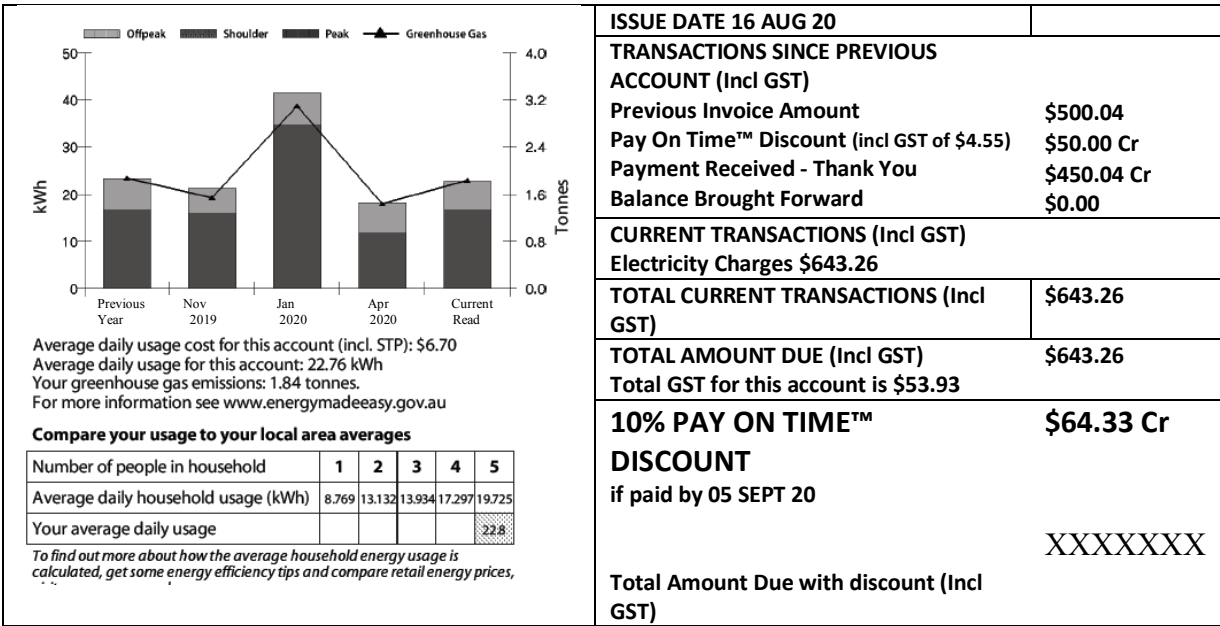
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Question 29 (2 marks)

A section of the electricity bill for Corie’s share-house is shown below.



There are five people living in the house who share the electricity costs equally.

If she pays the account on 2nd September, how much would she need to collect from each of her housemates?

2

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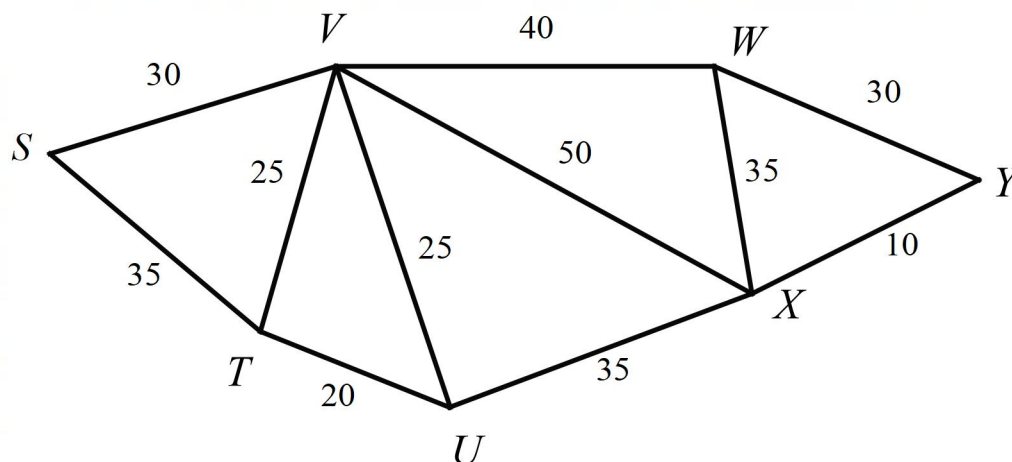
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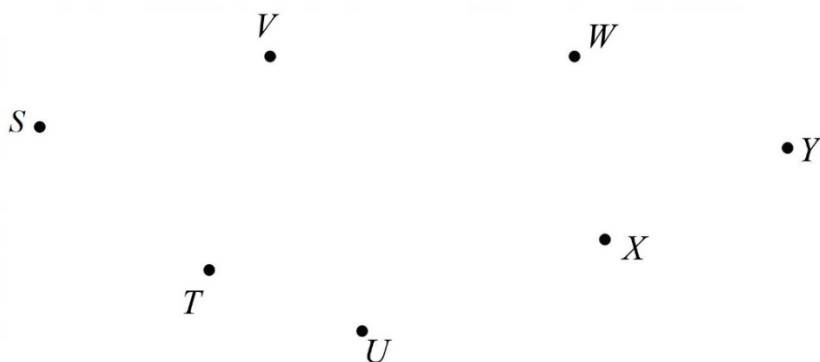
Question 30 (3 marks)

A new electricity supply network is to be constructed for seven buildings on a farm. The owners have considered possible routes for the cables connecting the buildings. The construction cost *in hundreds of dollars* is shown on each cable. The generator for the network can be located in any building.



- (a) Draw a minimum spanning tree for the electricity network on the vertices below.

2



- (b) Calculate the minimum cost of constructing the network of cables.

1

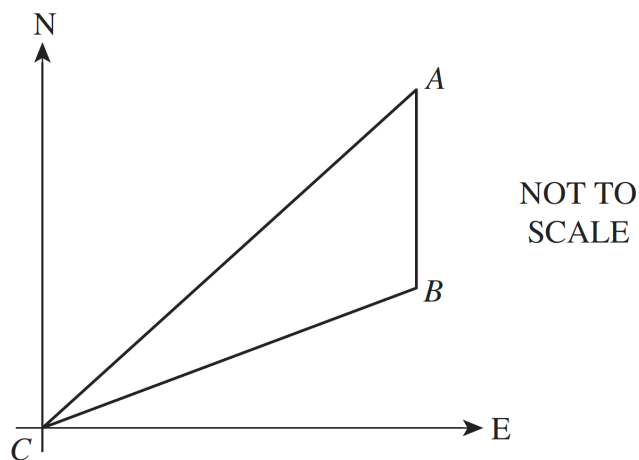
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Question 31 (5 marks)

Lewis travels 27 km from C to A on a bearing of 049°T . He then changes direction and travels due south for 12 km to B .



- (a) What is the size of $\angle CAB$? **1**

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- (b) Find the distance from B to C , correct to one decimal place. **2**

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- (c) Use the sine rule to find the size of $\angle ACB$ and, hence, the true bearing of B from C . **2**

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Question 32 (3 marks)

Bethany is offered two similar jobs and wants to compare the gross weekly pay.

The council job pays an hourly wage of \$25.60 for a 36-hour week, with overtime at time-and-a-half for any additional hours.

The public service job pays an annual salary of \$60 788.00 for a 40-hour week.

- (a) How much would she be paid weekly for the public service job? 1

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- (b) How much would she be paid weekly for the council job if she worked the normal hours only? 1

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- (c) How many hours of overtime would she need to work at the council job to achieve the same weekly pay as the public service job? 1

Answer to the nearest half hour.

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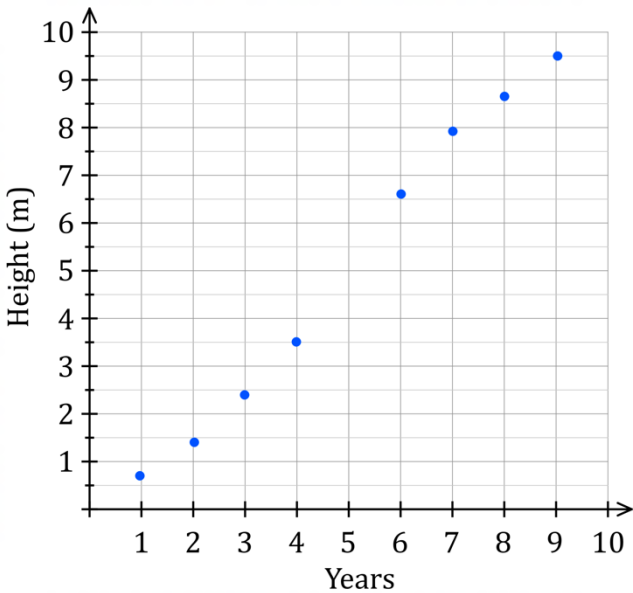
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Question 33 (4 marks)

Hayden is an agricultural scientist studying the growth of a particular tree over several years. The data he recorded is shown in the table below.

Years since Planting (t)	1	2	3	4	5	6	7	8	9
Height of Tree (H)	0.7	1.4	2.4	3.5		6.6	7.9	8.7	9.5

A scatterplot of the data is shown below.



- (a) What is Pearson’s correlation coefficient? Answer correct to 4 decimal places. 1

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- (b) Find the equation of the least-squares line of best fit in terms of years (t) and height (h). Give coefficients correct to 2 decimal places. 1

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Question 33 continues on the next page...

(c) **Question 33 continued**

Hayden did not record the tree's height after five years. Predict the height after five years, correct to one decimal place.

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- (d) Use algebra to estimate how many years it will take for the tree to reach a height of 20 metres. Answer correct to 1 decimal place.

1

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Question 34 (3 marks)

John's car uses 0.12 litres of fuel per kilometre on highway travel.

The lowest cost of fuel available is \$1.25 per litre.

- (a) What would be the lowest cost for him, in fuel, for a highway trip of 50 km? **1**

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- (b) Write an equation that gives the lowest cost in dollars (C), for fuel, of a highway trip of N kilometres. **2**

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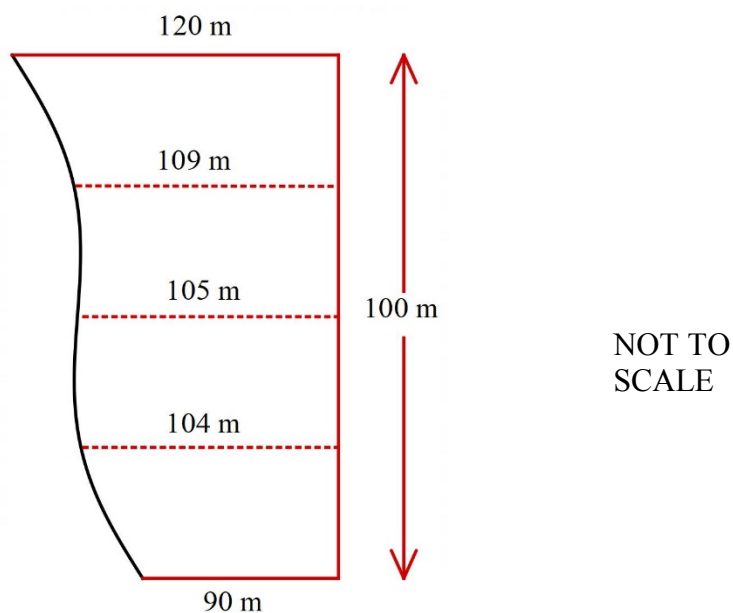
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Question 35 (3 marks)

Martin owns a field that is bounded on one side by a curved road.

He divides the field into four strips of equal width and records the measurements shown below.



Use four applications of the Trapezoidal Rule to approximate the area of the field.

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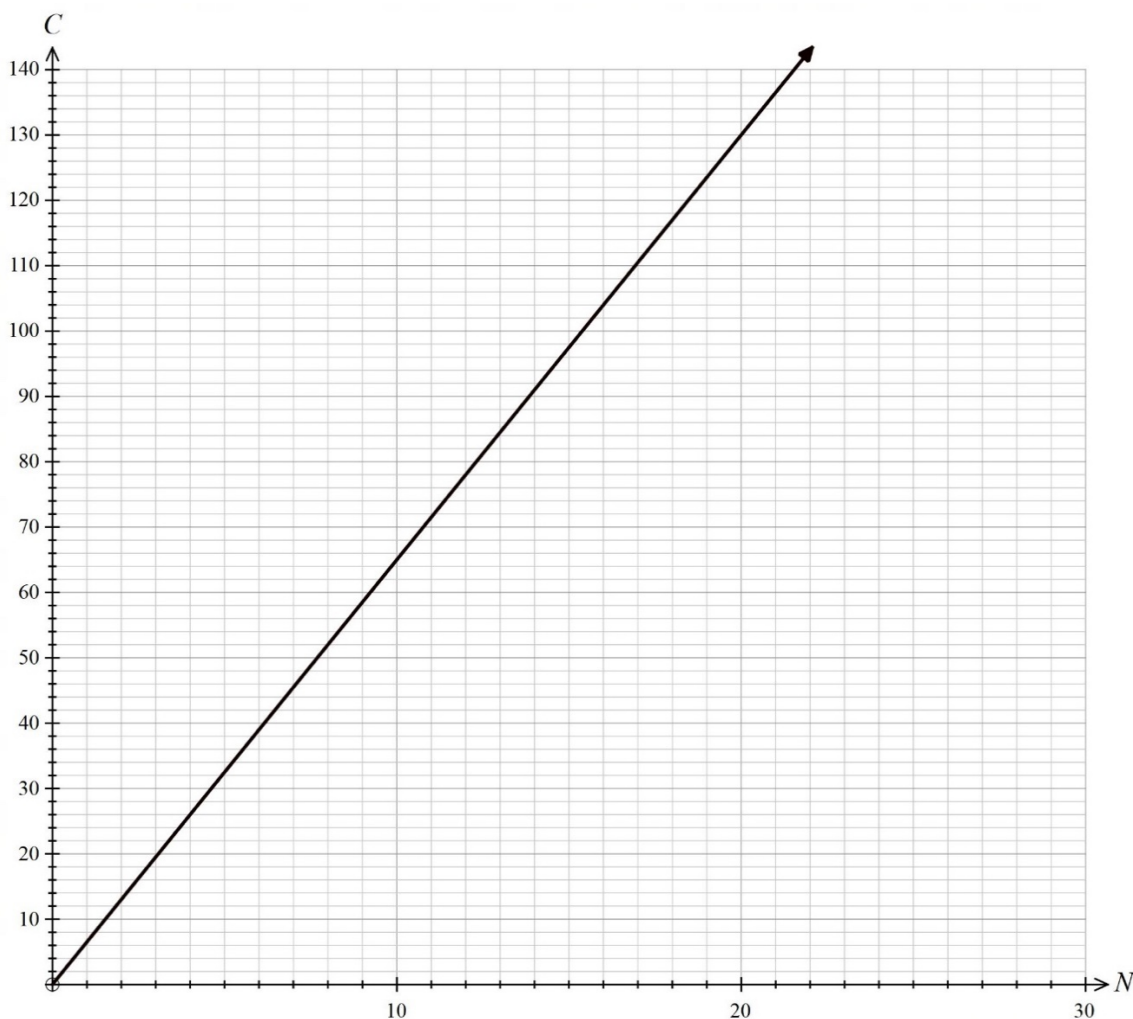
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Question 36 (4 marks)

Millie makes Venus Bars for a fete and sells the bars for \$6.50 each.

It costs her \$24 to set up to make the bars and then \$5.00 per bar for ingredients and cooking.

The line $I = 6.5N$ has been drawn on the graph to represent the income (I) from selling N bars.



- (a) Explain how the equation $C = 24 + 5N$ can be derived to represent the cost (C) of producing N bars. 1

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- (b) Draw the line which represents the equation $C = 24 + 5N$ on the graph above. 1

Question 36 continues on the next page...

Question 36 continued

- (c) Find the number of bars that need to be sold to break even. **1**

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- (d) What profit (or loss) would be made if she sold only 5 bars? **1**

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Question 37 (3 marks)

A year ago, Command Internet Services bought a new computer server for \$15 200.

A year later its value had depreciated to \$13 376.00 using the **declining balance method**.

- (a) What is the annual rate of depreciation? **1**

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- (b) Calculate its value after a further five years. **2**

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Question 38 (3 marks)

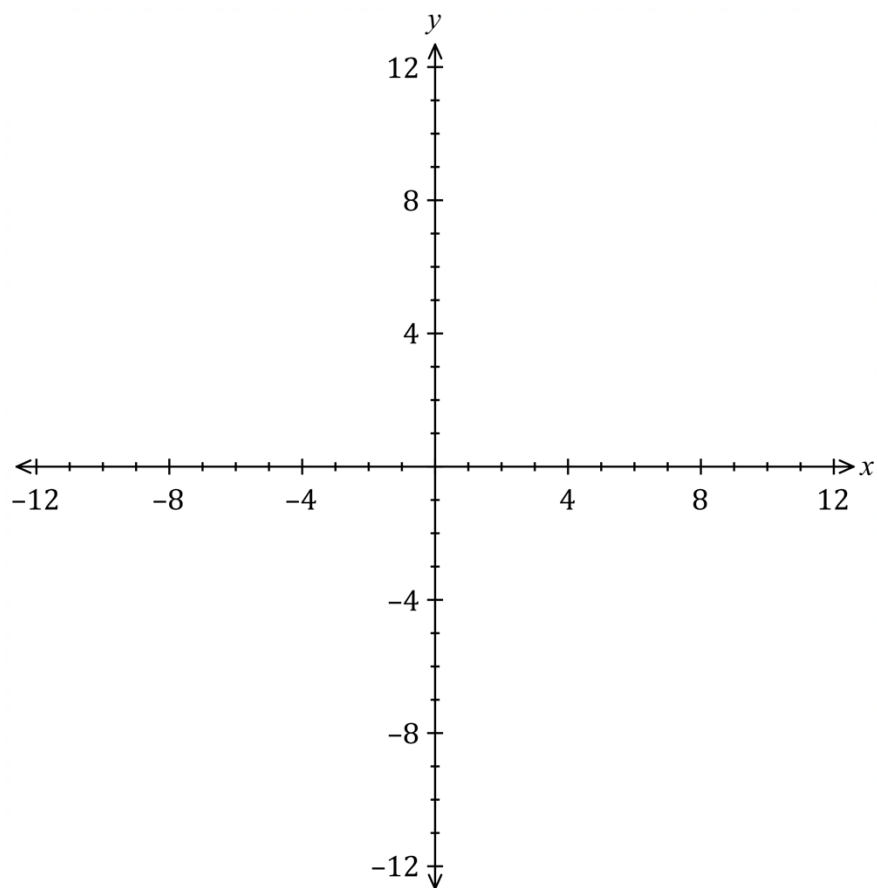
Use the graphical method to find the simultaneous solution of $y = 2x - 3$ and $x + 2y = 14$.

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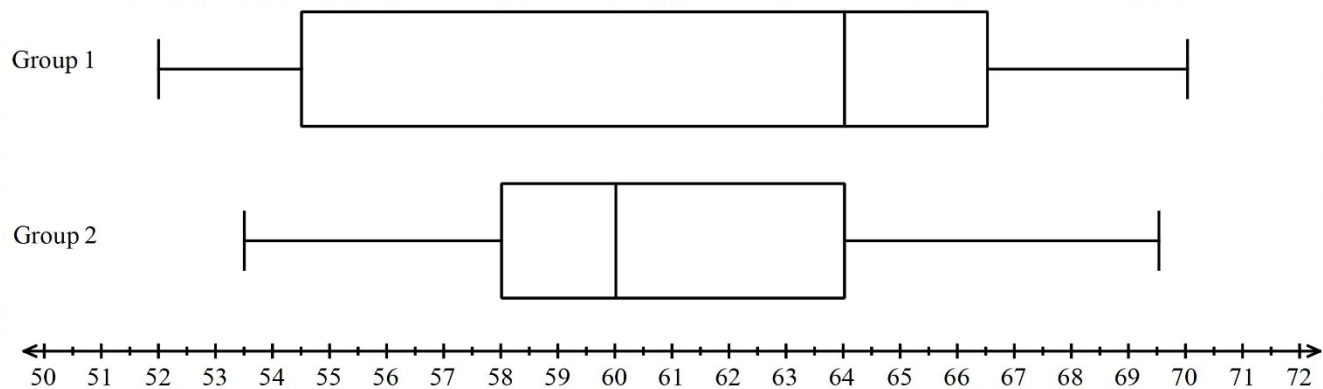
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Question 39 (3 marks)

Two groups, with 36 students in each, have their resting heart rate recorded.
The results are shown on the box-plots below.



(a) Compare the interquartile ranges for the two groups. **1**

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(b) How many more students had a heart rate above 64 in Group 1 compared to Group 2? **2**

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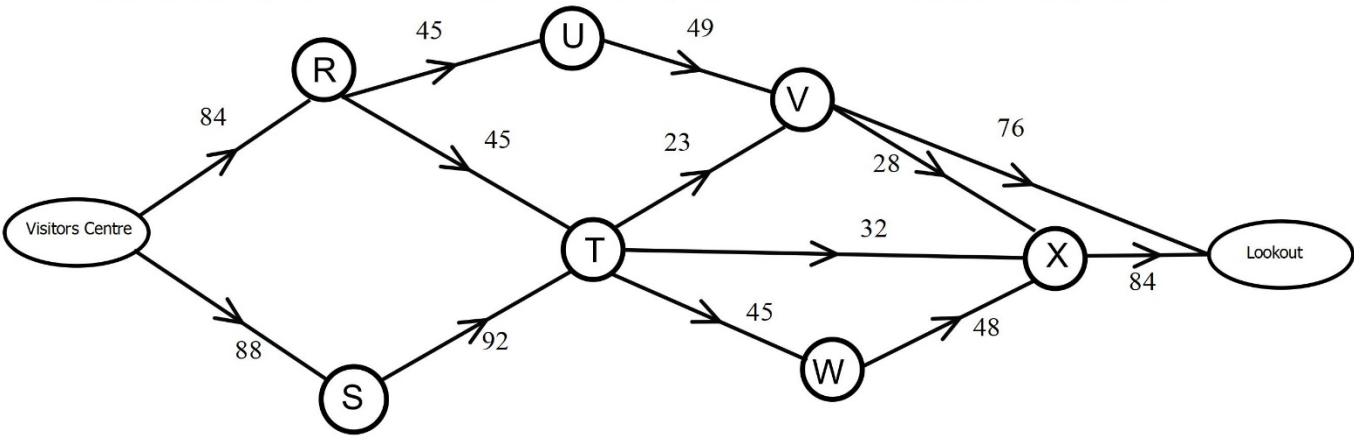
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Question 40 (3 marks)

To reduce congestion at Tao National Park, one-way trails are used to direct visitors from the Visitors Centre to the Lookout.

The network flow diagram below shows the layout of trails.



The trails pass through picnic areas which are labelled R through to X.

The capacity of each trail, in visitors per hour, is shown beside the trail.

All visitors return to the Visitors Centre along a single one-way trail which has a capacity of 160 visitors per hour. (This trail is not shown.)

- (a) What is the maximum flow of visitors from the Visitors Centre to the Lookout? 2

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- (b) What increase to the capacity of a single trail would allow the return trail to operate at its full capacity of 160? 1

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Question 41 (2 marks)

Madison, who is 18 years old, wants to use her heart rate to guide the intensity of her exercise.

To determine her target heart rate, she must first find her resting heart rate and the maximum heart rate for a person her age.

To calculate her resting heart rate (R), in beats per minute, she counts 18 beats of her heart in 20 seconds, while sitting quietly.

To estimate her maximum heart rate (M), she uses a rule of subtracting her age from 220.

To determine her target heart rate (T) for exercise she uses the formula below.

$$T = 0.7(M - R) + R$$

What is her target heart rate in beats per minute (bpm)?

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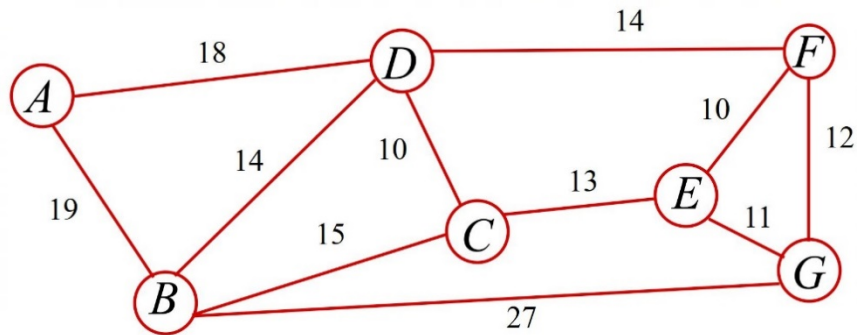
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Question 42 (4 marks)

The network diagram below represents a network of tracks joining buildings on a dairy farm.



All tracks can be travelled in either direction.
The numbers indicate the travel time between buildings in minutes.

- (a) Complete the missing values in the table below to represent this network diagram.

2

	A	B	C	D	E	F	G
A							
B							27
C							
D						14	
E						10	11
F				14	10		12
G		27			11	12	

- (b) Determine the shortest travel time between buildings A and G and the tracks which would be followed to achieve this time.

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Question 43 (4 marks)

The table shows the future values of an annuity of \$1 for periods between 4 and 8 years, for different interest rates. The contributions are made at the end of each year.

Years	Interest Rate Per Annum				
	5%	6%	7%	8%	9%
4	4.3101	4.3746	4.4399	4.5061	4.5731
5	5.5256	5.6371	5.7507	5.8666	5.9847
6	6.8019	6.9753	7.1533	7.3359	7.5233
7	8.1420	8.3938	8.6540	8.9228	9.2004
8	9.5491	9.8975	10.2598	10.6366	11.0285

- (a) An annuity account is opened with an interest rate of 6% per annum and contributions of \$4000 are made at the end of each year for 5 years. 1

Calculate the value of the annuity after the last contribution is made.

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- (b) Using an annuity account with the same interest rate as above, calculate the size of the contributions necessary to achieve a value of \$25 000 after 5 years. 1

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Question 43 continues on the next page...

Question 43 continued

- (c) The table shows the present values of an annuity of \$1 for periods between 58 and 62 months, for different interest rates.

Months	Interest Rate Per Month				
	0.4%	0.5%	0.6%	0.7%	0.8%
58	51.67171	50.23911	48.86109	47.53525	46.25932
59	52.46186	50.98419	49.56370	48.19786	46.88425
60	53.24887	51.72556	50.26213	48.85587	47.50421
61	54.03274	52.46324	50.95639	49.50931	48.11926
62	54.81348	53.19726	51.64651	50.15820	48.72942

Use the table to calculate the monthly repayment needed on a loan of \$25 000 at 6% per annum to be repaid over 5 years.

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END OF EXAMINATION

Extra writing space

If you use this space, clearly indicate which question you are answering.



HURLSTONE AGRICULTURAL HIGH SCHOOL

Year 12 Mathematics Standard 2
2020 HSC Trial Examination
(Assessment Task 4)
Multiple Choice Answer Sheet

NAME.....

EXAMPLE $2 + 4 =$

A 2 B 4 C 6 D 8 (A) (B) ● (D)

ATTEMPT ALL QUESTIONS

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

**This sheet should be removed from the question booklet
and handed in with your answer booklet.**

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Mathematics Standard 1

Mathematics Standard 2

REFERENCE SHEET

Measurement

Limits of accuracy

$$\text{Absolute error} = \frac{1}{2} \times \text{precision}$$

$$\text{Upper bound} = \text{measurement} + \text{absolute error}$$

$$\text{Lower bound} = \text{measurement} - \text{absolute error}$$

Length

$$l = \frac{\theta}{360} \times 2\pi r$$

Area

$$A = \frac{\theta}{360} \times \pi r^2$$

$$A = \frac{h}{2}(a + b)$$

$$A \approx \frac{h}{2}(d_f + d_l)$$

Surface area

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

$$A = 4\pi r^2$$

Volume

$$V = \frac{1}{3}Ah$$

$$V = \frac{4}{3}\pi r^3$$

Trigonometry

$$\sin A = \frac{\text{opp}}{\text{hyp}}, \quad \cos A = \frac{\text{adj}}{\text{hyp}}, \quad \tan A = \frac{\text{opp}}{\text{adj}}$$

$$A = \frac{1}{2}ab \sin C$$

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$c^2 = a^2 + b^2 - 2ab \cos C$$

$$\cos C = \frac{a^2 + b^2 - c^2}{2ab}$$

Financial Mathematics

$$FV = PV(1 + r)^n$$

Straight-line method of depreciation

$$S = V_0 - Dn$$

Declining-balance method of depreciation

$$S = V_0(1 - r)^n$$

Statistical Analysis

An outlier is a score

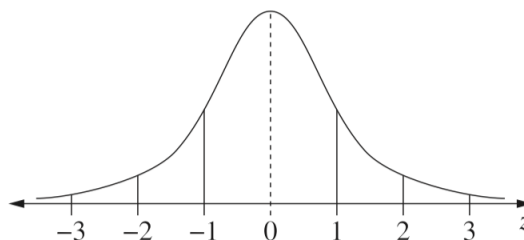
less than $Q_1 - 1.5 \times IQR$

or

more than $Q_3 + 1.5 \times IQR$

$$z = \frac{x - \mu}{\sigma}$$

Normal distribution



- approximately 68% of scores have z -scores between -1 and 1
- approximately 95% of scores have z -scores between -2 and 2
- approximately 99.7% of scores have z -scores between -3 and 3

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Hurlstone Agricultural High School

2020

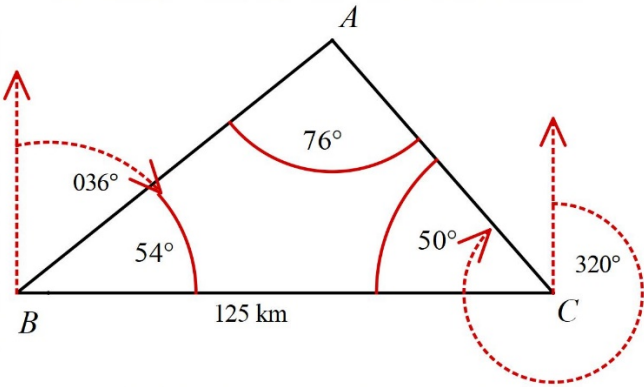
TRIAL HSC EXAMINATION

Mathematics Standard 2 Solutions

Section I

No	Working	Answer
1.	$\cos B = \frac{12}{16}$ $B = \cos^{-1}\left(\frac{12}{16}\right)$ $= 41.40962210927$ $= 41^\circ$ (nearest degree)	B
2.	Sloping side call it x $x^2 = 7^2 + 24^2 = 625$ $x = \sqrt{625} = 25$ Curved edge $= \frac{\pi \times d}{2}$ $= \frac{\pi \times 24}{2}$ $= 37.69911$ Perimeter $= 25 + 37.69911 + 10 + 17$ $= 89.69911$ $= 89.7 \text{ cm (3 s f)}$	C
3.	$FV = PV(1 + r)^n$ $= 4200(1.04)^3$ $= \$4724.4288$ $= \$4\,724.43$	D

No	Working	Answer
4.	The Tacoma would use more than either of the others, as it has higher rates for both city and country. Compare the other two. Firenze Fuel used city = $14.4 \times 0.4 = 5.76$ Fuel used country = $11.4 \times 1.2 = 13.68$ Fuel used = $13.68 + 5.76 = 19.44$ litres Vortex Fuel used city = $15.6 \times 0.4 = 6.24$ Fuel used country = $11.0 \times 1.2 = 13.20$ Fuel used = $6.24 + 13.20 = 19.44$ litres The Firenze and the Vortex use the same amount of fuel	C
5.	Only answer C has E following A and E and D as the only prerequisites for G <pre> graph LR Start[Start] -- A-2 --> J1(()) J1 -- B-3 --> J2(()) J1 -- C-3 --> J3(()) J2 -- F-8 --> J4(()) J3 -- D-3 --> J4 J3 -- E-5 --> J4 J3 -- G-4 --> J5(()) J5 -- H-2 --> End[End] </pre>	C
6.	Weekly gross salary = $54080 \div 52 = \\$1040.00$ Weekly pay after tax = $1040 \times 0.81 = \\$842.4$ Take home pay = $842.4 - 54 = \\$788.40$	B
7.	The time difference between the cities is $10 + 5 = 15$ hours. Sydney is ahead of New York, being plus (east) of NY. When it is 12:30 daylight saving time, it is 11:30 Eastern Standard Time So. go back 15 hours from 11:30 am Monday. Back 12 hours is 11:30 pm Sunday. Back a further 3 hours is 8:30 pm Sunday.	A
8.	Yield = $\frac{\text{dividend}}{\text{share price}} \times 100\%$ $= \frac{0.75}{12.5} \times 100\%$ $= 6\%$	A
9.	$\frac{170}{p} = \frac{10}{32}$ $10p = 170 \times 32$ $= 5440$ $\therefore p = 544$ The estimate of the parrot population is approximately 544.	B

No	Working	Answer
10	The smallest unit used by this timer is the second, so the absolute error is 0.5 sec . 2 minutes and 5 seconds is 125 seconds. $\% \text{ error} = \frac{0.5}{125} \times 100$ $= 0.4\%$	B
11	 $\frac{c}{\sin C} = \frac{a}{\sin A}$ $\frac{AB}{\sin 50^\circ} = \frac{125}{\sin 76^\circ}$ $AB = \frac{125 \sin 50^\circ}{\sin 76^\circ}$	D
12	$BAC_{MALE} = \frac{10N - 7.5H}{6.8M}$ $= \frac{10 \times 6 - 7.5 \times 3}{6.8 \times 80}$ $= \frac{37.5}{544}$ $= 0.06893382$ $= 0.07 (1 \text{ s f})$	D
13	A moderate negative correlation	A
14	$FV = PV(1 + r)^n$ $FV = 48000$ $r = \frac{0.036}{12} = 0.003$ $n = 3 \times 12 = 36$ $48000 = PV(1.003)^{36}$ $48000 = 1.1138676 \times PV$ $PV = \frac{48000}{1.1138676}$ $= 43093.097$ $= \$43093 \text{ (nearest dollar)}$ OR TEST THE 4 ALTERNATIVE ANSWERS	C
15	Cost = 190 Income = 225 Profit = 225 – 190 = \$35.00	D



HURLSTONE AGRICULTURAL HIGH SCHOOL

Year 12 Mathematics Standard 2

2020 HSC Trial Examination

(Assessment Task 4)

Multiple Choice Answer Sheet

NAME.....

EXAMPLE $2 + 4 =$

A 2 B 4 C 6 D 8 (A) (B) ● (D)

ATTEMPT ALL QUESTIONS

1	(A) ● (C) (D)
2	(A) (B) ● (D)
3	(A) (B) (C) ●
4	(A) (B) ● (D)
5	(A) (B) ● (D)
6	(A) ● (C) (D)
7	● (B) (C) (D)
8	● (B) (C) (D)
9	(A) ● (C) (D)
10	(A) ● (C) (D)
11	(A) (B) (C) ●
12	(A) (B) (C) ●
13	● (B) (C) (D)
14	(A) (B) ● (D)
15	(A) (B) (C) ●

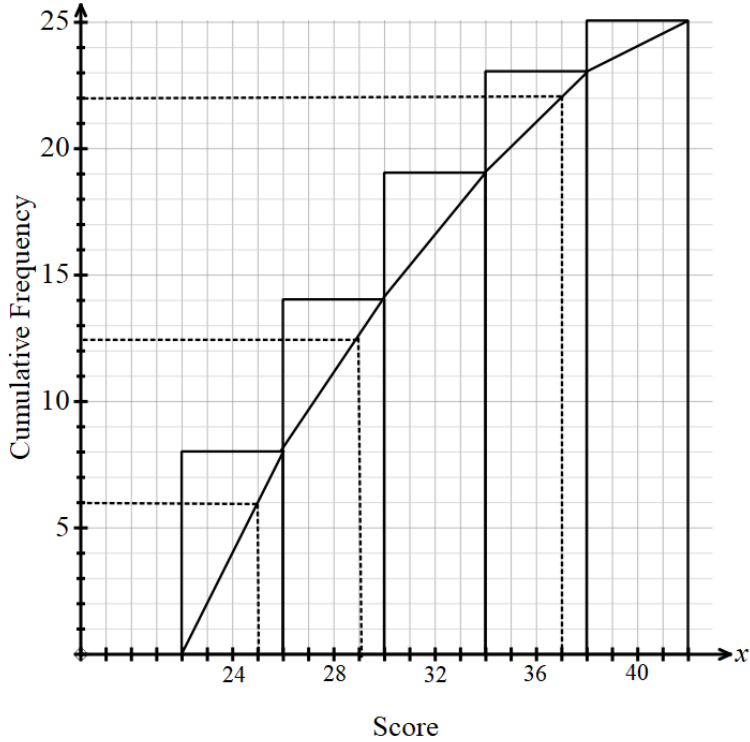
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and handed in with your answer booklet.

Hurlstone Agricultural High School Mathematics Standard 2 Trial HSC

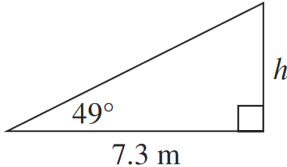
Solutions 2020

Section II

Question		Working and answer	Marks	Mark Allocation
16.		$D = 18\% \times \$19990$ $= \$3598.20$ $S = V_0 - Dn$ $= 19990 - 3598.20 \times 4$ $= \$5597.20$	2	2 marks for correct answer 1 mark for some relevant working
17.		$V = Ah$ $= 26 \times 15 \times 0.015$ $= 5.85\text{m}^3$ $V \text{ in litres} = 5.85 \times 1000$ $= 5850 \text{ L}$ The volume of water collected by the water tank is 5850 litres.	2	2 marks for correct answer 1 mark for some relevant working

Question	Working and answer	Marks	Mark Allocation
18. a)	 From 25 scores the median is the 13th score. From graph this corresponds to a score of 29.	1	1 mark for correct answer
b)	Using class centres, and their frequencies. $\bar{x} = \frac{24 \times 8 + 28 \times 6 + 32 \times 5 + 36 \times 4 + 40 \times 2}{25}$ $= \frac{744}{25}$ $= 29.76$ $= 29.8 \text{ (1 dec place)}$	1	1 mark for correct answer
c)	37 corresponds to 22 on the cumulative frequency axis. 21 out of 25 scored 36 or less so 4 out of 25 scored 37 or more. 4 out of 25 is a percentage of 16 %	1	1 mark for correct answer
d)	If top 76% are advanced to next round, then 24% is cut-off point. 24% is 6 out of 25 From graph CF of 6 corresponds to a score of 25.	1	1 mark for correct answer

Question		Working and answer	Marks	Mark Allocation
19.	a)	We want to divide 24 lollies in the ratio 3 : 5. Mints are $\frac{3}{8}$ of the 24 lollies $= \frac{3}{8} \times 24 = 9$ Mints Eclairs are $\frac{5}{8}$ of the 24 lollies $= \frac{5}{8} \times 24 = 15$ Eclairs (or Eclairs $= 24 - 9 = 15$ Eclairs)	2	2 marks for both correct answers 1 mark for working with a minor error or incomplete (such as only one of the values correctly)
	b)	Number of Snakes : Number of Caramels $= 1 : 3 = 24 : C$ $\frac{3}{1} = \frac{C}{24}$ $C = 24 \times 3 = 72$ Total in packet $= 72 + 24 = 96$	2	2 marks for correct answer 1 mark for working with a minor error or incomplete (such as only finding the number of caramels)
20.	a)	Number grey vehicles $= 36 - (15 + 6 + 4 + 2)$ $= 36 - 27 = 9$ $P(\text{Grey}) = \frac{9}{36} = \frac{1}{4}$	1	1 mark for correct answer
	b)	$P(\text{Blue}) = \frac{4}{36} = \frac{1}{9}$ $P(\text{Not Blue}) = 1 - \frac{1}{9} = \frac{8}{9}$	1	1 mark for correct answer

Question		Working and answer	Marks	Mark Allocation																														
21.		Principal (P) = \$50000.00 Annual Interest rate (r) = 8% This table assumes each month Monthly repayment (R) = \$500.00 is one twelfth of a year. <table><tr><th>N</th><th>Principal (P)</th><th>Interest (I)</th><th>P + I</th><th>P + I - R</th></tr><tr><td>1</td><td>\$45,000.00</td><td>\$300.00</td><td>\$45,300.00</td><td>\$44,800.00</td></tr><tr><td>2</td><td>\$44,800.00</td><td>\$298.67</td><td>\$45,098.67</td><td>\$44,598.67</td></tr><tr><td>3</td><td>\$44,598.67</td><td>\$297.32</td><td>\$44,895.99</td><td>\$44,395.99</td></tr><tr><td>4</td><td>\$44,395.99</td><td>\$295.97</td><td>\$44,691.96</td><td>\$44,191.96</td></tr><tr><td>5</td><td>\$44,191.96</td><td>\$294.61</td><td>\$44,486.58</td><td>\$43,986.57</td></tr></table> $I = \frac{8}{12} \div 100 \times 44,191.96$	N	Principal (P)	Interest (I)	P + I	P + I - R	1	\$45,000.00	\$300.00	\$45,300.00	\$44,800.00	2	\$44,800.00	\$298.67	\$45,098.67	\$44,598.67	3	\$44,598.67	\$297.32	\$44,895.99	\$44,395.99	4	\$44,395.99	\$295.97	\$44,691.96	\$44,191.96	5	\$44,191.96	\$294.61	\$44,486.58	\$43,986.57	2	2 marks for correct answer (in bold) 1 mark for correct interest or similar credit
N	Principal (P)	Interest (I)	P + I	P + I - R																														
1	\$45,000.00	\$300.00	\$45,300.00	\$44,800.00																														
2	\$44,800.00	\$298.67	\$45,098.67	\$44,598.67																														
3	\$44,598.67	\$297.32	\$44,895.99	\$44,395.99																														
4	\$44,395.99	\$295.97	\$44,691.96	\$44,191.96																														
5	\$44,191.96	\$294.61	\$44,486.58	\$43,986.57																														
22.		 $\frac{h}{7.3} = \tan 49^\circ$ $h = 7.3 \tan 49^\circ$ $= 8.3976...$ $\approx 8.4 \text{ m}$ The difference in height is 8.4 metres.	2	2 marks for correct answer 1 mark for some relevant working																														

23.	a)	Anika's line has an even number of points above and below the line for the full range. David's has more points below at one end and more above at the other end.	1	1 mark for either of these statements or similar.
	b)	Choose two points on the line such as (4, 34) and (10, 55). Calculate the gradient using any method. $\text{gradient} = \frac{\text{rise}}{\text{run}} = \frac{21}{6} = 3.5$ Intercept = 20 $y = mx + b$ $S = 3.5 A + 20$	2	2 marks for correct answer 1 mark for working with an error in gradient or intercept or which is incomplete
24.	a)	Usage = $\frac{80 \times 8 + 4 \times 16}{1000}$ = 0.704 kWh	1	1 mark for correct answer
	b)	Amount used in 1 day on standby for 16 hours = $4 \times 16 \div 1000 = 0.064$ kWh Amount used in a year = $0.064 \times 365 = 23.36$ kWh Money saved in a year = $23.36 \times 0.30 = \$7.008 = \7.01 per year	2	2 marks for correct answer 1 mark for answer that correctly calculates usage but is incomplete or has an error or similar merit

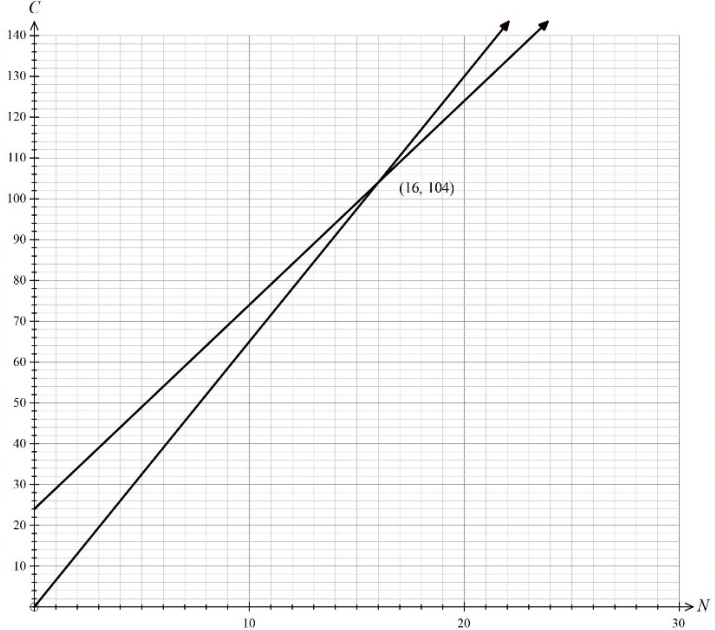
25.	a)		2	2 marks for correct tree 1 mark for tree with minor error in probabilities
	b)	$P(SS) = \frac{3}{16} \times \frac{2}{15} = \frac{1}{40}$ $P(MM) = \frac{1}{2} \times \frac{7}{15} = \frac{7}{30}$ $P(LL) = \frac{5}{16} \times \frac{4}{15} = \frac{1}{12}$ $P(\text{Two same size}) = P(SS) + P(MM) + P(LL) = \frac{1}{40} + \frac{7}{30} + \frac{1}{12}$ $= \frac{41}{120}$	1	1 mark for correct answer

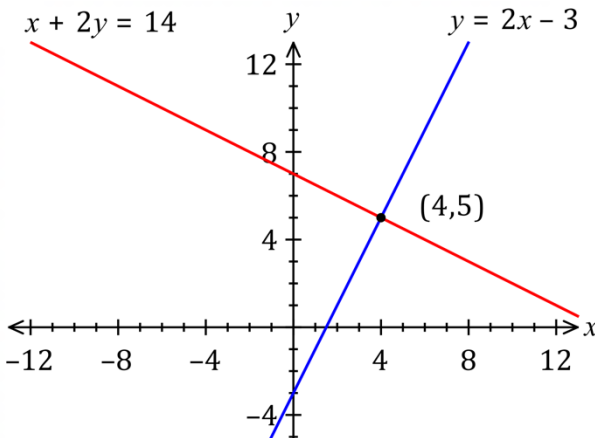
26.	a)	Forward scan shown at top of nodes. The minimum time is 29 days.	2	2 marks for correct answer 1 mark for answer that has a scan which is incomplete or has minor errors or similar merit
	b)	Forward scan top half of nodes and backward scan bottom half of nodes. The float on activity R is difference between forward and backward scans. $19 - 17 = 2$ days.	2	2 marks for correct answer 1 mark for working that shows a backward scan with a minor error or similar merit,
27.	a)	No interest for first 3 days as zero balance From 4th to 15th balance = 17.15 Interest = $17.15 \times 0.00041 \times 12$ = \$0.08	1	1 mark for correct answer
	b)	From 16th to 19th balance = 67.41 Interest = $67.41 \times 0.00041 \times 4$ = \$0.11 From 20th to 30th balance = 159.49 Interest = $159.49 \times 0.00041 \times 11$ = \$0.72 On 31st balance = 353.48 Interest = $353.48 \times 0.00041 \times 1$ = \$0.14 Interest charged = $0.08 + 0.11 + 0.72 + 0.14$ = \$1.05	2	2 marks for correct answer (allowing for rounding differences e.g. \$1.06) 1 mark for working which shows minor errors

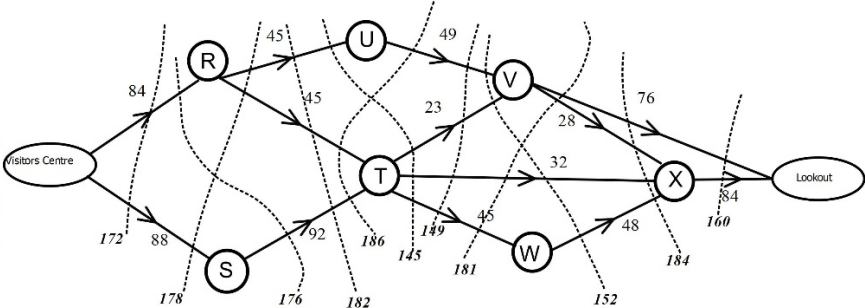
28.		$G = \frac{PD}{V_1 + V_2}$ $G = 21, D = 7.0, V_1 = 12.5 \text{ and } V_2 = 7.5.$ $21 = \frac{7P}{12.5 + 7.5}$ $21 = \frac{7P}{20}$ $7P = 420$ $P = \frac{420}{7} = 60$	2	2 marks for correct answer 1 mark for correct substitution and attempt at solution by any method or equivalent merit
29.		Paid in time to receive the discount, So amount due = $643.26 - 64.33$ = \$578.93 Amount shared = $578.93 \div 5$ = \$115.79 (Accept this answer or \$115.80)	2	2 marks for correct answer 1 mark for total only or similar credit
30.	a)	Either of the following	2	2 marks for correct answer 1 mark for a spanning tree which is not minimum
	b)	Sum of edges = $30 + 25 + 20 + 35 + 10 + 30 = 150$ Cost = \$15 000	1	1 mark for correct answer

31.	a)	AB is parallel to north direction. Therefore, $\angle CAB = 49^\circ$ (Alternate angles are equal when two lines are parallel.)	1	1 mark for correct answer
	b)	$a^2 = b^2 + c^2 - 2bc \cos A$ $BC^2 = 27^2 + 12^2 - 2 \times 27 \times 12 \times \cos 49^\circ$ $= 21.1630\dots$ $\approx 21.2 \text{ km}$ The distance from B to C is 21.2 km.	2	2 marks for correct answer 2 marks for using the cosine rule with at least 1 correct value
	c)	Use the sine rule to find $\angle ACB$. $\frac{\sin \angle ACB}{12} = \frac{\sin 49^\circ}{21.1630\dots}$ $\sin \angle ACB = \frac{12 \sin 49^\circ}{21.1630\dots}$ $\angle ACB = 25.3369\dots$ $\approx 25^\circ$ The true bearing of B from C is 074°T ($49^\circ + 25^\circ$).	2	2 marks for correct answer 2 marks for using the sine rule with at least 1 correct value
32.	a)	Weekly pay (Pub Serv) = $\\$60788.00 \div 52$ = \$1 169.00	1	1 mark for correct answer
	b)	Weekly pay (Council) = 25.60×36 = \$921.60	1	1 mark for correct answer
	c)	Difference in pay = $\\$1169 - 921.60$ = \$247.40 Normal hours to achieve difference = $\\$247.40 \div 25.6$ = 9.6640625 Equivalent hours at overtime = $9.6640625 \div 1.5$ = 6.44270833 = 6.5 hours (nearest half hour)	1	1 mark for correct answer

33.	a)	$r = 0.995193611 \dots$ ≈ 0.9952	1	1 mark for correct calculation
	b)	$y = mx + b$ $= BX + A$ $H = 1.19t - 0.85$	2	1 mark for correct answer
	c)	When $t = 5$ years $H = 1.19t - 0.85$ $= 1.19 \times 5 - 0.85$ ≈ 5.1 m Height of the tree after 5 years is 5.1 metres.	1	1 mark for correct answer
	d)	When $H = 20$ m $H = 1.19t - 0.85$ $20 = 1.19 \times t - 0.85$ $1.19t = 20.85$ $t \approx 17.5$ years $\therefore$ It takes 17.5 years for the tree to reach a height of 20 metres.		1 mark for correct answer
34.	a)	For a trip of 50 km fuel used $= 50 \times 0.12 = 6$ litres Cost $= 6 \times 1.25 = \$7.50$	1	1 mark for correct answer
	b)	For a trip of N km fuel used $= N \times 0.12 = 0.12N$ litres Cost $= 0.12N \times 1.25 = 0.15N$ $C = 0.15N$	2	2 marks for correct answer 1 mark for calculating the constant of variation or similar merit
35.		$A = \frac{h}{2}(d_f + d_l)$ Using four applications with a width of 25 m each $A = \frac{25}{2}(120 + 109) + \frac{25}{2}(109 + 105)$ $\quad + \frac{25}{2}(105 + 104) + \frac{25}{2}(104 + 90)$ $= 2862.5 + 2675 + 2612.5 + 2425$ $= 10\,575 \text{ m}^2$	3	3 marks for correct answer 2 marks for working with a minor error 1 mark for some relevant working

36.	a)	Each bar costs \$5.00 to make, so $5N$ is the cost of making N bars, but she paid \$24 to set up so this is added to the cost so the total is $C = 24 + 5N$	1	1 mark for any reasonable explanation
	b)		1	1 mark for correct graph of line.
	c)	Point of intersection is $(16, 104)$ so 16 bars need to be sold to break even.	1	1 mark for correct answer
	d)	From graph or using equations, $N = 5$ costs \$49.00 to make and the income is \$32.50 $\text{Loss} = 32.50 - 49.00 = \16.50	1	1 mark for correct answer

37.	a)	$\text{Loss in value} = 15200 - 13376$ $= 1824$ $\text{Percentage Depreciation} = \frac{1824}{15200} \times 100$ $= 12\% \text{ p.a.}$	1	1 mark for correct answer
	b)	$S = V_0(1 - r)^N$ $= 13376(1 - 0.12)^5$ $= \$7\,058.94$ OR $S = V_0(1 - r)^N$ $= 15200(1 - 0.12)^6$ $= \\$7\,058.94$	2	2 marks for correct answer 1 mark for minor error in use of formula or repetition of depreciation
38.	a)	 ∴ Simultaneous solution is (4, 5)	3	3 marks: Correct answer. 2 marks: Draws the graphs of the two equations. 1 mark: Shows some understanding.

39.	a)	Group 1 $IQR = 66.5 - 54.5 = 12$ Group 2 $IQR = 64 - 58 = 6$ Group 1 has a IQR twice that of Group 2	1	1 mark for correct comparison
	b)	In Group 1 64 is the median so 50% are above, or 18 students In Group 2 64 is the upper quartile so 25% are above, or 9 students There are 9 more students in Group 1	2	2 marks for correct answer 1 mark for identifying correct percentages for 64 or similar merit
40.	a)	 Using the minimum cut-maximum flow method the maximum flow is 145 visitors per hour.	2	2 marks for correct answer. 1 mark for answer of 149 or similar with some justification using cuts on a diagram.
	b)	Consider the cuts with capacities of less than 160 (ie. 145, 149 and 152). The lowest cut of 145 means we need to increase capacity by 15. Increasing RU by 15 would increase the cut of 145 to 160 but would still leave the 149 and 152 cuts. Increasing TV, TW or TX by 15 would increase both the 145 and 149 cuts to 160 or above but increasing TW would not affect the 152 cut. This leaves TV or TX. Therefore, raise the capacity of trail TV (or TX) by 15 people per hour.	1	1 mark for the correct answer in bold.
41.		$R = \frac{18}{20} \times 60 = 54 \text{ bpm}$ $M = 220 - 18 = 202$ $T = 0.7(M - R) + R$ $T = 0.7(202 - 54) + 54$ $= 0.7(148) + 54$ $= 103.6 + 54$ $= 157.6$ $= 158 \text{ bpm}$	2	2 marks for correct answer (rounded or not) 1 mark for at least 2 correct calculations

42.	a)	<table><tr><td></td><td>A</td><td>B</td><td>C</td><td>D</td><td>E</td><td>F</td><td>G</td></tr><tr><td>A</td><td></td><td>19</td><td></td><td>18</td><td></td><td></td><td></td></tr><tr><td>B</td><td>19</td><td></td><td>15</td><td>14</td><td></td><td></td><td>27</td></tr><tr><td>C</td><td></td><td>15</td><td></td><td>10</td><td>13</td><td></td><td></td></tr><tr><td>D</td><td>18</td><td>14</td><td>10</td><td></td><td></td><td>14</td><td></td></tr><tr><td>E</td><td></td><td></td><td>13</td><td></td><td></td><td>10</td><td>11</td></tr><tr><td>F</td><td></td><td></td><td></td><td>14</td><td>10</td><td></td><td>12</td></tr><tr><td>G</td><td></td><td>27</td><td></td><td></td><td>11</td><td>12</td><td></td></tr></table>		A	B	C	D	E	F	G	A		19		18				B	19		15	14			27	C		15		10	13			D	18	14	10			14		E			13			10	11	F				14	10		12	G		27			11	12		2	2 marks for 12 correct values added to the table 1 mark for attempt with up to three incorrect values
	A	B	C	D	E	F	G																																																													
A		19		18																																																																
B	19		15	14			27																																																													
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F				14	10		12																																																													
G		27			11	12																																																														
	b)	Shortest path is 44 minutes which passes through <i>ADFG</i>	2	2 marks for correct time and path 1 mark if either is provided correctly or if a minor error causes both to be incorrect																																																																

43.	a)	<table><tr><th rowspan="2">Years</th><th colspan="5">Interest Rate Per Annum</th></tr><tr><th>5%</th><th>6%</th><th>7%</th><th>8%</th><th>9%</th></tr><tr><td>4</td><td>4.3101</td><td>4.3746</td><td>4.4399</td><td>4.5061</td><td>4.5731</td></tr><tr><td>5</td><td>5.5256</td><td>5.6371</td><td>5.7507</td><td>5.8666</td><td>5.9847</td></tr><tr><td>6</td><td>6.8019</td><td>6.9753</td><td>7.1533</td><td>7.3359</td><td>7.5233</td></tr><tr><td>7</td><td>8.1420</td><td>8.3938</td><td>8.6540</td><td>8.9228</td><td>9.2004</td></tr><tr><td>8</td><td>9.5491</td><td>9.8975</td><td>10.2598</td><td>10.6366</td><td>11.0285</td></tr></table> Value = 5.6371×4000 = \$22548.40	Years	Interest Rate Per Annum					5%	6%	7%	8%	9%	4	4.3101	4.3746	4.4399	4.5061	4.5731	5	5.5256	5.6371	5.7507	5.8666	5.9847	6	6.8019	6.9753	7.1533	7.3359	7.5233	7	8.1420	8.3938	8.6540	8.9228	9.2004	8	9.5491	9.8975	10.2598	10.6366	11.0285	1	1 mark for correct answer	
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	b)	To achieve \$25 000 $25\ 000 = 5.6371 \times a$ $a = 25\ 000 \div 5.6371 = \$4\ 434.90$	1	1 mark for correct answer																																										
	c)	5 years = 60 months 6% per annum = 0.5% per month <table><tr><th>Months</th><th colspan="5">Interest Rate Per Month</th></tr><tr><th></th><th>0.4%</th><th>0.5%</th><th>0.6%</th><th>0.7%</th><th>0.8%</th></tr><tr><td>58</td><td>51.67171</td><td>50.23911</td><td>48.86109</td><td>47.53525</td><td>46.25932</td></tr><tr><td>59</td><td>52.46186</td><td>50.98419</td><td>49.56370</td><td>48.19786</td><td>46.88425</td></tr><tr><td>60</td><td>53.24887</td><td>51.72556</td><td>50.26213</td><td>48.85587</td><td>47.50421</td></tr><tr><td>61</td><td>54.03274</td><td>52.46324</td><td>50.95639</td><td>49.50931</td><td>48.11926</td></tr><tr><td>62</td><td>54.81348</td><td>53.19726</td><td>51.64651</td><td>50.15820</td><td>48.72942</td></tr></table> $25\ 000 = 51.72556 \times R$ $R = 25\ 000 \div 51.72556 = \\483.32	Months	Interest Rate Per Month						0.4%	0.5%	0.6%	0.7%	0.8%	58	51.67171	50.23911	48.86109	47.53525	46.25932	59	52.46186	50.98419	49.56370	48.19786	46.88425	60	53.24887	51.72556	50.26213	48.85587	47.50421	61	54.03274	52.46324	50.95639	49.50931	48.11926	62	54.81348	53.19726	51.64651	50.15820	48.72942	2	2 marks for correct answer (rounded to nearest dollar or cent) 1 mark for working with minor error in conversions or calculations
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