



SHORE

School Exam No:

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Set:

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Year 12

Mathematics Standard

HSC Task 2

March 6th 2023

General Instructions

- Working time – 45 minutes
- Write using black pen
- NESA-approved calculators may be used
- A reference sheet is provided
- In Questions 11 – 20, show relevant mathematical reasoning and/or calculations

Note: Any time you have remaining should be spent reviewing your answers.

Total marks – 40

Section I

10 marks

- Attempt Questions 1 – 10
- Allow about 10 minutes for this section

Section II

30 marks

- Attempt Questions 11 – 20
- Allow about 35 minutes for this section

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Section I

10 marks

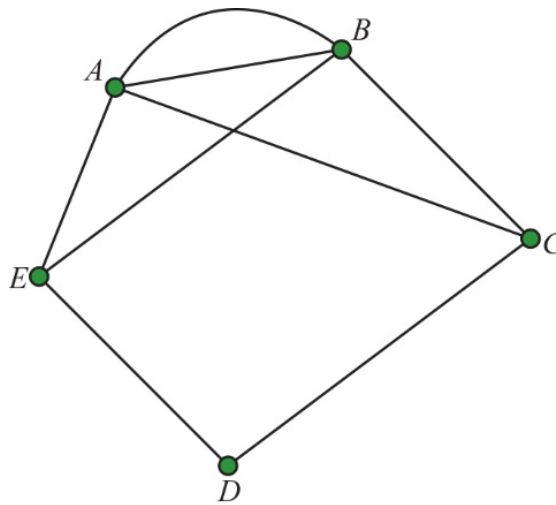
Attempt Questions 1–10

Allow about 10 minutes for this section

Use the multiple-choice answer sheet for questions 1–10

Assume 52 weeks in a year and 365 days in a year, where necessary

1 Consider the network below.



What is the degree of vertex B ?

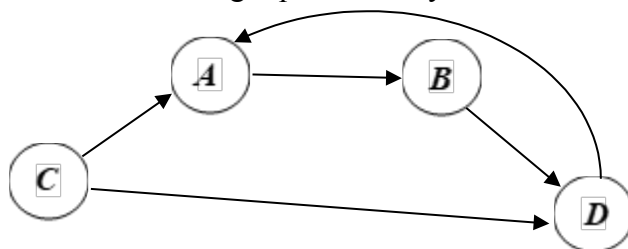
- A. 1
- B. 2
- C. 3
- D. 4

- 2 Kaitlyn and Max invested in a painting in the ratio 7 : 6. Five years later they sold the painting for \$23 660.

How much should Max receive from the sale of the painting?

- A. \$6 000
- B. \$10 920
- C. \$12 740
- D. \$20 280

- 3 What is the fuel consumption for a vehicle that travels 340 km using 51 litres of petrol?
- A. 7 L/100 km
 - B. 9 L/100 km
 - C. 15 L/100 km
 - D. 17 L/100 km
- 4 Tom is deciding between 4 different sized jars of jam.
- Which of the following sizes will give the best value for money?
- A. 200 g at \$2.80
 - B. 450 g at \$5.00
 - C. 600 g at \$6.80
 - D. 850 g for \$8.30
- 5 A child who weighs 14 kg needs to be given 15 mg of paracetamol for every 2 kg of body weight. Every 10 mL of a particular medicine contains 120 mg of paracetamol.
- What is the correct dosage of this medicine for the child?
- A. 5.6 mL
 - B. 8.75 mL
 - C. 11.43 mL
 - D. 17.5 mL
- 6 Which of the following represents a cycle in the network below?



- A. ABDCA*
- B. CABDAC*
- C. ABDA*
- D. CABDC*

7 Larry is 24 years old. He wishes to work out at 50-85% of his maximum heart rate.

Maximum heart rate (MHR), in beats per minute, can be calculated using the formula:

$$\text{MHR} = 220 - \text{Age of the person in years}$$

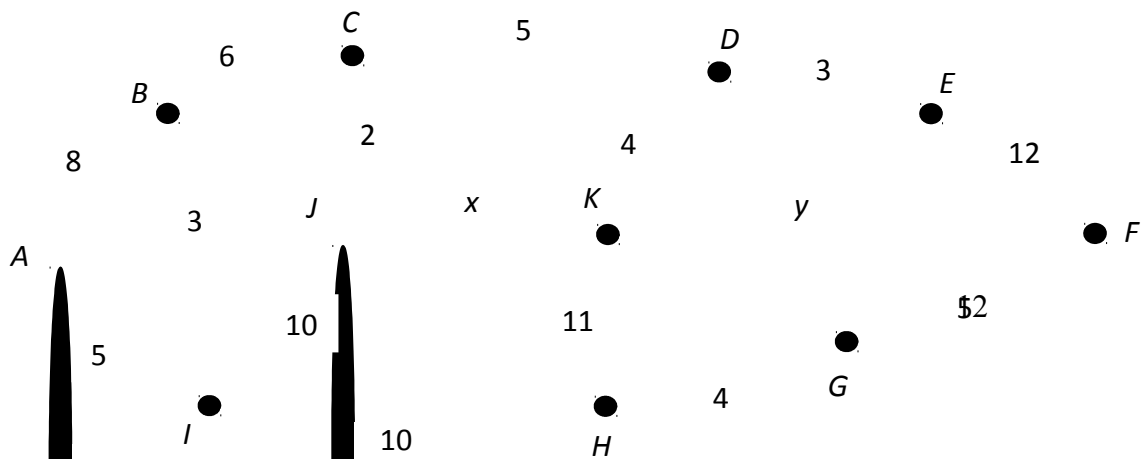
Between what two heart rates should Larry be aiming for to achieve his target heart rate?

- A. 70 to 152 beats per minute
 - B. 98 to 167 beats per minute
 - C. 110 to 187 beats per minute
 - D. 196 to 220 beats per minute
- 8** Which of the following speeds is equal to 12 m/s?
- A. 3 km/h
 - B. 43.2 km/h
 - C. 200 km/h
 - D. 432 km/h
- 9** A scientific study uses the ‘capture-recapture’ technique. In the first stage of the study, 24 sharks were caught, tagged and released. Later, in the second stage of the study, some sharks were captured from the same area. Eighteen of these were found to be tagged, which was 40% of the total captured during the second stage.

What is the estimate for the total population of sharks in this area?

- A. 40
- B. 53
- C. 60
- D. 173

10 A network of electrical cables connecting towns in a remote community is shown below. The distances between neighbouring towns, represented by vertices, are given in kilometres.



What is the minimum total length of cables, in kilometres, that is required to connect all towns?

- A. 35 if $x = 3$ and $y = 2$
- B. 37 if $x = 2$ and $y = 3$
- C. 40 if $x = 4$ and $y = 7$
- D. 40 if $x = 7$ and $y = 4$

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School Exam No:

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Year 12 Mathematics Standard HSC Task 2 2023

Date

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Question Numbers

11-15

Instructions

- Complete all boxes on the front cover of this writing booklet.
- Write using black pen.
- If you need more space, use the extra writing space at the back of this writing booklet.

Section II

30 marks

Attempt Questions 11 – 20

Allow about 35 minutes for this section

Answer the questions in the spaces provided.

Your responses should include relevant mathematical reasoning and/or calculations.

Extra writing space is provided at the end of each question booklet. If you use this space, clearly indicate which question you are answering.

Assume 52 weeks in a year, and 365 days in a year where necessary.

Question Booklet 1: Questions 11 – 15 (15 marks)

Question 11 (2 marks)

A full container has 3.6 L of a mixture of cleaning fluid and water, in the ratio 1 : 3. 2

How many litres of water were used in this mixture?

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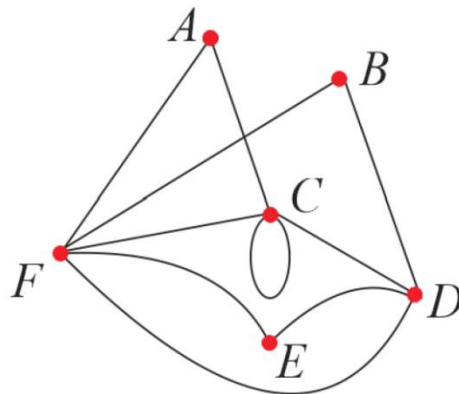
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Question 12 (2 marks)

Consider the network below.



(a) State the number of edges in the network.

1

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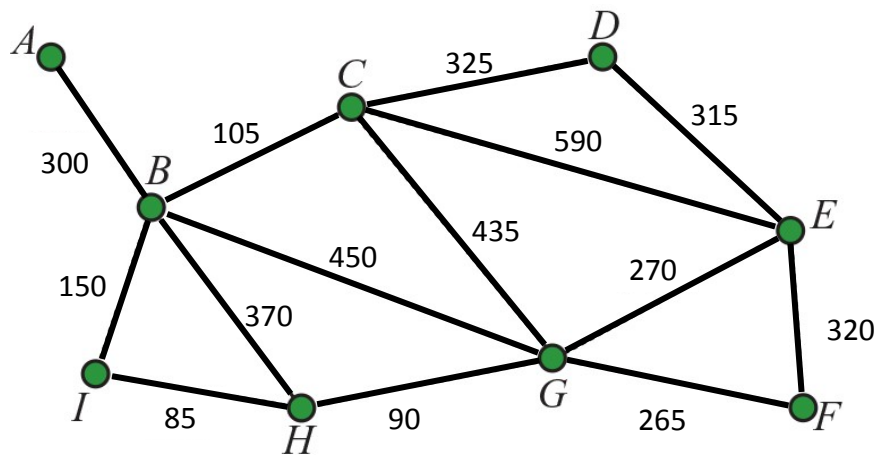
(b) Find the sum of the degrees of vertices in the network.

1

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Question 13 (3 marks)

A school is installing some internet cabling. The proposed costs, in dollars, for linking the different rooms (vertices $A - I$) are shown in the network diagram below.



- (a) State the shortest path between room C and room F .

1

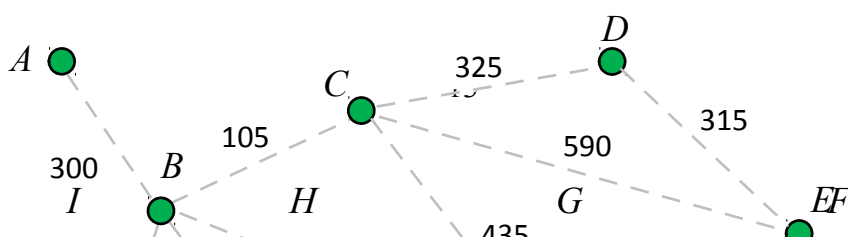
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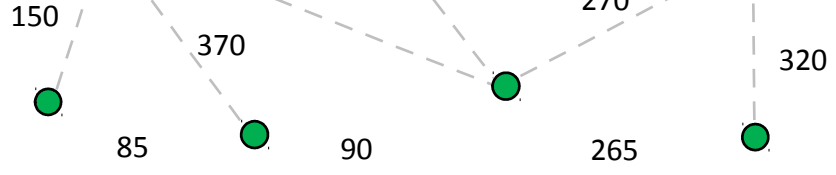
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- (b) On the outline below, draw the minimum spanning tree for this network.

2







Question 14 (4 marks)

A map has a scale of 1:300 000...

- (a) Two mountain peaks are 2 cm apart on the map.

What is the actual distance between the two mountain peaks, in kilometres?

2

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- (b) Two cities are 51 km apart.

How far apart are the two cities on the map, in centimetres?

2

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Question 15 (4 marks)

John is considering purchasing a new refrigerator and has the following two options:

4

Electrodux: 3 star energy rating of 32.83 kWh/month

Kevinator: 4 star energy rating 77.5 kWh/quarter

Which refrigerator is the cheapest option to run for a year, and by how much? Assume that electricity charges remained constant at 28.5c/kWh.

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End of Question Booklet 1

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Year 12 Mathematics Standard HSC Task 2 2023

Date

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Question Numbers

16-20

Instructions

- **Complete all boxes** on the front cover of this writing booklet.
- Write using black pen.
- If you need more space, use the extra writing space at the back of this writing booklet.

Question Booklet 2: Questions 16 – 20 (15 marks)

Question 16 (2 marks)

Andrew, Henry and Tom are the top scorers for the 1st Basketball team. In a recent match against Riverview, Andrew scored 36 points, Henry scored 24 points and Tom scored 16 points.

- (a) What is the ratio of Andrew's to Henry's to Tom's points scored, in simplest form? **1**

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- (b) In this match, the ratio of the total number of points scored by Andrew, Henry and Tom to the total number of points scored by the whole team is 2 : 3. **1**

How many points were scored by the whole team?

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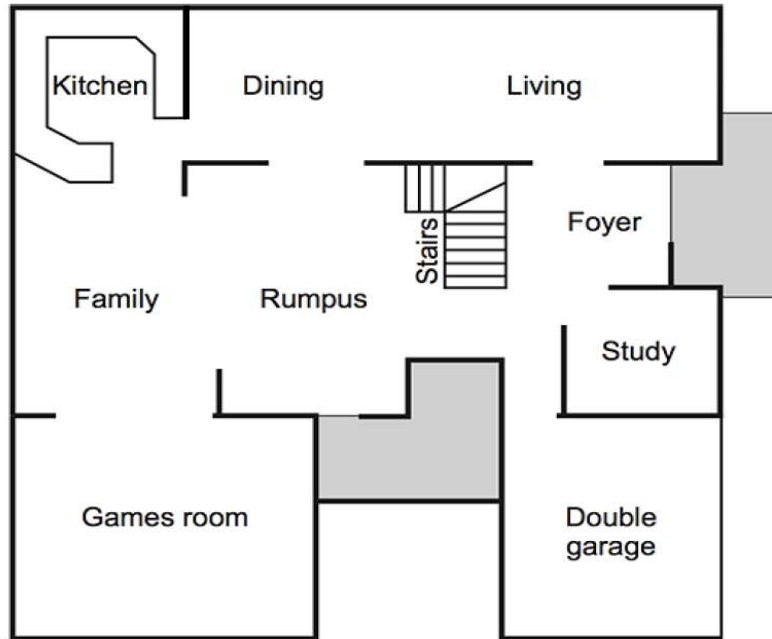
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Question 17 (3 marks)

The house plan of a ground floor is drawn to scale below. The scale is 1:150.



What is the cost of carpet for the dining and living rooms, if the carpet costs \$110 per square metre?

3

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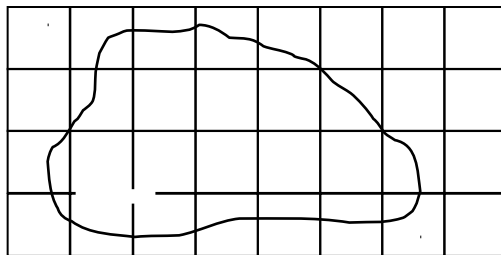
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Question 18 (4 marks)

A park is shown, on a grid of squares which each represent a square that is 10 metres by 10 metres. To use the grid square method for approximating area, count the number of whole grid squares within the boundary. Count the grid squares around the edge that are partially inside the boundary and multiply by 0.5. Add to find the total number of whole grid squares.



- (a) Calculate the area one grid square represents in the park. 1

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- (b) By first finding the total number of grid squares covered by the park, calculate the approximate area of the park using the formula: 1

$$\text{Area} = \text{total number of grid squares} \times \text{area of each grid square.}$$

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- (c) Fertiliser is used to cover the area of the park. 2

How much will it cost to buy the fertiliser, if 120 g/m² is required, and manure costs \$23.10 per kg?

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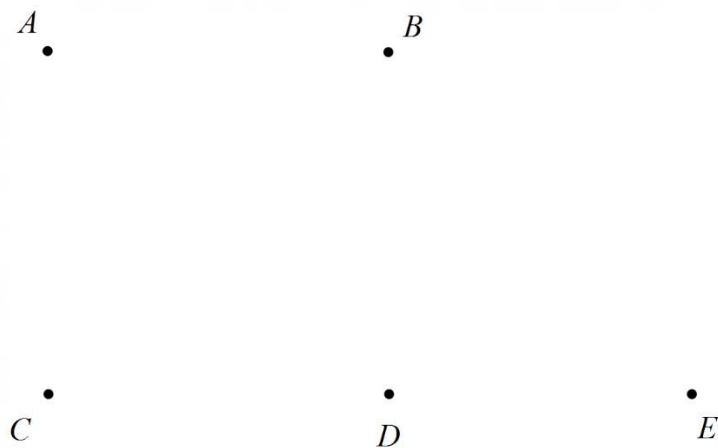
Question 19 (3 marks)

In Central New South Wales, there are five petrol stations A, B, C, D and E. The table below shows the length, in kilometres, of roads connecting these petrol stations.

	<i>A</i>	<i>B</i>	<i>C</i>	<i>D</i>	<i>E</i>
<i>A</i>		20	40		
<i>B</i>	20			20	45
<i>C</i>	40			15	
<i>D</i>		20	15		20
<i>E</i>		45		20	

- (a) Draw a network diagram to represent the information shown in the table.

2



(b) What is the shortest distance, in kilometres, between petrol stations *A* and *E*?

1

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Question 20 (3 marks)

3

Jonty mixes petrol and oil in the ratio 39:1 to make fuel for his new lawn mower. After pouring 6 litres of fuel into the lawn mower, he realises that he made a mistake. The petrol and oil ratio should have been 30:1.

What is the minimum amount of oil that must be added to the mixture in order to correct the ratio?

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Questions 16 – 20 Extra writing space

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

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2023 Mathematics Standard 2 HSC Task 2 Examination

Section I – Multiple Choice Answer Sheet

Select the alternative A, B, C or D that best answers the question. Fill in the response oval completely.

Sample: $2 + 4 =$ (A) 2 (B) 6 (C) 8 (D) 9
A B C D

If you think you have made a mistake, put a cross through the incorrect answer and fill in the new answer.

A B C D

If you change your mind and have crossed out what you consider to be the correct answer, then indicate the correct answer by writing the word *correct* and drawing an arrow as follows.

A B C D
correct

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

correct





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Year 12 Mathematics Standard HSC Task 2 2023

SOLUTIONS

Date

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Question Numbers

11-15

Instructions

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Section II

30 marks

Attempt Questions 11 – 20

Allow about 35 minutes for this section

Answer the questions in the spaces provided.

Your responses should include relevant mathematical reasoning and/or calculations.

Extra writing space is provided at the end of each question booklet. If you use this space, clearly indicate which question you are answering.

Assume 52 weeks in a year, and 365 days in a year where necessary.

Question Booklet 1: Questions 11 – 15 (15 marks)

Question 11 (2 marks)

A full container has 3.6 L of a mixture of cleaning fluid and water, in the ratio 1 : 3.

2

How many litres of water were used in this mixture?

$$C : W$$

$$1 : 3$$

$$3.6 \text{ L} = 4 \text{ parts}$$

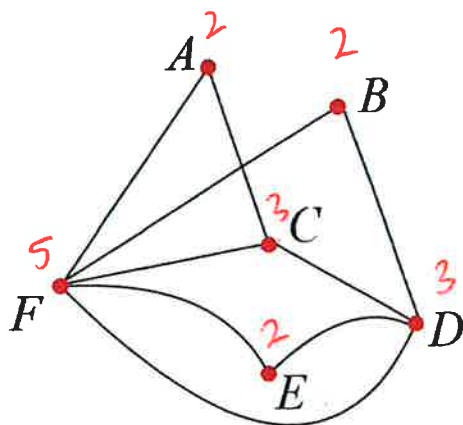
$$0.9 \text{ L} = 1 \text{ part}$$

$$\times 3$$

$$\therefore 2.7 \text{ L of water}$$

Question 12 (2 marks)

Consider the network below.



(a) State the number of edges in the network.

1

9

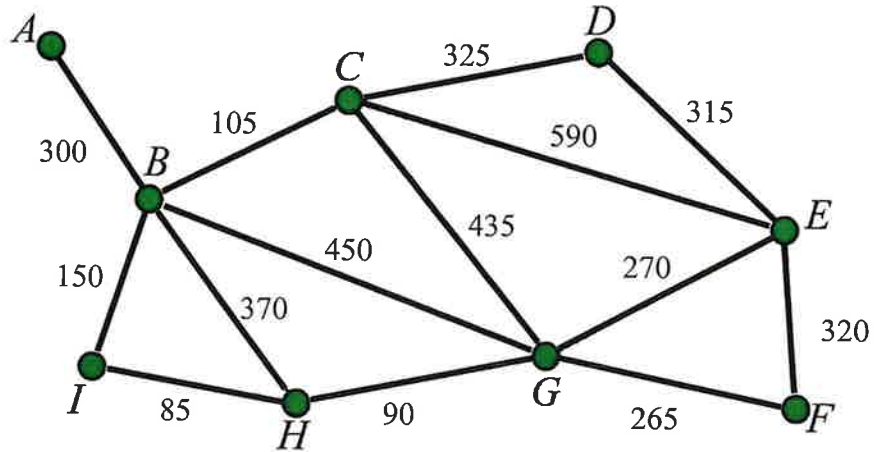
(b) Find the sum of the degrees of vertices in the network.

1

17

Question 13 (3 marks)

A school is installing some internet cabling. The proposed costs, in dollars, for linking the different rooms (vertices $A - I$) are shown in the network diagram below.



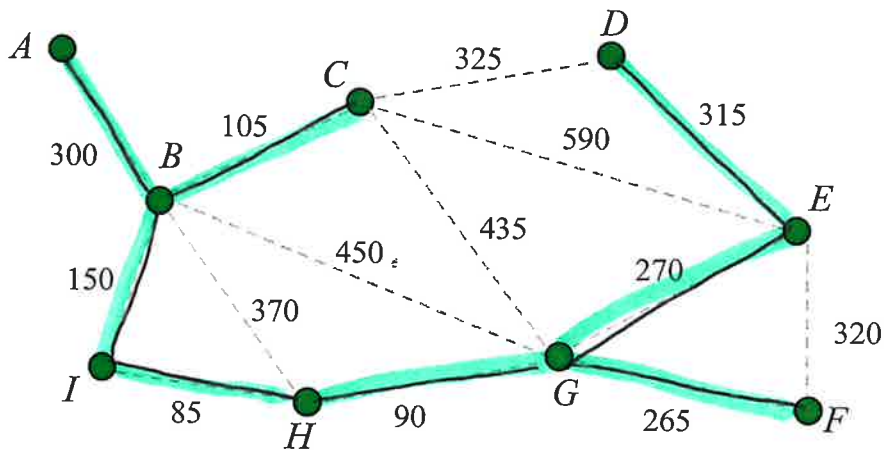
- (a) State the shortest path between room C and room F .

1

C B I H G F = \$695

- (b) On the outline below, draw the minimum spanning tree for this network.

2



Question 14 (4 marks)

A map has a scale of 1:300 000.

- (a) Two mountain peaks are 2 cm apart on the map.

What is the actual distance between the two mountain peaks, in kilometres?

2

$$\begin{aligned} 300\ 000 \times 2 &= 600\ 000\ \text{cm} \\ &\div 100 \div 1000 \\ &= 6\ \text{km} \end{aligned}$$

- (b) Two cities are 51 km apart.

How far apart are the two cities on the map, in centimetres?

2

$$1\ \text{cm} = 3\ \text{km}$$

$$51 \div 3 = 17$$

$$\therefore 17\ \text{cm}$$

Question 15 (4 marks)

John is considering purchasing a new refrigerator and has the following two options:

4

Electrodux: 3 star energy rating of 32.83 kWh/month

Kevinator: 4 star energy rating 77.5 kWh/quarter

Which refrigerator is the cheapest option to run for a year, and by how much? Assume that electricity charges remained constant at 28.5c/kWh.

Electrodux

$$32.83 \times 12 = 393.96 \text{ kWh/year}$$

$$393.96 \times 0.285 = \$112.28/\text{year}$$

Kevinator

$$77.5 \times 4 = 310 \text{ kWh/year}$$

$$310 \times 0.285 = \$88.35/\text{year}$$

\therefore The Kevinator is cheaper by \$23.93.

End of Question Booklet 1

Questions 11 – 15 Extra writing space

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

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Question Numbers

16-20

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Question Booklet 2: Questions 16 – 20 (15 marks)

Question 16 (2 marks)

Andrew, Henry and Tom are the top scorers for the 1st Basketball team. In a recent match against Riverview, Andrew scored 36 points, Henry scored 24 points and Tom scored 16 points.

- (a) What is the ratio of Andrew's to Henry's to Tom's points scored, in simplest form? **1**

$$\begin{aligned} & A : H : T \\ & 36 : 24 : 16 \\ & = 9 : 6 : 4 \end{aligned}$$

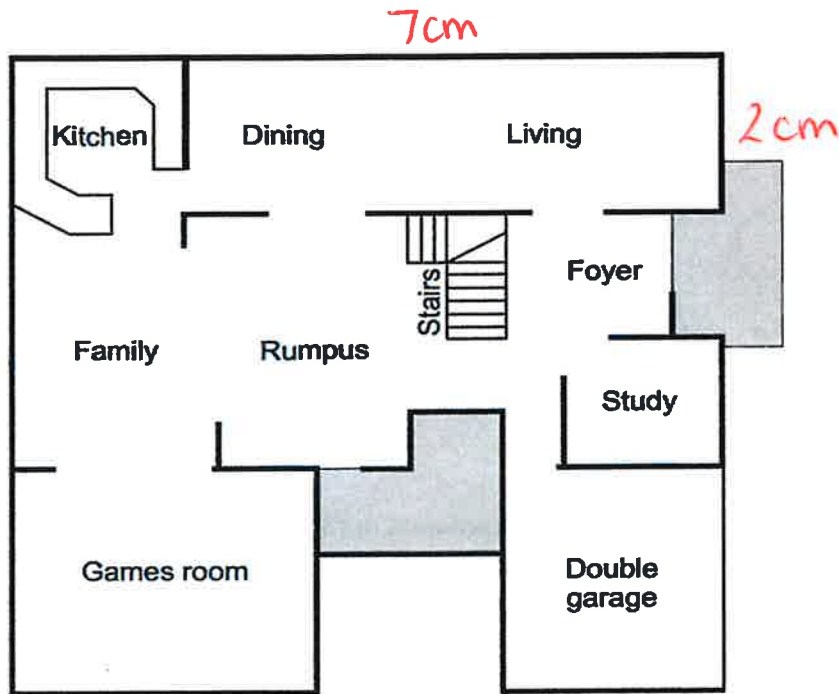
- (b) In this match, the ratio of the total number of points scored by Andrew, Henry and Tom to the total number of points scored by the whole team is 2 : 3. **1**

How many points were scored by the whole team?

$$\begin{aligned} & \text{Total } A, H, T : \text{Total Team} \\ & 2 : 3 \\ & = 76 : 114 \end{aligned}$$

Question 17 (3 marks)

The house plan of a ground floor is drawn to scale below. The scale is 1:150.



What is the cost of carpet for the dining and living rooms, if the carpet costs \$110 per square metre?

3

$$\begin{aligned} 7\text{cm} &= 7 \times 150 \\ &= 1050\text{ cm} \\ &= 10.5\text{ m} \end{aligned}$$

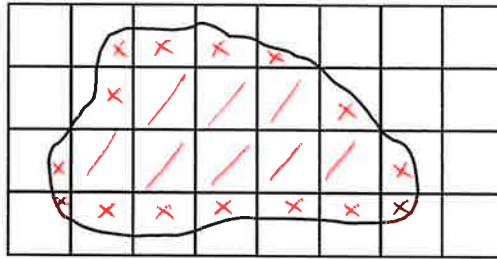
$$\begin{aligned} 2\text{cm} &= 2 \times 150 \\ &= 300\text{ cm} \\ &= 3\text{ m} \end{aligned}$$

$$\begin{aligned} \text{Area Room} &= 10.5 \times 3 \\ &= 31.5\text{ m}^2 \end{aligned}$$

$$\begin{aligned} \text{Cost} &= 31.5 \times 110 \\ &= \$3465 \end{aligned}$$

Question 18 (4 marks)

A park is shown, on a grid of squares which each represent a square that is 10 metres by 10 metres. To use the grid square method for approximating area, count the number of whole grid squares within the boundary. Count the grid squares around the edge that are partially inside the boundary and multiply by 0.5. Add to find the total number of whole grid squares.



8 whole
15 half

15½ altogether

- (a) Calculate the area one grid square represents in the park. 1

$$10 \times 10 = 100 \text{ m}^2$$

- (b) By first finding the total number of grid squares covered by the park, calculate the approximate area of the park using the formula: 1

Area = total number of grid squares \times area of each grid square.

$$A = 15.5 \times 100$$

$$= 1550 \text{ m}^2$$

- (c) Fertiliser is used to cover the area of the park. 2

How much will it cost to buy the fertiliser, if 120 g/m² is required, and manure costs \$23.10 per kg?

$$120 \times 1550 = 186000 \text{ g}$$

$$= 186 \text{ kg}$$

$$\text{Cost} = 186 \times 23.10$$

$$= \$4296.60$$

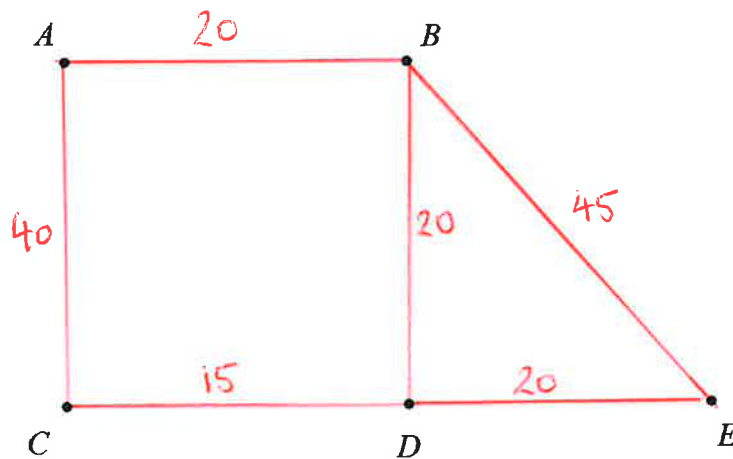
Question 19 (3 marks)

In Central New South Wales, there are five petrol stations A, B, C, D and E. The table below shows the length, in kilometres, of roads connecting these petrol stations.

	A	B	C	D	E
A		20	40		
B	20			20	45
C	40			15	
D		20	15		20
E		45		20	

(a) Draw a network diagram to represent the information shown in the table.

2



(b) What is the shortest distance, in kilometres, between petrol stations A and E?

1

$ABE = 65 \text{ km}$

$ABDE = 60 \text{ km}$

$\therefore \text{Shortest distance} = 60 \text{ km}$

Question 20 (3 marks)

Jonty mixes petrol and oil in the ratio 39:1 to make fuel for his new lawn mower. After pouring 6 litres of fuel into the lawn mower, he realises that he made a mistake. The petrol and oil ratio should have been 30:1.

3

What is the minimum amount of oil that must be added to the mixture in order to correct the ratio?

$$P : O \\ 39 : 1$$

$$6 \text{ L} = 40 \text{ parts} \\ 0.15 \text{ L} = 1 \text{ part}$$

\therefore Currently 0.15 L or 150 mL of oil in mixture
and 5.85 L or 5850 mL of petrol.

$$30 : 1$$

$$5.85 \div 30 = 0.195 \text{ L}$$

\therefore Oil should be 0.195 L or 195 mL

Jonty must add 0.045 L or 45 mL to
the mixture.

End of Paper

