Student Number

Hunters Hill High School

2026 TRIAL EXAMINATION

Mathematics Standard 2

General Instructions

- Reading time – 10 minutes
- Working time – 2 hours 30 minutes
- Write using black pen
- Calculators approved by NESA may be used
- A reference sheet is provided at the back of this paper
- For questions in Section II, show relevant mathematical reasoning and/or calculations
- Write your Student Number at the top of this page

Total marks: 100

Section I – 15 marks (pages 3 – 10)

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

Section II – 85 marks (pages 11 – 36)

- Attempt Questions 16 – 38
- Allow about 2 hours and 5 minutes for this section

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Section I

15 Marks
Attempt Questions 1–10
Allow about 15 minutes for this section

Use the multiple-choice answer sheet for Questions 1–15

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1. The distance from Sydney to Coffs Harbour is 530 km. The speed limit for much of the drive is 110 km/h, however, a driver on Learner (L) plates must not drive faster than 90 km/h.

How much more time will a Learner driver take to drive between Sydney and Coffs Harbour?

(A) 1 hour, 4 minutes

(B) 1 hour, 7 minutes

(C) 4 hours, 8 minutes

(D) 5 hours, 8 minutes

2. Five years ago, the cost of a jumper was $90.

Due to inflation, the price increased annually by 4%.

What is the price of this jumper now?

(A) $93.60

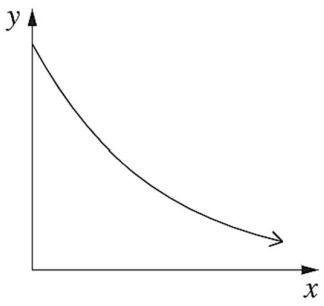
(B) $108.00

(C) $109.40

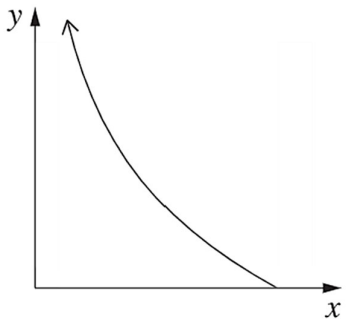
(D) $109.50

3. Which graph could represent $y + 2 = \frac{7}{x}$?

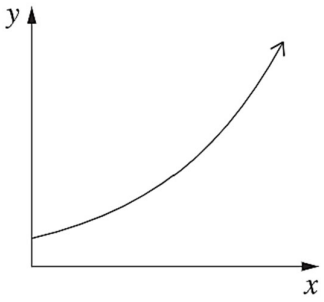
(A)



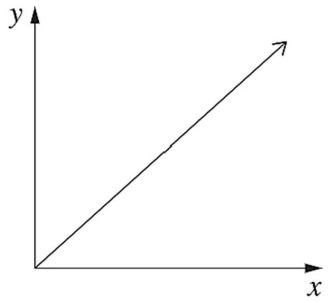
(B)



(C)

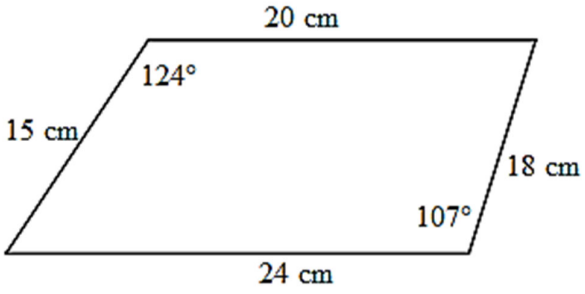


(D)



4. What is the area of the following shape, correct to three significant figures?

NOT TO SCALE



(A) 267.57 cm^2

(B) 268 cm^2

(C) 330 cm^2

(D) 330.00 cm^2

5. California has a population density of 250 people per square mile.

NSW has a population density of 10.4 people per square km.

Approximately how many more people per square km does California have than NSW, given that 1 mile = 1.61 km?

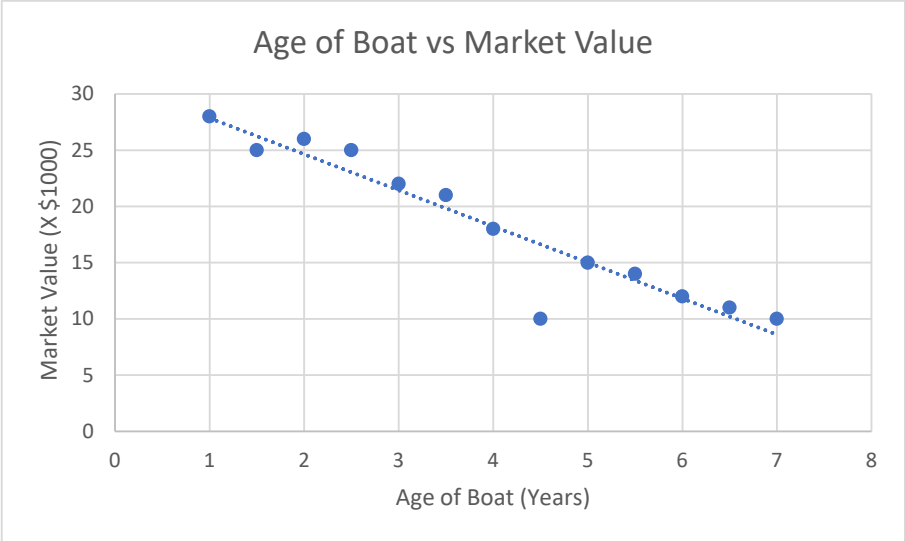
(A) 3

(B) 24

(C) 86

(D) 155

6. The market value and age of boats sold on Facebook Marketplace was recorded for 13 transactions.



Which Pearson's correlation coefficient best describes these observations?

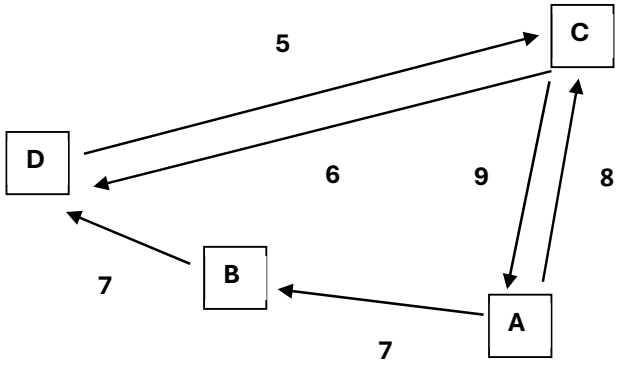
(A) -0.95

(B) -0.23

(C) 0.23

(D) 0.95

7. The diagram shows a directed network.



Which of the tables represents the directed network?

(A)

		To			
		A	B	C	D
From	A	-	-	5	-
	B	7	-	-	-
	C	8	-	9	6
	D	-	7	-	-

(B)

		To			
		A	B	C	D
From	A	-	7	8	-
	B	-	-	-	7
	C	9	-	-	6
	D	-	-	5	-

(C)

		To			
		A	B	C	D
From	A	-	-	8	7
	B	7	-	-	-
	C	9	-	-	6
	D	-	-	5	-

(D)

		To			
		A	B	C	D
From	A	-	7	8	-
	B	-	-	-	7
	C	6	-	-	9
	D	-	-	5	-

8. A bollard company has fixed costs of \$30 000 and a cost per bollard of \$45 per bollard manufactured. The company sells each bollard at a price of \$270.

Which of the following equations represents profit (P) in terms of the number of bollards manufactured and sold (x)?

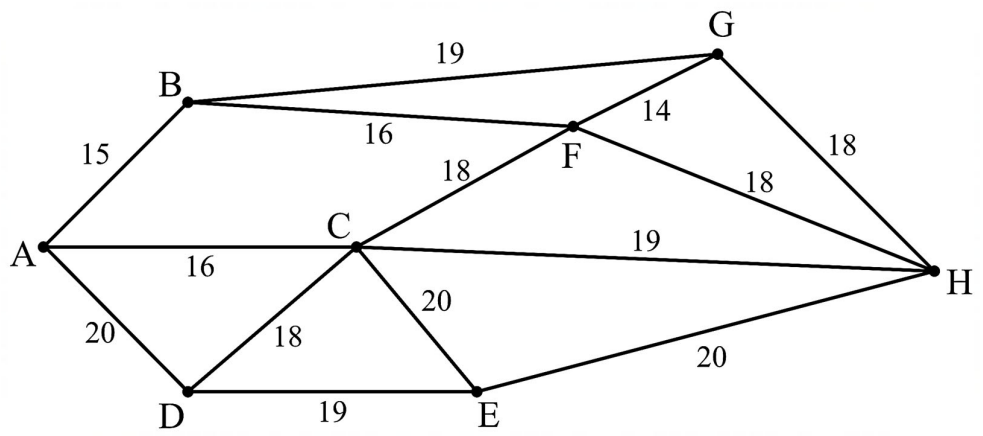
(A) $P = 30\,000 + 45x$

(B) $P = 270x$

(C) $P = 30\,000 - 45x$

(D) $P = 225x - 30\,000$

9. The diagram shows a network with weighted edges.



Which of the following edges must be included in any minimum spanning tree for this network?

(A) AB

(B) BG

(C) CE

(D) EH

10. Nate has filled a water cooler for soccer players to fill their bottles from.

The water cooler initially has 4 litres of water. However, it has a small hole in the base and is leaking at a rate of 0.2 litres per minute.

Which equation represents the volume (V) in the water cooler after number of seconds (t)?

(A) $V = -0.2t + 4$

(B) $V = 0.2t + 4$

(C) $V = -\frac{t}{300} + 4$

(D) $V = \frac{t}{300} + 4$

11. The table below shows the monthly repayments for a reducing balance loan of $1000 for various terms and interest rates.

Monthly repayments per $1000 borrowed						
Interest rate (% p.a.)	Term (years)					
	5	10	15	20	25	30
4.5	$18.64	$10.36	$7.65	$6.33	$5.56	$5.07
5.0	$18.87	$10.61	$7.91	$6.60	$5.85	$5.37
5.5	$19.10	$10.85	$8.17	$6.88	$6.14	$5.68
6.0	$19.33	$11.10	$8.44	$7.16	$6.44	$6.00
7.0	$19.80	$11.61	$8.99	$7.75	$7.07	$6.65
8.0	$20.28	$12.13	$9.56	$8.36	$7.72	$7.34

What is the monthly repayment on a $450 000 loan at 6% p.a. over 15 years?

(A) $3222

(B) $3798

(C) $4045.50

(D) $4995

12. The annual dividend on certain shares is 23.8 cents per share.

The current price is $4.80 per share.

Find the dividend yield if you own 1500 shares

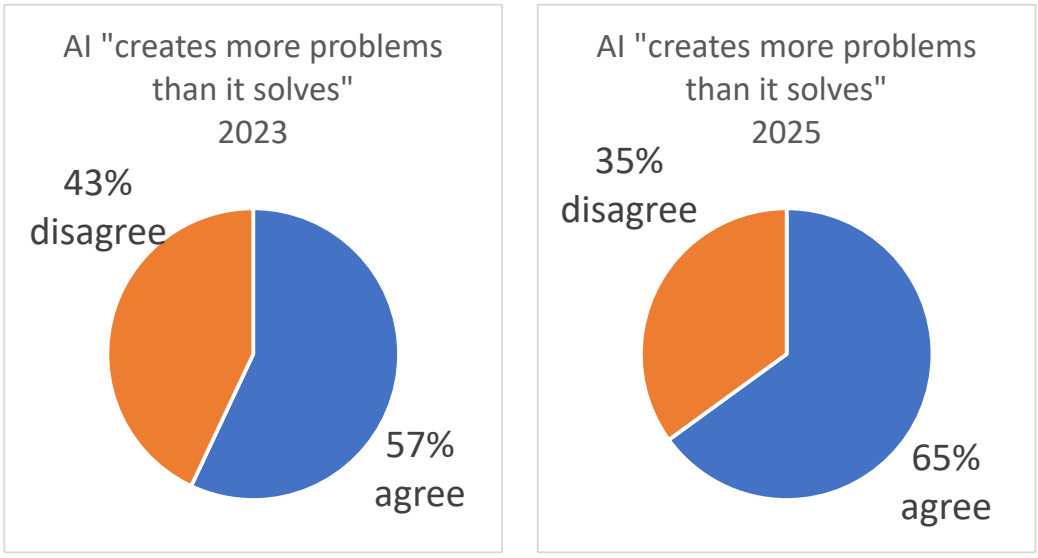
(A) 4.96%

(B) 5.5%

(C) 6.9%

(D) 7.2%

13. The sector graphs show the results of two survey of 3543 Australians. They were asked the same question in 2023 and again in 2025.



Approximately how many more people responded "agree" in 2025 than in 2023?

(A) 8

(B) 283

(C) 2303

(D) 2834

14. When properly managed, cotton plant height is normally distributed with a mean of 90 cm and a standard deviation of 12 cm.

What percentage of a properly managed crop is expected to be more than 102 cm tall?

(A) 16%

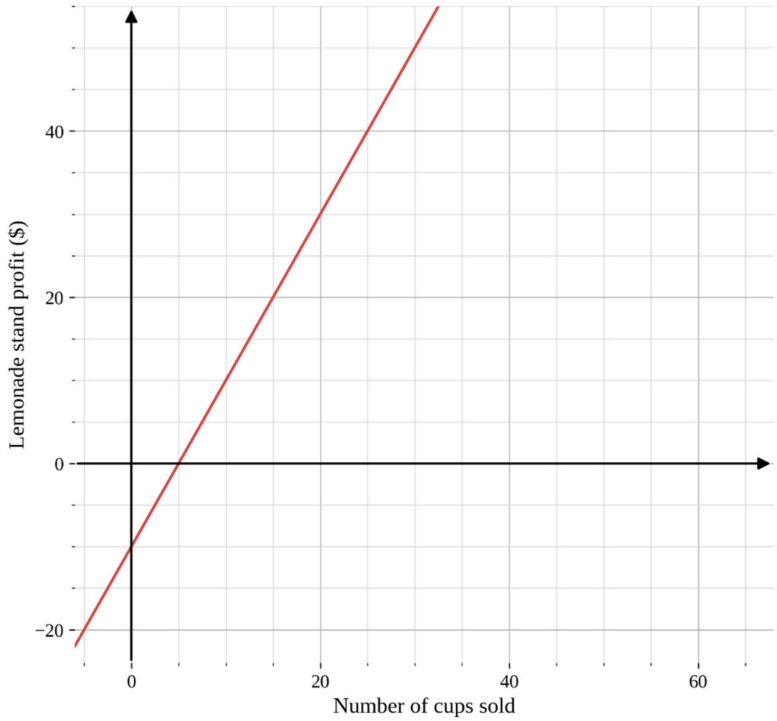
(B) 34%

(C) 68%

(D) 84%

15. Terry and Kris are selling lemonade for \$2 a cup. Their parents are requiring them to pay them back \$10 for the cost of lemons.

The following graph shows their profit based on the number of cups sold.



What is the value and meaning of the gradient of this graph?

(A) $m = 2$, 2 dollars profit for each cup sold

(B) $m = 5$, 5 dollars profit for each cup sold

(C) $m = 5$, 5 dollars owed initially

(D) $m = 10$, 10 dollars owed initially

End of Section I

Section II

85 marks
Attempt Questions 16 – 38
Allow about 2 hours and 5 minutes for this section

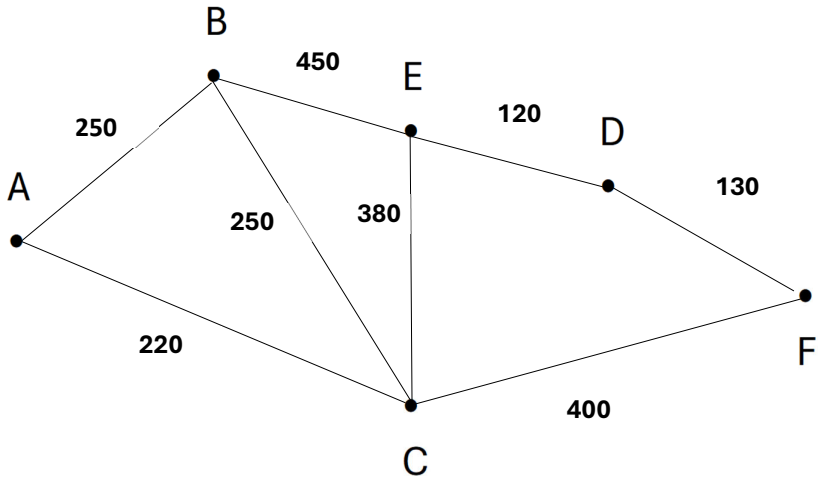
Answer questions in the spaces provided. Extra writing space is provided at the back of this booklet.

Question 16 (2 marks)

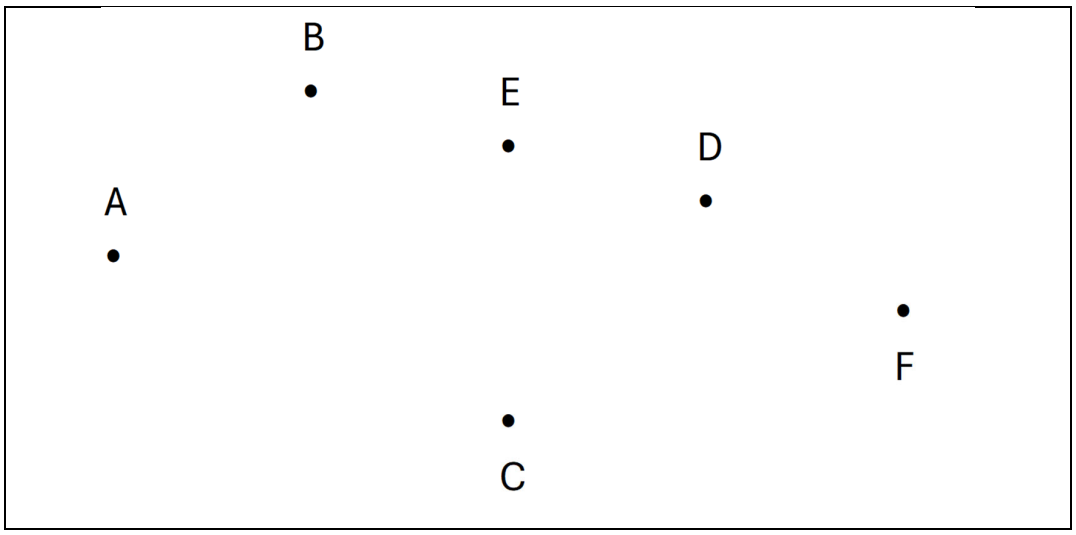
The cost of water is $3.17 per kL. A front-loading washing machine uses 50 L for one load. **2**
Calculate the fortnightly cost of water for a family who washes two loads a day. Correct your answer to the nearest cent.

Question 17 (4 marks)

The network diagram represents a series of trails in a national park. All distances are given in metres.



(a) Rangers need to check each location. Draw a minimum spanning tree which would allow rangers to access each of the locations A through F and determine its length. **3**



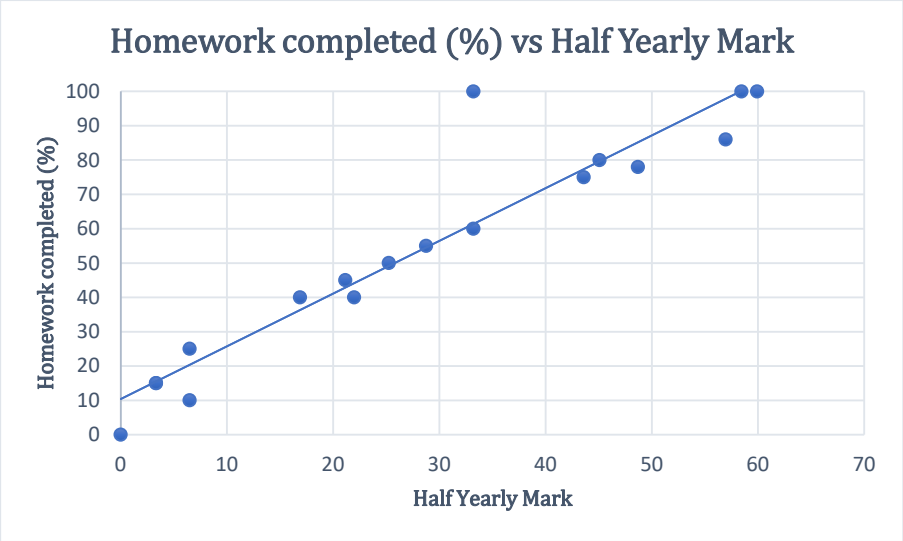
(b) The trail from C to E is found to be blocked. **1**
Assuming the rest of the trails are accessible, what is the shortest path from C to E?

Question 18 (3 marks)

A teacher was exploring the relationship between students' homework completion and their marks in the Half Yearly Examination.

The data for seventeen students is shown on the graph, with the least-squares regression line.

The student who received a Half Yearly mark of 45, and completed 80% of their homework, lies exactly on the least-squares regression line.



(a) What is the equation of the least-squares regression line for this data set? **2**

(b) Another student, whose marks are not on the graph, completed 16 out of 20 homework assignments and scored 30 on the Half Yearly Examination. **1**

Did this student do better or worse on the test than the regression line predicts? Provide a reason for your answer.

Question 19 (3 marks)

Dani bought 750 shares for $1.35 each.
In August, he received a dividend of 15 cents per share.

(a) How much did Dani receive in dividends? **1**

(b) This represented a dividend yield of 9.8%. **2**

What was the market price of the shares in August?

Question 20 (3 marks)

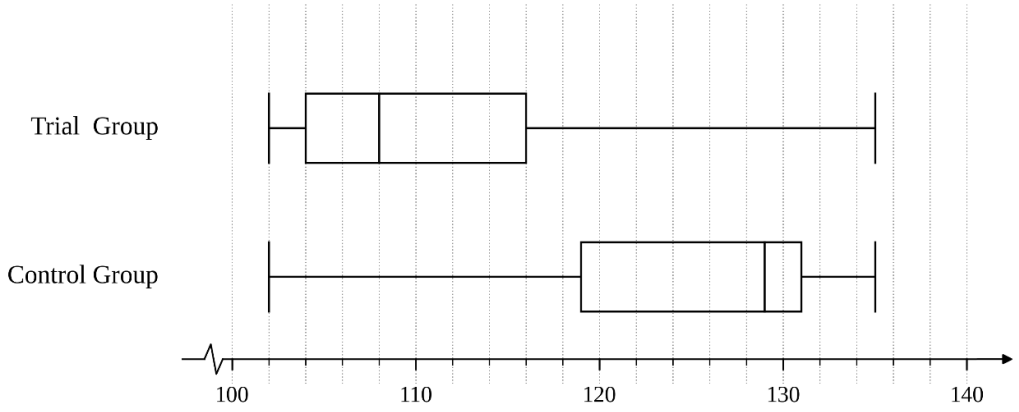
Keeley used her credit card to purchase a jacket for \$800 on June 8th. She made a repayment of \$400 on June 30th. She made no other purchases on her account in June. **3**

The credit card account has no interest free period. Compound interest is charged daily at the rate of 23% per annum, including the date of purchase and the date the account is paid.

Calculate the amount Keeley owes on the credit card immediately after the \$400 payment is made, correct to the nearest cent.

Question 21 (3 marks)

The graphs below compare the blood pressure of two groups of volunteers in a medical study. The trial group undertook a structured program of exercise and diet, while the control group maintained their previous habits. **3**



Compare the two data sets by examining the skewness of the distributions, and the measures of central tendency and spread.

Question 22 (4 marks)

Rebecca, a 75 kg human female, consumes 3 canned margarita drinks at a party over the course of 2 hours and fifteen minutes.

There are 1.2 standard drinks in each can.

The blood alcohol content (BAC) for human females can be estimated by:

$$BAC_{\text{female}} = \frac{10N - 7.5H}{5.5M}$$

Where N = number of standard drinks
H = number of hours drinking
M = mass in kilograms

(a) Calculate Rebecca's BAC at the end of the party, correct to three decimal places **2**

(b) The time it takes a person's BAC to reach zero is given by **2**

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

Calculate the time it takes for Rebecca's BAC to return to zero, assuming she stopped drinking after 2 hours and fifteen minutes. Give your answer to the nearest minute.

Question 23 (4 marks)

The floor plan for an apartment is shown below, with dimensions in metres.



(a) Using the scale in Bed 1, calculate the dimensions of Bed 2. Give the dimensions correct to 1 decimal place. **2**

(b) Between what lower and upper limits does the actual area of Bed 2 lie? **2**

Question 24 (3 marks)

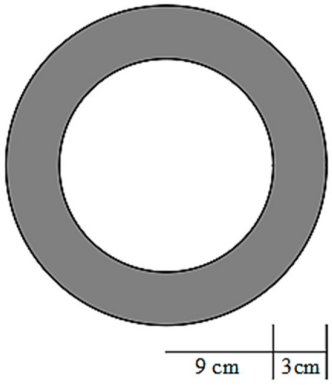
Higgins is paid $780 for working 30 hours at the normal rate per hour. Overtime is paid for working over 30 hours. **3**

When Higgins works 40 hours, he is paid a total of $1170.

Use calculations to show that Higgins is paid at time-and-a-half for overtime.

Question 25 (5 marks)

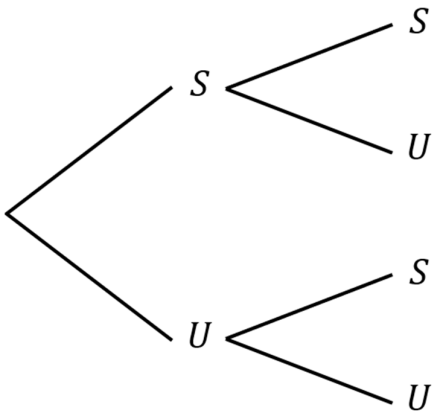
The figure below shows a circular dartboard with two circles sharing the same centre with radii of 12 cm and 9 cm respectively.



Two darts are thrown and hit the dartboard.
To compare the probability of darts landing in various regions, the following tree diagram is drawn, where S represents the shaded area and U represents the unshaded area.

(a) Calculate each probability and complete the probability tree diagram by writing probabilities on each of the branches. **3**

Assume each dart is equally likely to land on any point on the dartboard, so the probability of hitting a region depends only on its area.



Question 25 continues on page 22

Question 25 (continued)

(b) Which has a higher probability? **2**

- both darts land in the shaded region
- only one dart lands in the shaded region

Justify your answer with calculations.

Question 26 (3 marks)

The weekly rental on a house is shared by a number of people. The rent per person, R, varies inversely with the number of people living in the house, N.
If there are 4 people living in the house, each person pays $72.

(a) If $R = \frac{k}{N}$, where k is the constant of variation, find the value of k. **1**

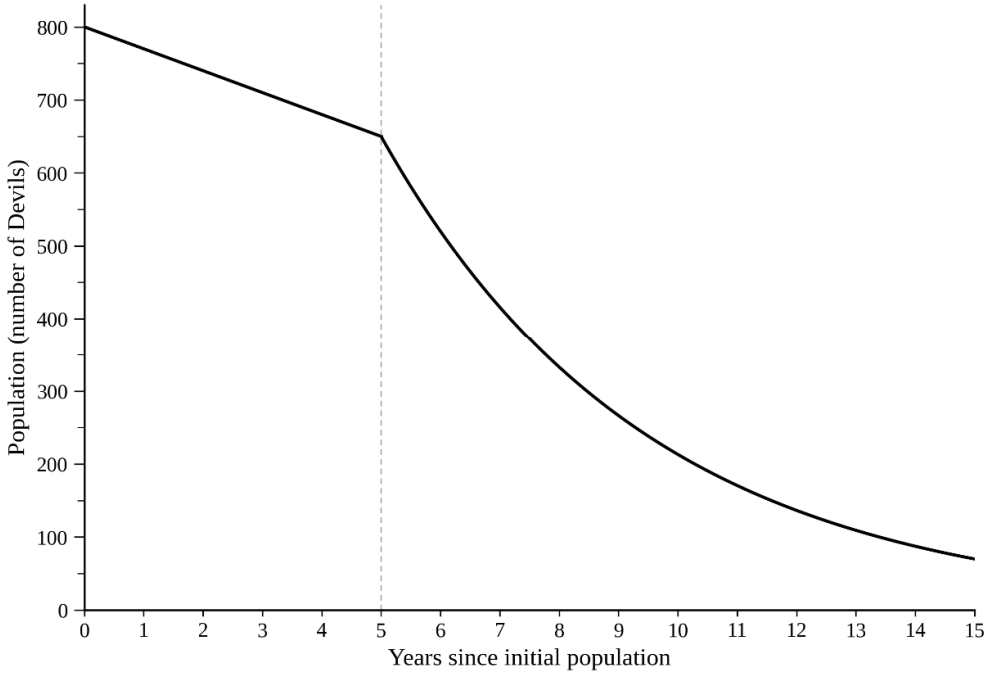
(b) How much would each person pay if there were 3 people living in the house? **1**

(c) How many people would need to live in the house if each person were only to pay $48 per week? **1**

Question 27 (4 marks)

When the Tasmanian devil population was impacted by devil facial tumour disease (DFTD), populations declined rapidly. **4**

The graph shows the decreasing population of one population of Tasmanian devils.



This population had an initial population of 800 devils.

For the first 5 years, the population declined by 30 devils per year.

At the end of the 5th year, the population (P) began to decline exponentially, according to the model $P = P_0(1 - r)^t$ where P_0 is the population on the 5th year, t is the number of years after the 5th year, and r is the annual rate of decline.

If the annual rate of decline after the 5th year was 20%, what was the total population after 15 years?

Question 28 (5 marks)

Consider the information in the following flow table.

From	To	Flow Capacity
A	B	350
B	C	300
C	D	150
C	E	150
D	E	100

(a) Convert the information into a network diagram, clearly indicating the direction and quantity of the flow. **2**

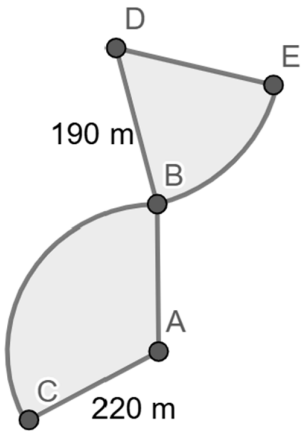
(b) Determine the flow capacity. **1**

(c) Identify one edge where its weight can be increased, to increase the outflow capacity by 50 units. Justify your choice. **2**

Question 29 (2 marks)

According to the Australian Design Rules, for a road with a speed limit of 80 km/h, a passing lane should be 650 m long. **2**

On a mountain pass, a road with a speed limit of 80 km/h is formed as two consecutive sectors of circles, as shown, from C to B to E.



The first sector, centred at A, has a radius of 220 m.

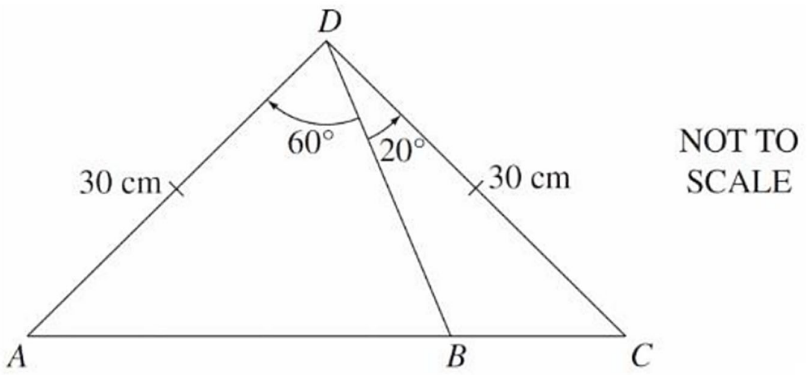
The second sector, centred at D, has a radius of 190 m.

Suppose $\angle CAB = 110°$ and $\angle BDE = 61°$.

Is there enough space to build a passing lane on the curved road C-B-E? Justify your response with calculations.

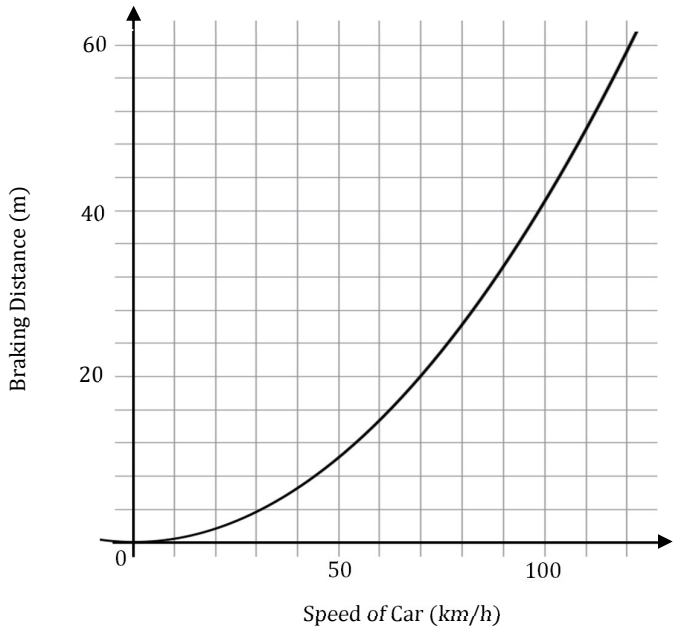
Question 30 (3 marks)

In the diagram, AD and DC are both 30 cm. **3**
Find the length of DB, correct to 2 decimal places.



Question 31 (4 marks)

The braking distance of a car, in metres, is modelled by the quadratic equation graphed below.



(a) According to the graph, what would be the braking distance of a car travelling at 110 km/h? **1**

(b) What is the car's total stopping distance if the driver responds to a hazard in 0.3 seconds? Correct your answer to 2 decimal places. **3**

Question 32 (3 marks)

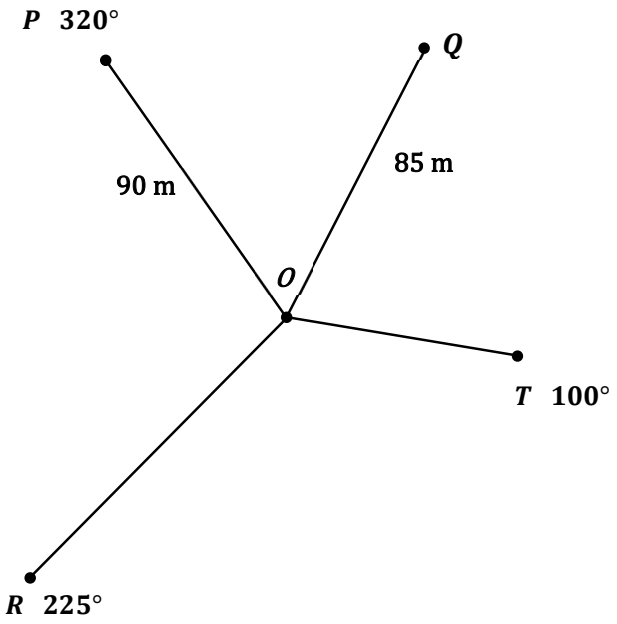
Sydney is 10 hours ahead of Coordinated Universal Time (UTC+10) and Vancouver is 7 hours behind Coordinated Universal Time (UTC−7). **3**

Roy travels from Sydney to Vancouver. His plane leaves Sydney at 9:20 am on Tuesday and travels to Vancouver non-stop.
When he arrives, it is 5:20 am in Vancouver on Tuesday.

How long was Roy's flight?

Question 33 (5 marks)

The following diagram shows the result of a compass radial survey.



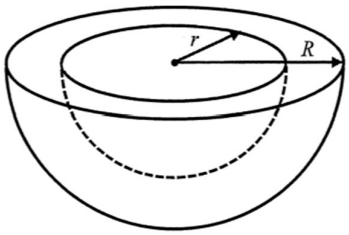
(a) If the distance between P and Q is 100 m, show that the true bearing of Q is 29°38′. **3**

(b) Find the area of the triangle POQ, rounded to the nearest square metre. **2**

Question 34 (4 marks)

A bowl is formed with two hemispheres. The inner radius is r cm and outer radius is R cm as shown below.

Concrete is used to form the bowl.



(a) Find a formula in terms of r and R for the total volume of concrete needed to form the bowl. **2**

(b) Using your formula from **(a)**, calculate how many litres of concrete will be needed if $R = 50$ cm and $r = 30$ cm, correct to the nearest litre. **2**

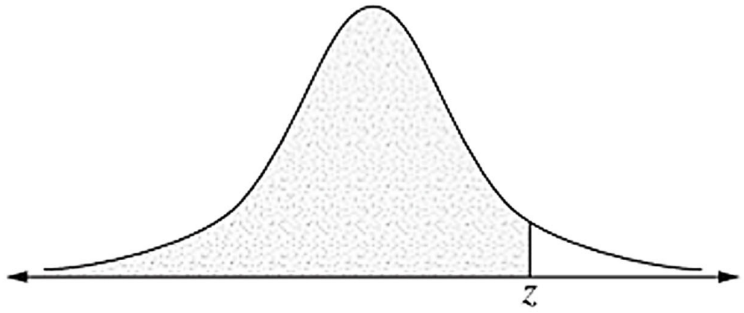
Question 35 (5 marks)

A random variable is normally distributed with mean 0 and standard deviation 1.

The table gives the probability that this random variable is less than z.

z	0.6	0.7	0.8	0.9	1.0	1.1	1.2	1.3
Probability	0.7275	0.7580	0.7881	0.8159	0.8413	0.8643	0.8849	0.9032

The probability values given in the table for different values of z are represented by the shaded area in the following diagram.



The scores for the final exam in a TAFE course in Electrotechnology are normally distributed with mean 62 and standard deviation 10.

(a) By calculating a z-score, find the percentage of scores that are between 62 and 70. **2**

(b) Explain why the percentage of scores between 54 and 70 is twice the answer you provided in **(a)**. **1**

Question 35 continues on page 33

Question 35 (continued)

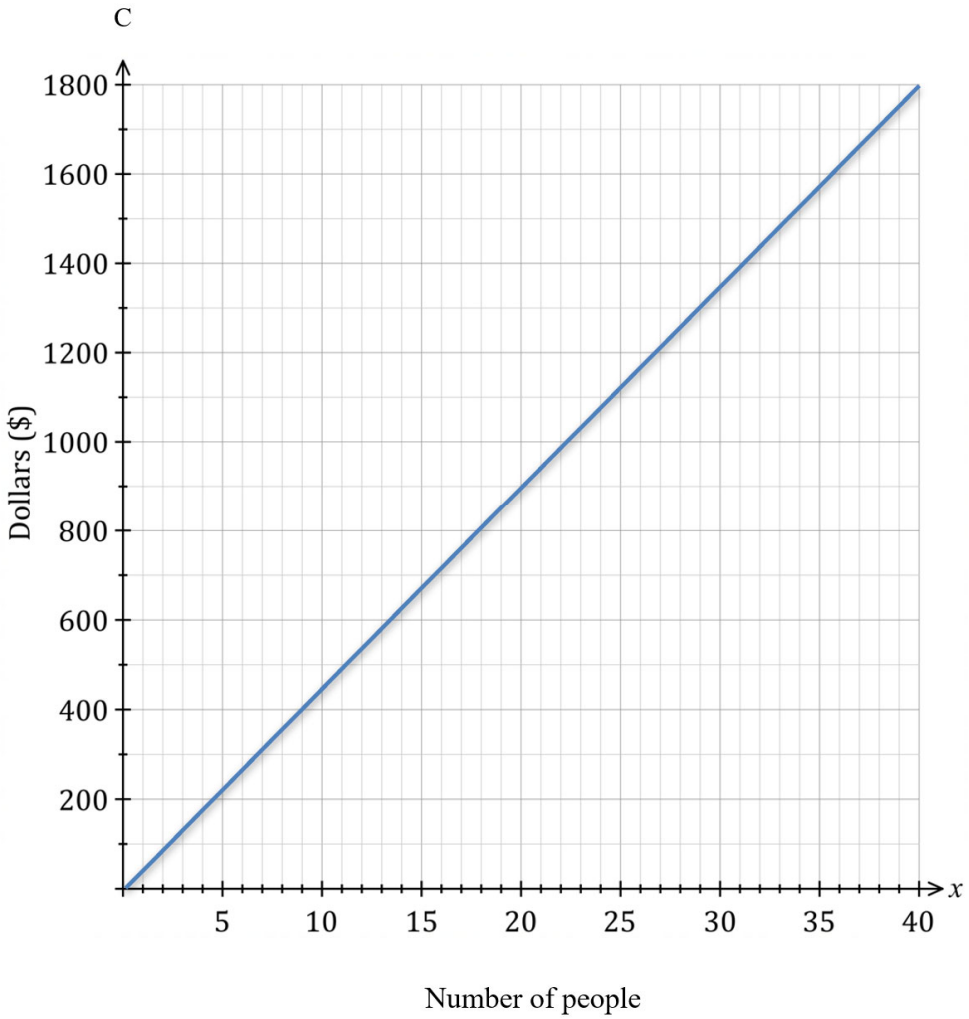
(c) By using the values in the table above, find an approximate minimum score that a student would need to be placed in the top 30% of candidates. **2**

Question 36 (6 marks)

A tour bus company offers tours at \$45 per person. The tour bus company has a fixed cost of \$650 per tour and a variable cost of \$20 per person.

(a) Determine the linear equation that represents the cost (C) per tour in terms of the number of people (x) per tour. **2**

(b) The graph of the Income (I) has been drawn on the grid below. **1**
Draw a graph of the equation from **(a)** on the same grid.



Question 36 continues on page 35

Question 36 (continued)

(c) State the coordinates of the point of intersection of the two lines drawn in **(b)**. Briefly explain the significance of this point of intersection. **2**

(d) At full capacity the bus can seat 50 people. How much profit will the company make if they sell 50 tickets? **1**

Question 37 (3 marks)

Concrete is to be made up of crushed rock, sand and cement in the ratio of 4:2:1 by weight.

(a) How much sand is needed if the concrete is to contain 6 kg of crushed rock? **1**

(b) Bricks are to be made to weigh 3 kg. How many bricks can be made with a mixture that contains 6 kg of crushed rock? **2**

Question 38 (4 marks) **Marks**

A project requires activities A to I to be completed. The activity chart shows the immediate prerequisite(s) and duration for each activity.

Activity	Immediate Prerequisite(s)	Duration in hours
A	–	5
B	–	4
C	–	3
D	A	3
E	B	7
F	D, E	2
G	C	1
H	F	3
I	G, H	5

(a) Draw a network diagram illustrating the information provided from the table. **2**

(b) Find the float time of activity G. **2**

End of examination

Section II Extra writing space

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

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SECTION I

1. Learner

$\frac{530}{90}$

$= 5°53'$

Full licence

$\frac{530}{110}$

$= 4°49'$

difference: 1h 4min

$\Rightarrow$ A

2. $P = A(1+r)^n$

$A = 90$
$r = 0.04$
$n = 5$

$P = 90(1.04)^5$
$= 109.4987$
$\doteq 109.50$

$\Rightarrow$ D

3. $x = 0$ should not be on curve

$\therefore$ B

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

$A_1 = \frac{1}{2}(24)(18)\sin 107$

$= 206.56\ldots$

$A_2 = \frac{1}{2}(20)(16)\sin 124$

$= 124.3556\ldots$

Total: 330 $(3\ sig.\ fgs)$

5. CA

250 $\frac{\text{people}}{\text{mi}^2}$

$250\ \text{people} \times \frac{1}{1.61^2\ \text{km}^2}$

$= 96.45\ \text{people/km}^2$

NSW

10.4 $\frac{\text{people}}{\text{km}^2}$

difference: 86 $\Rightarrow$ C

6. negative, strong

$\Rightarrow$ A

7. check: C $\rightarrow$ A weight of 8

⇒ eliminate (A), (C)

check: C → D weight of 6

⇒ B

8. Profit per ballard:

$270 - 45 = 225$

$P = 225x - 30000$

⇒ D

9. consider edges with least weight:

GF, AB, BF, AC

⇒ AB ⇒ A

10. after 1 minute, (60 seconds) 4L → 3.8L

check $t = 60$ ⇒ C

11. From table: \$8.44 per \$1000 borrowed

$450 \times 8.44 = 3798$

⇒ B

12. $DY = \frac{div}{M.P.} \times 100$

$= \frac{0.238}{4.8} \times 100 = 4.96\%$

⇒ A

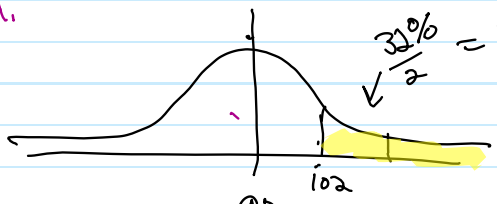
13. 57% → 65%

2019.81 people → 2302.95 people

283 person difference

⇒ D

14.



⇒ A

15. gradient: $\frac{rise}{run}$ = \$ per cup

$m = \frac{10}{5} = 2$

⇒ A

SECTION II

16. 100 L / day

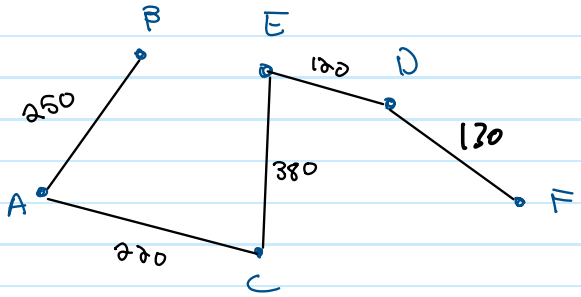
14 days = 1400 L

$1.4 \text{ kL} \times \$3.17 \frac{\$}{\text{kL}} = \$4.438$

Total cost: $4.44

Criteria	Marks
• Correct calculation of 100 L per load per day or 1.4 kL or 1400 L	1
• Correct answer	1

17a)



Total length = 250 + 220 + 380 + 120 + 130
= 1100 m

Criteria	Marks
• Draws a spanning tree	1
• Draws a minimum spanning tree	1
• Total length correctly stated	1

b)

C → B → E : 720 total

C → F → D → E : 650 total

∴ CFDE is shortest

Criteria	Marks
• Correct answer	1

18.a) (45, 80) and (0, 10) lie on line

$y = mx + c$

gradient: $m = \frac{\text{rise}}{\text{run}}$ y-intercept: 10

$= \frac{80-10}{45-0}$

$= \frac{70}{45}$

$= \frac{14}{9}$

$y = \frac{14}{9}x + 10$

Criteria	Marks
• Identifies gradient or y-intercept	1
• Correct gradient and y-intercept in an equation	1

b) $\frac{16}{20} \times 100 = 80\%$

As the point (30, 80) is above the regression line, this student did worse

Criteria	Marks
• Answer justified with reference to the data	1

than expected for the amount of homework completed.

19a) $750 \times \$0.15 \frac{\$}{\text{share}} = \$112.50$ in dividend

Criteria	Marks
• Correct answer	1

b) $DY = \frac{\text{dividend}}{\text{market price}} \times 100$

$9.8 = \frac{0.15}{\text{market price}} \times 100$

$m.p. = \frac{0.15}{9.8} \times 100$

$= \$1.53$ per share

Criteria	Marks
• Formula for DY	1
• Calculates market price correctly	1

20) $A = P(1+r)^n$

n:

June 8 — June 30

8 9 10 11 12 ... 30

3 | 20

23 days

Criteria	Marks
• Calculates daily rate or calculates number of days	1
• Use of compound interest formula	1
• Correct answer	1

r: $\frac{0.23}{365}$ daily rate

$A = 800\left(1 + \frac{0.23}{365}\right)^{23}$

$= 811.6752\ldots$

owing $= \$811.675\ldots - \$400$

she owes $411.68

21. The trial group is positively skewed, while the control group is negatively skewed. This indicates that the trial group data had more participants with lower blood pressure.

The range is 23 and the IQR is 12 for both groups, as seen on the graph.

However, the median for the control group is ~129 while the median for the trial group is 118.

Criteria	Marks
• Identifies skewness	1
• Identifies spread	1
• Identifies central tendency	1

22.a) $BAC = \frac{10N - 7.5H}{5.5M}$

$H = 2\frac{1}{4} = 2.25$
$M = 75$
$N = 3.6$

N: 1.2 drinks × 3 cans
$= 3.6$

$BAC = \frac{10(3.6) - 7.5(2.25)}{5.5(75)}$

$= 0.046$

Criteria	Marks
• Correct substitution into formula	1
• Correct answer, correct to three decimal places	1

b) $Time = \frac{BAC}{0.015}$

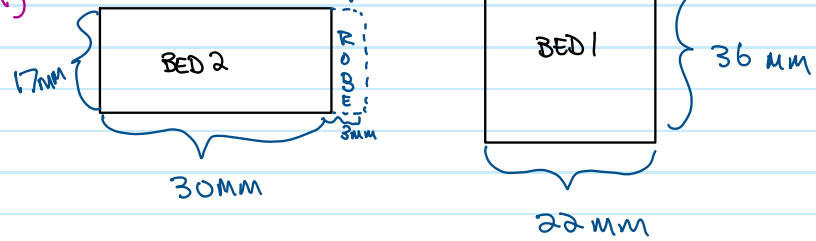
$= \frac{0.046}{0.015}$

$= 3.06\overline{6}$ hours

$=$ 3 hours, 4 minutes

Criteria	Marks
• Correct substitution into formula	1
• Correct answer in hours and minutes	1

23a) Actual measurement:



Criteria	Marks
• One dimension correct	1
• Two dimensions correct	1

Scale: 22mm : 2m

22 : 2000

11 : 1000

(scale factor 90.91)

OR:

Scale: 22mm : 2m

20 : 2000

1 : 100

Bed 2:

1545 × 2728

1.5 × 2.7 m

1700 × 3000

1.7 × 3.0m

b) $A = b \times l$ precision = 0.05m

lower 1.45 × 2.65

3.84 m^2

upper 1.55 × 2.75

4.26 m^2

1.65 × 2.95

4.87 m^2

1.75 × 3.05

5.34 m^2

Criteria	Marks
• Calculates area	1
• Calculates upper and lower limits	1

24. normal rate: $780 for 30 hours

$= \frac{780}{30}$

$= \$26/hr$

$1170 for 40 hours,

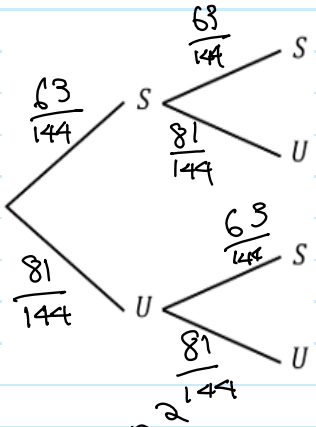
$1170 − $780 = $390 for 10 hours overtime

overtime rate: $\frac{390}{10} = \$39/hr$

since $26 × 1.5 = $39, he is paid at time and a half rate

Criteria	Marks
• Calculates amount paid for overtime	1
• Calculates dollar rate for overtime	1
• Calculates hourly overtime	1

25 a)



$A = \pi r^2$

let A_U = Area of unshaded, A_S = area of shaded

$A_U = \pi(9^2)$

$= 81\pi$

$A_{Total} = \pi(12^2)$

$= 144\pi$

$\therefore P(A_U) = \frac{81\pi}{144\pi}$

$= \frac{9}{16}$

$P(A_S) = \frac{144-81}{144}$

$= \frac{7}{16}$

Criteria	Marks
• Calculates area of shaded or unshaded	1
• Calculates area of shaded or unshaded	1
• Correct probability on all branches	1

b) $P(S,S) = \frac{63}{144} \times \frac{63}{144}$

$= \frac{3969}{}$

Criteria	Marks

20736

$P(U,S) + P(S,U) = \frac{81}{144} \times \frac{63}{144} + \frac{81}{144} \times \frac{63}{144}$

$= \frac{10206}{20736}$

As $P(US) + P(SU) > P(SS)$,

there is a higher probability that one dart lands in the shaded region

• Calculates P (S, S) or P (S, U)	1
• Correct answer with justification	1

26a) $R = \frac{k}{N}$

$72 = \frac{k}{4}$

$k = 4 \times 72$

$k = 288$

Criteria	Marks
• Correct answer	1

b) $R = ?$, $N = 3$ $\quad R = \frac{288}{3}$

$= 96$

rent would be $96

Criteria	Marks
• Correct answer	1

c) $R = 48$, $N = ?$ $\quad R = \frac{288}{N}$

$48 = \frac{288}{N}$

$N = \frac{288}{48}$

$N = 6$

∴ 6 people are needed

Criteria	Marks
• Correct answer	1

27. $P = P_0(1-r)^t$ $\quad r = 0.2$, $t = 10$, $P_0 = ?$

Population at year 5:

$30 \times 5 = 150$ decline

$P_0 = 200 - 150$

Criteria	Marks
• Identifies population at 5 years	1
• Uses compounding formula	1
• Correct substitution into formula	1
• Identifies time = 10	1

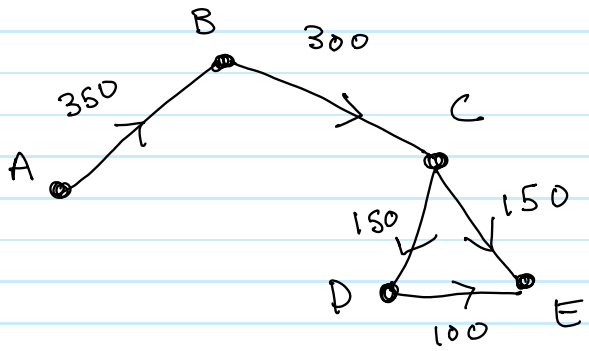
$= 650$

$P = 650(1-0.2)^{10}$

$= 69.793\ldots$

∴ Total population was 69 or 70 devils

28 a)



Criteria	Marks
• Correct diagram with labelled direction	1
• Correct diagram with labelled weight	1

b) $100+150$

250 flow capacity

Criteria	Marks
• Correct answer	1

c) Increase DE to 150, thus increasing total capacity to 300

Criteria	Marks
• Identifies an edge	1
• Clearly justifies choice	1

29

length CB

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

$$= \frac{110}{360} \times 2\pi (220)$$

$$= 422.3697$$

length EB

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

$$= \frac{61}{360} \times 2\pi (190)$$

$$= 202.2837$$

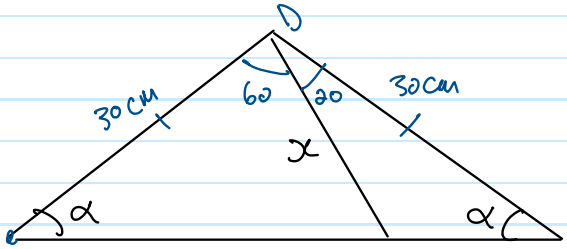
$CB+EB = 422.3697 + 202.2837$

$= 624.65$

Criteria	Marks
• Calculates arc length of one sector	1
• Correct answer with justification	1

∴ not enough space for a passing lane

30



let DB be x, $\angle DAB = \angle DCA = \alpha$

angle sum of $\triangle ADC = 180 = 80 + 2\alpha$

$100 = 2\alpha$

$\alpha = 50^\circ$

angle sum of $\triangle ADB = 180$

$\therefore \angle ABD = 70^\circ$

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

$$\frac{30}{\sin 70} = \frac{x}{\sin 50}$$

$$x = \frac{30 \times \sin 50}{\sin 70}$$

$$= 24.47 \text{ cm}$$

Criteria	Marks
• Identifies angle DAB	1
• Uses sine rule	1
• Correct answer with units identified	1

31 (a) (from graph) 50 m

Criteria	Marks
• Correct answer	1

(b) Stopping dist = braking dist + reaction dist.

reaction distance: $110 \text{ km/hr} = \frac{110000 \text{ m}}{60 \times 60 \text{ s}}$

$$= \frac{275}{9} \frac{\text{m}}{\text{s}}$$

Criteria	Marks
• Converts km/hr to m/s	1
• Finds reaction time distance	1
• Sums reaction time distance and braking distance to find stopping distance	1

$D = s \times t$

$= \frac{275}{9} \times 0.3 \text{ s}$

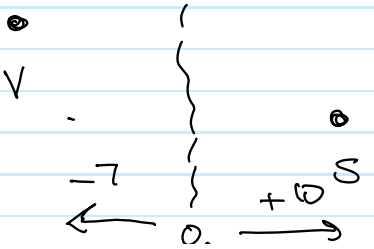
$= 9.17 \text{ m}$

Total distance:

$50 \text{m} + 9.17 \text{m}$

$= 59.17 \text{m}$

32.



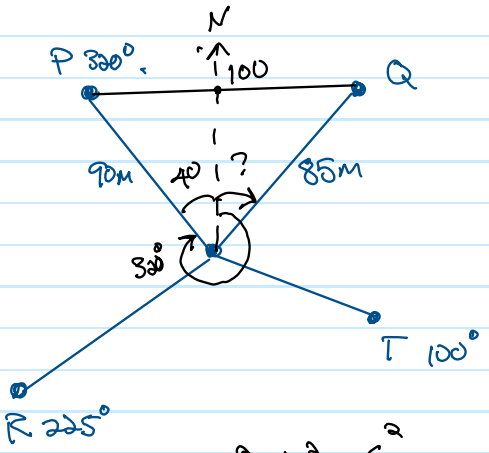
Criteria	Marks
• Convert Sydney to Vancouver time	1
• Finds time difference	1
• Finds flight time	1

17 hour time difference
9:20 am Tuesday Sydney

= 4:20 pm Monday Vancouver

4:20 mon. → 5:20 am Tues
= 13 hours
∴ Flight was 13 hours

33. a)



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

$$\cos(\angle POQ) = \frac{90^2+85^2-100^2}{2(90\times85)}$$

$$\cos(\angle POQ) = \frac{71}{204}$$

$$\angle POQ = 69.63^\circ$$
$$= 69^\circ 38'$$

$$\angle POQ - 40^\circ = 29^\circ 38'$$

∴ bearing is $29^\circ 38'$

Criteria	Marks
• Identifies 40 degrees	1
• Uses cosine rule to find angle POQ	1
• Subtracts to find bearing	1

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

$= \frac{1}{2} 90\times85 \sin(69.63)$

$= 3586\ m^2$

Criteria	Marks
• Substitutes correctly into area formula	1
• Correct answer from appropriate substitution	1

34(a) $V_{wire} = \frac{4}{3}\pi r^3$ (whole sphere)

$$V = \frac{1}{2}\left(\frac{4}{3}\pi R^3 - \frac{4}{3}\pi r^3\right)$$

$$= \frac{2}{3}\pi\left(R^3 - r^3\right)$$

Criteria	Marks
• Finds formula for one bowl	1
• Combines formula for both bowls	

(b) $R = 50 \quad r = 30$

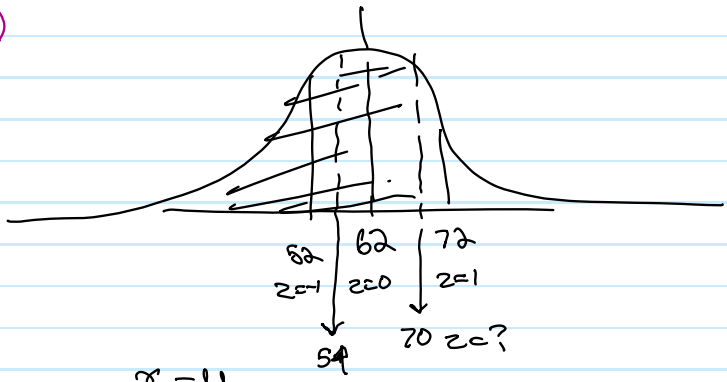
$$V = \frac{2}{3}\pi\left(50^3 - 30^3\right)$$

$$= 205\,250.72 \text{ cm}^3$$

$$= 205.25 \text{ L of concrete} \qquad 1000 \text{ cm}^3 = 1 \text{ L}$$

Criteria	Marks
• Substitutes into formula from a	1
• Finds answer in litres	1

35 (a)



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

$$z = \frac{70 - 62}{10}$$

$$= 0.8$$

from table: 0.7881 %

$$0.7881 - 0.5 = 0.2881$$

$\therefore P(62 < x < 71) = 28.81\%$

Criteria	Marks
• Finds z-score	1
• Applies z-score to find percentage	1

(b) $z = \frac{x - \mu}{\sigma}$

$$z_{54} = \frac{54 - 62}{10}$$

$$= -0.8$$

as $x = 54$ represents a z of -0.8, and the data is normally distributed, there is also 28.8% probability for scores between 54 and 62, thus doubling the probability.

Criteria	Marks
• Correct explanation	1

(c) $z = 0.6$: find x (score) → Probability

$0.6 = \frac{x - 62}{10}$

will be $1 - 0.7257$
$= 0.2743$

$6 = x - 62$

$x = 68$

scores of about 68 or higher will be in the top 30% of candidates

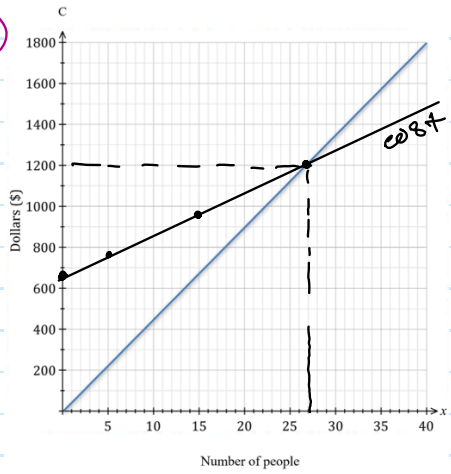
Criteria	Marks
• Identifies z-score	1
• Substitutes and solves to find score	1

36 a) Cost = 650 + 20 per person

$C = 650 + 20x$

Criteria	Marks
• Finds y-intercept or gradient	1
• Determines equation	1

b)



when $x = 5$

$C = 650 + 100$

$C = 750$

when $x = 15$

$C = 650 + 300$

$= 950$

Criteria	Marks
• Equation correctly graphed	1

(c) the intersection is the break-even point, at (27, 1190). They begin to turn a profit with 27 people

(check: $C = 650 + 27(20)$
$= 1190$)

Criteria	Marks
• Correctly identifies intersection	1
• Correctly explains break-even point	1

(d) profit = income − costs

Income: $50 \times 45 = \$2250$

cost: $650 + 20(50) = \$1650$

Profit = $600 for 50 people

Criteria	Marks
• Correct answer	1

37. (a)

R : S : C

4 : 2 : 1 ×1.5 → 6 : 3 : 1.5 (×1.5)

∴ 3 kg of sand is needed

Criteria	Marks
• Correct answer	1

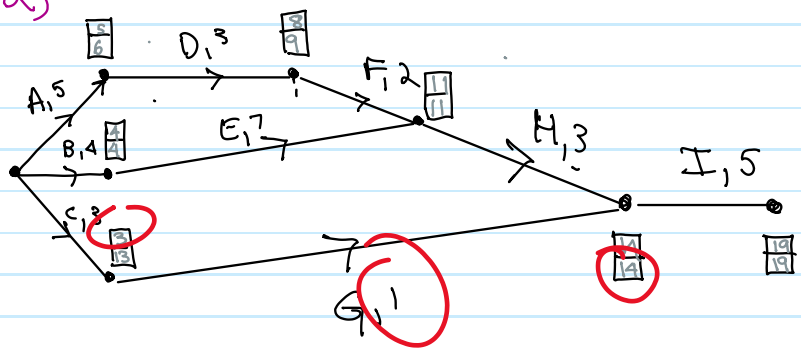
(b) $6 + 3 + 1.5 = 10.5$ kg total

$\frac{10.5}{3} = 3.5$ bricks

⇒ you can make 3 full bricks

Criteria	Marks
• Finds total weight or equivalent merit	1
• Divides to find number of bricks or equivalent	1

38 a)



Criteria	Marks
• Correct connections on diagram	1
• All sides labelled in correct location	1

b) Float time : 14 − 1 − 3

= 10 hours

Criteria	Marks
• Finds LST / EST	1
• Calculates float time	1