Student's Name: _____

Student Number: | | | | | | | | | |

Teacher's Name: _____

ABBOTSLEIGH

2023

HIGHER SCHOOL CERTIFICATE

Assessment 4

Trial Examination

Mathematics Standard 2

General Instructions

- Reading time – 10 minutes.
- Working time – 2 hours and 30 minutes
- Write using black pen.
- **NESA approved** calculators may be used.
- **NESA approved** reference sheet is provided.
- All necessary working should be shown in every question to gain full marks.
- Make sure your Student Number is on the front cover of each section.
- Answer the Multiple-Choice questions on the answer sheet provided.
- In Questions 16 - 37, show relevant mathematical reasoning and/or calculations.

Total marks – 100

- Attempt Sections I and II.

Section I — Pages 3 - 10

15 marks

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

Section II — Pages 11 - 38

85 marks

- Attempt Questions 16 - 37
- Allow about 2 hours and 5 minutes for this section.

Outcomes to be assessed:

Standard 2 Mathematics:

Preliminary Outcomes:

MS11-1 uses algebraic and graphical techniques to compare alternative solutions to contextual problems

MS11-2 represents information in symbolic, graphical and tabular form

MS11-3 solves problems involving quantity measurement, including accuracy and the choice of relevant units

MS11-4 performs calculations in relation to two-dimensional and three-dimensional figures

MS11-5 models relevant financial situations using appropriate tools

MS11-6 makes predictions about everyday situations based on simple mathematical models

MS11-7 develops and carries out simple statistical processes to answer questions posed

MS11-8 solves probability problems involving multistage events

MS11-9 uses appropriate technology to investigate, organise and interpret information in a range of contexts

HSC Outcomes:

MS2-12-1 uses detailed algebraic and graphical techniques to critically evaluate and construct arguments in a range of familiar and unfamiliar contexts

MS2-12-2 analyses representations of data in order to make inferences, predictions and draw conclusions

MS2-12-3 interprets the results of measurements and calculations and makes judgements about their reasonableness, including the degree of accuracy and the conversion of units where appropriate

MS2-12-4 analyses two-dimensional and three-dimensional models to solve practical problems

MS2-12-5 makes informed decisions about financial situations, including annuities and loan repayments

MS2-12-6 solves problems by representing the relationships between changing quantities in algebraic and graphical forms

MS2-12-7 solves problems requiring statistical processes, including the use of the normal distribution and the correlation of bivariate data

MS2-12-8 solves problems using networks to model decision-making in practical problems

MS2-12-9 chooses and uses appropriate technology effectively in a range of contexts, and applies critical thinking to recognise appropriate times and methods for such use

SECTION I

15 marks

Attempt Questions 1 – 15

Use the 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) ○

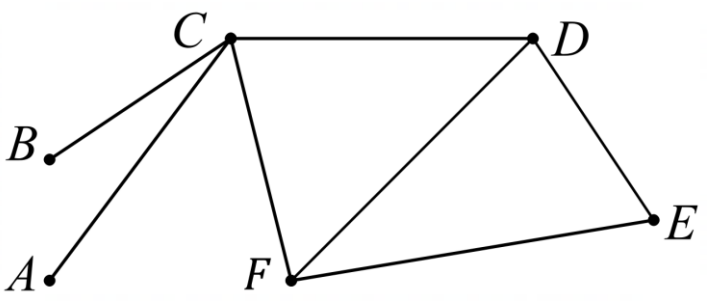
If you change your mind and have crossed out what you consider to be the correct answer, then indicate this by writing the word *correct* and drawing an arrow as follows.

correct ←

(A) ⊗ (B) ⊗ (C) ○ (D) ○

---

1. A network diagram is shown below.



NOT TO SCALE

How many edges will the minimum spanning tree have?

A. 5

B. 6

C. 7

D. 8

2. The speeds (in km/h) which are recorded on a radar device approaching a section of road work are normally distributed, with a mean of 75 and a standard deviation of 10.

The speed limit for the section is 80 km/h and 5000 vehicles passed the radar in one day.
How many vehicles were travelling at 5 km/h above the speed limit or more?

A. 80

B. 800

C. 3400

D. 4200

3. Charlotte is thinking of a number. Let the number be n. When Charlotte subtracts 8 from the number and multiples the result by 5, the answer is 2 more than n.
Which equation can be used to find n?

A. $5(n-8)=2n$

B. $5n-8=2n$

C. $5(n-8)=n+2$

D. $5n-8=n+2$

4. When an additional score is added to the data set below, the mean increases slightly, but the median remains the same.

Data set: 2, 4, 6, 10, 14, 14, 14, 16

Which of the following could have been the additional score?

A. 8

B. 10

C. 12

D. 14

5. The speed limit on the M1 Motorway to Newcastle is 110 km/h. This is equivalent to:

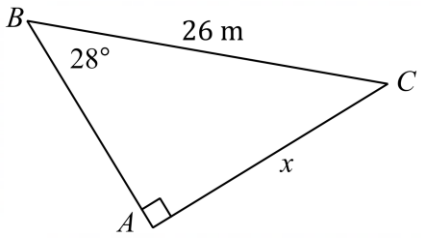
A. 1.8 m/s

B. 30.6 m/s

C. 110 m/s

D. 1833.3 m/s

6.



NOT TO SCALE

What is the value of x, correct to one decimal place?

A. 12.2 m

B. 18.4 m

C. 23.0 m

D. 55.4 m

7. Sophia is planning to take a holiday a year from now, and there are four options that she is considering.

Holiday	Estimated Cost
Backpacking Tasmania	$3 500
New Zealand Cruise	$4 300
Great Barrier Reef Adventure	$6 400
Grand Tour of Australia	$10 400

She earns $1 240 per week after deductions.

She has calculated her weekly spending to be $750 and she needs to put $1 500 away each month to cover bills.

If she saves the rest of her income towards her holiday, which is the most expensive holiday that she could afford to take?

A. Backpacking Tasmania

B. New Zealand Cruise

C. Great Barrier Reef Adventure

D. Grand Tour of Australia

8. A rock is measured to be 8.0 cm in length, correct to one decimal point.

What is the percentage error of this measurement?

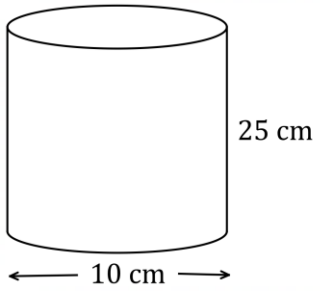
A. ± 0.125%

B. ± 0.625%

C. ± 1.25%

D. ± 6.25%

9. What is the surface area of this open-ended container?



NOT TO SCALE

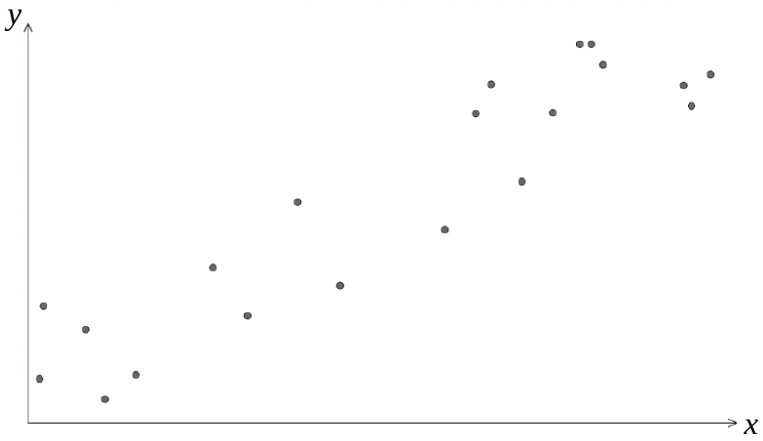
A. 250π cm^2

B. 275π cm^2

C. 300π cm^2

D. 600π cm^2

10. What is the best description of the correlation for the data shown on this scatterplot?



A. No correlation

B. Strong positive

C. Strong negative

D. Weak positive

11. Four cities have the following locations:

Sydney (34^0 S, 151^0 E)	Manila (15^0 N, 151^0 E)
Hawaii (20^0 N, 156^0 W)	Canberra (35^0 S, 149^0 E)

Which city will see the sun set last?

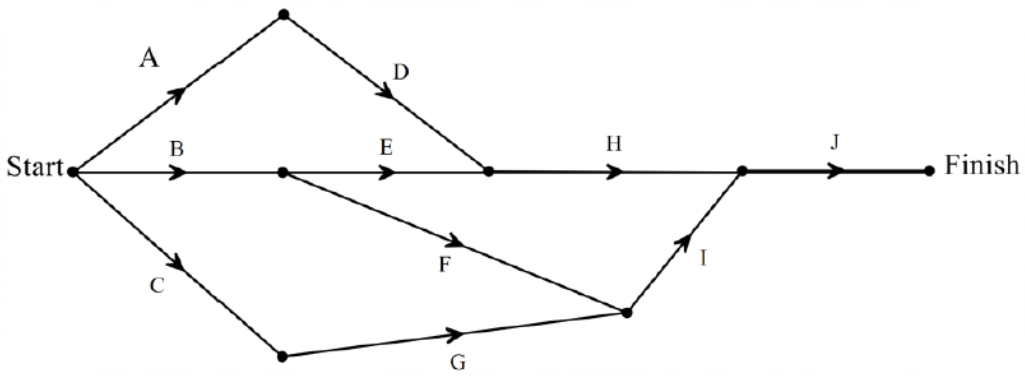
A. Sydney

B. Manila

C. Hawaii

D. Canberra

12. The directed network below indicates the sequence of activities needed to complete a project.



How many activities have **exactly** two immediate predecessors?

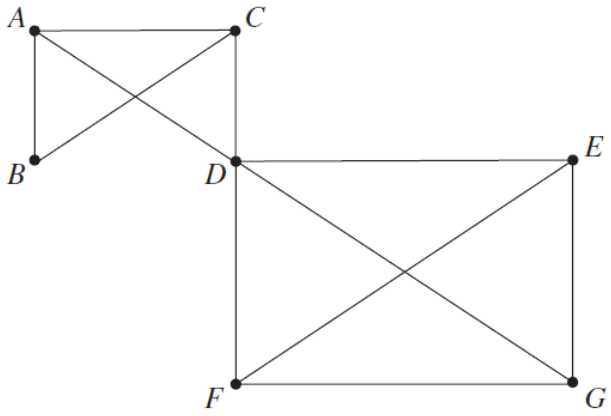
A. 1

B. 2

C. 3

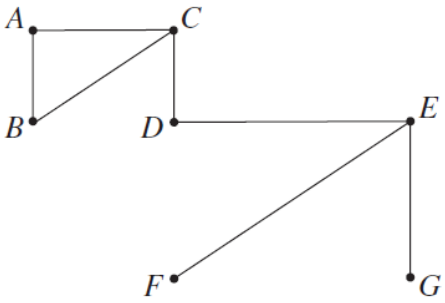
D. 4

13. A network diagram is shown.

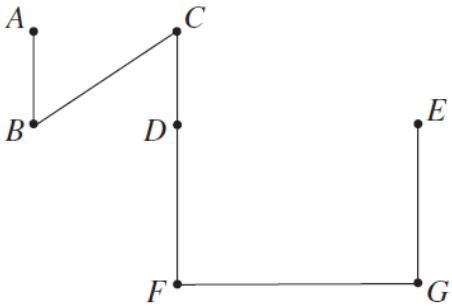


Which of the following could be **both** a spanning tree AND a path for the network diagram?

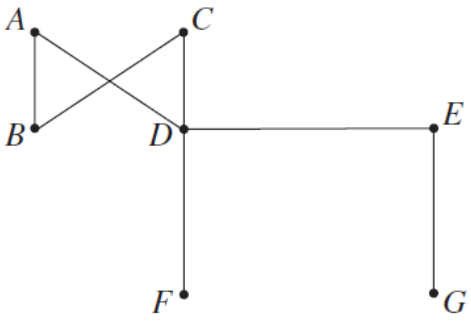
A.



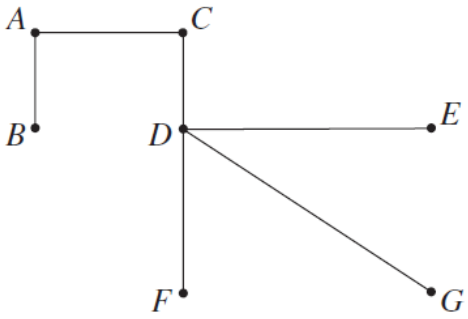
B.



C.



D.



14. The bearing of Jessica's home from her friend Audrey's home is 230°.
What is the bearing of Audrey's home form Jessicas home?

A. 040°

B. 050°

C. 120°

D. 140°

15. A piece of artwork is currently valued at $ 22 225.
It is estimated that the artwork will increase at an annual rate of 7.5% over the next two years.
Which of these calculations would give the estimated value of the artwork in 2 years' time?

A. $\$22\,225 \times 1.075 \times 2$

B. $\$22\,225 \times 1.075$

C. $\$22\,225 \times 1.075^2$

D. $\$22\,225 \div 1.075^2$

End of Section I

Student Number: | | | | | | | | | |

2023 TRIAL HIGHER SCHOOL CERTIFICATE EXAMINATION

Mathematics Standard 2

Section II Answer Booklet 1

Section II

85 marks

Attempt Questions 16-37

Allow about 2 hours and 5 minutes for this section

Booklet 1: Attempt Questions 16 – 25 (41 marks)

Booklet 2: Attempt Questions 26 – 37 (44 marks)

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 space is provided on pages 23, 24, 35, 36. If you use this space, clearly indicate which question you are answering.

Please Turn Over

Question 16 (3 marks)

An outdoor spa has a pump which is rated at 350 watts and a heater which is rated at 1.2 kW. The table below shows the amount of usage that the pump and heater have at different times of the year.

Average Usage	Warmer Months (October – March) (182 Days)	Cooler Months (April to September) (183 Days)
Pump	Runs for 3 hours per day for spa usage and 1.5 hours per day filtration	Runs for 1.5 hours per day spa usage and 1.2 hours per day filtration
Heater	Heats for 5 min 12 times per day	Heats for 12 minutes 12 times per day

How many kWh of energy would the spa use in a year? **3**

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Question 17 (4 mark)

The table below shows the current individual tax rates.

Taxable Income	**Tax on this income**
$0 to $18 200	Nil
$18 201 - $45 000	19c for each $1 over $18 200
$45 001 - $120 000	$5 092 plus 32.5c for each $1 over $45 000
$120 001 - $180 000	$29 467 plus 37c for each $1 over $120 000
$180 001 and over	$51 667 plus 45c for each $1 over $180 000

The Medicare levy to be paid is 2% of the taxable income.

(a) Evelyn calculates her tax payable as $10 599. What is her taxable income? **2**

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(b) How much will she have to pay for the Medicare levy. **1**

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(c) Evelyn had tax deductions of $1 250. What was her yearly income. **1**

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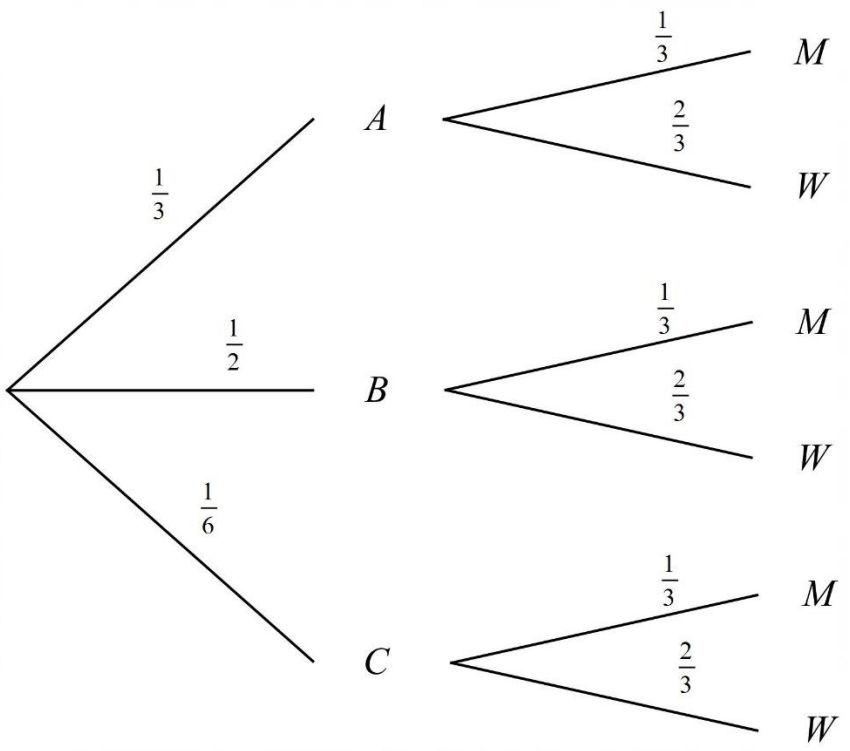
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Question 18 (3 marks)

There are three candidates for team leader on a camp, Andie, Bec and Cat.

There are two candidates for team mascot at the camp, Miao and Woof.

Based on a survey of camp attendees, the probability tree shows the likelihood of the candidates being chosen for each position.



(a) What is the probability that Andie will be leader with Miao as mascot? **1**

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(b) What is the probability that Andie will be the leader or Miao will be the mascot, but not both? **2**

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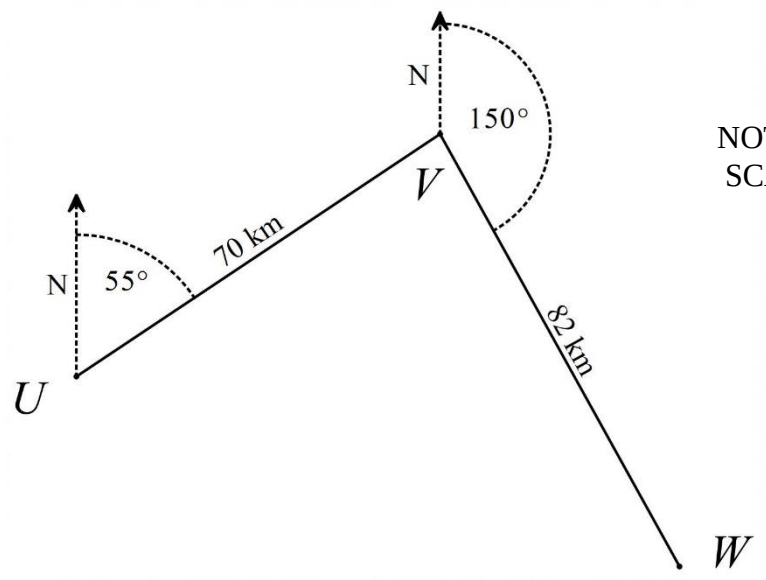
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Question 19 (4 marks)

A helicopter leaves Underwood and flies 70 km on a bearing of 055º to Vanna Beach.

It then flies 82 km on a bearing of 150º to Weston.

The diagram below illustrates the journey.



(a) It then plans to fly directly back to Underwood.
Calculate the distance that it will fly back to Underwood **2**

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(b) Determine the bearing (from Weston) on which it should fly to return to Underwood. **2**

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Question 20 (5 marks)

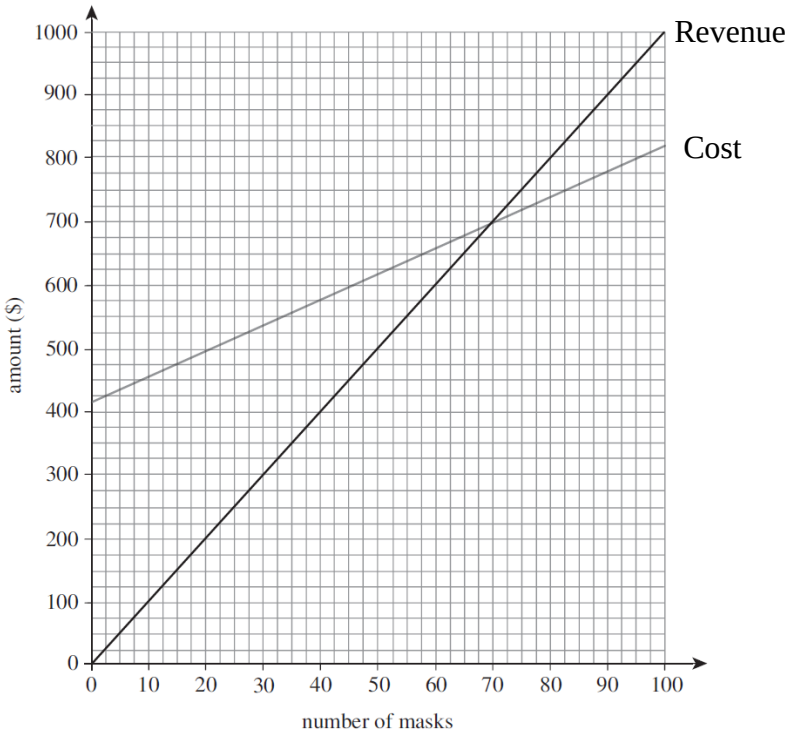
Willow's business Fashion Face Masks makes and sells embroidered face masks.

Willow purchases plain cloth masks and embroiders them with different patterns.

The cost of each plain mask is $4 and Willow sells the embroidered masks for $10 each.

Willow invests $420 in an embroidery machine and a thread kit to make 100 masks.

The production cost and revenue generated from the sale of the embroidered masks can be modelled with two linear equations, as shown in the graph.



NOT TO SCALE

(a) Using the graph, solve the two equations simultaneously and explain the significance of this solution for Willow's business. **2**

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(b) How many masks does Willow need to sell to obtain a revenue of $350. **1**

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(c) How much profit does Willow make if she sells 100 masks? **2**

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Question 21 (4 marks)

Xanthe bought a car for use with her cross-country training for $24 000.

For taxation purposes she needs to work out the depreciated value of the car each year.

(a) She initially decided to do this using the declining balance method at a rate of 25% p.a. Show that the depreciation of the car in the first four years is more than three times greater than the depreciation between the fourth and eight years using this method. **2**

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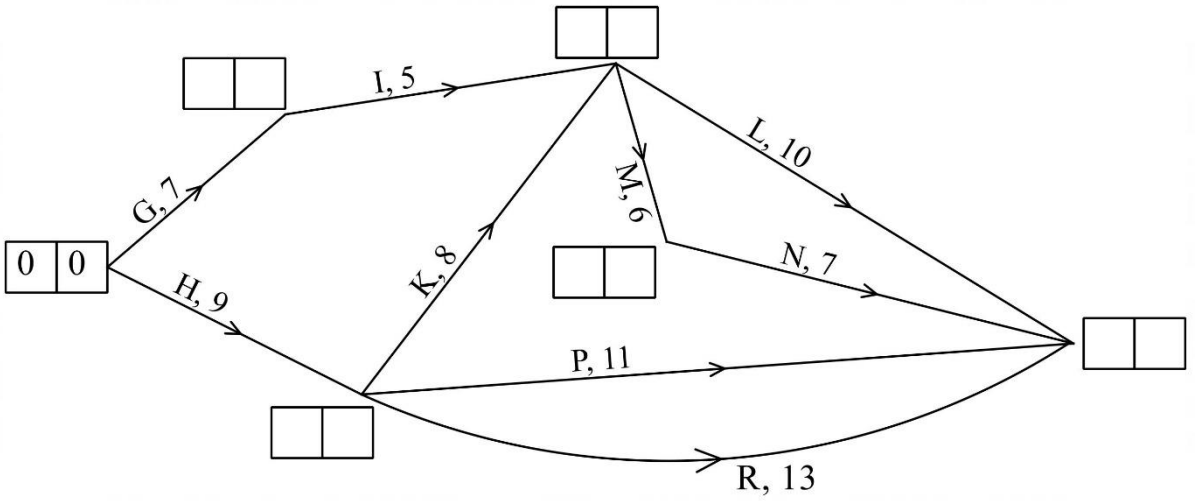
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Question 22 (4 marks)

The network diagram shows the nine steps needed to complete a project.
The time (in minutes) needed for each step is shown.



(a) Complete forward and backward scans on the diagram above and find the minimum time needed to complete the project **2**

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(b) What is the critical path for the project? **1**

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(c) What is the float time of activity I? **1**

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Question 23 (4 marks)

Chloe borrows $24 000 through a reducing balance loan.

Interest is calculated monthly.

Repayments of $800 are deducted at the end of each month.

Chloe uses the spreadsheet below to show the progress of her loan.

	A	B	C	D	E
1	*N*	*P*	*I*	*P* + *I*	*P* + *I* - *R*
2	1	$24,000.00	$160.00	$24,160.00	$23,360.00
3	2	$23,360.00	$155.73	$23,515.73	$22,715.73
4	3	$22,715.73	$151.44	$22,867.17	$22,067.17
5	4	$22,067.17	$147.11	$22,214.29	$21,414.29
6	5				
7	6				***X***

(a) What is the **annual** percentage interest rate? **2**

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(b) Complete the next two rows to find the amount ***X***, which would appear in cell E7. **2**

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Question 24 (5 marks)

A business produces cans of Solo lemon drink.



The capacity of the cans is normally distributed with a mean capacity of 375 ml and a standard deviation of 3 ml.

(a) What limits will the capacity of the cans of Solo almost certainly lie within? **2**

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(b) What percentage of cans lie between 372 ml and 381 ml? **3**

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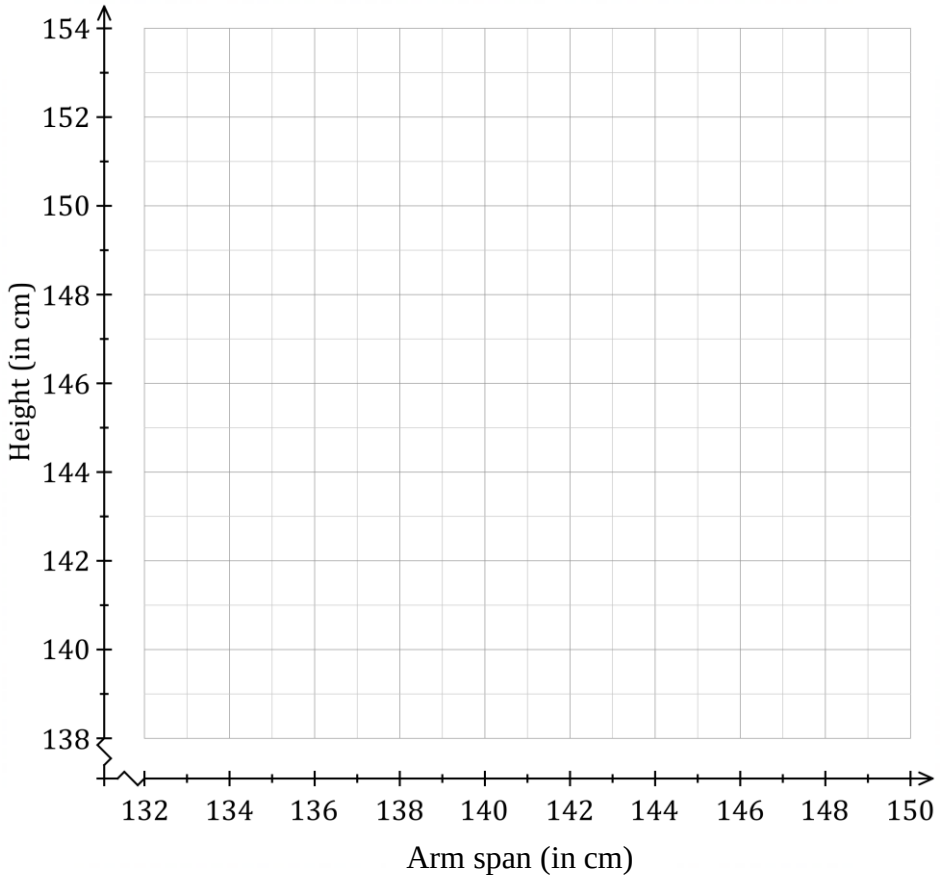
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Question 25 (5 marks)

The table below shows the arm span and height of seven adults.

Arm span (cm)	136	138	140	144	144	146	148
Height (cm)	142	142	146	148	149	150	152

(a) Construct a scatterplot of the data. **1**



(b) Draw a line of best fit on the scatterplot. **1**

(c) Classify the direction and the strength of this linear association. **1**

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(d) Peter has an arm span of 139 cm. What is his expected height? **1**

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(e) Find Pearson's correlation coefficient. Answer to 4 decimal places. **1**

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End of Booklet 1

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Section II Extra writing space

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

Section II Extra writing space

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

Student Number: | | | | | | | | | |

2023 TRIAL HIGHER SCHOOL CERTIFICATE EXAMINATION

Mathematics Standard 2

Section II Answer Booklet 2

Booklet 2: Attempt Questions 26 – 37 (44 marks)

Please Turn Over

Question 26 (3 marks)

With the knowledge that a pool ball has a volume of 75.8 cm^3.



NOT TO SCALE

Find the side length of the plastic rack required to hold all the balls at the start of the game. **3**

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Question 27 (3 marks) **3**

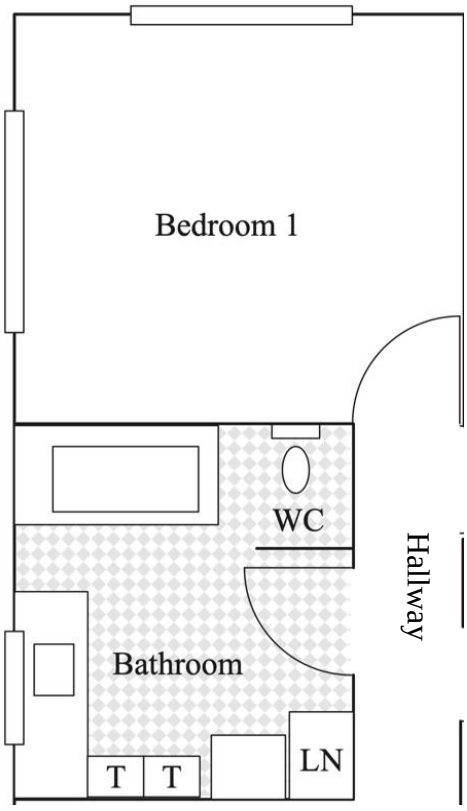
A section of a floor plan is shown. Scale of 1:125.

A tradesman is to paint the ceiling of the bedroom, bathroom and hallway.

He paints at a constant rate of 12 m^2 per hour.

He is paid to the nearest hour, a rate of $65/hr.

Find the labour cost to paint the ceiling if 2 coats of paint are required.



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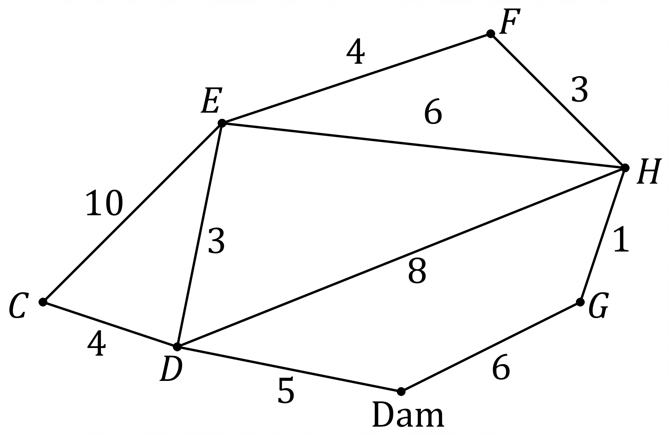
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Question 28 (6 marks)

The network diagram shows the pipes providing water from a dam to six farms. These pipes connect the farms to each other and to the dam. The lengths of the pipes (in km) are shown.



NOT TO SCALE

A plumber is hired to check the water pipes. He starts his examination at the dam.
He then travels along each of the pipes and returns to the dam without travelling along any pipe section more than once.

(a) Explain why such a path is possible for this network of pipes. **1**

……

(b) Find and draw this path that the plumber could follow. Use the diagram above. **2**

(c) Draw a minimum spanning tree on the network diagram below. **2**

(d) The system of pipes is due for replacement. What is the minimum length of pipe that can be used to service all of the farms? **1**

……

Question 29 (3 marks)

At our schools swimming carnival, the finish times for students under 17 who competed in the 50 m backstroke race are found to be normally distributed with a mean race time of 42 seconds and a standard deviation of 3 seconds.

The standard normal distribution table is shown. The values in the table represent the area under the normal curve to the left of the *z*-score.

z	*0.00*	*0.01*	*0.02*	*0.03*	*0.04*	*0.05*	*0.06*	*0.07*	*0.08*	*0.09*
0.0	0.50000	0.50399	0.50798	0.51197	0.51595	0.51994	0.52392	0.52790	0.53188	0.53586
0.1	0.53983	0.54380	0.54776	0.55172	0.55567	0.55966	0.56360	0.56749	0.57142	0.57535
0.2	0.57926	0.58317	0.58706	0.59095	0.59483	0.59871	0.60257	0.60642	0.61026	0.61409
0.3	0.61791	0.62172	0.62552	0.62930	0.63307	0.63683	0.64058	0.64431	0.64803	0.65173
0.4	0.65542	0.65910	0.66276	0.66640	0.67003	0.67364	0.67724	0.68082	0.68439	0.68793
0.5	0.69146	0.69497	0.69847	0.70194	0.70540	0.70884	0.71126	0.71566	0.71904	0.72240
0.6	0.72575	0.72907	0.73237	0.73565	0.73891	0.74215	0.74537	0.74857	0.75175	0.75490
0.7	0.75804	0.76115	0.76424	0.76730	0.77035	0.77337	0.77637	0.77935	0.78230	0.78524
0.8	0.78814	0.79103	0.79389	0.79673	0.79955	0.80234	0.80511	0.80785	0.81057	0.81327
0.9	0.81594	0.81859	0.82121	0.82381	0.82639	0.82894	0.83147	0.83398	0.83646	0.83891
1.0	0.84134	0.84375	0.84614	0.84849	0.85083	0.85314	0.85543	0.85769	0.85993	0.86214
1.1	0.86433	0.86650	0.86864	0.87076	0.87286	0.87493	0.87698	0.87900	0.88100	0.88298
1.2	0.88493	0.88686	0.88877	0.89065	0.89251	0.89435	0.89617	0.89796	0.89973	0.90147
1.3	0.90320	0.90490	0.90658	0.90824	0.90988	0.91149	0.91308	0.91466	0.91621	0.91774
1.4	0.91924	0.92073	0.92220	0.92364	0.92507	0.92647	0.92785	0.92922	0.93056	0.93189
1.5	0.93319	0.93448	0.93574	0.93699	0.93822	0.93943	0.94062	0.94179	0.94295	0.94408
1.6	0.94520	0.94630	0.94738	0.94845	0.94950	0.95053	0.95154	0.95254	0.95352	0.95449

Using the standardised scores and the standard normal distribution table, find the probability that a randomly chosen competitor achieves a finish time between **43 and 46** seconds.

Give your answer as a percentage correct to one decimal places. **3**

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Question 30 (4 marks)

Ava contributes $8500 to an investment account every quarter of a year for 2 years.

The account pays 8% interest per annum, compounded quarterly.

Future value of $1								
Period	*1%*	*2%*	*3%*	*4%*	*5%*	*6%*	*7%*	*8%*
1	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
2	2.0100	2.0200	2.0300	2.0400	2.0500	2.0600	2.0700	2.0800
3	3.0301	3.0604	3.0909	3.1216	3.1525	3.1836	3.2149	3.2464
4	4.0604	4.1216	4.1836	4.2465	4.3101	4.3746	4.4399	4.5061
5	5.1010	5.2040	5.3091	5.4163	5.5256	5.6371	5.7507	5.8666
6	6.1520	6.3081	6.4684	6.6330	6.8019	6.9753	7.1533	7.3359
7	7.2135	7.4343	7.6625	7.8983	8.1420	8.3938	8.6540	8.9228
8	8.2857	8.5380	8.8923	9.2142	9.5491	9.8975	10.2598	10.6366

(a) What is the future value of Ava's annuity at the end of 2 years? **2**

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(b) Calculate the total amount of interest that Ava will earn on her investment at the end of 2 years. **2**

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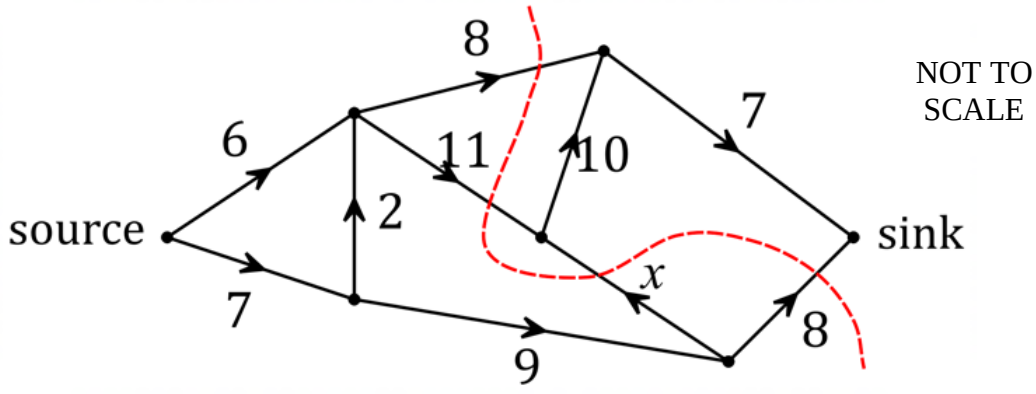
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Question 31 (4 marks)

For the network shown below, the capacity of the cut shown is 30.



(a) What is the value of x? **2**

……..

……..

(b) What is the minimum cut – maximum flow of this network. Show this on the diagram. **2**

……..……

……..……

Question 32 (3 marks)

In the Atherton region in the tropical forests, 96 rare birds were captured, tagged, and released. Five months later, 72 birds were recaptured from the same region, and it was found that 18 of these birds had previously been tagged. Use an appropriate method to give an estimate of the number of rare birds in this rainforest region. **3**

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Question 33 (4 marks)

Miss Ward sells soap bubble markers for $20 each at a market.

Each bubble marker costs her $14.75 to build and she has to pay a fee of $150 to sell these at the market.

(a) Write an equation to describe the relationship between income and the number of bubble markers. **1**

……...

……

(b) Write an equation to describe the relationship between costs and the number of bubble markers. **1**

……...

……

(c) How many bubble markers must Ava sell to make a profit? **2**

……...

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Question 34 (3 marks)

Alyssa purchased a car for $56 789.

This table shows the stamp duty rates for a motor vehicle in NSW.

Vehicle value	*Rate*
0–$4999	Nil
$5000–$44 999	$3 for every $100 (or part thereof)
$45 000 and over	$1300 plus $6 for every $100 (or part thereof)

(a) Using the table, calculate the stamp duty payable on the car. **1**

……..

……..

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(b) The car has an expected depreciation rate of 12% per annum.

What is the salvage value of the car after 6 years? **2**

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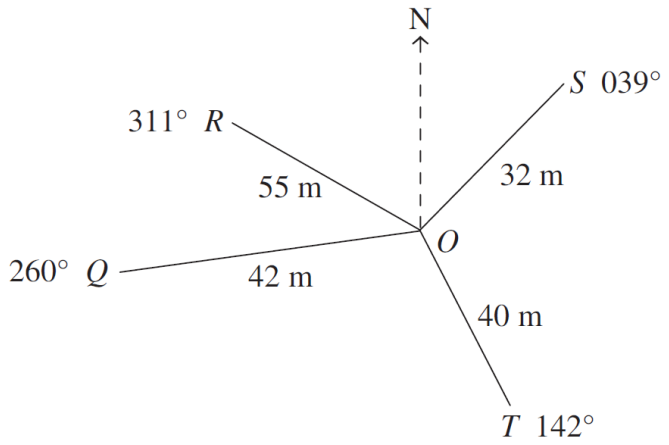
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Question 35 (5 marks)

Ella took a compass radial survey of a block of land as shown.



NOT TO SCALE

(a) Find the size of $\angle ROS$. **1**

……

……

……

(b) Calculate the area of triangle *ROS* correct to the nearest square metre. **2**

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……

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(c) Ella then realises that the southern part of the field does not have a fence correctly installed. What is the length of fencing required to be repaired? **2**

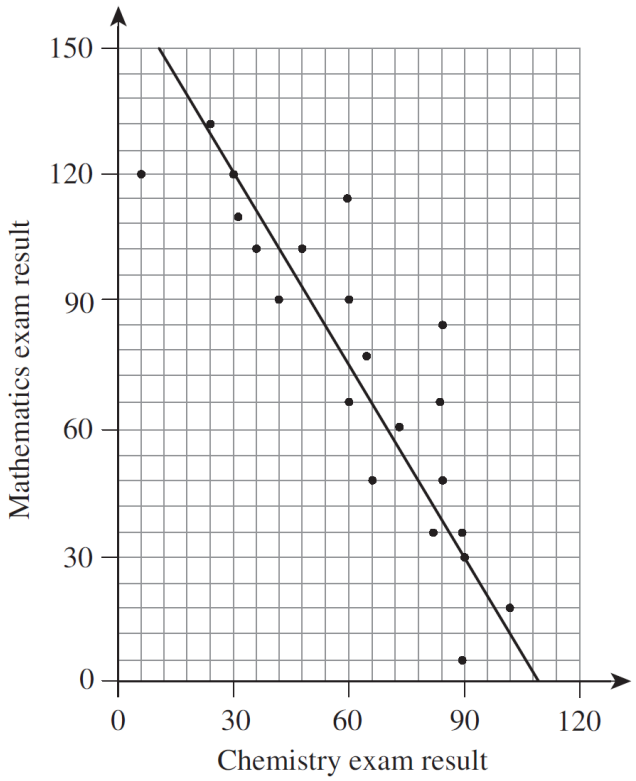
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Question 36 (3 marks)

The Mathematics and Chemistry Olympiad results for a group of students are recorded on this scatterplot.



(a) Calculate the gradient of the line of best fit. **1**

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……

(b) Identify the correlation between the Mathematics and Chemistry results. **2**

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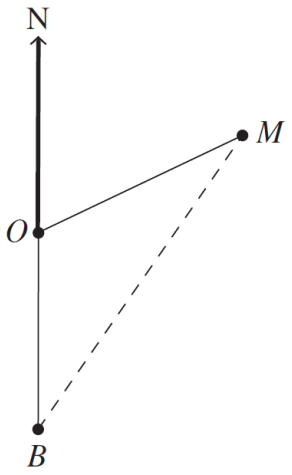
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Question 37 (3 marks)

A mother pelican (M) leaves her nest (O) and flies on a bearing of 048° for 9.5 km.

A baby bird (B) leaves the same nest and flies due South for 4 km.



NOT TO SCALE

(a) Find the distance that the two birds are apart at this time. **1**

……

……

……

(b) Find the bearing of the baby bird from its mother. **2**

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End of Booklet 2

Section II Extra writing space

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

Section II Extra writing space

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

Student's Name: Solutions

Student Number: | | | | | | | | | |

Teacher's Name: _____

ABBOTSLEIGH

2023

HIGHER SCHOOL CERTIFICATE

Assessment 4

Trial Examination

Mathematics Standard 2

General Instructions

- Reading time – 10 minutes.
- Working time – 2 hours and 30 minutes
- Write using black pen.
- **NESA approved** calculators may be used.
- **NESA approved** reference sheet is provided.
- All necessary working should be shown in every question to gain full marks.
- Make sure your Student Number is on the front cover of each section.
- Answer the Multiple-Choice questions on the answer sheet provided.
- In Questions 16 - 37, show relevant mathematical reasoning and/or calculations.

Total marks – 100

- Attempt Sections I and II.

Section I Pages 3 - 10

15 marks

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

Section II Pages 11 - 38

85 marks

- Attempt Questions 16 - 37
- Allow about 2 hours and 5 minutes for this section.

Outcomes to be assessed:

Standard 2 Mathematics:

Preliminary Outcomes:

MS11-1 uses algebraic and graphical techniques to compare alternative solutions to contextual problems

MS11-2 represents information in symbolic, graphical and tabular form

MS11-3 solves problems involving quantity measurement, including accuracy and the choice of relevant units

MS11-4 performs calculations in relation to two-dimensional and three-dimensional figures

MS11-5 models relevant financial situations using appropriate tools

MS11-6 makes predictions about everyday situations based on simple mathematical models

MS11-7 develops and carries out simple statistical processes to answer questions posed

MS11-8 solves probability problems involving multistage events

MS11-9 uses appropriate technology to investigate, organise and interpret information in a range of contexts

HSC Outcomes:

MS2-12-1 uses detailed algebraic and graphical techniques to critically evaluate and construct arguments in a range of familiar and unfamiliar contexts

MS2-12-2 analyses representations of data in order to make inferences, predictions and draw conclusions

MS2-12-3 interprets the results of measurements and calculations and makes judgements about their reasonableness, including the degree of accuracy and the conversion of units where appropriate

MS2-12-4 analyses two-dimensional and three-dimensional models to solve practical problems

MS2-12-5 makes informed decisions about financial situations, including annuities and loan repayments

MS2-12-6 solves problems by representing the relationships between changing quantities in algebraic and graphical forms

MS2-12-7 solves problems requiring statistical processes, including the use of the normal distribution and the correlation of bivariate data

MS2-12-8 solves problems using networks to model decision-making in practical problems

MS2-12-9 chooses and uses appropriate technology effectively in a range of contexts, and applies critical thinking to recognise appropriate times and methods for such use

SECTION I

15 marks

Attempt Questions 1 – 15

Use the 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) ○

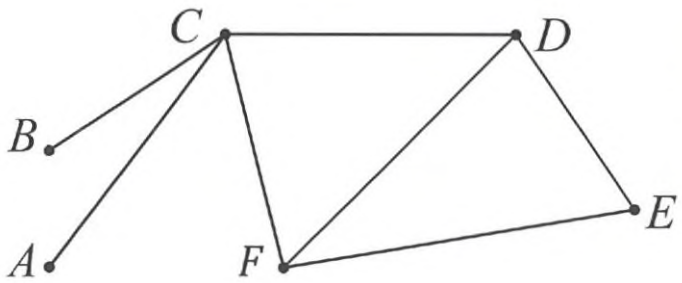
If you change your mind and have crossed out what you consider to be the correct answer, then indicate this by writing the word *correct* and drawing an arrow as follows.

correct ←

(A) ⊗ (B) ● (C) ○ (D) ○

---

1. A network diagram is shown below.



NOT TO SCALE

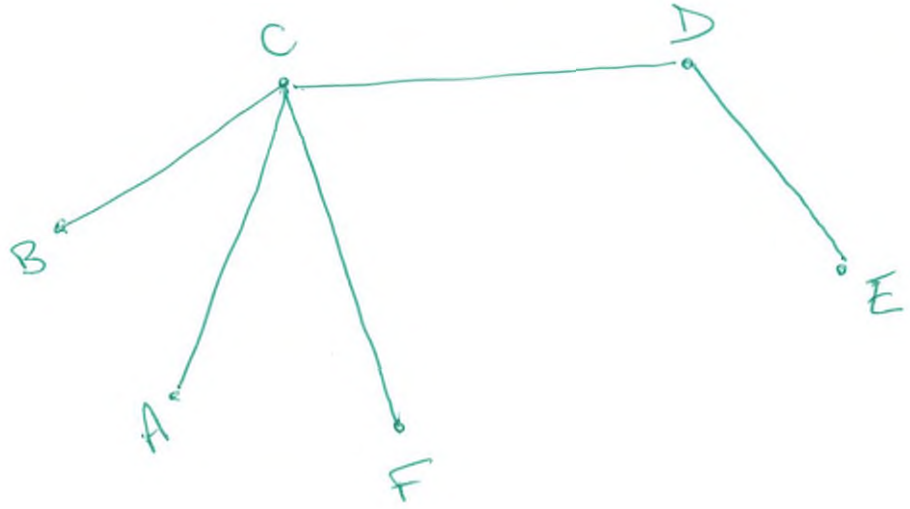
How many edges will the minimum spanning tree have?

A. 5

B. 6

C. 7

D. 8



2. The speeds (in km/h) which are recorded on a radar device approaching a section of road work are normally distributed, with a mean of 75 and a standard deviation of 10.

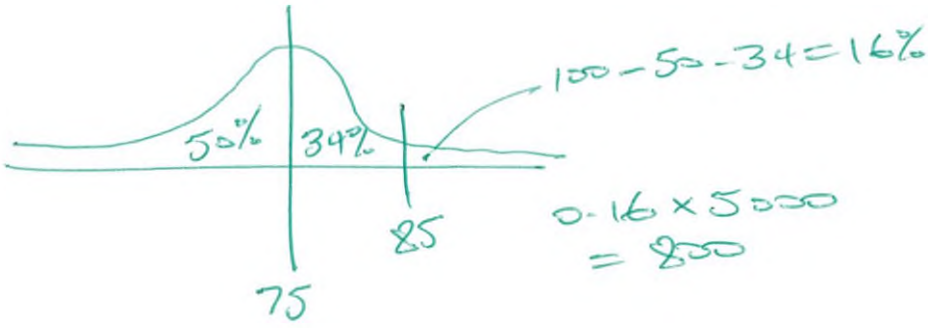
The speed limit for the section is 80 km/h and 5000 vehicles passed the radar in one day.
How many vehicles were travelling at 5 km/h above the speed limit or more?

A. 80

B. 800

C. 3400

D. 4200



3. Charlotte is thinking of a number. Let the number be n. When Charlotte subtracts 8 from the number and multiples the result by 5, the answer is 2 more than n.
Which equation can be used to find n?

A. $5(n-8)=2n$

B. $5n-8=2n$

C. $5(n-8)=n+2$

D. $5n-8=n+2$

$5(n-8)=n+2$

4. When an additional score is added to the data set below, the mean increases slightly, but the median remains the same.

Median = 12.

Data set: 2, 4, 6, 10, | 14, 14, 14, 16

Which of the following could have been the additional score?

A. 8

B. 10

C. 12

D. 14

5. The speed limit on the M1 Motorway to Newcastle is 110 km/h. This is equivalent to:

A. 1.8 m/s

B. 30.6 m/s

C. 110 m/s

D. 1833.3 m/s

$110 \text{ km/hr} = \frac{110 \times 1000}{60 \times 60}$ m/sec

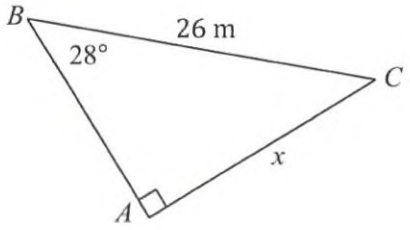
$= \frac{110 \times 10}{36}$

$= \frac{1100}{36}$

$= 30.555\ldots$

$\doteq 30.6$ m/sec

6.



NOT TO SCALE

What is the value of x, correct to one decimal place?

A. 12.2 m

B. 18.4 m

C. 23.0 m

D. 55.4 m

$\sin 28 = \frac{x}{26}$

$x = 26 \sin 28$

$= 12.206\ldots$

$\doteq 12.2$

7. Sophia is planning to take a holiday a year from now, and there are four options that she is considering.

Holiday	Estimated Cost
Backpacking Tasmania	$3 500
New Zealand Cruise	$4 300
Great Barrier Reef Adventure	$6 400
Grand Tour of Australia	$10 400

She earns $1 240 per week after deductions.

She has calculated her weekly spending to be $750 and she needs to put $1 500 away each month to cover bills.

If she saves the rest of her income towards her holiday, which is the most expensive holiday that she could afford to take?

Weekly income less spending
$= 1240 - 750$
$= 490$

Annual income less spending
$= 52 \times 490$
$= 25480$

Annual bills $= 1500 \times 12$
$= 18000$

Available for holiday $= 25480 - 18000$
$= \$7480$

A. Backpacking Tasmania

B. New Zealand Cruise

C. Great Barrier Reef Adventure

D. Grand Tour of Australia

8. A rock is measured to be 8.0 cm in length, correct to one decimal point.

What is the percentage error of this measurement?

Absolute error $= \frac{1}{2} \times 0.1$
$= 0.05$

% error $= \frac{0.05}{8.0} \times 100$

$= 0.625\%$

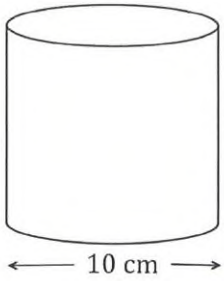
A. ± 0.125%

B. ± 0.625%

C. ± 1.25%

D. ± 6.25%

9. What is the surface area of this open-ended container?



NOT TO SCALE

$SA = 2\pi rh$

$= 2\pi \times 5 \times 25$

$= 250\pi \text{ cm}^2$

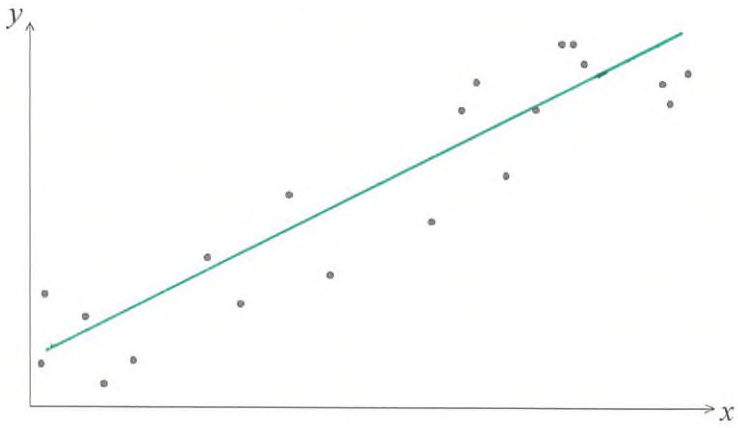
A. 250π cm^2

B. 275π cm^2

C. 300π cm^2

D. 600π cm^2

10. What is the best description of the correlation for the data shown on this scatterplot?



A. No correlation

B. Strong positive

C. Strong negative

D. Weak positive

11. Four cities have the following locations:

Sydney (34^0 S, 151^0 E)	Manila (15^0 N, 151^0 E)
Hawaii (20^0 N, 156^0 W)	Canberra (35^0 S, 149^0 E)

Which city will see the sun set last?

A. Sydney

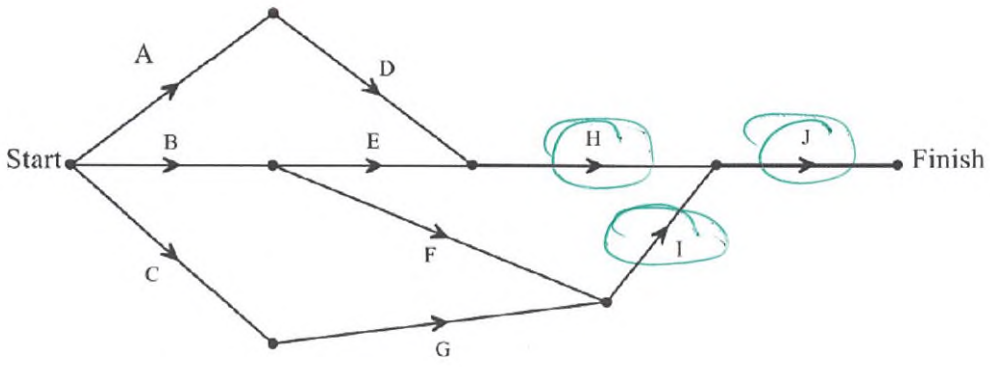
B. Manila

C. Hawaii

D. Canberra

Sun sets in the West. Hawaii most westerly of the cities.

12. The directed network below indicates the sequence of activities needed to complete a project.



How many activities have **exactly** two immediate predecessors?

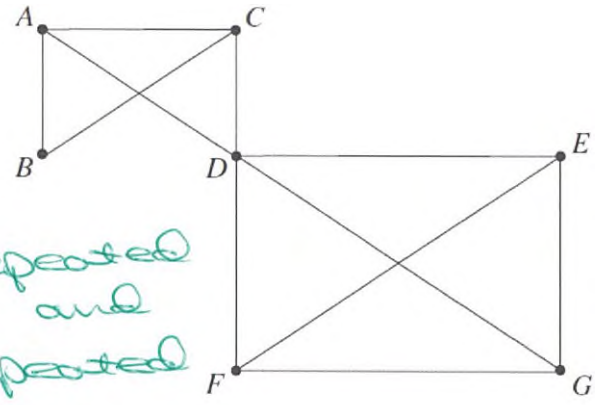
A. 1

B. 2

C. 3

D. 4

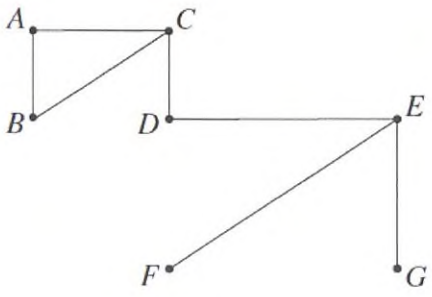
13. A network diagram is shown.



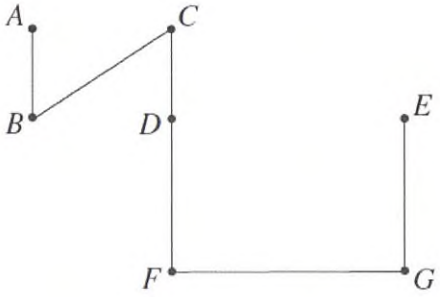
Path = No repeated edges and no repeated vertices.

Which of the following could be **both** a spanning tree AND a path for the network diagram?

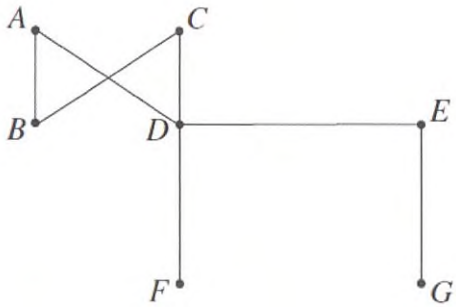
A.



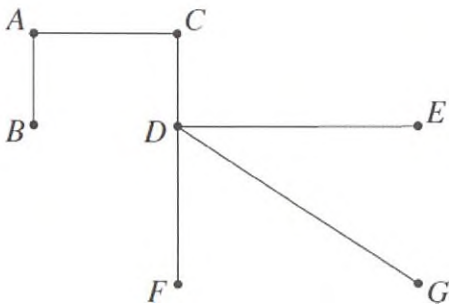
B.



C.

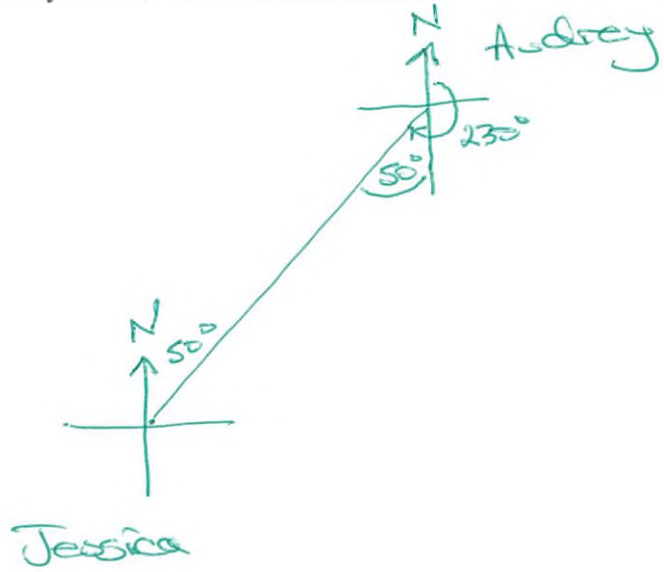


D.



14. The bearing of Jessica's home from her friend Audrey's home is 230°.

What is the bearing of Audrey's home form Jessicas home?



A. 040°

B. 050°

C. 120°

D. 140°

15. A piece of artwork is currently valued at $ 22 225.

It is estimated that the artwork will increase at an annual rate of 7.5% over the next two years.

Which of these calculations would give the estimated value of the artwork in 2 years' time?

A. $22 225 × 1.075 × 2

B. $22 225 × 1.075

C. $22 225 × 1.075^2

D. $22 225 ÷ 1.075^2

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

$= 22225(1+0.075)^2$

$= 22225 \times 1.075^2$

End of Section I

Question 16 (3 marks)

An outdoor spa has a pump which is rated at 350 watts and a heater which is rated at 1.2 kW. The table below shows the amount of usage that the pump and heater have at different times of the year.

Average Usage	Warmer Months (October – March) (182 Days)	Cooler Months (April to September) (183 Days)
Pump 0.35kW	Runs for 3 hours per day for spa usage and 1.5 hours per day filtration 4.5 hr/day	Runs for 1.5 hours per day spa usage and 1.2 hours per day filtration 2.7 hr/day
Heater 1.2 kW	Heats for 5 min 12 times per day 1 hr/day	Heats for 12 minutes 12 times per day 144 min = 2.4 hr/day

How many kWh of energy would the spa use in a year? **3**

Pump = 182 × 4.5 × 0.350 + 183 × 2.7 × 0.350

= 459.585 kWh

Heater = 182 × 1 × 1.2 + 183 × 2.4 × 1.2

= 745.44 kWh

∴ Total energy use = 459.585 + 745.44

= 1205.025 kWh

Question 16 continues on next page

Question 17 (4 mark)

The table below shows the current individual tax rates.

Taxable Income	Tax on this income
\$0 to \$18 200	Nil
\$18 201 - \$45 000	19c for each \$1 over \$18 200
\$45 001 - \$120 000	\$5 092 plus 32.5c for each \$1 over \$45 000
\$120 001 - \$180 000	\$29 467 plus 37c for each \$1 over \$120 000
\$180 001 and over	\$51 667 plus 45c for each \$1 over \$180 000

The Medicare levy to be paid is 2% of the taxable income.

(a) Evelyn calculates her tax payable as \$10 599. What is her taxable income? **2**

(Taxable income - 45000) × 0.325 + 5092 = 10599

Taxable income = $\frac{10599 - 5092}{0.325} + 45000$

= \$61944.615...

≈ \$61944.62

(b) How much will she have to pay for the Medicare levy. **1**

Levy = 0.02 × 61944.62

= \$1238.8924...

≈ \$1238.89

(c) Evelyn had tax deductions of \$1 250. What was her yearly income. **1**

Yearly income = 61944.62 + 1250

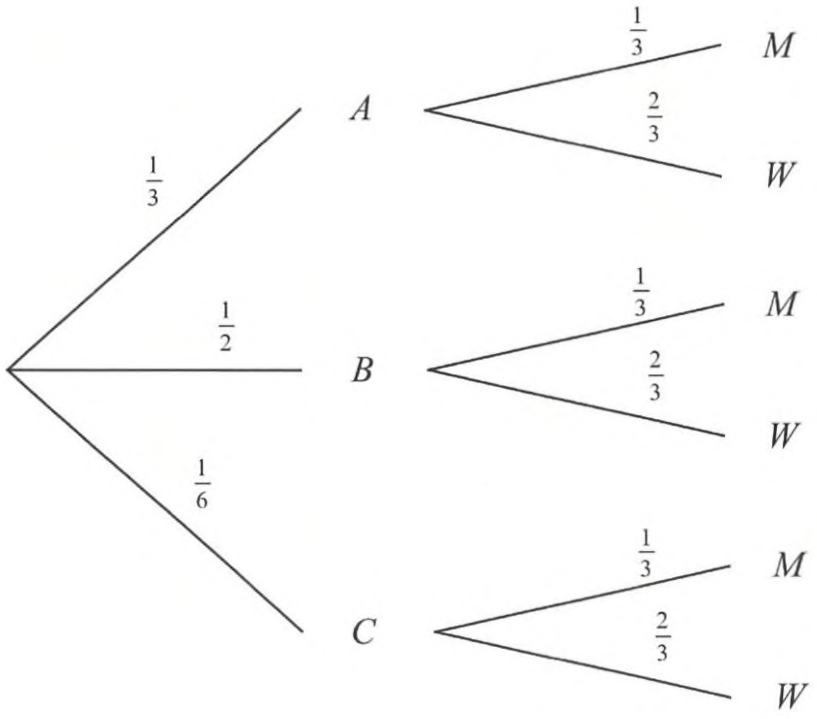
= \$63194.62

Question 18 (3 marks)

There are three candidates for team leader on a camp, Andie, Bec and Cat.

There are two candidates for team mascot at the camp, Miao and Woof.

Based on a survey of camp attendees, the probability tree shows the likelihood of the candidates being chosen for each position.



(a) What is the probability that Andie will be leader with Miao as mascot? **1**

$P(A \text{ and } M) = \frac{1}{3} \times \frac{1}{3}$

$= \frac{1}{9}$

(b) What is the probability that Andie will be the leader or Miao will be the mascot, but not both? **2**

$P(A \text{ or } M) = \frac{1}{3} \times \frac{2}{3} + \frac{1}{2} \times \frac{1}{3} + \frac{1}{6} \times \frac{1}{3}$

$= \frac{2}{9} + \frac{1}{6} + \frac{1}{18}$

$= \frac{4}{18} + \frac{3}{18} + \frac{1}{18}$

$= \frac{8}{18}$

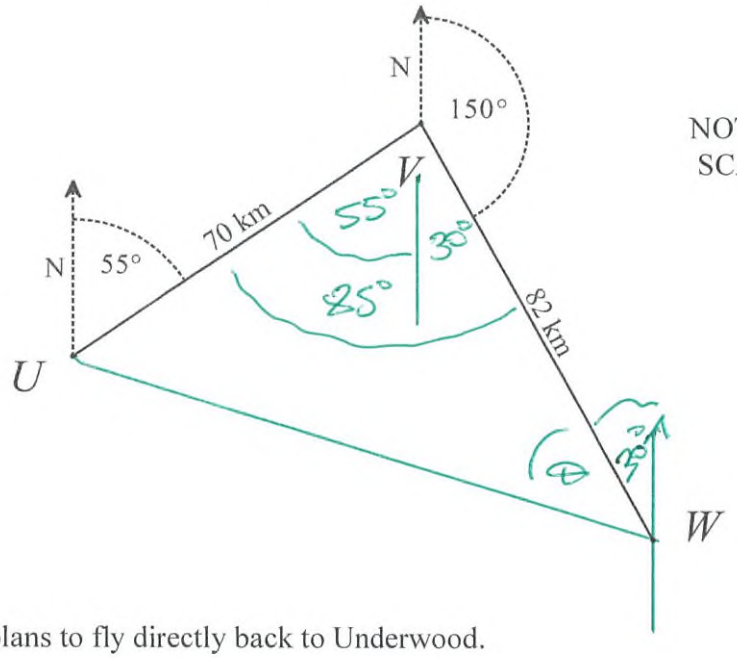
$= \frac{4}{9}$

Question 19 (4 marks)

A helicopter leaves Underwood and flies 70 km on a bearing of 055° to Vanna Beach.

It then flies 82 km on a bearing of 150° to Weston.

The diagram below illustrates the journey.



(a) It then plans to fly directly back to Underwood.
Calculate the distance that it will fly back to Underwood **2**

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

$UW = \sqrt{70^2 + 82^2 - 2 \times 70 \times 82 \cos 85}$

$= 103.070\ldots$

$\doteq 103.07$ km (2 d.p.)

(b) Determine the bearing (from Weston) on which it should fly to return to Underwood. **2**

$\frac{\sin\theta}{70} = \frac{\sin 85}{103.07}$

$\theta = \sin^{-1}\left(\frac{70 \sin 85}{103.07}\right)$

$= 42.575\ldots°$

$= 43°$ (nearest degree)

∴ Bearing from Weston to Underwood

$= 360 - 30 - 43$

$= 287$

Question 20 (5 marks)

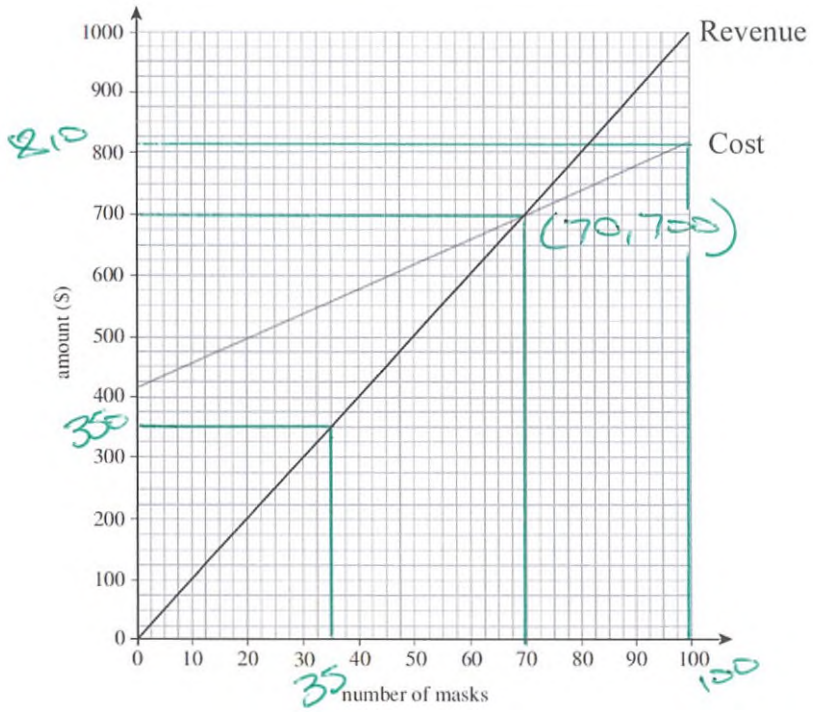
Willow's business Fashion Face Masks makes and sells embroidered face masks.

Willow purchases plain cloth masks and embroiders them with different patterns.

The cost of each plain mask is $4 and Willow sells the embroidered masks for $10 each.

Willow invests $420 in an embroidery machine and a thread kit to make 100 masks.

The production cost and revenue generated from the sale of the embroidered masks can be modelled with two linear equations, as shown in the graph.



NOT TO SCALE

(a) Using the graph, solve the two equations simultaneously and explain the significance of this solution for Willow's business. **2**

Solution is (70, 700). This is breakeven point. Need to sell > 70 masks to make a profit.

(b) How many masks does Willow need to sell to obtain a revenue of $350. **1**

35 masks (from graph)

(c) How much profit does Willow make if she sells 100 masks? **2**

Profit = 1000 − 810

= $190

Question 21 (4 marks)

Xanthe bought a car for use with her cross-country training for $24 000.

For taxation purposes she needs to work out the depreciated value of the car each year.

(a) She initially decided to do this using the declining balance method at a rate of 25% p.a. Show that the depreciation of the car in the first four years is more than three times greater than the depreciation between the fourth and eight years using this method. **2**

$n=4$ $S = 24000(1-0.25)^4$ $n=8$ $S = 24000(1-0.25)^8$

$= \$7593.75$ $= \$2402.71$

Depreciation first 4 years $= \$24000 - \$7593.75$

$= \$16406.25$

Depreciation b/w 4th and 8th years $= 7593.75 - 2402.71$

$= \$5191.04$

$3 \times 5191.04 = \$15573.12 < \$16406.25$

(b) She decided to change to the straight-line method, as calculations were easier, but wants the value after eight years to be the same as she calculated using the declining balance method. By what amount should she depreciate the car each year, and what percentage is this of the new cars value? **2**

$24000 - 2402.71 = 21597.29$

$\therefore D_n = 21597.29$

$n = 8$

$D = \frac{21597.29}{8}$

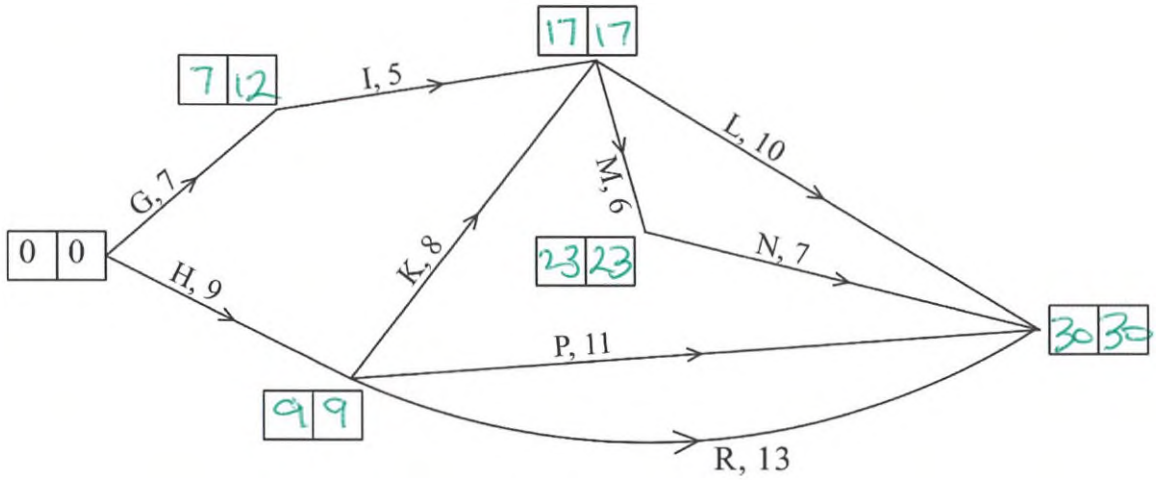
$= \$2699.66$

$\frac{2699.66}{24000} \times 100 = 11.25\%$

She should depreciate car by $2699.66 per year, representing 11.25% of the cars initial value per year.

Question 22 (4 marks)

The network diagram shows the nine steps needed to complete a project.
The time (in minutes) needed for each step is shown.



(a) Complete forward and backward scans on the diagram above and find the minimum time needed to complete the project **2**

Min. time = 30 minutes

(b) What is the critical path for the project? **1**

Critical path = H, K, M, N.

(c) What is the float time of activity I? **1**

Float time = 12 - 7
= 5 mins

Question 23 (4 marks)

Chloe borrows $24 000 through a reducing balance loan.

Interest is calculated monthly.

Repayments of $800 are deducted at the end of each month.

Chloe uses the spreadsheet below to show the progress of her loan.

	A	B	C	D	E
1	*N*	*P*	*I*	*P* + *I*	*P* + *I* - *R*
2	1	$24,000.00	$160.00	$24,160.00	$23,360.00
3	2	$23,360.00	$155.73	$23,515.73	$22,715.73
4	3	$22,715.73	$151.44	$22,867.17	$22,067.17
5	4	$22,067.17	$147.11	$22,214.29	$21,414.29
6	5	$21414.29	$142.76	$21557.05	$20757.05
7	6	$20757.05	$138.38	$20895.43	*X*

$20095.43

(a) What is the **annual** percentage interest rate? **2**

24000 × Monthly interest = $160

∴ Monthly interest = $\frac{160}{24000} \times 100$

= 0.67% (2 d.p.)

∴ Annual interest = 0.67 × 12

= 8%

(b) Complete the next two rows to find the amount *X*, which would appear in cell E7. **2**

X = $20095.43

Question 24 (5 marks)

A business produces cans of Solo lemon drink.



The capacity of the cans is normally distributed with a mean capacity of 375 ml and a standard deviation of 3 ml.

(a) What limits will the capacity of the cans of Solo almost certainly lie within? **2**

Upper limit $= 375 + 3 \times 3$
$= 384$ ml

Lower limit $= 375 - 3 \times 3$
$= 366$ ml

99.7% of cans can be expected to have a capacity between 384 ml and 366 ml

(b) What percentage of cans lie between 372 ml and 381 ml? **3**

$z_{375} = \frac{372 - 375}{3}$ $z_{381} = \frac{381 - 375}{3}$

$= -1$ $= 2$

% b/w 372 and 381 ml $= \frac{68}{2} + \frac{95}{2}$

$= 34 + 47.5$

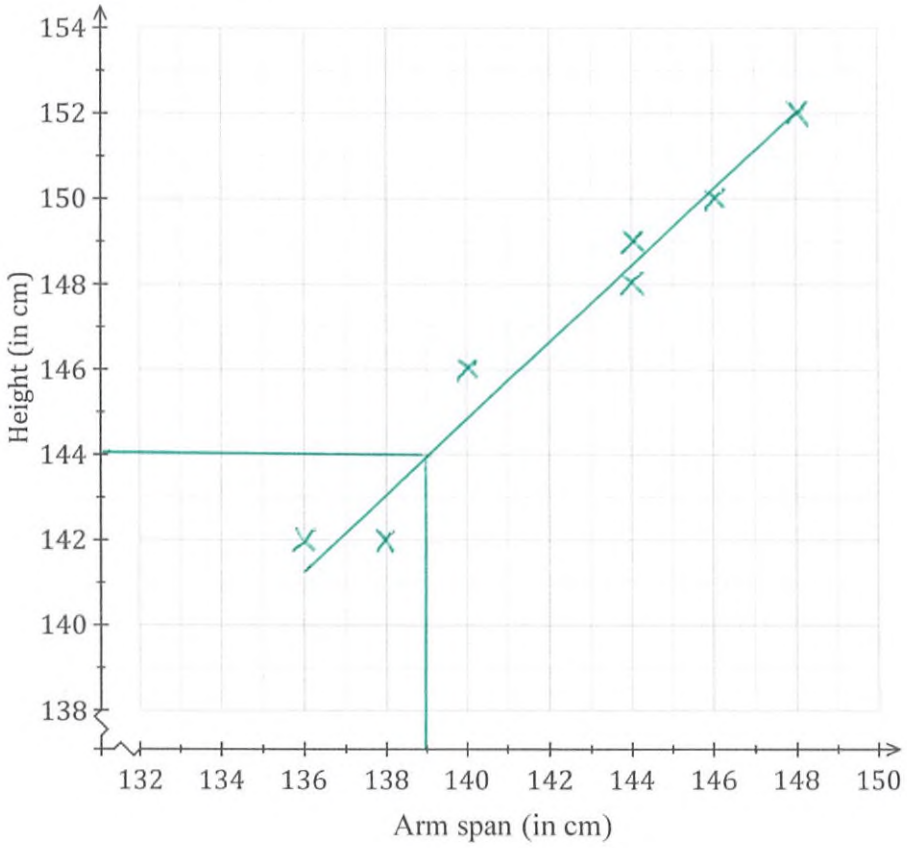
$= 81.5\%$

Question 25 (5 marks)

The table below shows the arm span and height of seven adults.

Arm span (cm)	136	138	140	144	144	146	148
Height (cm)	142	142	146	148	149	150	152

(a) Construct a scatterplot of the data. **1**



(b) Draw a line of best fit on the scatterplot. **1**

(c) Classify the direction and the strength of this linear association. **1**

Strong, positive association.

(d) Peter has an arm span of 139 cm. What is his expected height? **1**

Expected height = 144 cm

(e) Find Pearson's correlation coefficient. Answer to 4 decimal places. **1**

$r = 0.9811$

End of Booklet 1

Question 26 (3 marks)

With the knowledge that a pool ball has a volume of 75.8 cm^3.



NOT TO SCALE

Find the side length of the plastic rack required to hold all the balls at the start of the game. **3**

$75.8 = \frac{4}{3}\pi r^3$

$r^3 = \frac{75.8 \times 3}{4\pi}$

$r = 2.625\ldots$

$= 2.63$ cm (2 d.p.)

Side length of rack $= 2.63 \times 10$

$= 26.3$ cm

Question 27 (3 marks) **3**

A section of a floor plan is shown. Scale of 1:125.

A tradesman is to paint the ceiling of the bedroom, bathroom and hallway.

He paints at a constant rate of 12 m^2 per hour.

He is paid to the nearest hour, a rate of \$65/hr.

Find the labour cost to paint the ceiling if 2 coats of paint are required.



$60 \times 125 = 7500$ mm

$= 7.5$ m

$104 \times 125 = 13000$ mm

$= 13$ m

$\therefore$ Area of ceiling $= 7.5 \times 13$

$= 97.5\ m^2$

2 coats of paint $= 195\ m^2$

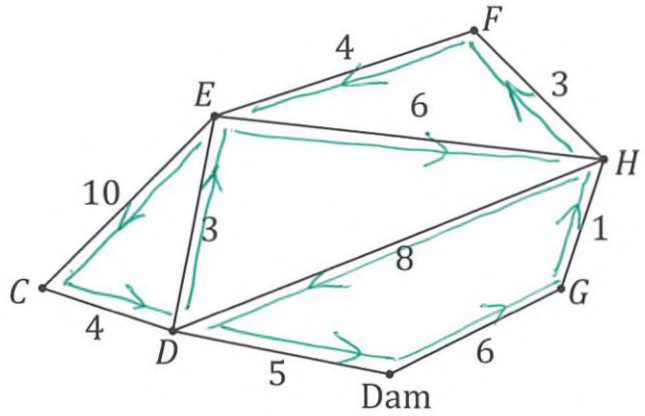
$\frac{195}{12} = 16.25$ hrs

$\therefore 16 \times 65 = \$1040$

Painter is paid \$1040

Question 28 (6 marks)

The network diagram shows the pipes providing water from a dam to six farms. These pipes connect the farms to each other and to the dam. The lengths of the pipes (in km) are shown.



NOT TO SCALE

Start / Finish

A plumber is hired to check the water pipes. He starts his examination at the dam. He then travels along each of the pipes and returns to the dam without travelling along any pipe section more than once.

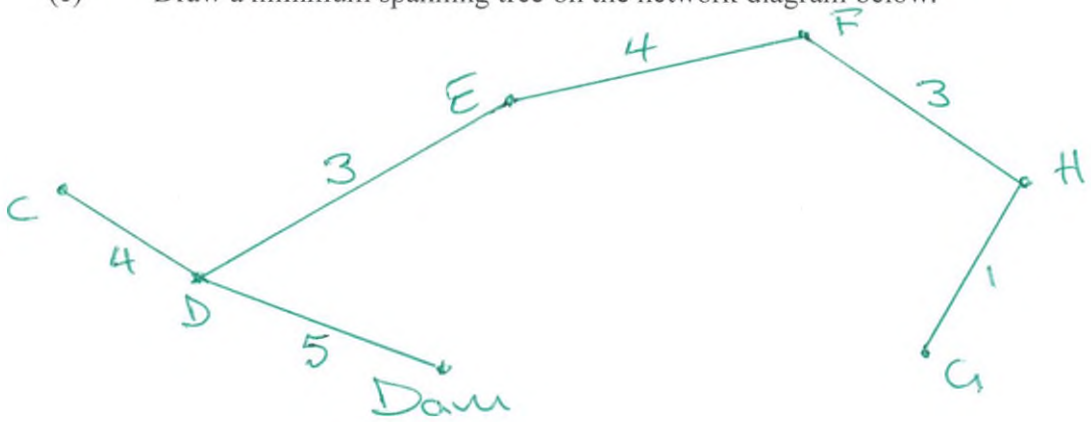
(a) Explain why such a path is possible for this network of pipes. **1**

Eulerian circuit. Network is connected and all vertices have even degree.

(b) Find and draw this path that the plumber could follow. Use the diagram above. **2**

Dam → G → H → D → E → H → F → E → C → D → Dam

(c) Draw a minimum spanning tree on the network diagram below. **2**



(d) The system of pipes is due for replacement. What is the minimum length of pipe that can be used to service all of the farms? **1**

Min length = 5 + 4 + 3 + 4 + 3 + 1

= 20 km

Question 29 (3 marks)

At our schools swimming carnival, the finish times for students under 17 who competed in the 50 m backstroke race are found to be normally distributed with a mean race time of 42 seconds and a standard deviation of 3 seconds.

The standard normal distribution table is shown. The values in the table represent the area under the normal curve to the left of the z-score.

z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.50000	0.50399	0.50798	0.51197	0.51595	0.51994	0.52392	0.52790	0.53188	0.53586
0.1	0.53983	0.54380	0.54776	0.55172	0.55567	0.55966	0.56360	0.56749	0.57142	0.57535
0.2	0.57926	0.58317	0.58706	0.59095	0.59483	0.59871	0.60257	0.60642	0.61026	0.61409
0.3	0.61791	0.62172	0.62552	0.62930	0.63307	0.63683	0.64058	0.64431	0.64803	0.65173
0.4	0.65542	0.65910	0.66276	0.66640	0.67003	0.67364	0.67724	0.68082	0.68439	0.68793
0.5	0.69146	0.69497	0.69847	0.70194	0.70540	0.70884	0.71126	0.71566	0.71904	0.72240
0.6	0.72575	0.72907	0.73237	0.73565	0.73891	0.74215	0.74537	0.74857	0.75175	0.75490
0.7	0.75804	0.76115	0.76424	0.76730	0.77035	0.77337	0.77637	0.77935	0.78230	0.78524
0.8	0.78814	0.79103	0.79389	0.79673	0.79955	0.80234	0.80511	0.80785	0.81057	0.81327
0.9	0.81594	0.81859	0.82121	0.82381	0.82639	0.82894	0.83147	0.83398	0.83646	0.83891
1.0	0.84134	0.84375	0.84614	0.84849	0.85083	0.85314	0.85543	0.85769	0.85993	0.86214
1.1	0.86433	0.86650	0.86864	0.87076	0.87286	0.87493	0.87698	0.87900	0.88100	0.88298
1.2	0.88493	0.88686	0.88877	0.89065	0.89251	0.89435	0.89617	0.89796	0.89973	0.90147
1.3	0.90320	0.90490	0.90658	0.90824	0.90988	0.91149	0.91308	0.91466	0.91621	0.91774
1.4	0.91924	0.92073	0.92220	0.92364	0.92507	0.92647	0.92785	0.92922	0.93056	0.93189
1.5	0.93319	0.93448	0.93574	0.93699	0.93822	0.93943	0.94062	0.94179	0.94295	0.94408
1.6	0.94520	0.94630	0.94738	0.94845	0.94950	0.95053	0.95154	0.95254	0.95352	0.95449

Using the standardised scores and the standard normal distribution table, find the probability that a randomly chosen competitor achieves a finish time between **43 and 46** seconds.

Give your answer as a percentage correct to one decimal places. **3**

$z_{43} = \frac{43-42}{3}$ $z_{46} = \frac{46-42}{3}$

$= 0.33$ $= 1.33$

$P(Z < 0.33) = 0.62930$ $P(Z < 1.33) = 0.90824$

$P(0.33 < Z < 1.33) = 0.90824 - 0.62930$

$= 0.27894$

$= 27.9\%$ (1 d.p.)

Question 30 (4 marks)

Ava contributes $8500 to an investment account every quarter of a year for 2 years.

The account pays 8% interest per annum, compounded quarterly.

Future value of $1								
Period	*1%*	*2%*	*3%*	*4%*	*5%*	*6%*	*7%*	*8%*
1	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
2	2.0100	2.0200	2.0300	2.0400	2.0500	2.0600	2.0700	2.0800
3	3.0301	3.0604	3.0909	3.1216	3.1525	3.1836	3.2149	3.2464
4	4.0604	4.1216	4.1836	4.2465	4.3101	4.3746	4.4399	4.5061
5	5.1010	5.2040	5.3091	5.4163	5.5256	5.6371	5.7507	5.8666
6	6.1520	6.3081	6.4684	6.6330	6.8019	6.9753	7.1533	7.3359
7	7.2135	7.4343	7.6625	7.8983	8.1420	8.3938	8.6540	8.9228
8	8.2857	8.5380	8.8923	9.2142	9.5491	9.8975	10.2598	10.6366

(a) What is the future value of Ava's annuity at the end of 2 years? **2**

Periods = 2 × 4 Quarterly interest = $\frac{8}{4}$

= 8 = 2%

FV = 8.5380 × 8500

= $72573

(b) Calculate the total amount of interest that Ava will earn on her investment at the end of 2 years. **2**

Contributions = 8 × 8500

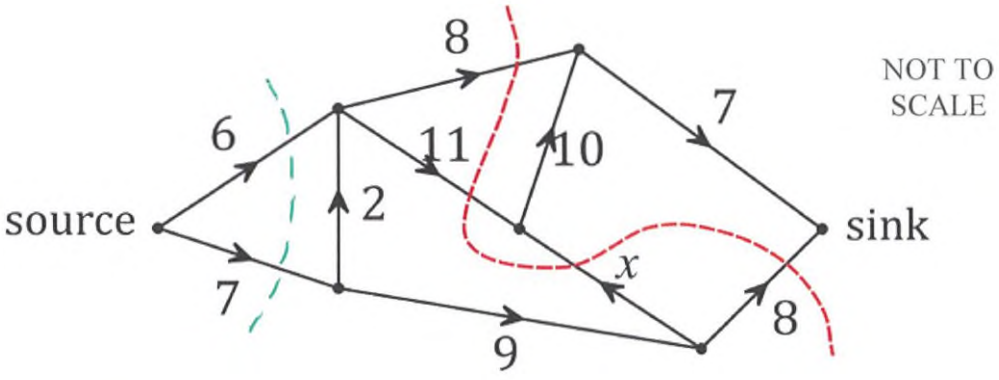
= 68000

Interest = 72573 − 68000

= $4573

Question 31 (4 marks)

For the network shown below, the capacity of the cut shown is 30.



(a) What is the value of x? **2**

$x = 30 - 8 - 11 - 8$

$= 3$

(b) What is the minimum cut – maximum flow of this network. Show this on the diagram. **2**

Min. cut $= 6 + 7$

$= 13$

Min. cut = Max. flow

$\therefore$ Max flow $= 13$

Question 32 (3 marks)

In the Atherton region in the tropical forests, 96 rare birds were captured, tagged, and released. Five months later, 72 birds were recaptured from the same region, and it was found that 18 of these birds had previously been tagged. Use an appropriate method to give an estimate of the number of rare birds in this rainforest region. **3**

$\frac{96}{p} = \frac{18}{72}$

$18p = 96 \times 72$

$p = \frac{96 \times 72}{18}$

$= 384$

$\therefore$ Approx. 384 rare birds in region.

Question 33 (4 marks)

Miss Ward sells soap bubble markers for $20 each at a market.

Each bubble marker costs her $14.75 to build and she has to pay a fee of $150 to sell these at the market.

(a) Write an equation to describe the relationship between income and the number of bubble markers. **1**

$I = 20 \times n$ where n = number of bubble markers

(b) Write an equation to describe the relationship between costs and the number of bubble markers. **1**

$C = 14.75n + 150$ where n is the number of bubble markers.

(c) How many bubble markers must Ava sell to make a profit? **2**

$C = I$ for break-even.

$20n = 14.75n + 150$

$5.25n = 150$

$n = \frac{150}{5.25}$

$= 28.57$

$\therefore$ Miss Ward needs to sell at least 29 bubble markers to make a profit.

Question 34 (3 marks)

Alyssa purchased a car for $56 789.

This table shows the stamp duty rates for a motor vehicle in NSW.

Vehicle value	*Rate*
0–$4999	Nil
$5000–$44 999	$3 for every $100 (or part thereof)
$45 000 and over	$1300 plus $6 for every $100 (or part thereof)

(a) Using the table, calculate the stamp duty payable on the car. **1**

Stamp Duty = 1300 + 6 × 118

= $2008

$\frac{56789 - 45000}{100}$

= 117·89

≈ 118

(b) The car has an expected depreciation rate of 12% per annum.

What is the salvage value of the car after 6 years? **2**

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

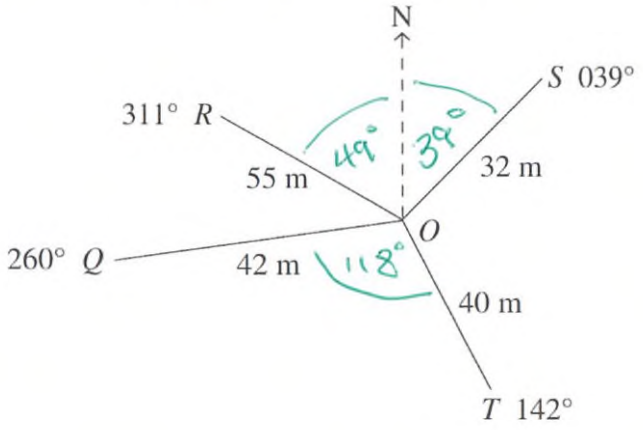
$= 56789(1-0.12)^6$

= $26373.04

Salvage value = $26373.04 (2 d.p.)

Question 35 (5 marks)

Ella took a compass radial survey of a block of land as shown.



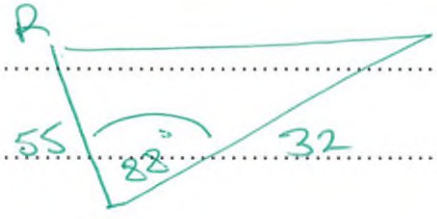
NOT TO SCALE

(a) Find the size of $\angle ROS$. **1**

$\angle ROS = 49 + 39$

$= 88°$

(b) Calculate the area of triangle ROS correct to the nearest square metre. **2**



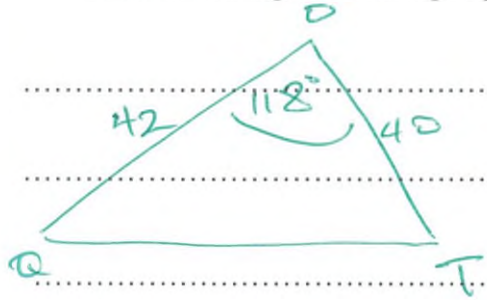
$A = \frac{1}{2}ab\sin C$

$= \frac{1}{2} \times 55 \times 32 \times \sin 88$

$= 879.463...$

$\doteq 879 \text{ m}^2$ (nearest m)

(c) Ella then realises that the southern part of the field does not have a fence correctly installed.
What is the length of fencing required to be repaired? **2**



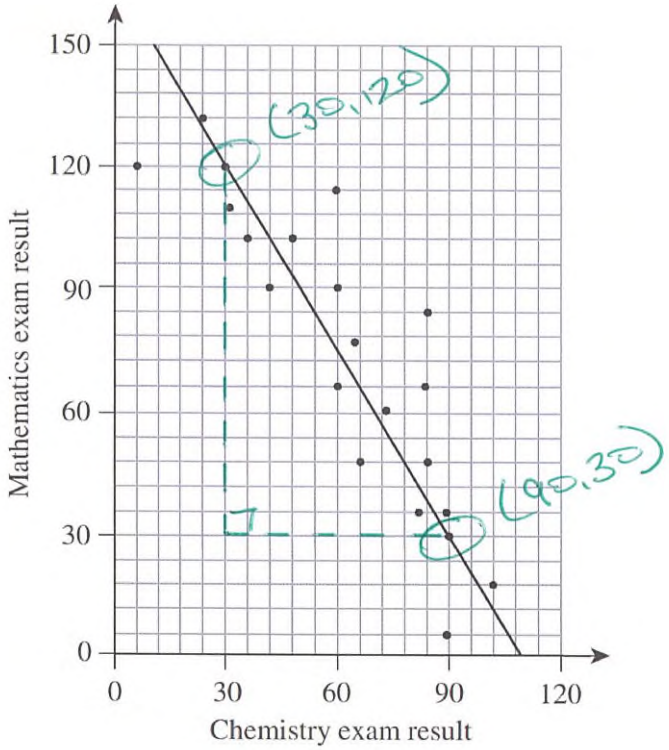
$c = \sqrt{42^2 + 40^2 - 2 \times 42 \times 40 \times \cos 118}$

$= 70.295...$

$\doteq 70.30 \text{ m}$ (2 d.p.)

Question 36 (3 marks)

The Mathematics and Chemistry Olympiad results for a group of students are recorded on this scatterplot.



(a) Calculate the gradient of the line of best fit. **1**

$m = \frac{y_2 - y_1}{x_2 - x_1}$

$= \frac{30 - 120}{90 - 30}$

$= \frac{-90}{60} = -\frac{3}{2}$ or $m = -1.5$

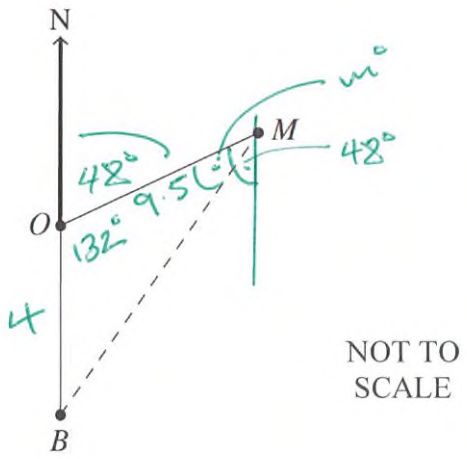
(b) Identify the correction between the Mathematics and Chemistry results. **2**

Weak, negative, linear.

Question 37 (3 marks)

A mother pelican (M) leaves her nest (O) and flies on a bearing of 048° for 9.5 km.

A baby bird (B) leaves the same nest and flies due South for 4 km.



(a) Find the distance that the two birds are apart at this time. **1**

$c = \sqrt{4^2 + 9.5^2 - 2 \times 4 \times 9.5 \times \cos 132°}$

$= 12.534...$

$\doteq 12.53$ km (2 d.p.)

(b) Find the bearing of the baby bird from its mother. **2**

$\frac{\sin m°}{4} = \frac{\sin 132}{12.53}$

$m = 13.71°$

$= 13°43'$

$48° - 13°43' = 34°17'$

∴ Bearing of B from M is

$180 + 34°17' = 214°17'$

End of Booklet 2