Student Number: _____

2022 **TRIAL HSC EXAMINATION**

Mathematics Standard 2

General Instructions

- Reading time – 10 minutes
- Working time – $2\frac{1}{2}$ hours
- 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

Total marks: 100

Section I – 15 marks (pages 2–5)

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

Section II – 85 marks (pages 6–22)

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

Section I

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

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

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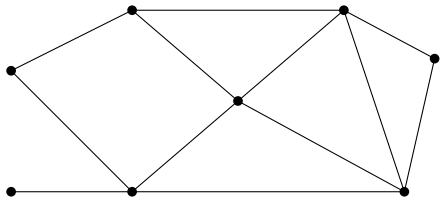
1 A network diagram is shown below.



How many odd vertices does this network contain?

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

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2 Which expression is equal to $3 - (x + 2) - 2(x - 3)$?

A. $11 - 3x$ B. $7 + x$ C. $7 - 3x$ D. $-5 - 3x$

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3 Michaela is a personal trainer. She records her client's weight as part of their programme. How can this data be classified?

A. Continuous numerical B. Discrete numerical

C. Nominal categorical D. Ordinal categorical

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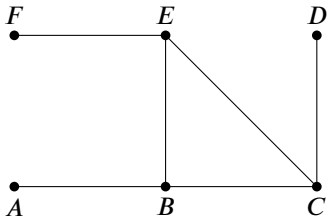
4 Which edge must be removed to transform this network into a tree?



A. AB B. BC C. CD D. EF

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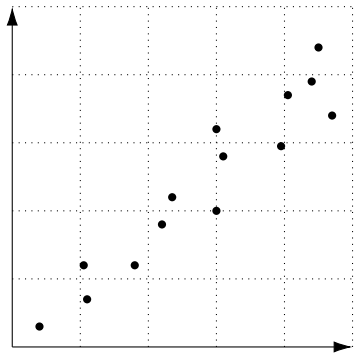
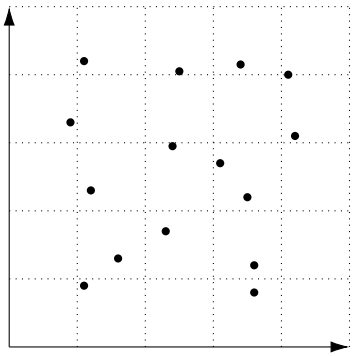
5 For a set of bivariate data, Pearson's correlation coefficient is 0.9. Which graph below best represents this set of bivariate data?

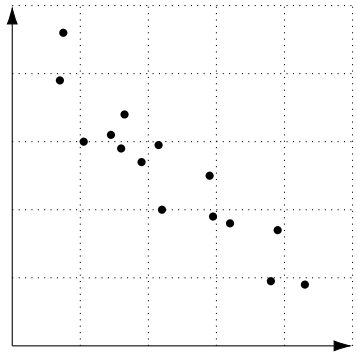
A.



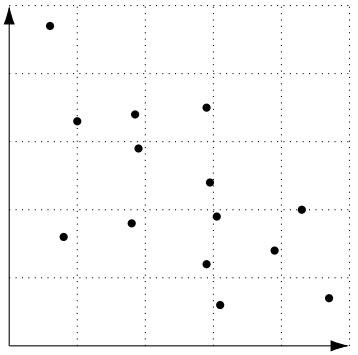
B.



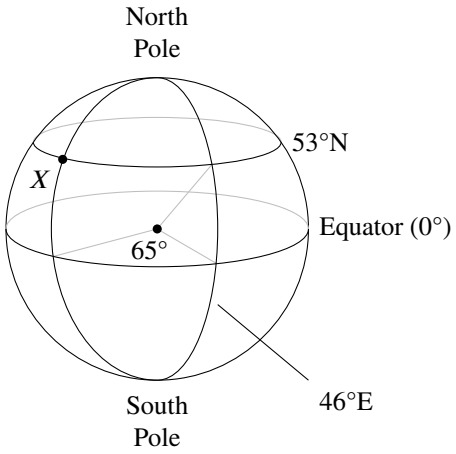
C.



D.



6 What are the coordinates of point X shown in the diagram below?



A. (53°N, 46°E) B. (53°N, 19°W) C. (12°S, 46°E) D. (12°S, 19°W)

7 A microwave oven costs \$396, inclusive of 10% goods and services tax (GST). What is the price of the microwave oven before the GST is included?

A. \$36 B. \$39.60 C. \$356.40 D. \$360

8 On the weekend, Lachlan drank 3 standard drinks between 6 pm and 9:30 pm. He usually weighs approximately 88 kg. Using the model $\text{BAC}_{\text{male}} = \dfrac{10N - 7.5H}{6.8M}$, what was his blood alcohol concentration at 9:30 pm when he stopped drinking?

A. 0.006 B. 0.021 C. 0.094 D. 0.096

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9 Victoria bought a portfolio of 1400 shares for \$25 200 and received an annual dividend of \$1.35 per share. What is the dividend yield per share?

A. 3.4% B. 7.5% C. 9.6% D. 13.3%

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10 The following cumulative frequency table shows the results of a test.

Score (x)	Frequency (f)	Cumulative Frequency (cf)
14	2	2
15	4	6
16	5	11
17	6	17
18	5	22
19	7	29
20	2	31

What is the median score?

A. 17 B. 18 C. 19 D. 20

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11 A survey of 100 students was conducted. They were asked about their gender and if they have a driver's licence. The results are summarised in the table below.

	Male	Female	Total
Licence	35	30	65
No Licence	20	15	35
Total	55	45	100

A student is selected at random from the males. What is the probability that the student selected has a driver's licence?

A. $\frac{7}{11}$ B. $\frac{7}{13}$ C. $\frac{7}{20}$ D. $\frac{11}{20}$

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12 A car is travelling at a speed of v kilometres per hour. Which of these expressions shows the speed when converted to metres per second?

A. $v \times 60 \times 60 \times 1000$

B. $\dfrac{v}{60 \times 60 \times 1000}$

C. $\dfrac{v \times 60 \times 60}{1000}$

D. $\dfrac{v \times 1000}{60 \times 60}$

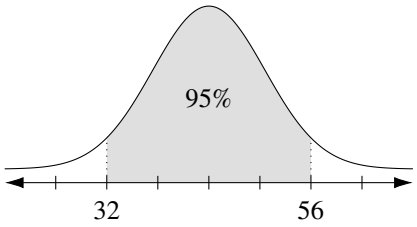
13 The table below shows the monthly repayment of \$1000 on a reducible balance loan.

Duration of Loan (years)	Interest Rate (% p.a.)			
	9%	9.25%	9.5%	9.75%
20	\$6.38	\$6.77	\$7.17	\$7.57

What is the monthly repayment for a loan of \$310 000 at 9% p.a. over 20 years?

A. \$1531.20 B. \$1977.80 C. \$474 672 D. \$558 000

14



Which of the following is true for the normal distribution graph above?

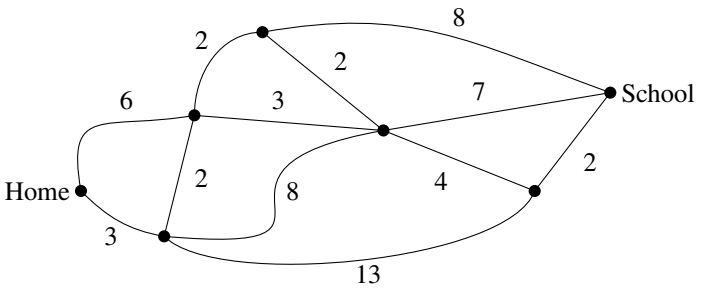
A. Mean = 24, standard deviation = 6

B. Mean = 24, standard deviation = 12

C. Mean = 44, standard deviation = 6

D. Mean = 44, standard deviation = 12

15 The diagram shows the network of roads that Stephanie can use to travel between home and school. The numbers on the roads show the time, in minutes, that it takes her to ride a bicycle along each road.



Using this network of roads, what is the shortest possible time for Stephanie to ride from home to school?

A. 12 minutes B. 13 minutes C. 14 minutes D. 15 minutes

Section II

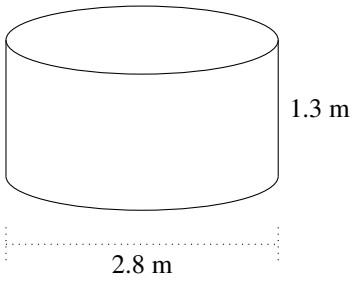
85 marks
Attempt Questions 16–37
Allow about 2 hours and 5 minutes for this section

Answer the questions in the spaces provided. These spaces provide guidance for the expected length of response.

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

Question 16 (5 marks)

A water tank is to be made of insulated sheet metal. The tank is in the shape of a closed cylinder with a diameter of 2.8 metres and a height of 1.3 metres, as shown in the diagram below.



(a) Find the volume of this water tank. Give your answer correct to the nearest cubic metre. **2**

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(b) Find the capacity, in litres, of the tank. **1**

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(c) Find the area of sheet metal required to construct the tank. Give your answer correct to the nearest square metre. **2**

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Question 17 (4 marks)

Auckland, New Zealand, has coordinates (37°S, 175°E). Singapore has coordinates (2°N, 104°E).

(a) Ignoring time zones, calculate the time difference between the two cities, correct to the nearest minute. **2**

(b) The flight time from Auckland to Singapore is 9 hours 30 minutes. If a flight departs Auckland at 1:45 pm on Monday afternoon, what is the time and day in Singapore when it arrives? **2**

Question 18 (3 marks)

Bob has installed a new rainfall shower head which has an average flow rate of 9 litres per minute. Bob usually has two 10 minute showers each day. The cost of water usage is $2.38 per kilolitre. Calculate the annual cost of Bob's showers. **3**

Question 19 (2 marks)

A map has a scale of 1 : 500 000.

(a) Two mountain peaks are 2 cm apart on the map. What is the actual distance (in kilometres) between the two mountain peaks? **1**

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(b) Two cities are 75 km apart. How far apart are the two cities on the map, in centimetres? **1**

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Question 20 (4 marks)

A table of future value interest factors for an annuity of $1 is shown.

Future value of an Annuity of $1

Number of Periods	Interest rate per period			
	0.45%	0.54%	4.5%	5.4%
3	3.014	3.016	3.137	3.165
6	6.068	6.082	6.717	6.871
9	9.164	9.197	10.802	11.210
12	12.302	12.363	15.464	16.291
24	25.284	25.551	41.689	46.912
36	38.985	39.620	86.164	104.471
48	53.445	54.628	161.588	212.664
60	68.705	70.638	289.498	416.035
72	84.809	87.716	506.418	798.309

An annuity involves contributions of $1000 per month for 6 years. The interest rate is 5.4% per annum, compounded monthly.

(a) Calculate the future value of this annuity. **2**

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(b) Calculate the interest earned on this annuity. **2**

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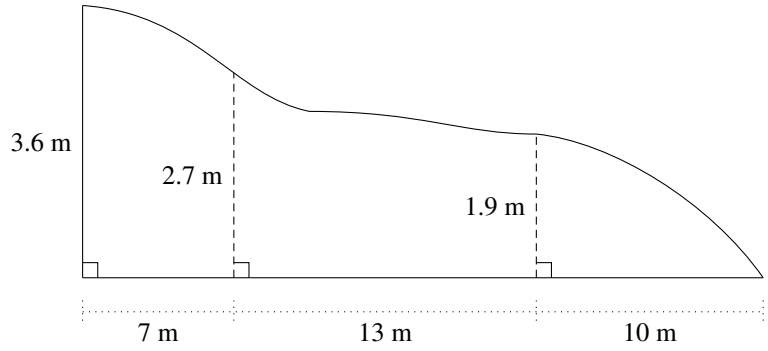
Question 21 (3 marks)

The cross-section of a rocky outcrop in a quarry is shown in the diagram below. **3**



The cross-section has a width of 30 metres and a height of 3.6 metres at its highest point.
At intervals across the width of the outcrop perpendicular distances of 2.7 metres and 1.9 metres are taken to the top of the rock face.

Using three applications of the Trapezoidal rule, find an estimate for the area of the cross-section of the rocky outcrop.

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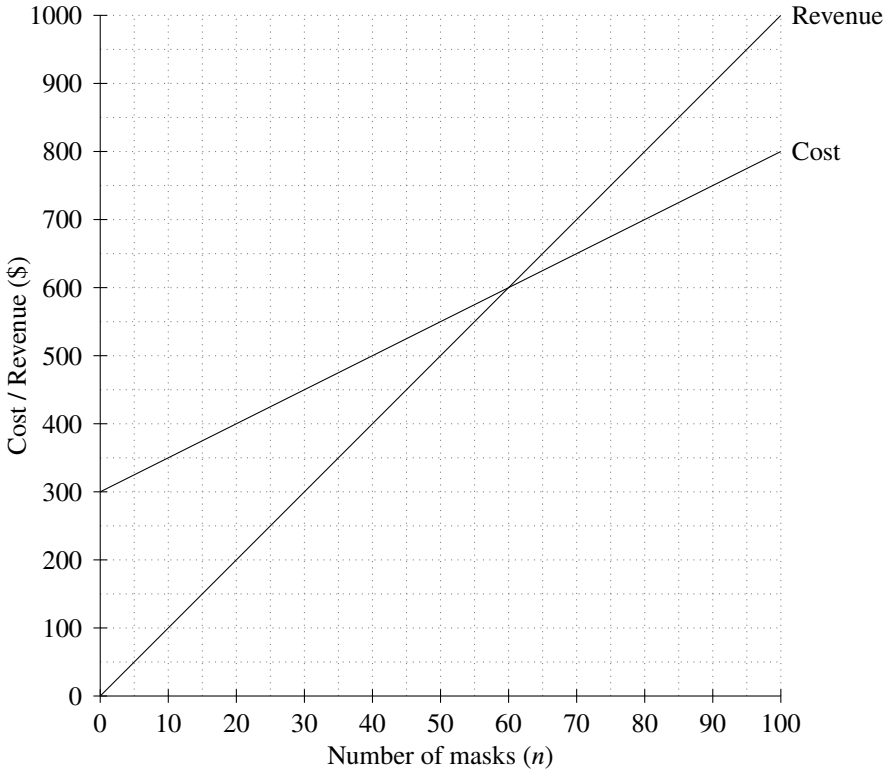
Question 22 (5 marks)

Fiona's Fashion Face Masks makes and sells embroidered face masks. Fiona purchases plain cloth masks and embroiders them with different patterns.
The cost of each plain mask is \$5 and Fiona sells the embroidered masks for \$10 each. Fiona invests \$300 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.



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

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(b) How many masks does Fiona need to produce and sell to obtain a revenue of \$350? **1**

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

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Question 23 (5 marks)

Gigi borrowed $37 000 so she could buy a new car. Reducible interest on the loan was charged at 6% p.a., with repayments of $872 due at the end of every month for 4 years. The table below sets out her monthly repayment schedule for the first four months and for the final two months of the loan.

Month	Amount owing at start of month ($)	Interest charged ($)	Repayment ($)	Amount owing at end of month after repayment ($)
1	37 000.00	185.00	872.00	36 313.00
2	36 313.00	181.57	872.00	35 622.57
3	35 622.57	178.11	872.00	34 928.68
4	*A*	*B*		
⋮	⋮	⋮	⋮	⋮
47	1567.43	7.84	872.00	703.27
48	703.27	3.52	*X*	–

(a) Calculate the values for A and B in the table. **2**

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(b) Gigi repays the loan after her 48th repayment. Show that this last repayment (X) will be $706.79. **1**

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(c) Find the total amount of interest that Gigi pays on this loan. **2**

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Question 24 (3 marks)

Solve the equation: $\frac{2x-3}{5} - 7 = 0$ **3**

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Question 25 (2 marks)

In the region of a tropical forest, 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 the "capture-recapture" method to give an estimate of the number of rare birds in this region of the forest. **2**

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Question 26 (2 marks)

School analysis of data suggests that there is a correlation between how a student performs in Year 10 and their final result in Year 12. Below are the results of eleven students in Mathematics in Year 10 and in Year 12.

Results in Year 10	69	87	78	54	80	89	53	50	69	68	90
Results in Year 12	78	92	84	74	86	92	68	70	78	80	94

(a) Calculate the value of the correlation coefficient. Give your answer correct to 3 decimal places. **1**

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(b) Describe the strength and direction of the correlation between results in Year 10 and results in Year 12. **1**

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Question 27 (3 marks)

Robyn has a credit card with no annual fees and charges. Interest is charged daily at 22.5% p.a., compounding daily, on all purchases.

(a) Show that the daily interest rate is approximately 0.00062. **1**

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Robyn goes on a shopping spree and spends $2490 using her credit card. Robyn pays off her credit card in full 13 days later.

(b) Calculate the interest that Robyn must pay. **2**

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Question 28 (4 marks)

Arabella's business purchased equipment for $370 000 at the start of 2019. The equipment has a useful life of 5 years, and will reach the end of its useful life at the end of 2024.

(a) For the first two years of its life the value of the equipment depreciated by $70 000 per year. What was the value of the equipment at the end of 2021? **2**

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(b) After the first two years, the depreciation method was changed to the declining-balance method. For the remainder of the useful life of the equipment, the salvage value depreciated by 20% per year. What is the value of the equipment when it reaches the end of its useful life? **2**

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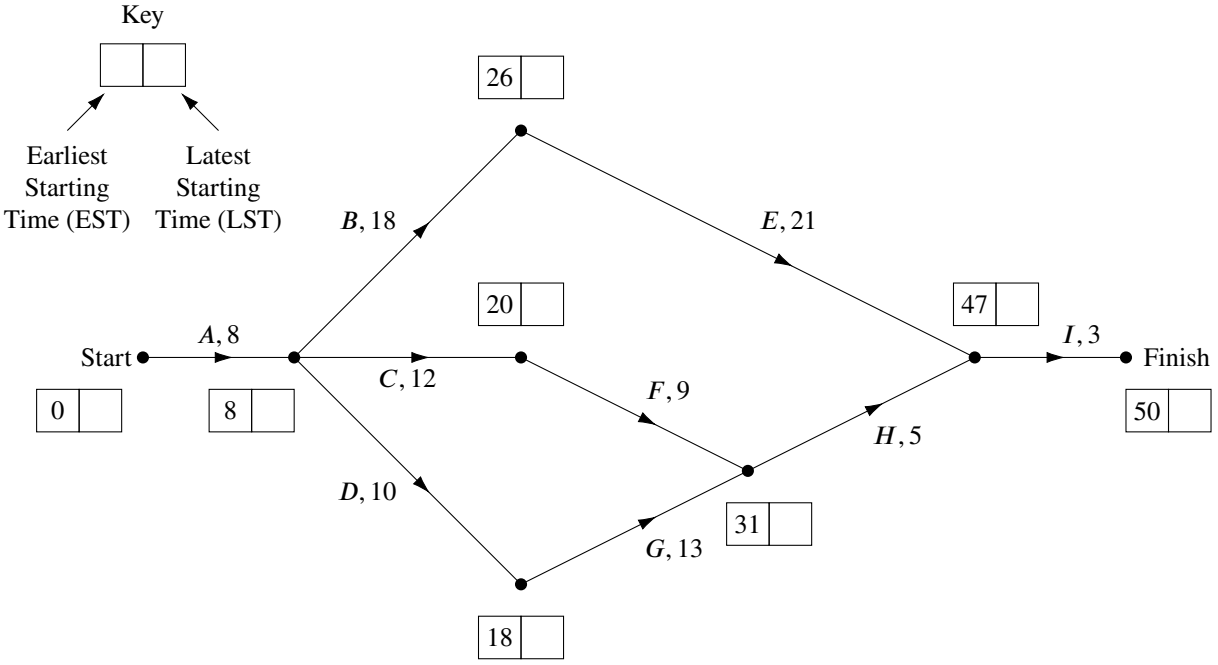
Question 29 (6 marks)

A particular project is comprised of nine activities. An activity chart for the project is shown below. Each path shows an activity and its duration in days.



(a) What is the expected duration of the project? **1**

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(b) The EST for each activity has been given. Complete a backward scan to find the LST for each activity. **2**

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

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(d) Briefly explain the meaning of the term *float time*. **1**

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(e) Which activity has the greatest float time? **1**

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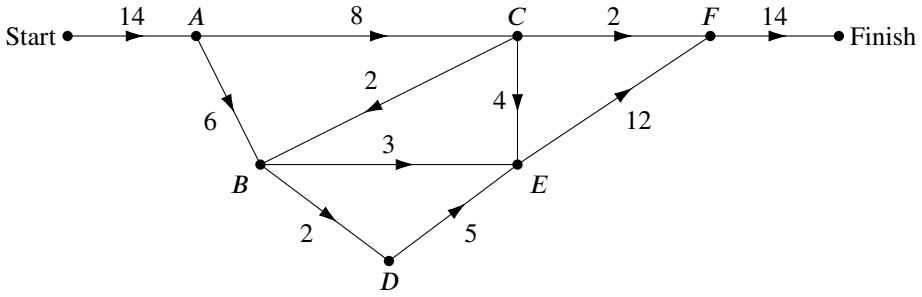
Question 30 (4 marks)

The network diagram shows a system of pipes with the capacities for each pipe in litres per second.



(a) Determine the maximum flow of the network. **2**

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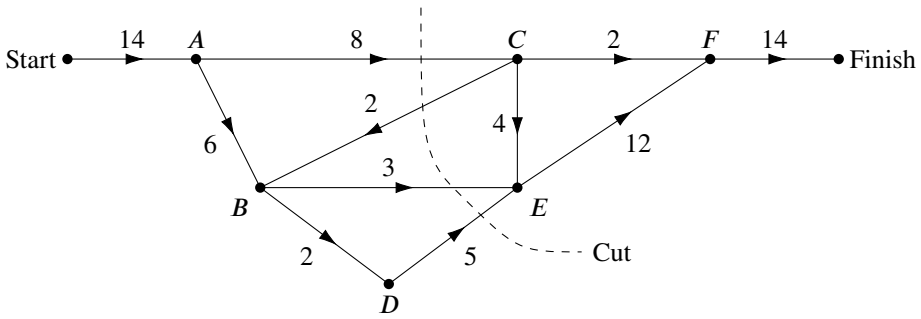
(b) A cut is added to the network as shown. **1**



What is the capacity of this cut?

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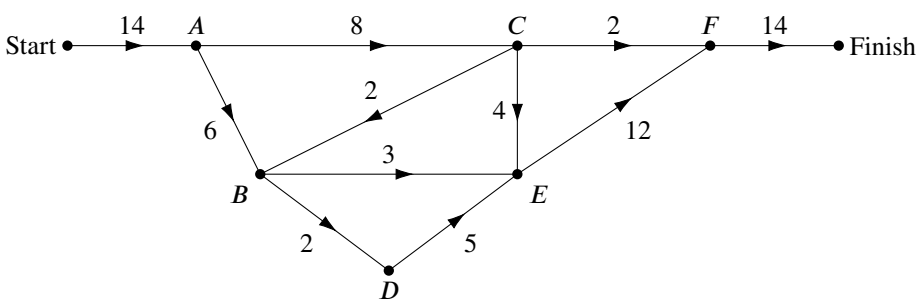
(c) Draw the minimum cut for this network on the diagram below. **1**

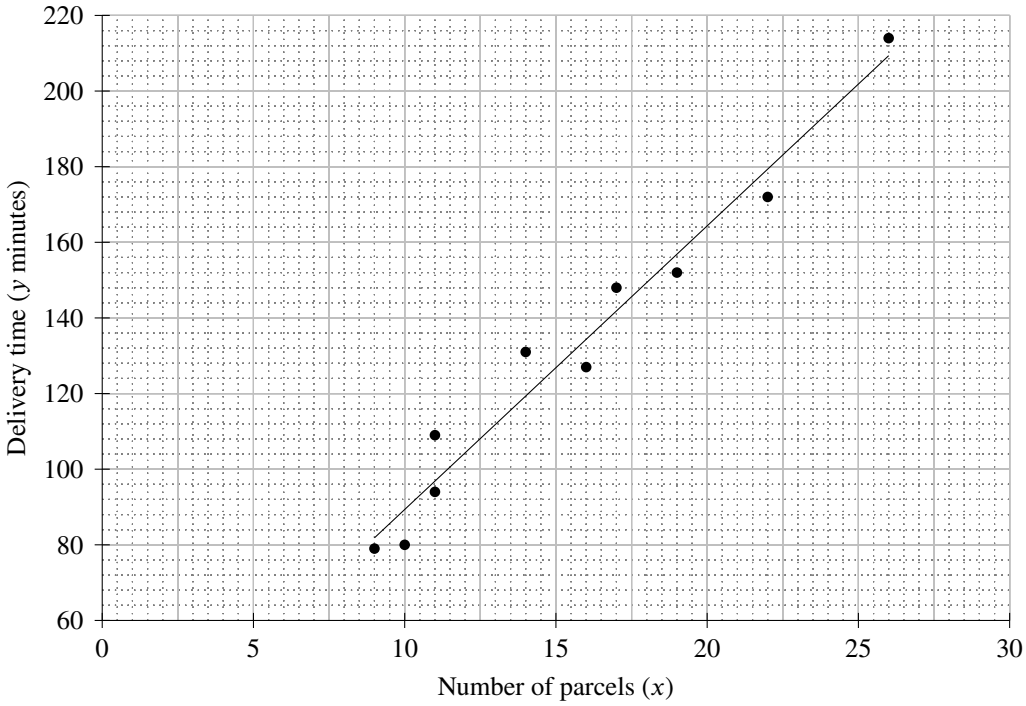


Question 31 (5 marks)

A parcel delivery company has a depot on the outskirts of a town. Each weekday, a van leaves the depot to deliver parcels across a nearby area. The table below shows the number of parcels to be delivered (x) and the total delivery time for the van (y minutes) for a random sample of 10 weekdays.

Number of parcels (x)	9	16	22	11	19	26	14	10	11	17
Delivery time (y minutes)	79	127	172	109	152	214	131	80	94	148

The points from the table are plotted in the scatterplot below and the least-squares line of best fit has been added to the scatterplot.



(a) The gradient of the least-squares line of best fit is approximately 7.5. What is the significance of this value in the context of the question? **1**

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(b) Use your calculator to find the equation of the least-squares line of best fit. Give your equation in the form $y = mx + c$. **2**

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(c) Estimate the delivery time for a delivery of 20 parcels across the local area. **1**

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(d) Macy estimated that a delivery of 45 parcels will have a delivery time of approximately 352 minutes. Comment on reliability of her estimation. **1**

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Question 32 (3 marks)

The lengths of salmon at a fish farm are found to be normally distributed with a mean length of 520 mm and a standard deviation of 30 mm.

(a) Find the expected percentage of fish with lengths between 490 mm and 550 mm. **1**

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The fish farm rejects fish with a length which is more than two standard deviations below the mean length.

(b) What is the minimum length of salmon which the fish farm will accept? **1**

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(c) What percentage of fish would you expect to be rejected by the fish farm? **1**

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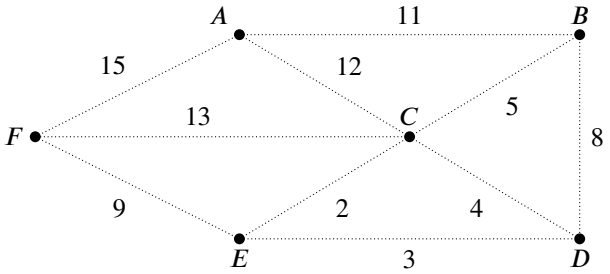
Question 33 (4 marks)

A school is planning to connect six classrooms with electrical cabling. The diagram below shows the possible ways that cables can be installed. The rooms are indicated as A, B, C, D, E and F. The length of cabling (in metres) required between rooms is also shown.



(a) Using a suitable method, determine the minimum length of cable required to ensure that all six rooms are connected. **2**

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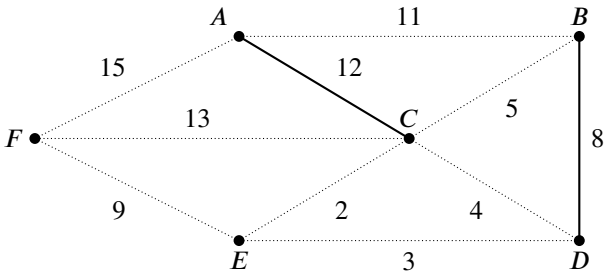
(b) Electricians discover that suitable cabling has already been installed along AC and along BD. These existing cables can be used to connect all six rooms and are indicated in the diagram below. **2**



What is the minimum length of additional cable that now needs to be installed to connect all six rooms?

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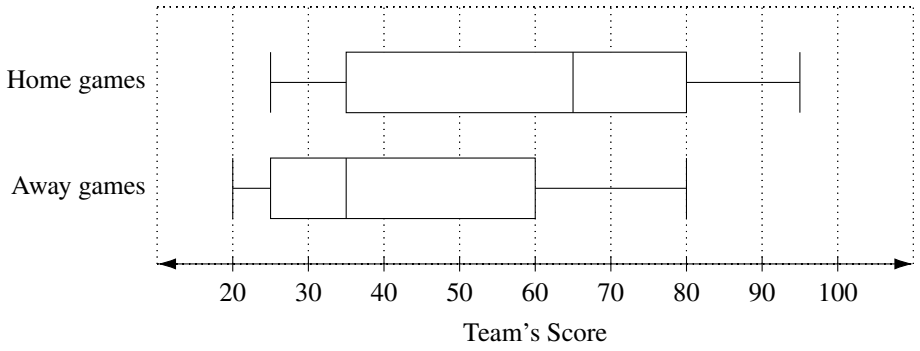
Question 34 (5 marks)

A local basketball team played 23 home games and 23 away games during their season. The team's score during each game was recorded and shown in the box-and-whisker plot below.



(a) What was the team's lowest home game score? **1**

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(b) What percentage of the team's away game scores were less than 35? **1**

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(c) Compare and contrast the distributions of the team's home and away game scores. In your answer, comment on the skewness of the distributions, measures of central tendency and spread. **3**

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Question 35 (5 marks)

At the final stage of manufacture, new cars undergo two independent tests. The first test is a mechanical test. The probability that a car will fail the mechanical test is 0.1. The second test is a paint test. The probability that a car will fail the paint test is 0.15.

(a) What is the probability that the car passes the paint test? **1**

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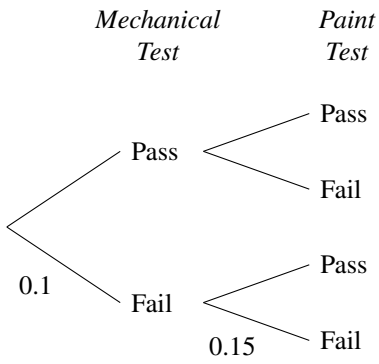
The outcomes of the two tests can be arranged in the tree diagram shown below.



(b) Complete the tree diagram by writing the correct probabilities on each of the branches. **2**

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(c) Determine the probability that a car selected at random will pass both tests. **2**

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Question 36 (5 marks)

An Easter school holiday concert had ticket prices as follows.

- Adult: \$20
- Child: \$7

(a) Find the total income from ticket sales on a day where 179 adult tickets were sold and 203 child tickets were sold. **1**

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(b) The next day 472 tickets were sold at the same prices. The ratio of adult tickets sold to child tickets sold is $1 : 3$. Find how many adult tickets and how many child tickets were sold on that day. **2**

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For the July school holidays, the concert prices increased. The adult ticket cost $2\frac{1}{2}$ times as much as a child ticket.

(c) On one particular day a total of 218 adult tickets and 394 child tickets were sold, with a total income of \$7512 from sales. Find the cost of a child ticket for this show. **2**

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Question 37 (3 marks)

Laura wishes to buy a new car in three years. She is able to make regular equal monthly deposits of $796 in an annuity for the three years, where interest is earned at a rate of 3.12% p.a., compounded monthly.

Present value of an annuity of $1

Number of Periods	Interest rate per annum 3.12%
36	34.3241

(a) Juliette advises Laura that she will be better off if she can invest a single lump sum at the start of the three years, make no further deposits, and earn interest at the same rate. **1**

Using the information in the table, what single amount does Laura need to invest at the start of the three years to reach her saving goal?

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(b) How much extra interest will Laura earn if she can afford to deposit the lump sum? **2**

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End of paper

2 UNIT STANDARD MATHEMATICS
2022 TRIAL HSC EXAMINATION

SECTION I

1 1 **B**

2 $3-(x+2)-2(x-3) = 3-x-2-2x+6$
$= 7-3x$ 2 **C**

3 3 **A**

4 Of those listed, only removing BC will create a tree. All other choices will create a disconnected network. 4 **B**

5 5 **A**

6 6 **B**

7 Using the unitary method 7 **D**

110% of wholesale price $= \$396$
1% of wholesale price $= 396 \div 110$
$= 3.6$
100% of wholesale price $= 3.6 \times 100$
$= 360$

$\therefore$ The wholesale price of the microwave oven is \$360.

8 $\text{BAC}_{\text{male}} = \dfrac{10N - 7.5H}{6.8M}$
$= \dfrac{10(3) - 7.5(3.5)}{6.8(88)}$
$= \dfrac{3.75}{598.4}$
$= 0.00626671122$
≈ 0.006 8 **A**

9 Total dividend $= 1400 \times 1.35$
$= \$1890$

$\therefore$ Dividend yield $= \dfrac{\text{dividend}}{\text{market value}} \times \dfrac{100}{1}$
$= \dfrac{1890}{25200} \times \dfrac{100}{1}$
$= 7.5\%$ 9 **B**

10 10 **A**

11 $P(\text{student has licence}) = \frac{35}{55}$
$= \frac{7}{11}$ 11 **A**

12 Speed $= v$ km/h 12 **D**

$= v \times 1000$

$= 1000v$ m/h

$= 1000v \div 60 \div 60$

$= \dfrac{1000v}{60 \times 60}$ m/s

13 Monthly repayment $= 310 \times 6.38$ 13 **B**

$= \$1977.80$

14 Mean $= \dfrac{32 + 56}{2}$ 14 **C**

$= 44$

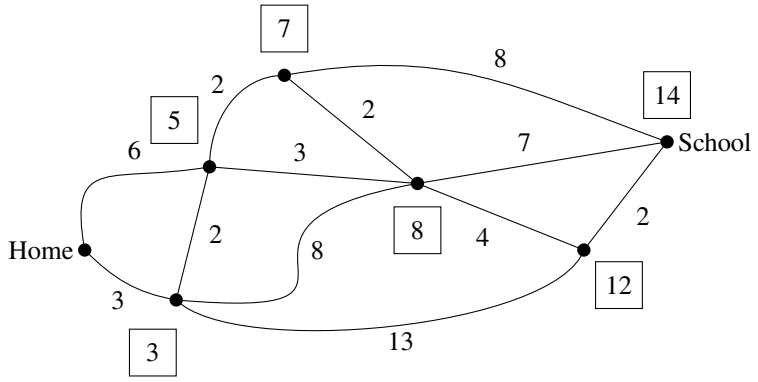
Score 1 standard deviation above mean $= \dfrac{44 + 56}{2}$

$= 50$

$\therefore$ Standard deviation $= 50 - 44$

$= 6$

15 15 **C**



SECTION II

QUESTION 16

(a) Volume $= \pi r^2 h$

$= \pi \times 1.4^2 \times 1.3$

$= 8.004778081$

≈ 8 m^3

(b) Capacity $= 8$ kL

$= 8000$ L

(c) Surface area $= 2\pi r^2 + 2\pi rh$

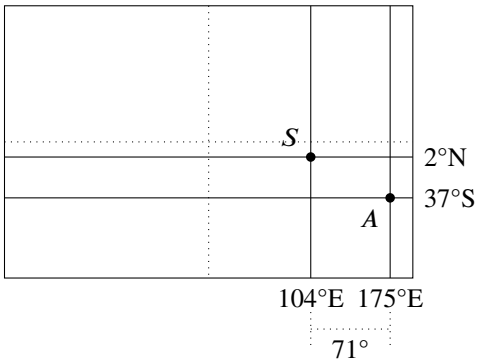
$= 2 \times \pi \times 1.4^2 + 2 \times \pi \times 1.4 \times 1.3$

$= 23.75044046$

≈ 24 m^2

QUESTION 17

(a)



$$\text{Angular difference} = 175 - 104$$
$$= 71^\circ$$

$$\therefore \text{Time difference} = \frac{71}{15}$$
$$= 4.733333333 \text{ hours}$$
$$= 4 \text{ h } 44 \text{ min}$$

(b) Flight time = 9 h 30 min

	Auckland	Singapore
Time of departure	1:45 pm Mon	9:01 am Mon
Time of arrival		6:31 pm Mon

$\therefore$ The flight arrives in Singapore at 6:31 pm on Monday evening.

QUESTION 18

$$\text{Total shower time per day} = 10 \times 2$$
$$= 20 \text{ minutes}$$
$$\text{Total shower time per year} = 20 \times 365$$
$$= 7300 \text{ minutes}$$
$$\text{Amount of water used per year} = 7300 \times 9$$
$$= 65\,700 \text{ L}$$
$$= 65.7 \text{ kL}$$
$$\text{Annual cost} = 65.7 \times 2.38$$
$$= \$156.37$$

QUESTION 19

(a) Scale $= 1 : 500\,000$

Distance $= 2 \times 500\,000$
$= 1\,000\,000$ cm
$= 1000000 \div 100 \div 1000$
$= 10$ km

(b) Length $= 75 \div 500000$
$= 0.00015$ km
$= 0.00015 \times 1000 \times 100$
$= 15$ cm

QUESTION 20

(a) $r = 5.4 \div 12$
$= 0.45\%$ per month
$n = 6 \times 12$
$= 72$ months

Future value $= 1000 \times 84.809$
$= \$84\,809$

(b) Total amount deposited $= 1000 \times 72$
$= \$72\,000$

Interest $= 84809 - 72000$
$= \$12\,809$

QUESTION 21

$$\text{Area} \approx \frac{h}{2}[d_f + d_l] + \frac{h}{2}[d_f + d_l] + \frac{h}{2}[d_f + d_l]$$
$$\approx \frac{7}{2}[3.6 + 2.7] + \frac{13}{2}[2.7 + 1.9] + \frac{10}{2}[1.9 + 0]$$
$$\approx 22.05 + 29.9 + 9.5$$
$$\approx 61.45 \text{ m}^2$$

QUESTION 22

(a) The point of intersection of the two lines is $(60, 600)$. This means that Fiona will make a profit if she makes and sells more than 60 masks.

(b) Fiona needs to produce and sell 35 masks to obtain a revenue of \$350.

(c) Profit $= 1000 - 800$
$= \$200$

QUESTION 23

(a) $r = 6 \div 12$
$= 0.5\%$ p.a.
$= 0.005$

$A = \$34\,928.68$

$B = Prn$
$= 34928.68 \times 0.005 \times 1$
$= \$174.64$

(b) Final repayment $= 703.27 + 3.52$
$= \$706.79$

(c) Total repayments $= 47 \times 872 + 706.79$
$= \$41\,690.79$

$\therefore$ Interest $= 41690.79 - 37000$
$= \$4690.79$

QUESTION 24

$$\frac{2x-3}{5} - 7 = 0$$
$$\frac{2x-3}{5} = 7$$
$$2x - 3 = 35$$
$$2x = 38$$
$$x = 19$$

QUESTION 25

Let N be the number of rare birds in the forest.

$$\frac{96}{N} = \frac{18}{72}$$
$$18N = 6912$$
$$N = 384$$

$\therefore$ There are approximately 384 rare birds in the forest.

QUESTION 26

(a) Correlation coefficient $= 0.980615944$
≈ 0.981

(b) The correlation coefficient indicates a strong positive correlation between results in Year 10 and results in Year 12. As marks in Year 10 increase, marks in Year 12 also increase.

QUESTION 27

(a) Interest rate $= 22.5\%$ p.a.
$= 22.5 \div 365$
$= 0.06164383562\%$ p.a.
$= 0.06164383562 \div 100$
$= 0.0006164383562$
≈ 0.00062

(b) Balance $= P(1 + r)^n$
$= 2490(1 + 0.00062)^{13}$
$= 2490(1.00062)^{13}$
$= \$2510.14$

Interest $= 2510.14 - 2490$
$= \$20.14$

QUESTION 28

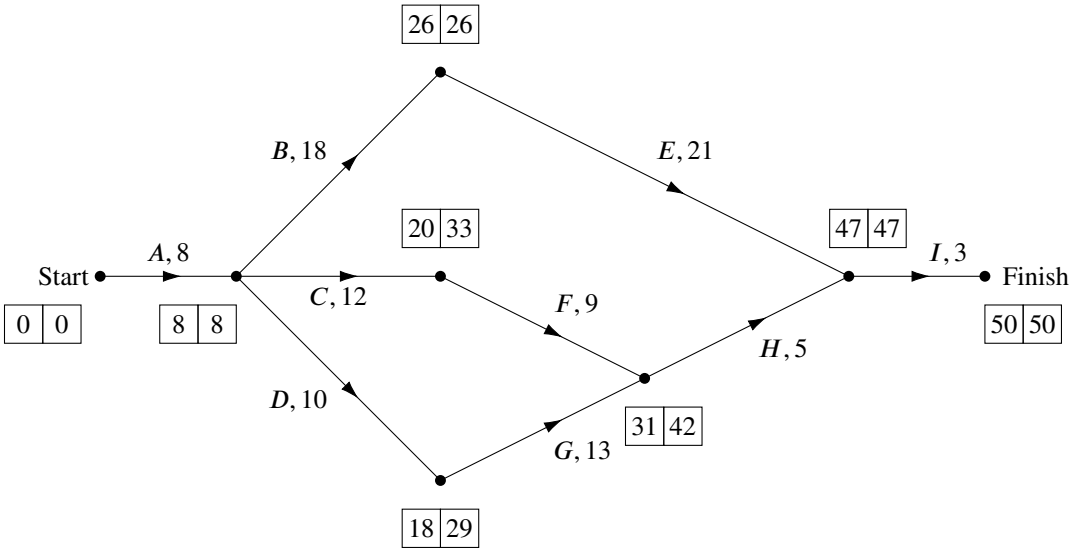
(a) Salvage value $= V_0 - Dn$
$= 370000 - 70000 \times 2$
$= \$230\,000$

(b) Salvage value $= V_0(1 - r)^n$
$= 230000(1 - 0.20)^3$
$= 230000(0.80)^3$
$= \$117\,760$

QUESTION 29

(a) The expected duration is 50 days.

(b)



(c) The critical path is $ABEI$.

(d) Float time is the maximum delay possible before starting an activity without affecting the overall completion time of the project.

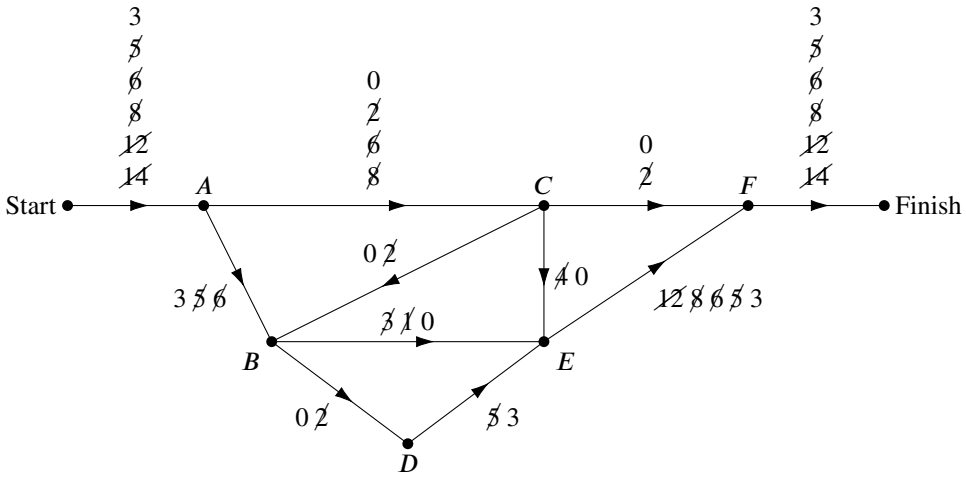
(e) We look at the float time of the activities which are not on the critical path.

Float time for $C = 33 - 12 - 8$
$= 13$
Float time for $D = 29 - 10 - 8$
$= 11$
Float time for $F = 42 - 20 - 9$
$= 13$
Float time for $G = 42 - 18 - 13$
$= 11$
Float time for $H = 47 - 5 - 31$
$= 11$

$\therefore$ Activities C and F each have the greatest float time.

QUESTION 30

(a)



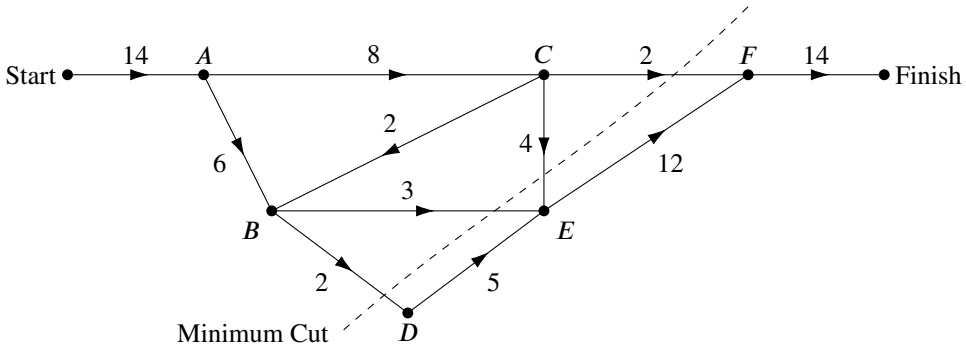
Possible routes are:

$SACFT$	2
$SACEFT$	4
$SACBEFT$	2
$SACBDEFT$	0
$SABEFT$	1
$SABDEFT$	2
Maximum flow:	11

$\therefore$ The maximum flow through this network is 11 litres per second.

(b) Capacity of cut $= 8 + 3 + 5$
$= 16$

(c)



QUESTION 31

(a) The gradient of 7.5 means that for every extra parcel that is delivered, the delivery time will increase by 7.5 minutes. In other words, the delivery time increases by 7.5 minutes per parcel.

(b) Equation of least-squares line of best fit is approximately $y = 7.501x + 14.336$.

(c) Using the equation, when $x = 20$,

$$\begin{aligned} y &= 7.501(20) + 14.336 \\ &= 164.356 \\ &\approx 164 \end{aligned}$$

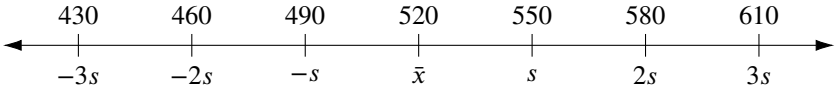
$\therefore$ A delivery of 20 parcels should have a delivery time of approximately 164 minutes.

or

Using the graph, a delivery of 20 parcels should have a delivery time of approximately 164 minutes.

(d) The data sample collected gives delivery times for deliveries between 9 and 26 parcels. A delivery of 45 parcels will be well outside the range of data collected, so the prediction may not be reliable.

QUESTION 32



(i) Percentage = 68%

(ii) Minimum length = 460 mm

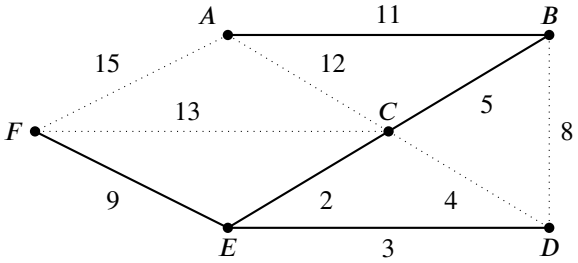
(iii) Percentage $= \frac{1}{2}(100 - 95)$

$= 2\frac{1}{2}\%$

QUESTION 33

(a) Using Kruskal's algorithm, we list all the possible edges. We then use the edges with the shortest distance in the spanning tree.

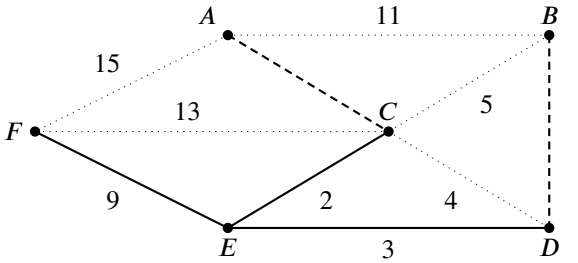
$AB = 11$ ✓
$AC = 12$
$AF = 15$
$BC = 5$ ✓
~~$BD = 8$~~ but this cannot be used as it would create a cycle
~~$CD = 4$~~ but this cannot be used as it would create a cycle
$CE = 2$ ✓
$CF = 13$
$DE = 3$ ✓
$EF = 9$ ✓



∴ Minimum length of cable $= 11 + 5 + 2 + 3 + 9$
$= 30$ m

(b) Using Kruskal's algorithm, we list all the possible edges, but we don't list AC and BD as those lengths are already installed. We then use the edges with the shortest distance in the spanning tree.

$AB = 11$
$AF = 15$
~~$BC = 5$~~ but this cannot be used as it would create a cycle
~~$CD = 4$~~ but this cannot be used as it would create a cycle
$CE = 2$ ✓
$CF = 13$
$DE = 3$ ✓
$EF = 9$ ✓



∴ Minimum length of additional cable $= 2 + 3 + 9$
$= 14$ m

QUESTION 34

(a) Lowest home game score = 25

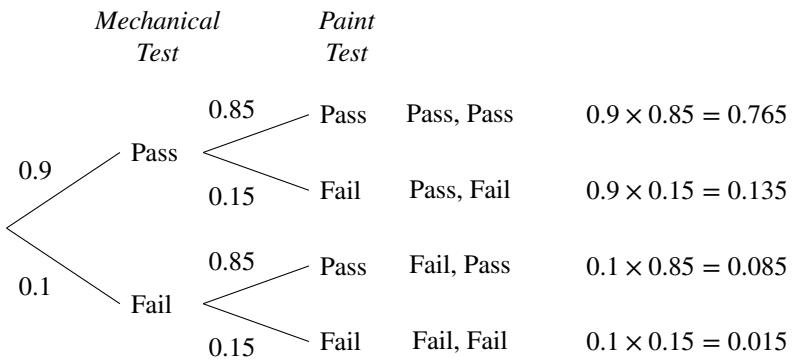
(b) 50% of away games scores were less than 35

(c) The team tends to perform better at home than away. The median score is higher at home. Their top 25% of scores at home are more than any away game scores. The home game scores are negatively skewed while the away game scores are positively skewed. Away game scores are clustered in the 20s, 30s and 40s while home game scores are clustered in the 60s, 70s and 80s. The interquartile range is higher for home games than away games. This also suggests that home scores are greater than away scores.

QUESTION 35

(a) $P(\text{car passes paint test}) = 1 - 0.15$
$= 0.85$

(b)



(c) $P(\text{car passes both tests}) = 0.9 \times 0.85$
$= 0.765$

QUESTION 36

(a) Total income $= 179 \times 20 + 203 \times 7$
$= \$5001$

(b) Ratio $= 1 : 3$

4 parts $= 472$
1 part $= 472 \div 4$
$= 118$
3 parts $= 118 \times 3$
$= 354$
$\therefore$ 118 adult tickets and 354 child tickets were sold.

(c) Let x be the price of a child ticket. Therefore the price of an adult ticket is $2.5x$.

Total income = Income from adult tickets + Income from children's tickets
$7512 = (218 \times 2.5x) + (394 \times x)$
$7512 = 545x + 394x$
$939x = 7512$
$x = 8$

$\therefore$ A child ticket costs \$8.

QUESTION 37

(a) Present value $= 796 \times 34.3241$
$= \$27\,321.98$

(b) Amount deposited in annuity $= 796 \times 12 \times 3$
$= \$28\,656$

Amount deposited as lump sum $= \$27\,321.98$

$\therefore$ Extra interest $= 28656 - 27321.98$
$= \$1334.02$