2022 | TRIAL HIGHER SCHOOL
CERTIFICATE EXAMINATION

Mathematics Standard 2

Staff Involved:
- JWH ● RAS ● JAI ● BHC
- DZP ● ALY ● ARP ● JZT*

DATE: Friday 5th August

175 copies

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 separate reference sheet is provided
- For questions in Section II, show relevant mathematical reasoning and / or calculations

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Total marks: 100

Section I – 15 marks (pages 2 - 7)
- Attempt Questions 1 – 15
- Allow about 25 minutes for this section

Section II – 85 marks (pages 9 - 29)
- Attempt Questions 16 - 39
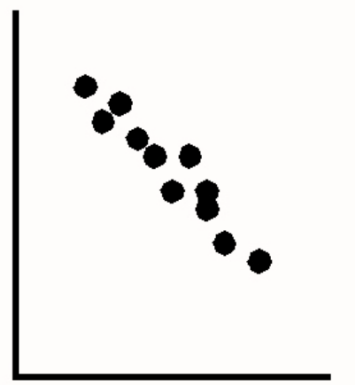- Allow about 2 hours and 5 minutes for this section

Section I

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1   Which would be the best approximation of Pearson's Correlation Coefficient (r) for the scatter plot below?

(A)   0.9

(B)   0.4

(C)   −0.4

(D)   −0.9

2   In the triangle below, AD is 30 cm, BC is 28 cm and CD is 12 cm in length.
Find the value of θ. *Answers are rounded to the nearest degree.*
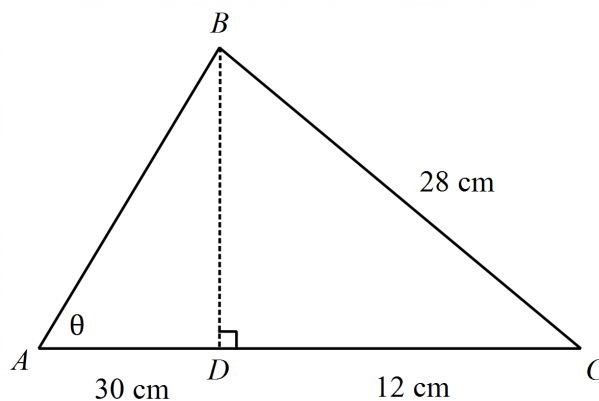

DIAGRAM IS
NOT TO SCALE

(A)   40°

(B)   42°

(C)   57°

(D)   69°

3 A set of weight scales measure the weight of a horse correct to the nearest 5 kg. A horse is weighed at 285 kg using these scales. What is the percentage error in this measurement? Answers have been rounded to 2 significant figures.

(A) 0.0088%

(B) 0.018%

(C) 0.88%

(D) 1.8%

4 The Pareto chart below shows the annual sales for a company for various countries.
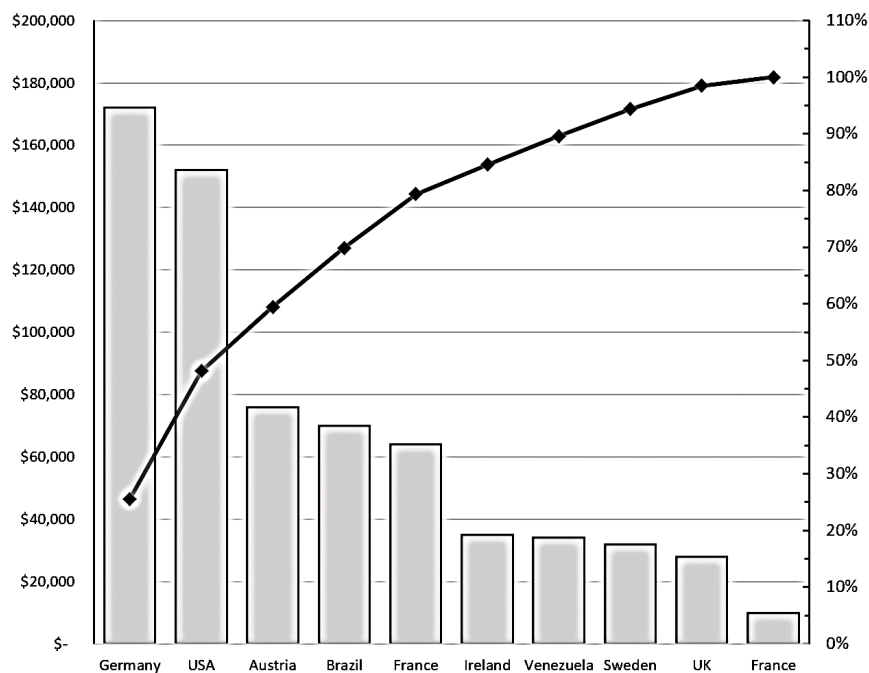
Approximately what percentage of total sales did Ireland contribute?

(A) 5%

(B) 10%

(C) 40%

(D) 80%

5 Natasha was studying the black widow spider population in a woodchip storage yard.
She caught and marked 30 spiders and released them back into the yard.
A month later she caught 120 spiders, of which 10 were already marked.
What is the estimated spider population in the storage yard?

(A) 40

(B) 150

(C) 360

(D) 1200

6   Phillip needs to visit 4 sites called A, B, C and D.
     The distance between each site (in metres) is shown in the table below.

	A	B	C	D
A		72		35
B	72		57	28
C		57		40
D	35	28	40	

Find the minimum distance Phillip can travel to visit each site if he does not want to retrace his steps. He starts at Site A and does not want to return to Site A.

(A)   103 m

(B)   120 m

(C)   132 m

(D)   140 m

7   A school wishes to survey students about their study habits.

The school has a total of 750 students, 95 of whom are boarders distributed amongst the year groups as shown in the table below.

A stratified sample of 80 students is to be randomly selected to take the survey.

How many of these should be Year 12 boarders?

Answers have been rounded to the nearest whole number.

	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12
Boarders	8	14	11	14	18	30
Day students	106	104	114	109	112	110

(A)   3

(B)   10

(C)   15

(D)   25

8   A group of students sat two different exam papers and their scores are given in the table below. Use your calculator to find the equation of the least squares regression line for the scores. (Answers have been rounded).

Student	A	B	C	D	E	F	G	H
Paper 1 (x)	65	73	42	52	84	60	70	79
Paper 2 (y)	78	88	60	73	92	77	84	89

(A) $y = 3.25\,x + 1.25$

(B) $y = 1.25x - 3.25$

(C) $y = 31.9\,x + 0.735$

(D) $y = 0.735\,x + 31.9$

9   Bruce bought a car for \$38 000 in 2012 and sold it 10 years later. It depreciated using the declining balance method, at a rate of 8% p.a.

By how much had the car depreciated when he sold it?

(A)   \$7 600

(B)   \$16 507

(C)   \$21 493

(D)   \$30 400

10   Calculate the annual cost of running a 350 watt television every day for 3 hours per day, if the average rate for electricity is 19^c/kWh. Answers are rounded to the nearest cent.

(A)   \$199.50

(B)   \$7.28

(C)   \$72.82

(D)   \$7281.75

11 Which of the following graphs represents $y = 2^x - 5$?

(A)
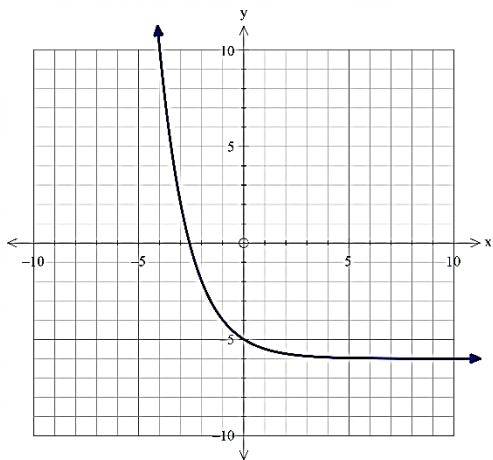
(B)
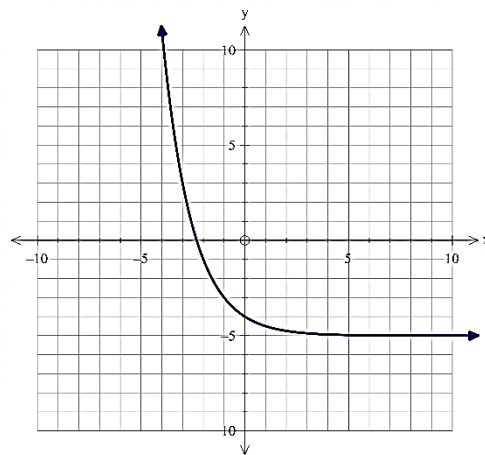
(C)
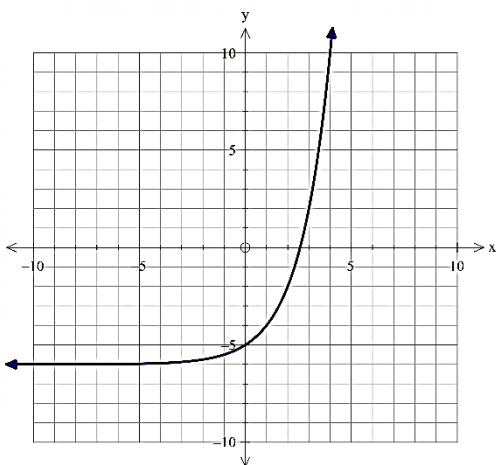
(D)
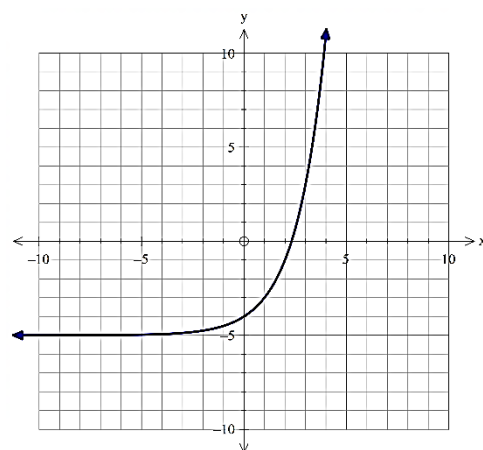
12 If we rearrange $s = ut + \frac{1}{2}at^2$ to make a the subject, the correct expression is:

(A) $a = \frac{2s - ut}{t^2}$

(B) $a = \frac{2(s - ut)}{t^2}$

(C) $a = \frac{\sqrt{2s - 2ut}}{t}$

(D) $a = \frac{-2ut + s}{t^2}$

13 For the network below, which is the maximum flow?
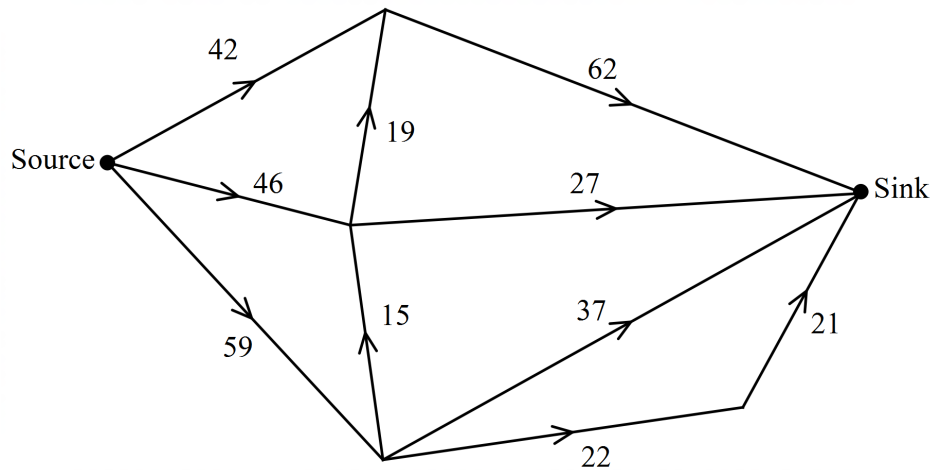
(A) 142

(B) 146

(C) 147

(D) 148

14 Clint is practising firing arrows at a target and records his points out of 30:

$28, 30, 29, 30, 27, 29, 28, 25, 30, 28$

If his next two scores are 28 and 30, which of the following will this affect?

(A) Mean only

(B) Mean and median

(C) Mean, median and mode

(D) Range

15 Tony bought 360 shares in Starkless Industries at a total cost of $2304. The dividend yield was 12.5%. What was the value of the dividend per share?

(A) $0.80

(B) $1.95

(C) $2.88

(D) $6.40

End of Section I

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Mathematics Standard 2

Section II Answer Booklet

85 marks
Attempt Questions 16-39
Allow about 2 hours and 5 minutes for this section

Instructions:

- Write your Student Number at the top of the page where indicated.

- 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 31 and 32. If you use this space, clearly indicate which question you are answering.

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Question 16 (2 marks)

Below is the graph of a home loan. Use the graph to answer the questions below.

Home loan balance
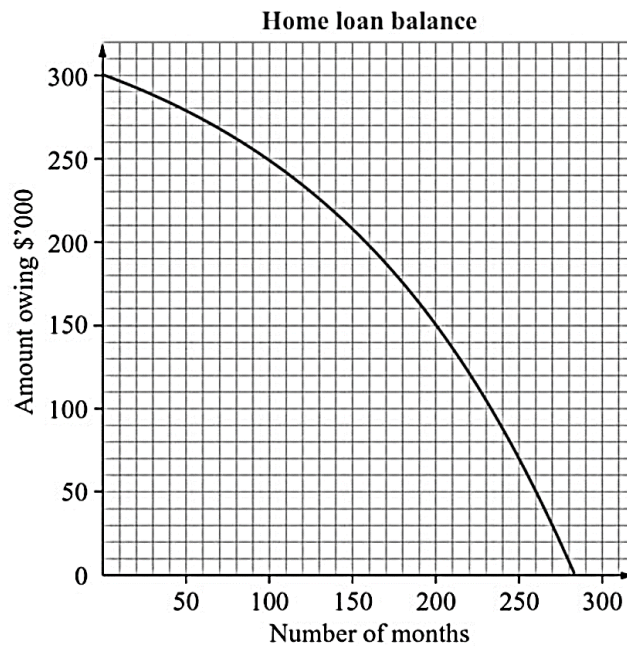
(a)   How much was borrowed?   **1**

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(b)   How long did it take to pay off half of the loan? (Answer in years and months)   **1**

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Question 17 (1 mark)

Scott and Hope find some money and split it in the ratio 7 ∶ 9.   **1**
If Hope receives $450, how much money did they find in total?

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Question 18 (2 marks)

For the network drawn here:
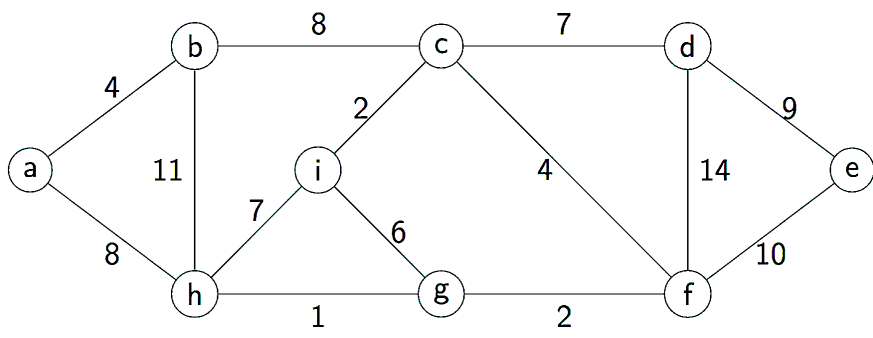
Draw the minimum spanning tree in the space below and find its length.   **2**

Length of minimum spanning tree = _____

Question 19 (2 marks)

On a full tank of 56 litres of petrol, Jarvis' car can travel a distance of 896 km.

(a)   Calculate the fuel consumption of the car in L/100 km.   **1**

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(b)   How far can the car travel on 12 litres of petrol?   **1**

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Question 20 (3 marks)

This table shows the tax rates for the current financial year.

Taxable income	Tax on this income
0 – $18,200	Nil
$18,201 – $45,000	19 cents for each $1 over $18,200
$45,001 – $120,000	$5,092 plus 32.5 cents for each $1 over $45,000
$120,001 – $180,000	$29,467 plus 37 cents for each $1 over $120,000
$180,001 and over	$51,667 plus 45 cents for each $1 over $180,000

Sam's annual taxable income is $96 400. He has made PAYG contributions of $2140 per month.

He must also pay the Medicare levy, which is 2% of his taxable income.

Will he have a tax debt or a tax refund? Justify your answer with calculations. **3**

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Question 21 (5 marks)

This network diagram shows the completion time for a project. The timings for each activity are shown in hours.
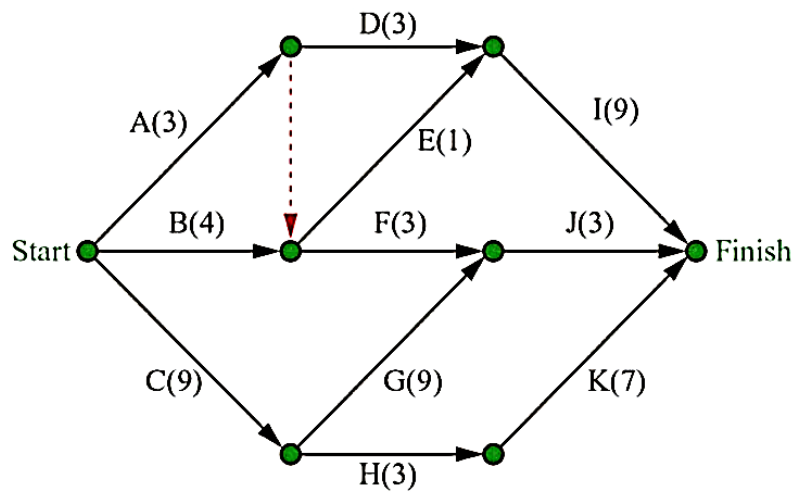
(a) By performing a forward and backward scan on the network diagram, find the minimum time required to complete the project? **2**

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(b) List the activities (in order) that lie on the critical path. **1**

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

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(d) If the time taken for activity D is changed to 9 hours what, if any, change will this make to the critical path? **1**

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Question 22 (1 mark)

The scale on a map is given as 3 cm = 5 km. The distance between two towns on the map is 2.2 cm. Find the actual distance between the two towns. Answer correct to 1 decimal place. **1**

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Question 23 (5 marks)

The following volumes of various alcohol contain one standard drink:

(a) Between 7.30 pm and 10.15 pm, James drinks 2 × 285 ml full strength beers, 90 ml of spirits and 200 ml of wine. James weighs 85 kg.

Use the formula below to estimate his Blood Alcohol Content (BAC). *Round your answer to 3 decimal places.* **3**

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

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The number of hours required for a person to reach zero BAC after they stop consuming alcohol is given by the following formula.

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

(b) If James stops drinking at 10.15 pm, at what time will he have a zero BAC? Give your answer correct to the nearest minute. **2**

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Question 24 (5 marks)

Carol wishes to save for an overseas holiday which will cost $28 000.

(a)   She looks at investing $22 000 at 8% p.a. interest compounding monthly for 3 years.
Will she save enough for holiday or not?
Calculate how much more or how much less than the required amount she will have.   **2**

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(b)   Carol also considers an annuity that pays 8% p.a., compounding quarterly. Using the table
below, how much does she need to deposit each quarter to save $28 000 after 3 years?   **2**

TABLE: Future value interest factors for an annuity of $1.

Period	Interest rate per period									
	2%	2.5%	3%	3.5%	4%	4.5%	5%	5.5%	6%	8%
1	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
2	2.0200	2.0250	2.0300	2.0350	2.0400	2.0450	2.0500	2.0550	2.0600	2.0800
3	3.0604	3.0756	3.0909	3.1062	3.1216	3.1370	3.1525	3.1680	3.1836	3.2464
4	4.1216	4.1525	4.1836	4.2149	4.2465	4.2782	4.3101	4.3423	4.3746	4.5061
5	5.2040	5.2563	5.3091	5.3625	5.4163	5.4707	5.5256	5.5811	5.6371	5.8666
6	6.3081	6.3877	6.4684	6.5502	6.6330	6.7169	6.8019	6.8881	6.9753	7.3359
7	7.4343	7.5474	7.6625	7.7794	7.8983	8.0192	8.1420	8.2669	8.3938	8.9228
8	8.5830	8.7361	8.8923	9.0517	9.2142	9.3800	9.5491	9.7216	9.8975	10.6366
9	9.7546	9.9545	10.1591	10.3685	10.5828	10.8021	11.0266	11.2563	11.4913	12.4876
10	10.9497	11.2034	11.4639	11.7314	12.0061	12.2882	12.5779	12.8754	13.1808	14.4866
11	12.1687	12.4835	12.8078	13.1420	13.4864	13.8412	14.2068	14.5835	14.9716	16.6455
12	13.4121	13.7956	14.1920	14.6020	15.0258	15.4640	15.9171	16.3856	16.8699	18.9771
15	17.2934	17.9319	18.5989	19.2957	20.0236	20.7841	21.5786	22.4087	23.2760	27.1521
18	21.4123	22.3863	23.4144	24.4997	25.6454	26.8551	28.1324	29.4812	30.9057	37.4502
20	24.2974	25.5447	26.8704	28.2797	29.7781	31.3714	33.0660	34.8683	36.7856	45.7620
21	25.7833	27.1833	28.6765	30.2695	31.9692	33.7831	35.7193	37.7861	39.9927	50.4229
24	30.4219	32.3490	34.4265	36.6665	39.0826	41.6892	44.5020	47.5380	50.8156	66.7648
25	32.0303	34.1578	36.4593	38.9499	41.6459	44.5652	47.7271	51.1526	54.8645	73.1059
30	40.5681	43.9027	47.5754	51.6227	56.0849	61.0071	66.4388	72.4355	79.0582	113.2832
36	51.9944	57.3014	63.2759	70.0076	77.5983	86.1640	95.8363	106.7652	119.1209	187.1021

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(c)   Which option will mean that Carol pays less, and by how much?   **1**

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Question 25 (5 marks)

Jane holds a bag of 80 coins of the same shape and size. There are 30 silver and 50 gold coins. She randomly selects 2 coins without replacement.

(a)   Write the probabilities for the two coins onto the branches of the tree diagram below.   **1**

Coin 1   **Coin 2**

$\frac{30}{80}$ Silver

Silver

Gold

$\frac{50}{80}$ Gold

Silver
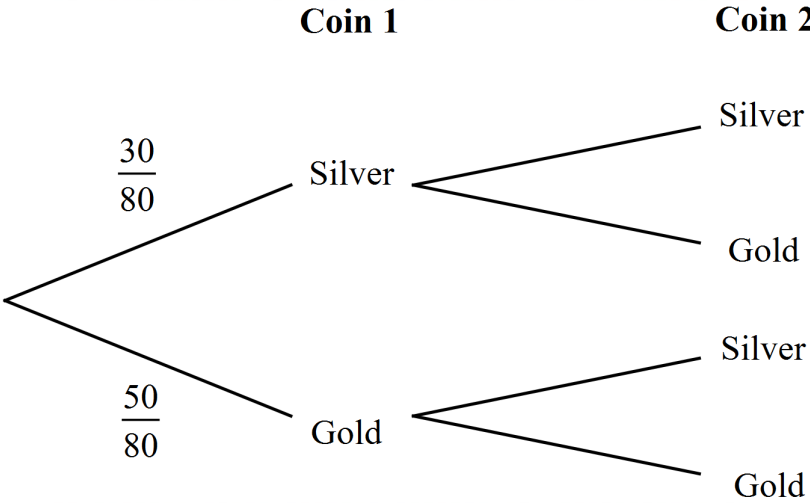
Gold

(b)   What is the probability that Jane will pick one coin of each type?   **2**

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(c)   What is the probability that Jane will pick at least one gold coin?   **2**

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Question 26 (5 marks)

Data was collected on the height and lung capacity of a group of students.
A scatter plot of the data was then created and a line of best fit constructed, to model the relationship between height (H) and lung (L) capacity.

(L) Lung capacity versus height
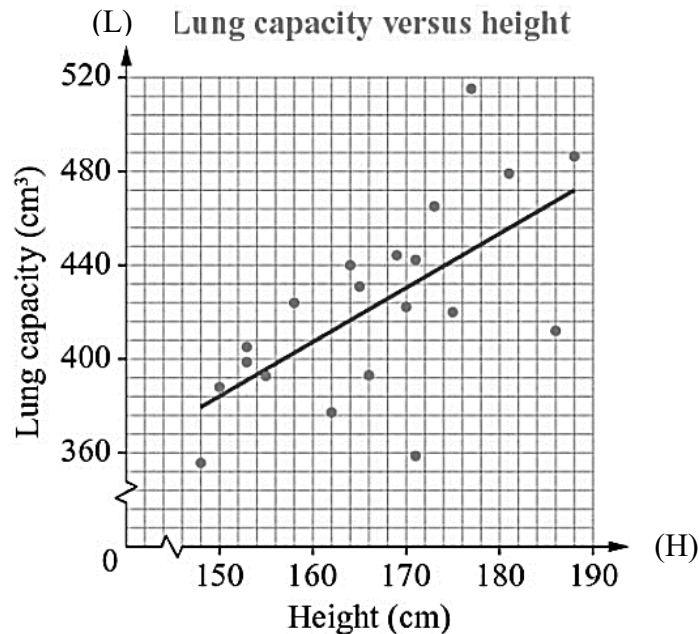
(a) Determine the gradient of the line of best fit. **2**

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(b) Determine the equation of the line of best fit shown on the graph. **2**

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(c) Give an approximate height for a person with a lung capacity of 489 cm^3.
Answer correct to the nearest whole number. **1**

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Question 27 (3 marks)

Solve $\dfrac{2x}{3} - 5 = \dfrac{x+10}{4}$ **3**

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Question 28 (3 marks)

The cost (C) per person to hire a venue varies inversely with the number of people (P) who are willing to pay. When 14 people pay, the cost is $64 per person.

(a)   Write an equation (in terms of C and P) to model this situation.   **2**

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(b)   How many people have paid if the cost is reduced to $35.84 per person?   **1**

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Question 29 (7 marks)

A group (A) of students from Sokovia High School took a maths test. Their scores out of 16 are shown on the cumulative frequency histogram and polygon (ogive) below.

Test Scores out of 16
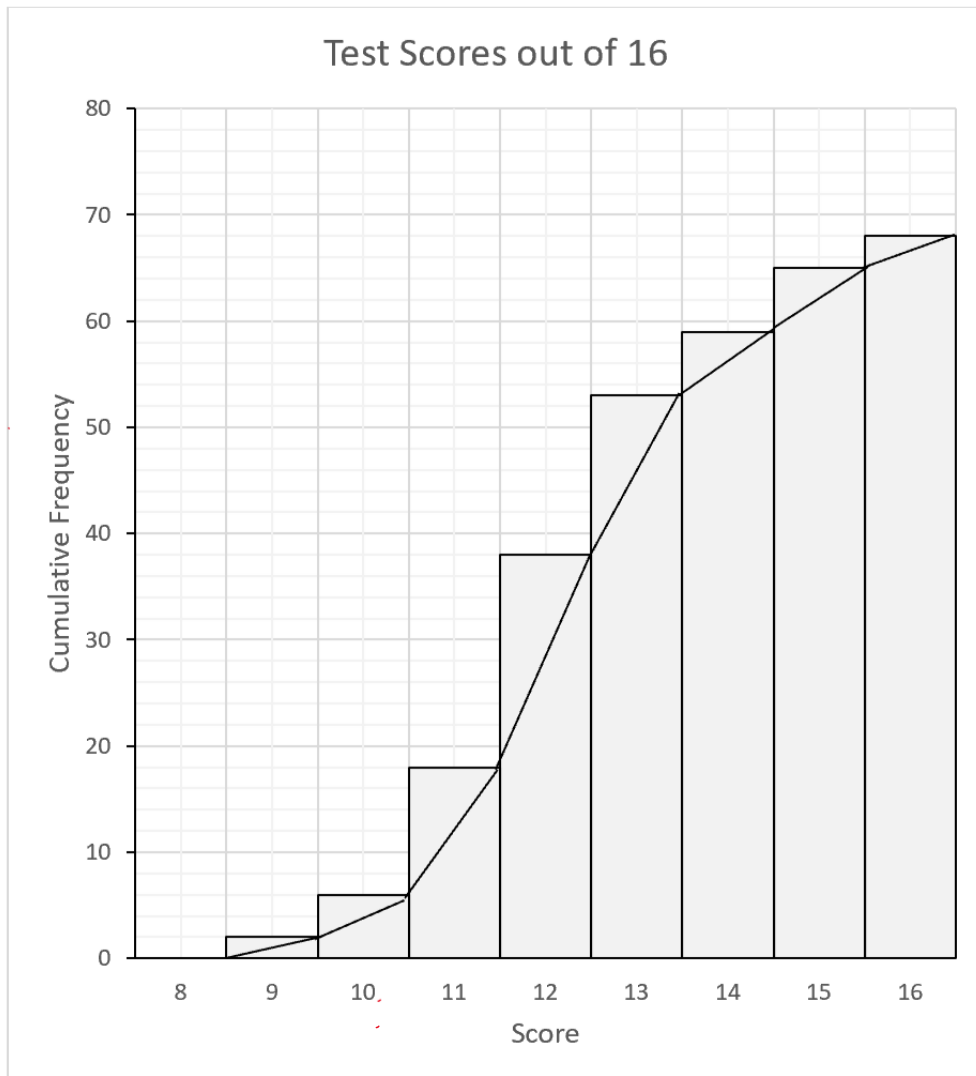
(a)   Use the ogive to give the five-number summary for the scores.   **2**

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<div align="center">

Question 29 continues on the next page

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(b) Another group (B) at the school took the same test. Their results are shown on the box and whisker plot drawn below.

Add a box and whisker plot (in the space provided) for group A using your five-number summary. **1**

GROUP A

GROUP B

2   4   6   8   10   12   14   16
SCORE
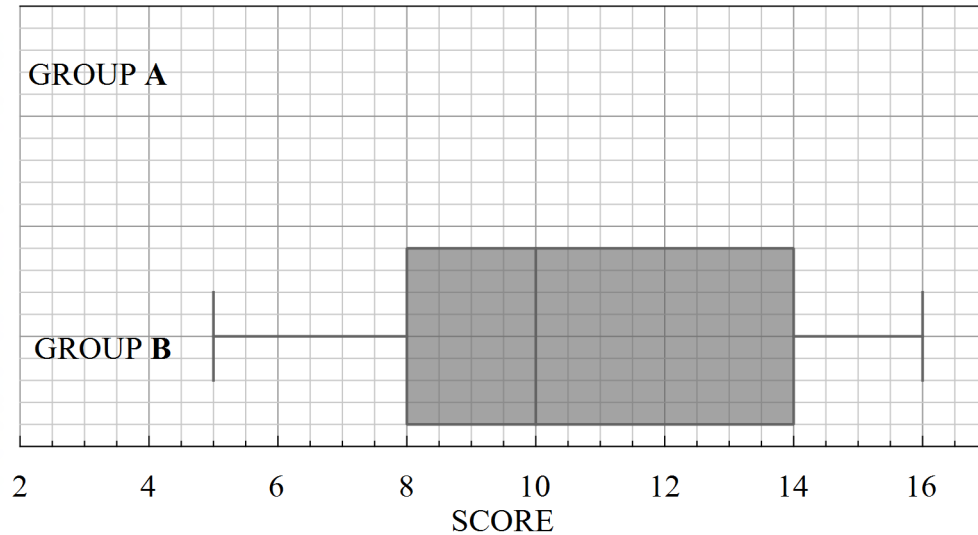
(c) If both groups had the same number of students, how many students in Group B had scores of 8 or more? **1**

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(d) Group A claimed that they performed better on the test than Group B. Is this true?
Justify your answer by referring to the measure of location and spread for both classes. **3**

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Question 30 (4 marks)

Wanda wishes to measure the amount of water in a part of a river. The cross-section of the river is shown in the diagram below.

21 m

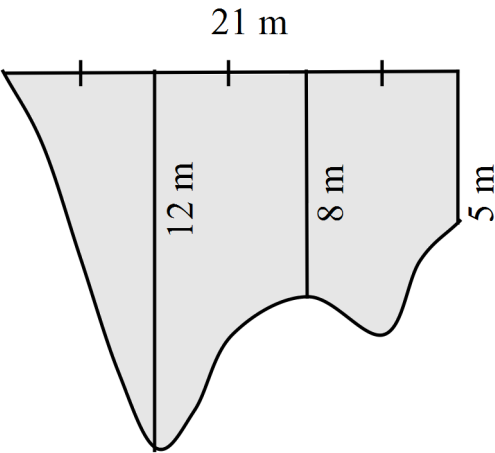(a)   Use three applications of the trapezoidal rule to find an approximate area of the cross section.

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(b)   Calculate the capacity of that part of the river if it is 14.5 metres in length. Give your answer in litres.

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Question 31 (3 marks)

Rocky has a credit card on which interest at 15% per annum is charged on the amount owing and **compounding daily**, including both the date of purchase and date of payment.

On 14th June Rocky owes $950 on his credit card. He makes no other purchases using the credit card. Calculate the amount owing on the credit card on 12th July. **3**

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Question 32 (4 marks)

The distance it takes for a car to come to a stop after braking is approximated by the formula:

$$\textbf{Braking distance } (d) = 0.01v^2$$

where d is the braking distance in metres and v is the speed of the car in km/h.

(a)　Calculate the braking distance of a car travelling at 95 km/h. **1**

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(b)　The stopping distance of car includes the braking distance and the reaction-time distance:

　　Stopping distance = reaction-time distance + braking distance

　　Calculate the stopping distance for the car in (a) assuming a reaction time of 2.5 seconds. Give your answer correct to 1 decimal place. **3**

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Question 33 (4 marks)

Drax runs joy-flights around the city. Each flight costs him $768 for jet fuel plus $52 per person in other costs. Drax charges his passengers $84 per person.
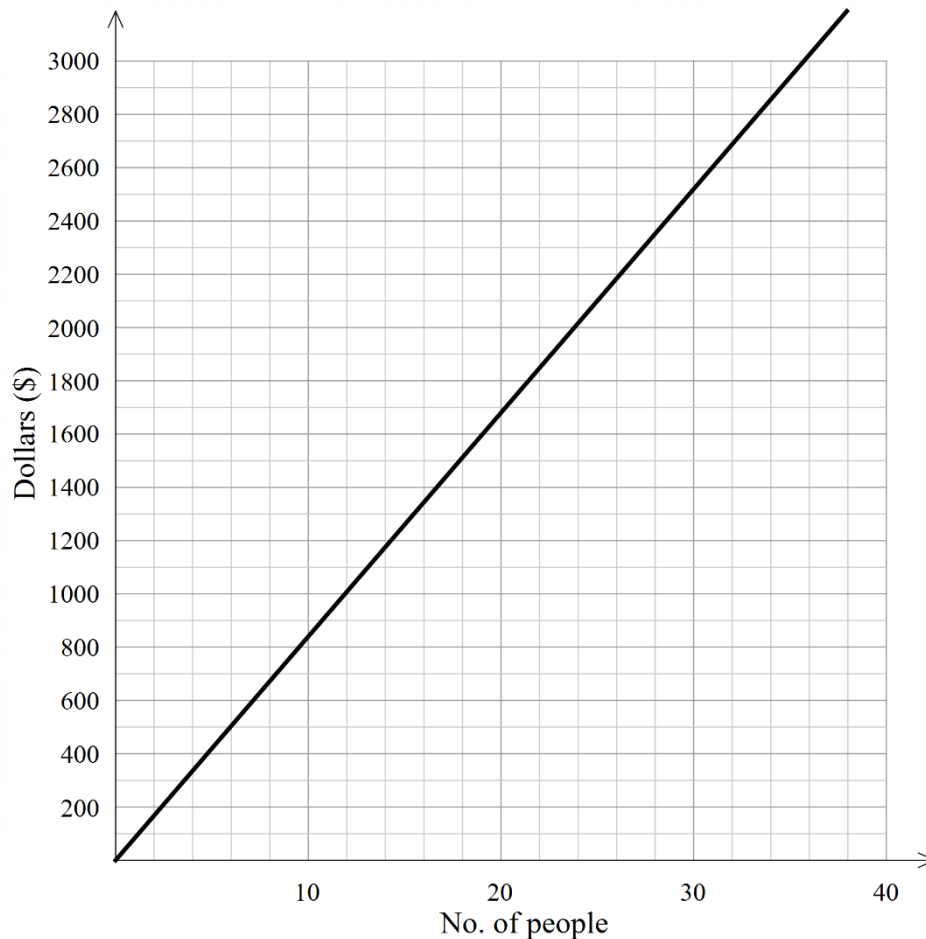
(a)   Write an equation to represent Drax's costs.   **1**

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(b)   Write an equation to represent Drax's income.   **1**

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(c)   On the grid below, Drax's income equation is already drawn.
        Draw a graph to represent the cost equation from (a).   **1**

(d)   From the graph, determine the approximate number of people Drax needs to sign-up to break even.   **1**

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Question 34 (3 marks)

In the triangle below ∠A = 26°, AB = 15.8 cm and AC = 22.1 cm.
Calculate the size of ∠B, if it is an obtuse angle. Give your answer to the nearest degree. **3**

A

26°

DIAGRAM IS
NOT TO
SCALE

22.1 cm

15.8 cm

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Question 35 (3 marks)

Town A is at (37°N, 135°W) and Town B is at (41°N, 105°E).

Find the time and day in Town A if it is 8am on Monday in Town B.
It is given that 15° $= 1$ hour of time difference. Ignore daylight saving. **3**

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Question 36 (3 marks)

A person's maximum heart rate (MHR) in beats per minute (bpm) is estimated using the formula:

$$MHR = 220 - \text{age in years.}$$

Henry is 38 years old and exercises at 85% of his MHR. His heart pumps 70 ml with each beat.

Calculate the volume of blood pumped by his heart during a 20-minute exercise session.

Give your answer in litres, to 4 significant figures. **3**

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Question 37 (3 marks)

Eric wishes to paint the entire surfaces of the sphere and the cylinder below.
The cylinder has a height of 14 cm and a radius of 2 cm.

The sphere and the cylinder each take the same amount of paint. Find the radius (r) of the sphere. **3**

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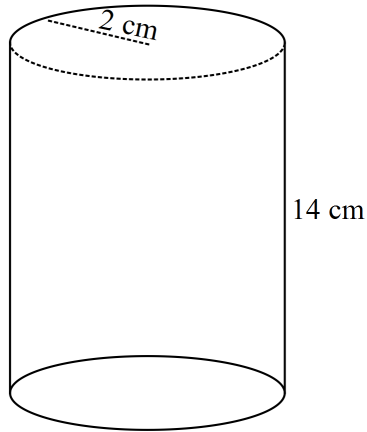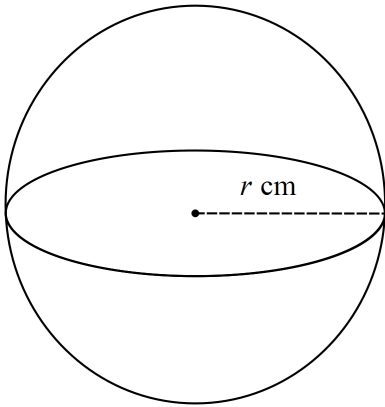
Question 38 (4 marks)

Loki launches a firework from a ledge. It travels along a quadratic path modelled by the equation:

$$h = -\frac{t^2}{2} + 7t + 16$$

h is the height above the ground (metres) and t the time (seconds), as shown on the graph below.
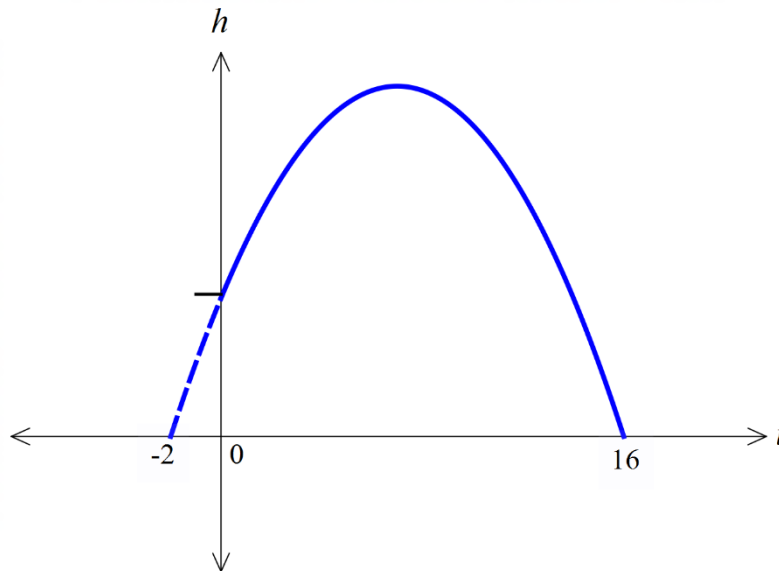
(a) By first finding a suitable value of t, find the maximum height the firework reaches during its flight. **2**

....

....

....

(b) What is the height of the cliff ledge from which Loki launches the firework? **1**

....

....

(c) How much longer is the downward flight of the firework than the upward flight? **1**

....

....

Question 39 (5 marks)

Nick acquires a triangular piece of land.

He will put a circular pond on the property and the remaining (shaded) area is to be covered in grass.

$PQ = 84$ m, $OQ = 82$ m and $RQ = 93$ m.
The true bearings of P, Q and R from O are shown on the diagram.
The radius of the pond is 25 m and the cost of the grass is \$12 per m^2.

Calculate the cost (to the nearest dollar) of the grass required.　　　　　**5**

Note: For any calculations, round each measurement to the nearest whole number or nearest degree.
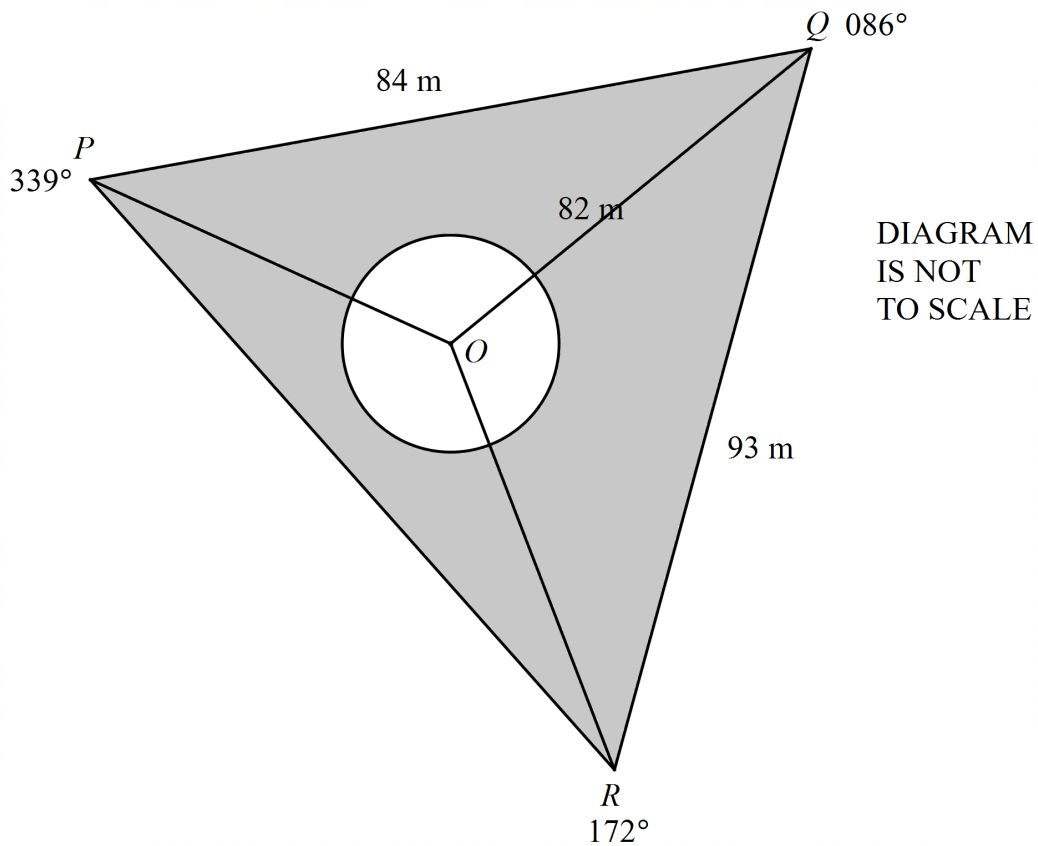
Q 086°

84 m

P
339°

82 m

DIAGRAM
IS NOT
TO SCALE

O

93 m

R
172°

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End of Paper

Section II extra writing space

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

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

2022 Trial HSC Standard 2 Maths

1. -0.9 Ⓓ

2. $BD = \sqrt{28^2 - 12^2} = 25.298$

$\tan\theta = \dfrac{25.298}{30}$

$\theta = 40°$ Ⓐ

3. Precision 5kg Absolute error 2.5kg

Percentage error $= \dfrac{2.5}{285} \times 100 = 0.877\%$

Ⓒ

4.

5% Ⓐ
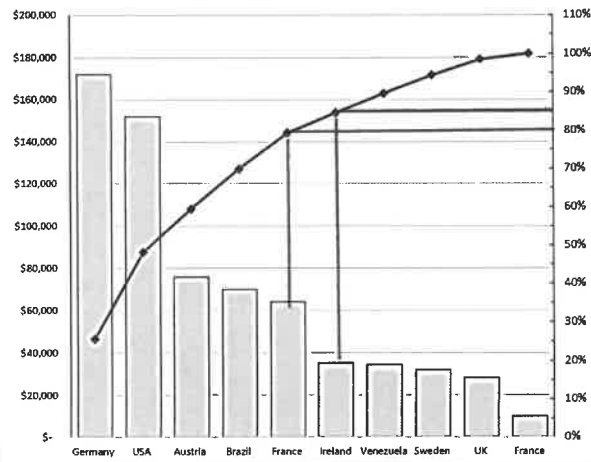
5. $\dfrac{30}{x} = \dfrac{10}{120}$ Ⓒ

$30 \times 120 = 10 \times x$

$\therefore x = \dfrac{30 \times 120}{10} = 360$

6.

Ⓑ
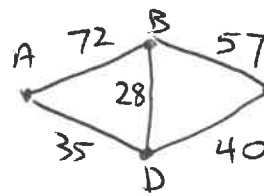
$35 + 28 + 57 = 120$

7. $\dfrac{30}{750} \times 80 = 3.2$ Ⓐ

8. Use calculator $A = 31.92$

Ⓓ $B = 0.73$

$y = Bx + A$

9. $38\,000(1 - 0.08)^{10} = 16\,506.76$

Ⓒ $38\,000 - 16\,506.76 = 21\,493.24$

10. $350 \div 1000 = 0.35 \text{kW}$ Ⓒ

$3 \times 365 = 1095$ hours

Cost $= 0.35 \times 1095 \times 0.19 = \$72.82$

11. when $x = 0$

$y = 2^0 - 5 = 1 - 5 = -4$

↙ shape Ⓓ

12. $s = ut + \dfrac{1}{2}at^2$

$s - ut = \dfrac{1}{2}at^2$

① $2(s - ut) = at^2$

$\dfrac{2(s - ut)}{t^2} = a$

Ⓑ

13.

(B)
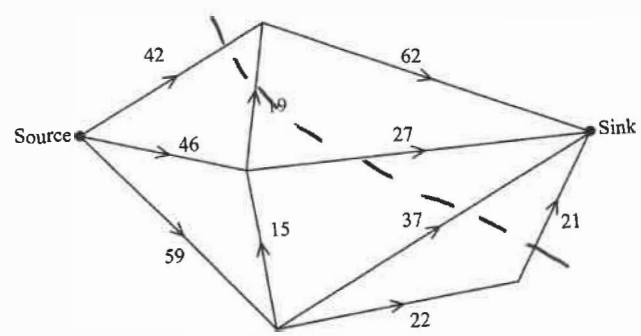
42+19+27+

37+21=146

17. total parts = 7+9 = 16

450 ÷ 9 = $50 is 1 part

16 × 50 = $800 in total

18.

Draw the minimum spanning tree in the space below and find its length.

Length of minimum spanning tree = 37

14.

(A)

	Old	New
Mean	28.4	28.5 ✓
Median	28.5	28.5
Mode	28,30	28,30
Range	5	5

15. 2304 ÷ 360 = $6.40

$\frac{12.5}{100} \times 6.4 = \$0.80$ (A)

16. a) $300 000

b)
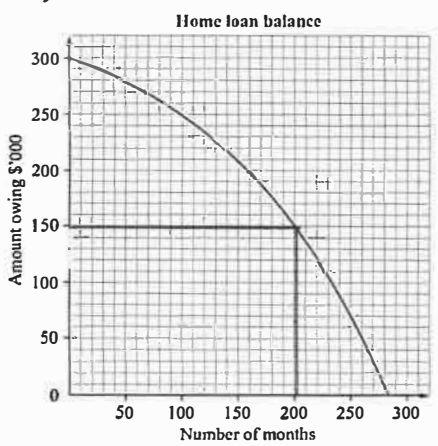
200 months

= 16 years 8 months

19. a) 56L / 896km) ÷ 8.96
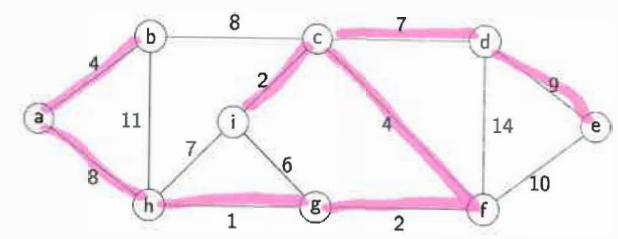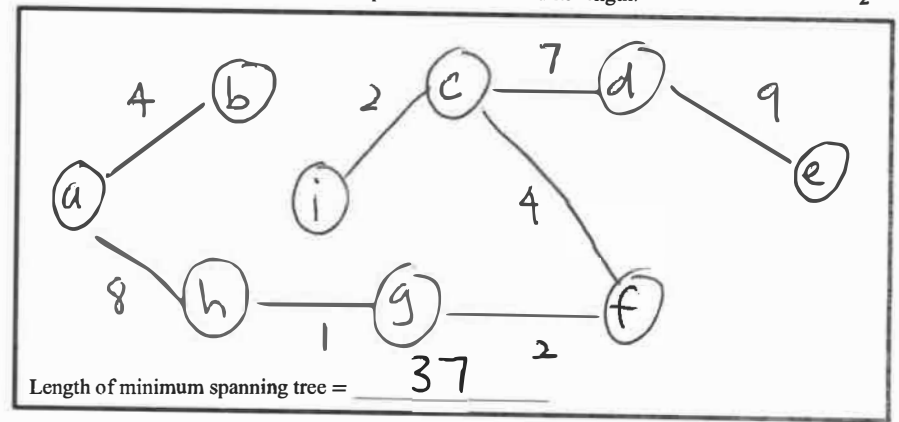
÷8.96 ✓ ___ L/100km   ÷ 8.96

6.25 L/100km

b) 12 ÷ 6.25 = 1.92

1.92 × 100 = 192 km

(2)

20. Medicare = $0.02 \times 96400 = \$1928$

Tax $= 5092 + (96400 - 45000) \times 0.325$

$\qquad = 21797$

total tax $= 21797 + 1928$

$\qquad = \$23725$

total paid $= 2140 \times 12 = \$25680$

Refund $= 25680 - 23725 = \$1955$

21. a)

21 hours

b) C, G, J

c) $21 - 6 - 9 = 6\,hrs$

d)

Another critical path A,D,I will appear.

22.

$$\times \tfrac{11}{15}\left(\begin{array}{l} 3cm = 5km \\ 2.2 = 3.\dot{6}\,km \end{array}\right) \times \tfrac{11}{15}$$

So 3.7km

23a) $N = 2 + 3 + 2 = 7$

$H = 2\,hours\ 45\,mins$ or 2.75

$BAC_m = \dfrac{10 \times 7 - 7.5 \times 2.75}{6.8 \times 85}$

$\qquad\qquad = 0.0854238\ldots$

$\qquad\qquad = 0.085\ (3\,d.p.)$

b) $Time = \dfrac{0.085}{0.015} = 5.\dot{6}$

$\qquad\qquad\qquad = 5\,hours\ 40\,mins$

So $3:55\,am$

Q24 a) $FV = 22000\left(1 + \dfrac{8}{1200}\right)^{36}$

$\qquad\qquad = 27945.22$

She will have $\$54.78$ less than she needs.

b) $28000 \div 13.4121 = \$2087.67$

③

Q24 c) Option 1: $22000
Option 2: $2087.67 × 12
= $25052.04

She will pay $3052.04 less with option 1.

25. a)

	Coin 1	Coin 2

Coin 1: $\frac{30}{80}$ Silver, $\frac{50}{80}$ Gold

Coin 2 (from Silver): $\frac{29}{79}$ Silver, $\frac{50}{79}$ Gold

Coin 2 (from Gold): $\frac{30}{79}$ Silver, $\frac{49}{79}$ Gold
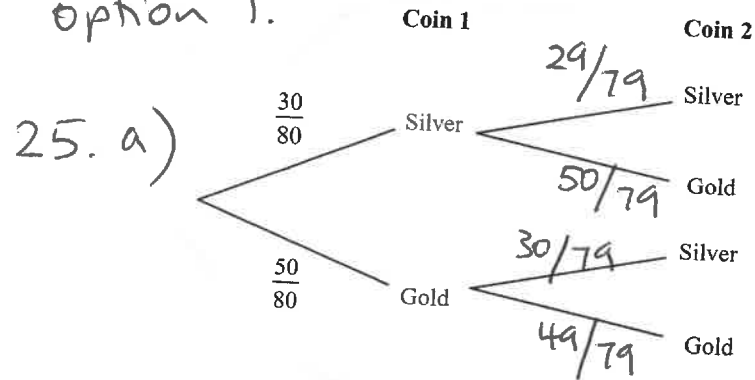
b) $P(SG) + P(GS) = \frac{30}{80} \times \frac{50}{79} \times 2 = \frac{75}{158}$

c) $P(\text{at least 1G}) = 1 - P(\text{no G}) = 1 - P(SS)$
$= 1 - \frac{30}{80} \times \frac{29}{79}$
$= \frac{545}{632}$

26 a) choose two points on the line of best fit eg. $(150, 384)$
$(174, 440)$

$m = \frac{rise}{run} = \frac{440 - 384}{174 - 150} = 2.3$

b) $L = 2.3H + C$
use a point on the line eg. $(164, 416)$
$416 = 2.3(164) + C$
$\therefore C = 38.8$

$$L = 2.3H + 38.8$$

c) $489 = 2.3H + 38.8$
$H = 195.739$
$H = 196$ cm

27. $\frac{8x}{3} - 20 = x + 10$ multiply each term by 4

$\frac{8x}{3} - x = 30$ add 20 to both sides

$8x - 3x = 90$ subtract x from both sides

$5x = 90$ multiply by 3

$x = \frac{90}{5}$ divide by 5

$x = 18$

④

28. a) $C = \dfrac{k}{P}$

$64 = \dfrac{k}{14}$

$\therefore C = \dfrac{896}{P}$

$k = 14 \times 64$

$k = 896$

b) $35.84 = \dfrac{896}{P}$

$P = \dfrac{896}{35.84} = 25$ people

29 a)

lowest score = 9
$Q_1 = 11$
median = 12
$Q_3 = 13$
highest score = 16

Test Scores out of 16

b)

GROUP A
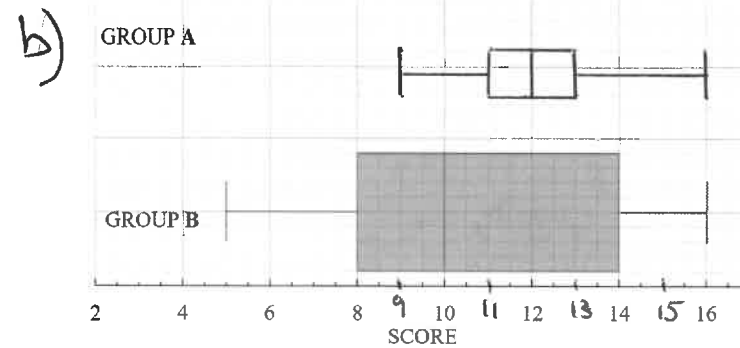
GROUP B

SCORE

c) 68 students in each group

$\dfrac{3}{4} \times 68 = 51$

d)

Group	A	B
median	12	10
IQR	2	6
Range	7	11

Yes true.
Group A performed better because the Median (12) was higher than the median (10) of group B. The score for group A were less spread with an IQR (2) and Range (7) compared to group B: IQR (6) Range (11).

⑤

30.
a) $A \doteq \frac{1}{2}(0+12) + \frac{1}{2}(12+8) + \frac{1}{2}(8+5)$
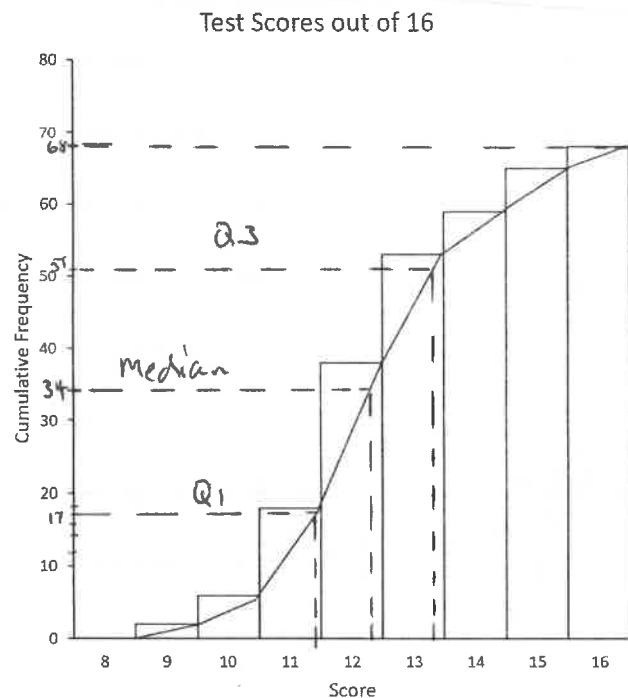
$\doteq 157.5 m^2$

b) $V = 157.5 \times 14.5$

$= 2283.75 m^3$

Capacity $= 2283.75 kL$

$= 2283750 L$

31. June $= 17$ days July $= 12$ days

total $= 29$ days

$FV = 950\left(1 + \frac{15}{36500}\right)^{29} = 961.387299..$

$= \$961.39$

32.
a) $d = 0.01 \times 95^2$

$= 90.25 m$

b) $95 km/h = 26.39 m/s$

$26.39 \times 2.5 = 65.975 m$ (reaction-time distance)

total $= 90.25 + 65.975$

$= 156.225$

$= 156.2 (1 d.p.) m$

33. Cost $= \$768 + 52 \times$ Person

a) $C = \$768 + \$52P$

b) Income $= \$84 \times$ Person

$I = \$84P$

c) $C = 768 + 52P$

P	0	10	20
C	768	1288	1808

From graph

$P = 24$ or 25
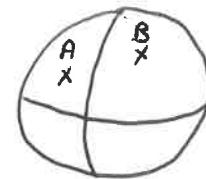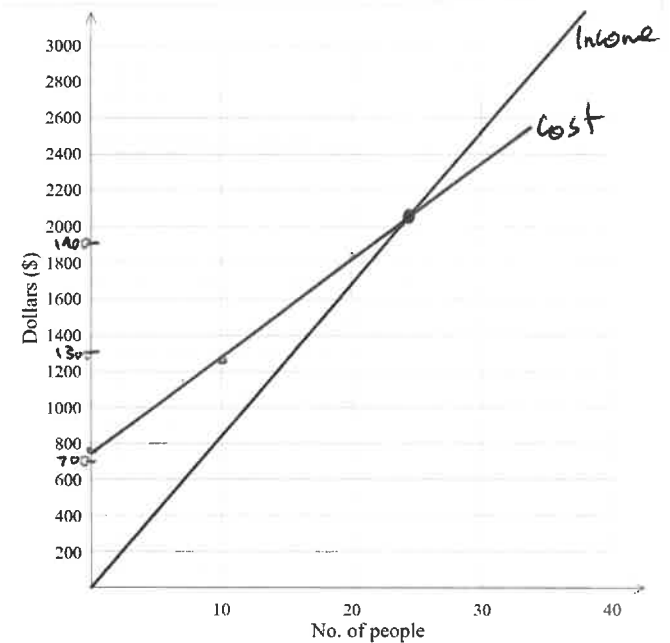
35.

Difference in longitude $= 135° + 105°$

$= 240°$

$240° \div 15° = 16$ hours

Town B is 16 hours ahead

8am Monday $-$ 16 hours

$= 4pm$ Sunday in

Town A.

34. $BC^2 = 15 \cdot 8^2 + 22 \cdot 1^2 - 2 \times 15 \cdot 8 \times 22 \cdot 1 \times \cos 26°$

$BC^2 = 110 \cdot 3681898$

$BC = 10 \cdot 5056$

$\dfrac{\sin B}{22 \cdot 1} = \dfrac{\sin 26°}{10 \cdot 5056}$

$\sin B = \dfrac{22 \cdot 1 \times \sin 26°}{10 \cdot 5056}$

$\sin B = 0 \cdot 922175$

$B = \sin^{-1}(0 \cdot 922\ldots)$

$\angle B = 67°15'$

but obtuse

$\angle B = 180 - 67°15'$

$= 112°45'$

$= 113°$

36. $MHR = 220 - 38 = 182 \text{ bpm}$

$0 \cdot 85 \times 182 = 154 \cdot 7 \text{ bpm for exercise}$

$154 \cdot 7 \times 70 = 10829 \text{ mL}$

$20 \times 10829 = 216580 \text{ mL} = 216 \cdot 58 \text{ L}$

$= 216 \cdot 6 \text{ L} \ (4 \text{ sig. figs})$ ⑦

37. $SA_{cylinder} = 2\pi r^2 + 2\pi r h$

$= 2 \times \pi \times 2^2 + 2 \times \pi \times 2 \times 14$

$= 8\pi + 56\pi$

$= 64\pi$

$SA_{sphere} = 4\pi r^2$

equate both surface areas

$\therefore 64\pi = 4\pi r^2$

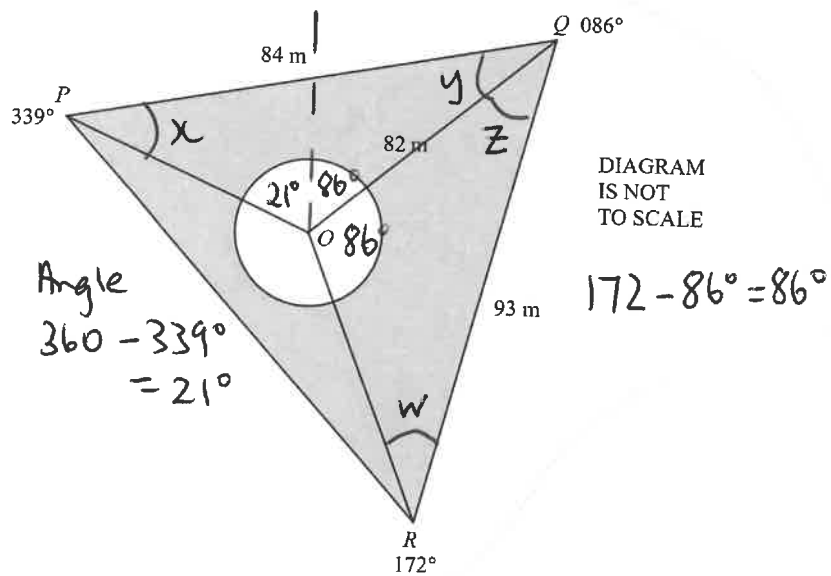$\dfrac{64\pi}{4\pi} = r^2$

$r^2 = 16$

$r = \pm 4$

use $r = 4 \text{ cm}$

38. a) $\dfrac{2 + 16}{2} = 9 \qquad -2 + 9 = 7 \text{ use } t = 7$

$h = -\dfrac{7^2}{2} + 7(7) + 16 = 40 \cdot 5 \text{ m}$

b) when $t = 0$

$h = 16 \text{ m}$

c) upward $t = 7 \sec$ difference $= 2 \sec$

$t = 9 \sec$

39.

DIAGRAM IS NOT TO SCALE

Angle
$360 - 339°$
$= 21°$

$172 - 86° = 86°$

$\dfrac{\sin x}{82} = \dfrac{\sin 107°}{84}$

$\angle x = \sin^{-1}\left(\dfrac{82 \times \sin 107°}{84}\right)$

$= 68° \, 59' \, 34.2''$

$\angle x = 69°$

$\angle y = 180° - 107° - 69° = 4°$

$\dfrac{\sin w}{82} = \dfrac{\sin 86°}{93}$

$\angle w = \sin^{-1}\left(\dfrac{82 \times \sin 86°}{93}\right)$

$\angle w = 61° 35' 27'' = 62°$

$\angle z = 180° - 86° - 62° = 32°$

$\text{Area}_{\triangle PQR} = \dfrac{1}{2} \times 84 \times 93 \sin(32° + 4°)$

$= 2295.8891$

$= 2296 \text{m}^2$

$\text{Area circle} = \pi \times 25^2$

$= 1963.495$

$= 1963 \text{m}^2$

$\text{Grass Area} = 2296 - 1963$

$= 333 \text{m}^2$

$\text{Cost} = 333 \times \$12 = \$3996$

⑧