NESA Number: _____

Teacher: KS   LK

July 2023
TRIAL EXAMINATION

Mathematics Standard 2

Writing time   2 hours 30 minutes
Reading time   10 minutes
Total Marks   100

General Instructions

- Write using black, non-erasable pen.
- Diagrams must be drawn using pencil.
- A NESA-approved calculator may be used.
- All relevant working should be shown for each question.

Additional materials needed

- Reference Sheet
- Multiple-Choice Answer Sheet

Structure & Suggested Time Spent

- **Section I** (Multiple Choice) **15 Marks**
  Attempt all questions.
  Allow about 25 minutes.

- **Section II** (Extended Response) **85 Marks**
  Attempt all questions.
  Answer in the space provided.
  Allow about 2 hours and 5 minutes.

Section I	Section II		
Q1 - 15	Q16 - 28	Q29 – 39	TOTAL
___ 15	___ 43	___ 42	___ 100

Section I

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

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

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

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

A ⬭   B ⬤   C ⬭   D ⬭

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

A ⬤   B ⨂   C ⬭   D ⬭

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

correct

A ⨂   B ⨂   C ⬭   D ⬭

1   Which of these numbers has been written correct to three significant figures?

(A)   0.025

(B)   2.050

(C) 2.05×10^4

(D)   250 003

3

2 Phoebe invested $12 000 at a simple interest rate of 7% per annum.

Calculate the future value of Phoebe's investment after 8 years.

(A) $6720

(B) $13 440

(C) $18 720

(D) $20 618

**3** If m has the value of -3, what is the value of $m - m^2$?

(A) -36

(B) -12

(C) 0

(D) 6

4 The table provides details of a data set.

Minimum value	35
Lower quartile	50
Interquartile range	70
Range	95
Median	65

Which of these five-number summaries could represent this data?

(A)   35 50 65 70 75

(B)   35 50 65 70 130

(C)   35 50 65 120 95

(D)   35 50 65 120 130

5 In triangle ABC, what is the length of side AC, correct to one decimal place?
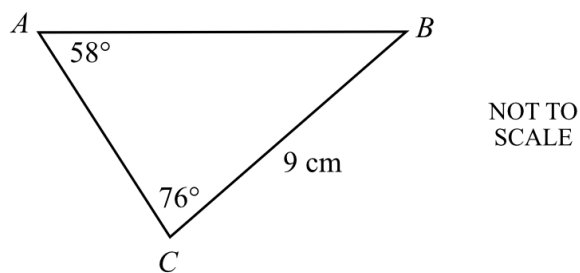
(A)   6.7 cm

(B)   7.6 cm

(C)   7.9 cm

(D)   10.3 cm

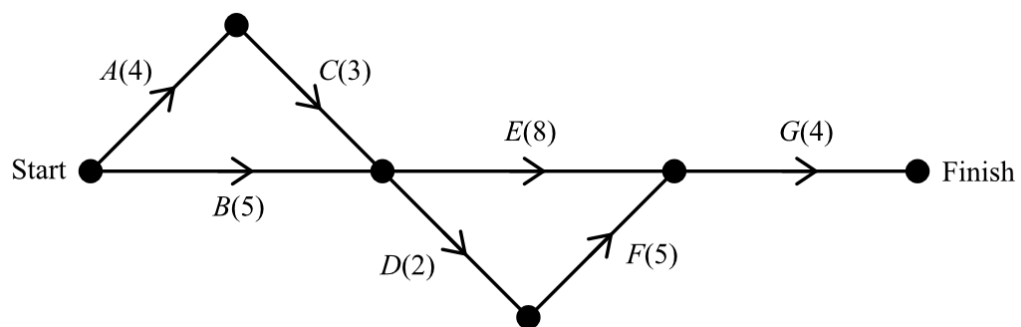**6** Which of the following correctly expresses a as the subject of $A = \dfrac{h}{2}(a+b)$?

(A) $\quad a = \dfrac{Ah}{2} - b$

(B) $\quad a = \dfrac{\frac{1}{2}A - bh}{h}$

(C) $\quad a = \dfrac{2A + bh}{h}$

(D) $\quad a = \dfrac{2A - bh}{h}$

7 The diagram shows the tasks A to G that must be completed in a project. Also shown are the durations of each task in days.

What is the minimum number of days required to complete the project?

(A)   16

(B)   17

(C)   19

(D)   31

8 A bag of 12 apples is being sold for $4.59.

The average weight of an apple in the bag is 75 grams.

What is the price of the apples when expressed as a rate in dollars per kilogram?

(A) $3.83/kg

(B) $5.10/kg

(C) $6.12/kg

(D) $7.34/kg

9 At a restaurant, a bill was issued to a customer with the items purchased shown.
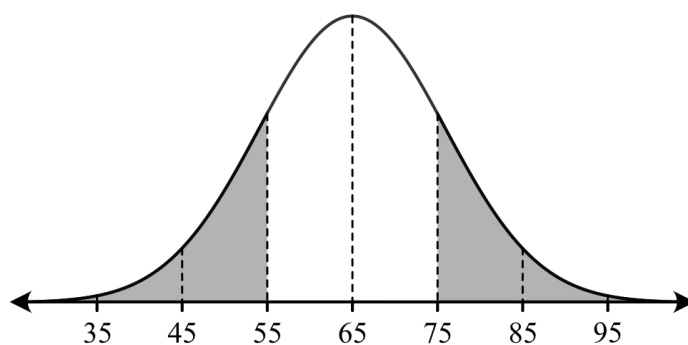
Entrée:	$18.00
Main meal:	
Dessert:	$12.00
GST (10%):	
Total:	**$79.20**

Two of the costs are missing from the bill, the main meal and the GST (which is added to the cost of the three items).

What was the cost of the main meal?

(A) $38.00

(B) $41.00

(C) $41.30

(D) $42.00

10 The normal distribution below has a mean of 65 and a standard deviation of 10.

What percentage of results lie in the shaded region?

(A) 16%

(B) 32%

(C) 34%

(D) 68%

11 A town's current population of 15 480 is expected to grow steadily at an annual rate of 12%. The predicted population after 10 years is approximately

(A) 48 079

(B) 34 056

(C) 18 576

(D) 17 338

12 The tables below represent carbon emissions from sectors of an economy and a further breakdown of emissions within the transport sector.

Carbon emissions from sectors of the economy

Sector	Percentage
Agriculture	2
Commercial	10
Industry	38
Mining	5
Transport	26
Residential	19

Carbon emissions from within the Transport sector

Transport	Percentage
Rail	5
Air	12
Water	6
Trucks/buses	19
Cars	58

What percentage of the total carbon emissions in the economy are produced by cars?
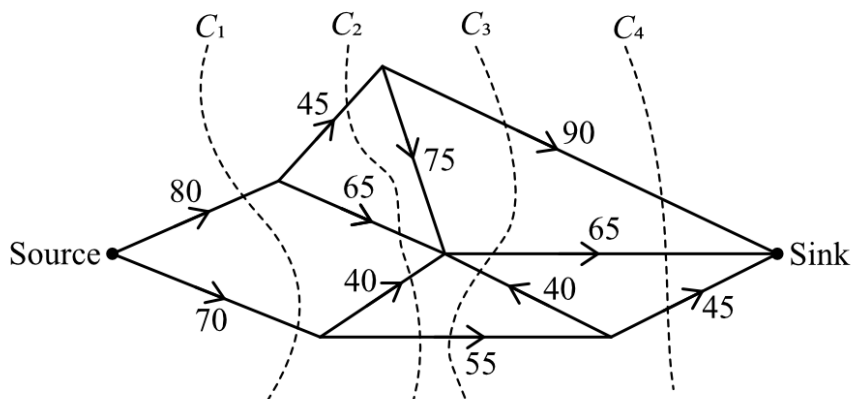
(A)   14.8

(B)   15.1

(C)   32

(D)   84

13 The hemisphere below has a radius of 6 metres.
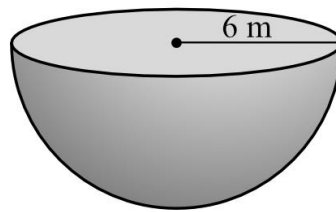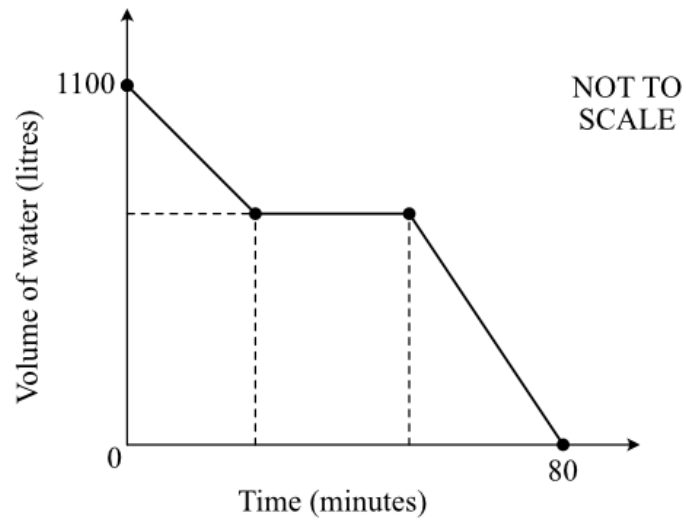

What is the volume of this hemisphere, correct to one decimal place?

(A) $339.3 \ \text{m}^3$

(B) $452.4 \ \text{m}^3$

(C) $678.6 \ \text{m}^3$

(D) $904.8 \ \text{m}^3$

14 Which cut $(C_1, C_2, C_3 \text{ or } C_4)$ could be used to determine the maximum flow from the source to the sink in this network?

(A) C_1

(B) C_2

(C) C_3

(D) C_4

15 The graph below shows the volume of water, in litres, as it drains from a tank over a period of time, in minutes.

The 1100 litre tank took 80 minutes to empty.

The volume of water in the tank initially decreased by 300 litres in 20 minutes.

It then did not change for a period of time.

Finally, the volume of water in the tank decreased at a rate of 32 litres per minute.

The period of time, in minutes, for which the volume of water in the tank did not change is

(A)   20

(B)   25

(C)   35

(D)   55

End of Section I

Section II
85 marks
Attempt all questions.
Allow about 2 hours and 5 minutes for this section.
Answer each question in the space provided.
Show all relevant working in questions involving calculations.

Marks

16   There is a 15-hour time difference between City A and City B.
City B is 10 hours ahead of Coordinated Universal Time (UTC$+10$).
City A is west of City B.

(a)   What is the UTC for City A?   1

(b)   A plane leaves city B at 10:30 pm on Tuesday and flies non-stop to city A.   2
The flight takes 20 hours and 24 minutes.
What time and day is it in city A when the plane lands?

17 Solve $x + \dfrac{2x-1}{4} = 3$.

2

18 The table shows the types of customer complaints received by an online business in a month.

Type of complaint	Frequency	Cumulative frequency	Cumulative percentage
Stock shortage	102	102	51
Delivery fee	56	*A*	79
Delivery time	20	178	89
Damaged item	10	188	*B*
Returns policy	8	196	98
Product information	4	200	100
Total	200		

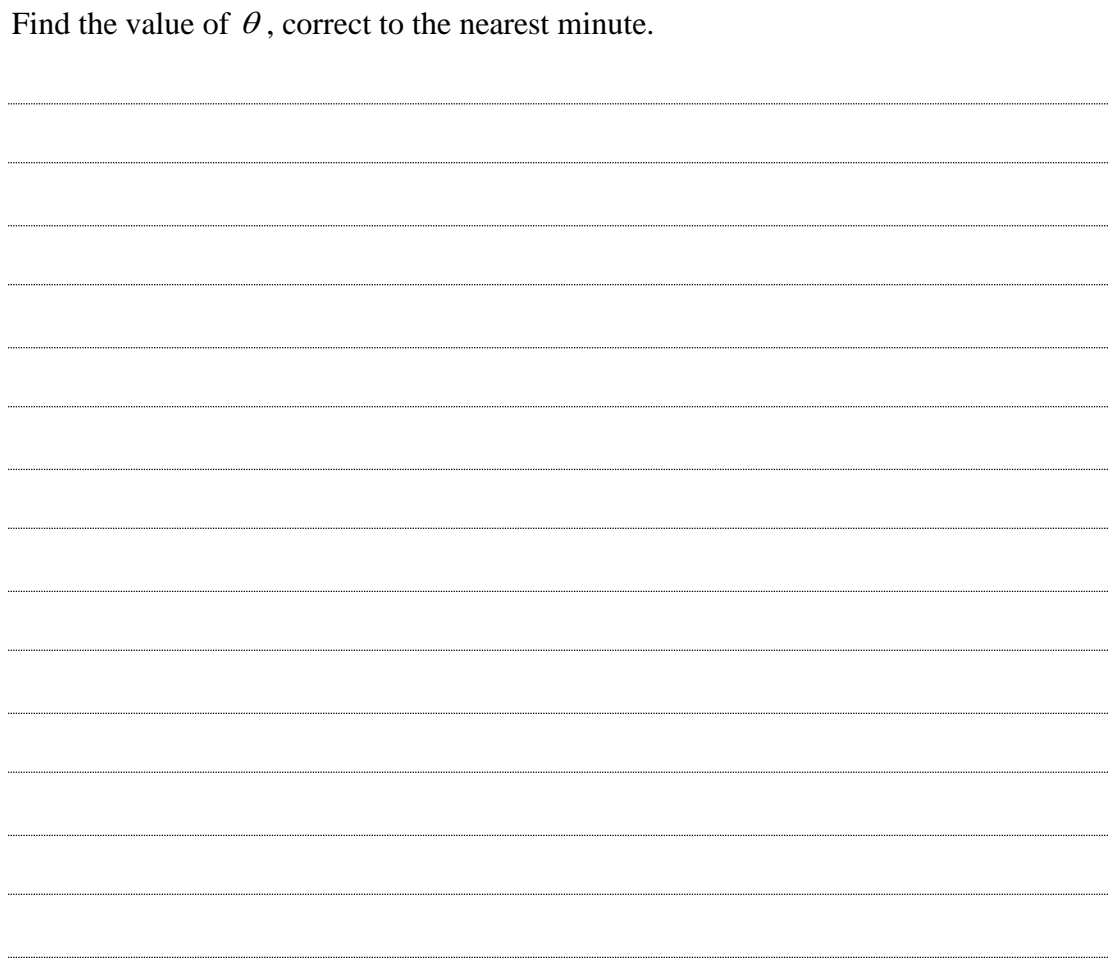(a) What are the values of *A* and *B*? **2**

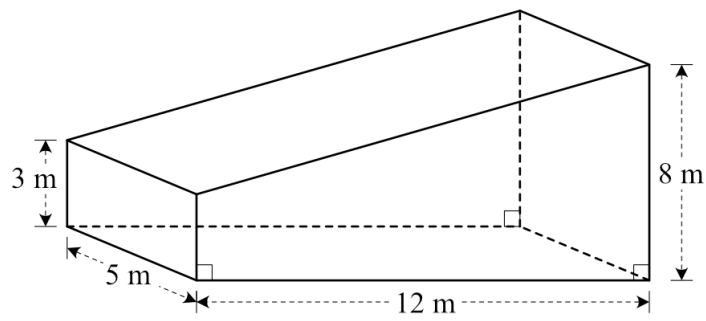(b) The data from the table are shown in the following Pareto chart. **1**
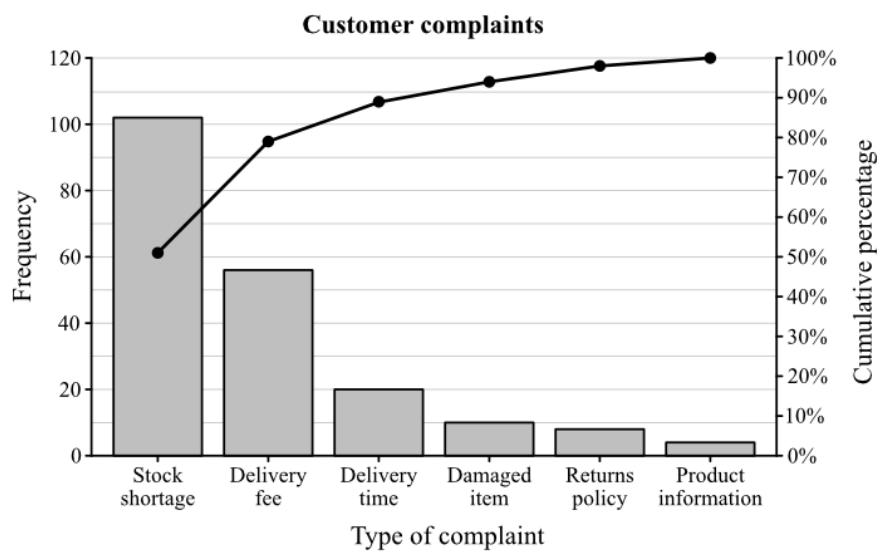
The manager will address 80% of the complaints.
Which types of complaints will the manager address?

14

19 In the following triangle, θ is an obtuse angle. **3**

Find the value of θ, correct to the nearest minute.

15

20 Find the total surface area of the trapezoidal prism in m^2. **3**

NOT TO
SCALE

21 Frankie plans to invest $25 000 for 2 years. She is offered two different investment options.

Option *A*: Interest is paid at 7.2% per annum, compounded monthly.
Option *B*: Interest is paid at r% per annum simple interest.

(a) Calculate the future value of Frankie's investment after 2 years if she chooses Option *A*.

2

(b) Find the value of r in Option *B* that would give Frankie the same future value after 2 years as for Option *A*. Give your answer correct to two decimal places.

2

22   A school installs 12 new Interactive Classroom Boards that each have a power rating of 220 watts. All the Boards are on for 6 hours a day, for 185 days of the year.

If electricity costs 34 cents per kWh, how much do the Boards cost to run for a year?

<div style="text-align:right">**3**</div>

23 A box contains 14 red apples and 6 green apples. Sandra randomly takes an apple from the box and eats in. Harry then randomly takes an apple from the box and eats it.

(a) What is the probability that Sandra takes a red apple from the box and eats it? **1**

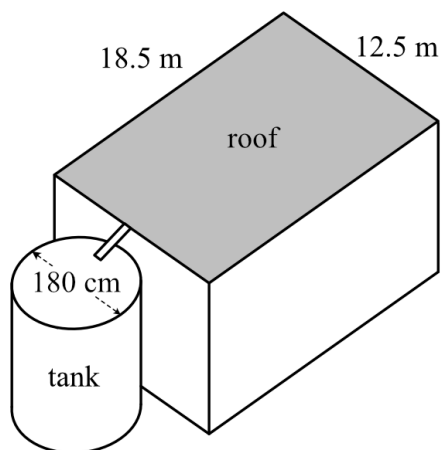(b) Complete the probability tree diagram by writing the correct probability on each branch. **2**

Sandra   Harry

Red
- Red
- Green

Green
- Red
- Green
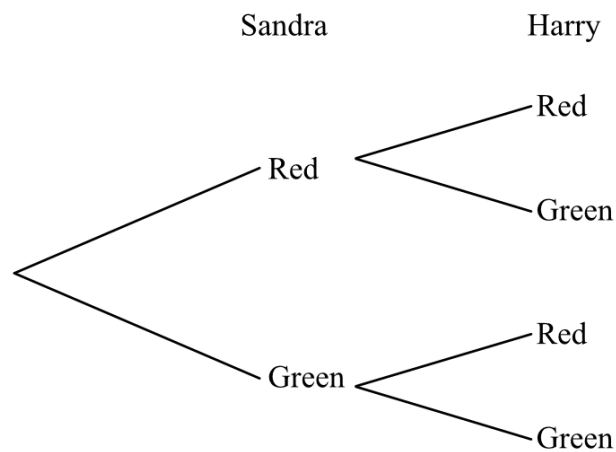
(c) Calculate the probability that Sandra and Harry eat an apple of the same colour. **2**

24   During a storm, 15 mm of rain falls onto a rectangular roof with dimensions **4**
18.5 m × 12.5 m.

The rainfall is collected in a cylindrical tank with a diameter of 180 cm and a
capacity of 3600 litres.

Assuming the tank was empty before the rainfall and that all of the rainfall is
directed into the tank, what is the height of the water in the tank after the rainfall?
Answer correct to the nearest centimetre.

25 A new car is bought for \$36 850. Each year the value of the car is depreciated by the same percentage. **3**

The table shows the value of the car, based on the declining-balance method of depreciation, for the first three years.
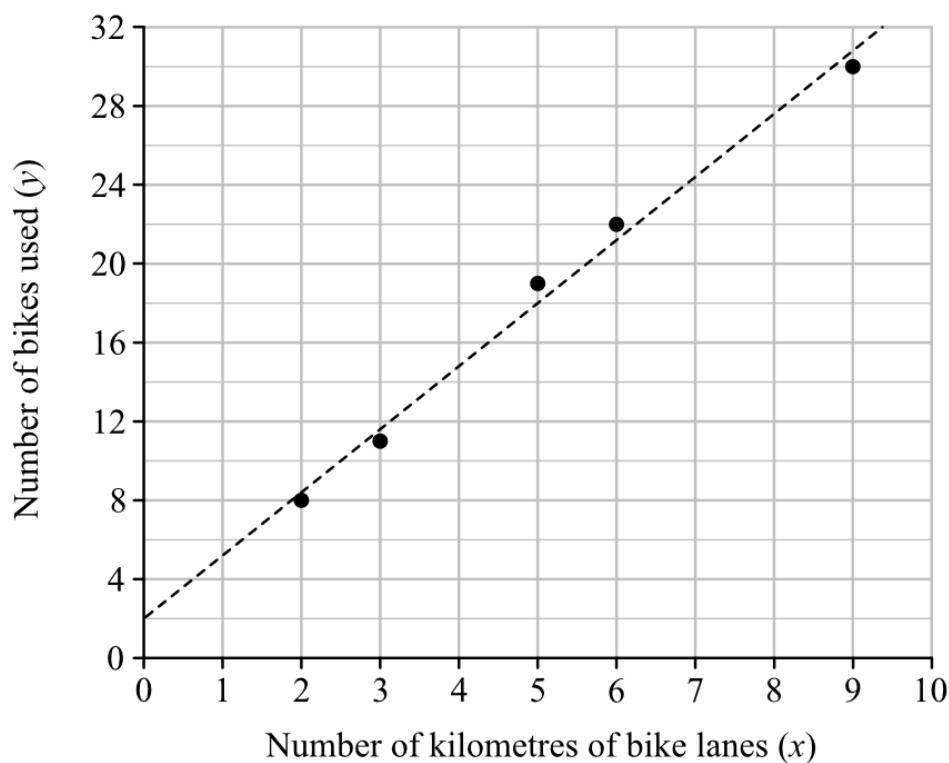
End of year	Value
1	\$30 954.00
2	\$26 001.36
3	\$21 841.14

What is the value of the car at the end of 8 years?

26 A city's transportation department is studying the correlation between the number of bicycles used from a city bike-share program and the number of kilometres of bike lanes in the city.

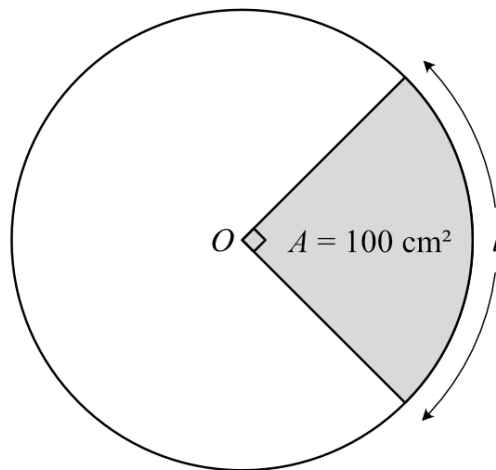The diagram shows the dataset used in the investigation and the least-squares regression line.

Number of bikes used (y)

Number of kilometres of bike lanes (x)

(a) Find the equation of the least-squares regression line relating to the dataset. **2**

(b) Suppose a sixth data point was collected for a city which had 10 kilometres of bike lanes. In that city, 25 bikes were used. What would happen to the gradient found in part (a)? **1**

27   In the circle below, with centre O, the area of the quadrant is 100 cm^2.   **3**

Calculate the length of the arc l, correct to one decimal place.

28   A female person's blood alcohol content (*BAC*) can be estimated using the formula:

$$BAC = \frac{10N - 7.5H}{5.5M}$$

Where *N* is the number of standard drinks consumed in *H* hours, and *M* is the person's weight in kilograms.

After drinking a number of standard drinks over a period of 4 hours, Maree has a *BAC* of 0.06.

(a)   If Maree weighs 60.6 kg, approximately how many standard drinks did she consume during the 4 hours?   **2**

(b)   After a person stops drinking alcohol, the time T, in hours, it takes for their   **2**
       BAC to return to zero can be determined using the formula:

$$T = \frac{BAC}{0.015}$$

Maree had reached a *BAC* of zero at 3:00 am on Sunday morning after her
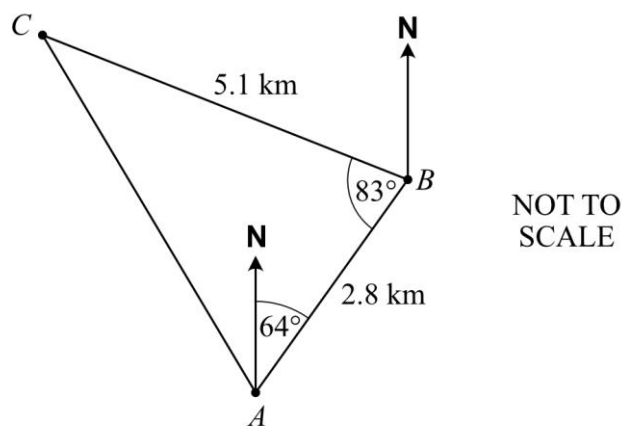drinking the night before.

At approximately what time on Saturday did Maree begin drinking alcohol?

End of question 28

29 A yacht race follows the triangular course shown in the diagram. The course from *A* to *B* is 2.8 km on a true bearing of 064°. At *B* the course changes direction. The course from *B* to *C* is 5.1 km and $\angle ABC = 83°$.

(a) What is the bearing of *C* from *B*? **1**

(b) Use the cosine rule to determine the distance from *C* to *A*.
Give your answer correct to one decimal place. **2**

30 Charlotte opens a new credit card account on 1 January. She uses it for the first time, on 15th January to buy a pair of shoes. She uses it again on 24th January to buy some new clothes. She makes no further purchases or repayments during the month of January. The details of her purchases are outlined in the credit card statement below.

Credit card statement

Date	Transaction	Amount
15 January	Shoes	$220.00
24 January	Clothing	$415.00

Charlotte's credit card has an interest rate of 16.5% per annum, compounded daily. The card does not have an interest-free period. Interest is calculated to include the day of the transaction and the day on which the account balance is paid.

(a) Calculate the daily interest rate, as a percentage, correct to four decimal places. This value can be used in part (b). **1**

(b) Charlotte intends to pay her account balance in full, including interest, on 5 February. How much will Charlotte pay in total? **2**

31 The following graph indicates z-scores of 'height-for-age' for girls aged 5–19 years.

'Height-for-age' for girls aged 5–19 years (z-scores)

Source: U.S. Census Bureau, Population Division

(a) What is the z-score for an 11-year-old girl of height 145 cm? **1**

(b) Mirabel is 165 cm tall. She is taller than 84% of girls her age. How old is she? **1**

(c) The interquartile range (IQR) contains the middle 50% of heights. Does Mirabel's height fall within the IQR? Explain your reasoning. **2**

28

32 A team project requires the completion of eight activities, *A* to *H*.
The directed network diagram shows the activities and their completion time, in hours.
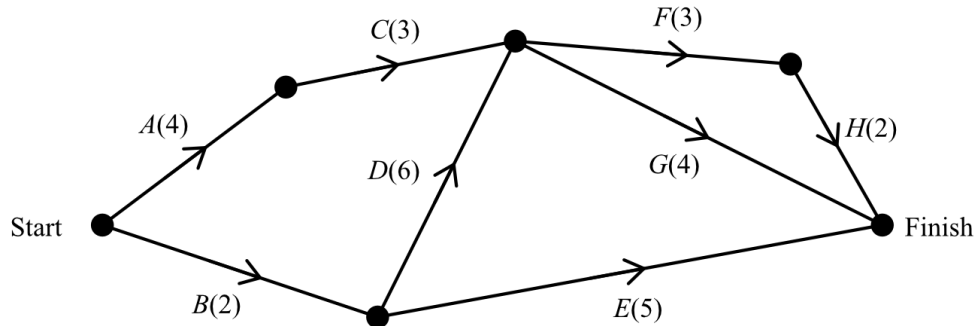
(a) List the immediate prerequisite(s) of activity *G*. **1**

(b) List the activities which make up the critical path for this project and state the minimum completion time. **2**

(c) What is the float time for activity *C*? **2**

(d) The team is considering adding an additional activity (*X*) to the project. **1**
It would have a completion time of 2 hours, an earliest start time (EST) of 8 hours and a latest start time (LST) of 9 hours.
Add a directed edge to show activity *X* on the diagram above.

33   The table shows income tax rates for the 2022-2023 financial year.   **3**

Taxable income	Tax on this income
0 – $18 200	Nil
$18 201 – $45 000	19c for each $1 over $18 200
$45 001 – $120 000	$5092 plus 32.5c for each $1 over $45 000
$120 001 – $180 000	$29 467 plus 37c for each $1 over $120 000
$180 001 and over	$51 667 plus 45c for each $1 over $180 000

Rosa has a gross annual salary of $164 500. She has allowable tax deductions of $5200 for work-related expenses and $660 in union fees.
Rosa must also pay a Medicare Levy of 2% of her taxable income.

Calculate the total tax payable by Rosa including the Medicare Levy.

34   Tom builds a model of a fighter aircraft. The model is made to a scale of 1:72.

22 cm

NOT TO
SCALE

(a)   The length of the model is 22 cm.   **1**
What is the length of the real aircraft in metres?

(b)   The real aircraft has a wingspan of 10.7 metres.   **1**
What is the wingspan of the model, correct to the nearest centimetre?

(c)   The real aircraft can hold 8200 kg of fuel in its fuel tanks when full.   **1**
Assuming the aircraft uses fuel at a constant rate of 40 kg/min, for how
many minutes can the plane fly on a full tank of fuel?

35   A company stocks two different grades of timber.   **5**

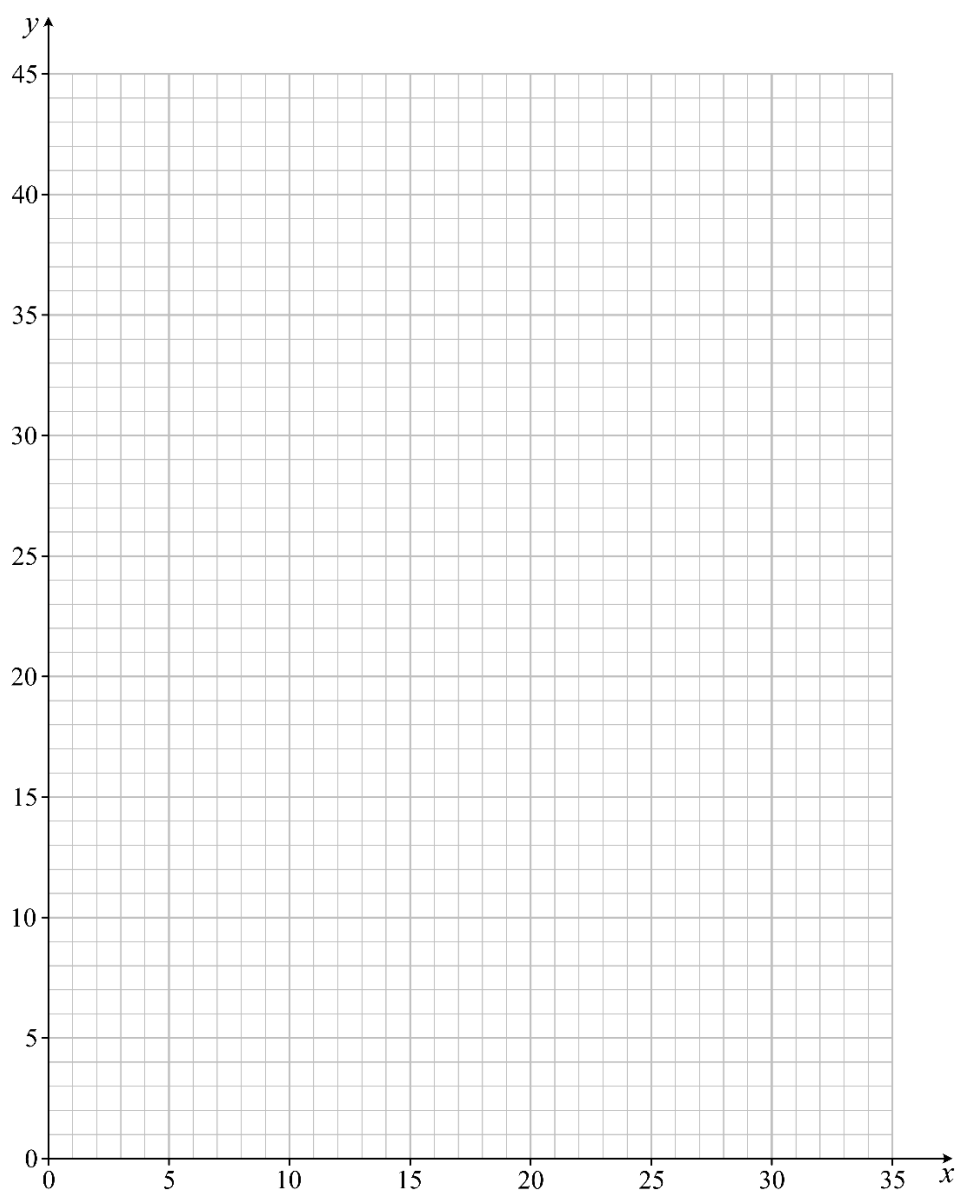Grade *A* sells for $6 per square metre. Grade *B* sells for $2 per square metre.

Harry, a carpenter, purchases 30 m^2 of timber, including some of each grade.
The total cost is $84.

Let x represent the number of square metres of grade *A* timber purchased and
y represent the number of square metres of grade *B* timber purchased.

Using the information above, write down two equations for x and y, then solve
these simultaneous equations graphically on the number plane on the next page. Do
not solve the equations algebraically. From your graph determine how many square
metres of each grade of timber was purchased.

Question 35 continues on page 33

Number of square metres of grade *A* = ………………

Number of square metres of grade *B* = ………………

End of Question 35

36 Lucas borrows $300 000 from a bank. The loan is repaid over 25 years at a rate of 7.2% per annum, compounded monthly. The repayments have been set at $2160 per month.

The interest charged and the balance owing for the first three months of the loan are shown in the spreadsheet below.

Month	Principal (at start of month)	Interest charged	Monthly repayment	Balance (at end of month)
1	$300 000	$1800	$2160	$299 640
2	$299 640	*A*	$2160	$299 277.84
3	$299 277.84	$1795.67	$2160	*B*

(a) What are the values of *A* and *B*?　　　　　　　　　　　　　　　　　**2**

(b) After 100 months of paying the loan, Lucas decides to make a lump sum payment of $30 000 and to continue making the monthly repayments of $2160. The loan will then be fully paid after a further 160 monthly repayments.　　　　**3**
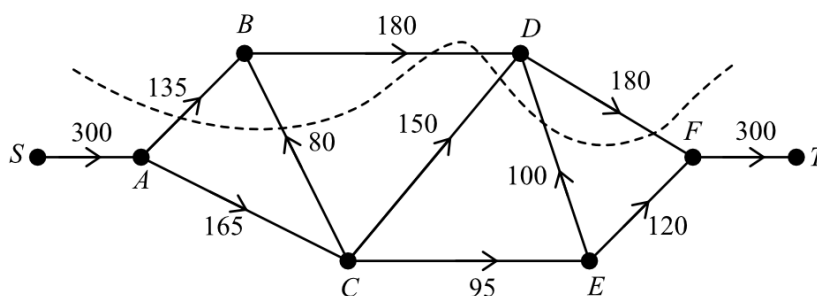
How much less will Lucas pay overall by making the lump sum payment?

37 The flow of water through a series of pipes is shown in the network below. The water flows from the source (*S*) to the sink (*T*) and the numbers on the edges show the maximum capacity of each pipe in litres per hour.
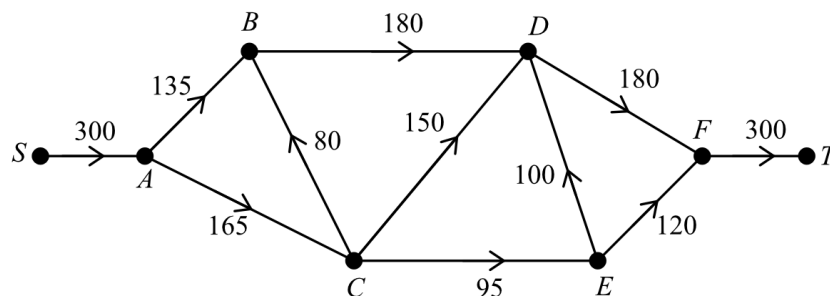
(a) In the diagram below, an invalid cut has been marked on the network. Explain why it is invalid.   **1**

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

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

Table of future value interest factors

| Number of periods | Interest rate per period | | | | | |
	1%	2%	3%	4%	5%	6%
2	2.0100	2.0200	2.0300	2.0400	2.0500	2.0600
4	4.0604	4.1216	4.1836	4.2465	4.3101	4.3746
6	6.1520	6.3081	6.4684	6.6330	6.8019	6.9753
8	8.2857	8.5830	8.8923	9.2142	9.5491	9.8975
10	10.4622	10.9497	11.4639	12.0061	12.5779	13.1808

Eva deposits $5000 into a savings account at the end of each year for 6 years. The interest rate for these 6 years is 4% per annum, compounded annually.
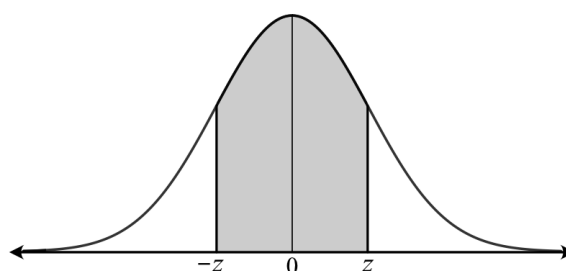
After the 6th deposit, Eva stops making deposits but leaves the money in the savings account. The money in her savings account then earns interest at 2.75% per annum, compounded annually, for a further four years.

Find the amount of money in Eva's savings account at the end of ten years.

39 A random variable is normally distributed with mean 0 and standard deviation 1. The table gives the probability that this random variable lies between $-z$ and z for different values of z.

z	Probability
0.00	0.0000
0.25	0.1974
0.50	0.3829
0.75	0.5467
1.00	0.6827
1.25	0.7887
1.50	0.8664
1.75	0.9199
2.00	0.9545

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

(a) Using the table, determine the probability that this random variable will lie between $z = -0.75$ and $z = 1.5$. **2**

(b) The arm span (in metres) for a group of 1800 residents of a town are normally distributed with a mean of 1.63 metres and a standard deviation of 0.26 metres. **2**

By first calculating the z-score, use the table above to determine how many of the residents will have an arm span greater than 1.5 metres.

Ascham School

July 2023
TRIAL EXAMINATION

Mathematics Standard 2

Writing time   2 hours 30 minutes
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Total Marks   100

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- Diagrams must be drawn using pencil.
- A NESA-approved calculator may be used.
- All relevant working should be shown for each question.

Additional materials needed

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- Multiple-Choice Answer Sheet

Structure & Suggested Time Spent

- **Section I** (Multiple Choice) **15 Marks**
  Attempt all questions.
  Allow about 25 minutes.

- **Section II** (Extended Response) **85 Marks**
  Attempt all questions.
  Answer in the space provided.
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Section I	Section II		
Q1 - 15	Q16 - 28	Q29 – 39	TOTAL
15	43	42	100

Section I

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

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

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

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

A ◯   B ●   C ◯   D ◯

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

A ●   B ✖   C ◯   D ◯

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

correct

A ✖   B ✖   C ◯   D ◯

1   Which of these numbers has been written correct to three significant figures?

(A)   0.025

(B)   2.050

(C) 2.05×10^4

(D)   250 003

2   Phoebe invested $12 000 at a simple interest rate of 7% per annum.

Calculate the future value of Phoebe's investment after 8 years.

(A) $6720

(B) $13 440

(C) $18 720

(D) $20 618

$I = Prn$
$= 12000 \times 0.07 \times 8$
$= \$6720$

$FV = P + I$
$= 12000 + 6720$
$= \$18720$

3   If m has the value of -3, what is the value of $m - m^2$?

(A) -36

(B) -12

(C) 0

(D) 6

$m - m^2 = -3 - (-3)^2$
$= -3 - 9$
$= -12$

4 The table provides details of a data set.

Minimum value	35
Lower quartile	50
Interquartile range	70
Range	95
Median	65

Which of these five-number summaries could represent this data?

(A)   35 50 65 70 75

(B)   35 50 65 70 130

(C)   35 50 65 120 95

(D)   35 50 65 120 130

$IQR = Q_3 - Q_1$
$70 = Q_3 - 50$
$\therefore Q_3 = 120$

$Range = max. value - min value$
$95 = max. value - 35$
$\therefore max value = 130$

five-number summary : min. value, Q1, median, Q3, max. value

5 In triangle *ABC*, what is the length of side *AC*, correct to one decimal place?

A   58°   B

NOT TO SCALE

9 cm

76°

C
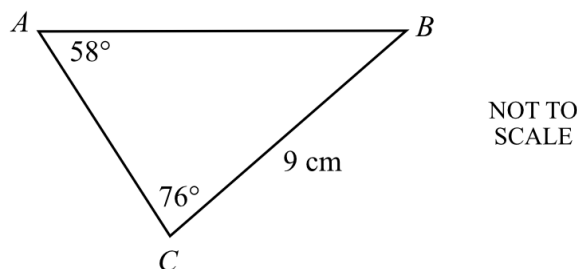
(A)   6.7 cm

(B)   7.6 cm

(C)   7.9 cm

(D)   10.3 cm

$\angle ABC = 180° - 58° - 76°$
$= 46°$

$\dfrac{AC}{\sin 46} = \dfrac{9}{\sin 58}$

$AC = \dfrac{9 \sin 46}{\sin 58}$

$= 7.634...$
$= 7.6$ cm (1dp)

5

6 Which of the following correctly expresses a as the subject of $A = \dfrac{h}{2}(a+b)$?
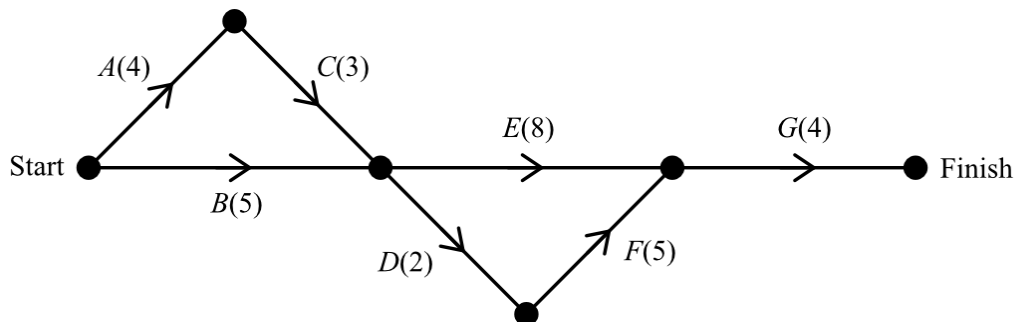
(A) $a = \dfrac{Ah}{2} - b$

(B) $a = \dfrac{\frac{1}{2}A - bh}{h}$

(C) $a = \dfrac{2A + bh}{h}$

(D) $a = \dfrac{2A - bh}{h}$

Handwritten working:

$A = \dfrac{h}{2}(a+b)$

$2A = h(a+b)$

$2A = ha + hb$

$2A - hb = ha$

$a = \dfrac{2A - hb}{h}$

7 The diagram shows the tasks A to G that must be completed in a project. Also shown are the durations of each task in days.

What is the minimum number of days required to complete the project?

(A) 16

(B) 17

(C) 19

(D) 31

Handwritten working:

$ACEG : 4+3+8+4 = 19$ ← maximum time from start to finish

$ACDFG = 4+3+2+5+4 = 18$

$BEG = 5+8+4 = 17$

$BDFG = 5+2+5+4 = 16$

8   A bag of 12 apples is being sold for $4.59.

The average weight of an apple in the bag is 75 grams.

What is the price of the apples when expressed as a rate in dollars per kilogram?

(A) $3.83/kg

(B) $5.10/kg

(C) $6.12/kg

(D) $7.34/kg

Handwritten working:

Total weight of bag of apples $= 75 \times 12$

$= 900g$

$= 0.9 \, kg$

Price as rate $= \$4.59$ for $0.9 \, kg$

$\div 0.9 \quad \div 0.9$

$= \$5.10$ for $1 \, kg$

$= \$5.10/kg$

9   At a restaurant, a bill was issued to a customer with the items purchased shown.

Entrée:	$18.00
Main meal:	
Dessert:	$12.00
GST (10%):	
Total:	**$79.20**

Two of the costs are missing from the bill, the main meal and the GST (which is added to the cost of the three items).

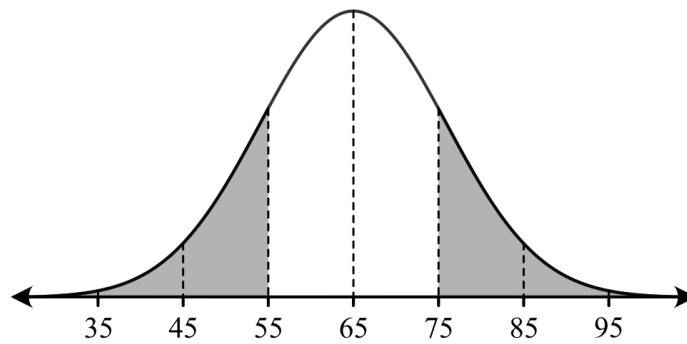What was the cost of the main meal?

(A) $38.00

(B) $41.00

(C) $41.30

(D) $42.00

Handwritten working:

Cost before GST $= \$79.20 \div 1.1$

$= \$72$

Cost of main meal $= 72 - 18 - 12$

$= \$42$

10 The normal distribution below has a mean of 65 and a standard deviation of 10.

What percentage of results lie in the shaded region?

(A) 16%

$100\% - 68\% = 32\%$

(B) 32%

(C) 34%

(D) 68%

11 A town's current population of 15 480 is expected to grow steadily at an annual rate of 12%. The predicted population after 10 years is approximately

(A) 48 079

$r = 12\% = 0.12$

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

(B) 34 056

$= 15480\,(1+0.12)^{10}$

(C) 18 576

$= 15480 \times 1.12^{10}$

$= 48078.53\ldots$

(D) 17 338

≈ 48079

12 The table represents carbon emissions from sectors of an economy and a further breakdown of emissions within the transport sector.
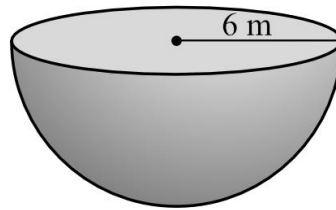
Carbon emissions from sectors of the economy

Sector	Percentage
Agriculture	2
Commercial	10
Industry	38
Mining	5
Transport	26
Residential	19

Carbon emissions from within the Transport sector

Transport	Percentage
Rail	5
Air	12
Water	6
Trucks/buses	19
Cars	58

What percentage of the total carbon emissions in the economy are produced by cars?

(A)   14.8

(B)   15.1

(C)   32

(D)   84

% emissions from cars in overall economy $= 58\%$ of 26%

$= 0.58 \times 0.26$

$= 0.1508$

$\approx 15.1\%$

13 The hemisphere below has a radius of 6 metres.

6 m

What is the volume of this hemisphere, correct to one decimal place?

(A)   339.3 m³
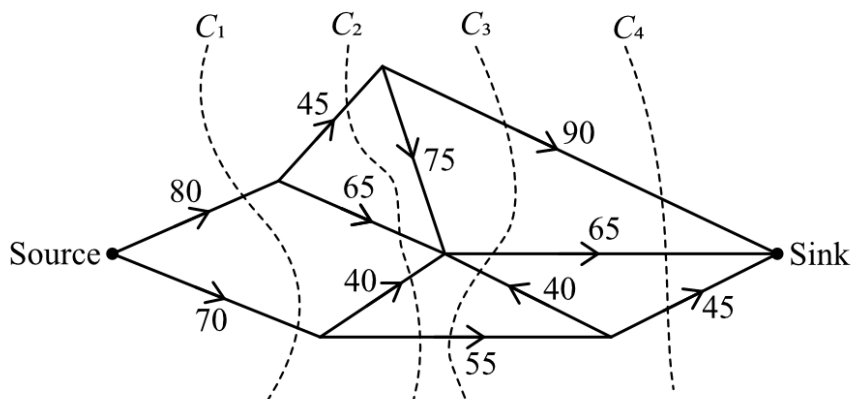
(B)   452.4 m³

(C)   678.6 m³

(D)   904.8 m³

$$V = \tfrac{1}{2} \times \tfrac{4}{3}\pi r^3$$

$$= \tfrac{1}{2} \times \tfrac{4}{3} \times \pi \times 6^3$$

$$= 452.389...$$

$$= 452.4 \text{ m}^3 \text{ (1dp)}$$

14 Which cut $(C_1, C_2, C_3 \text{ or } C_4)$ could be used to determine the maximum flow from the source to the sink in this network?

C_1 C_2 C_3 C_4

45
90
75
80   65
65
Source   Sink
40   40
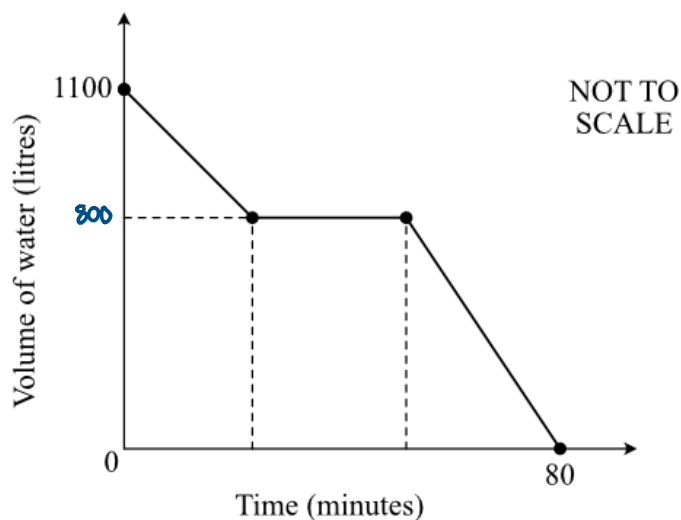70   45
55

(A) C_1 $= 80 + 70 = 150$ (minimum cut = maximum flow)

(B) C_2 $= 45 + 65 + 40 + 55 = 205$

(C) C_3 $= 90 + 65 + 55 = 210$ (40 goes in wrong direction)

(D) C_4 $= 90 + 65 + 45 = 200$

10

15 The graph below shows the volume of water, in litres, as it drains from a tank over a period of time, in minutes.

The 1100 litre tank took 80 minutes to empty.

The volume of water in the tank initially decreased by 300 litres in 20 minutes.

It then did not change for a period of time.

Finally, the volume of water in the tank decreased at a rate of 32 litres per minute.

The period of time, in minutes, for which the volume of water in the tank did not change is

(A)   20

(B)   25

(C)   35

(D)   55

Find volume, V, when time, t = 20 mins

$$V = 1100 - 300$$
$$= 800 L$$

$$\text{Time to empty } 800L = \frac{800}{32}$$
$$= 25 \text{ mins}$$

∴ *Period when volume did not change*
$$= 80 - 20 - 25$$
$$= 35 \text{ mins}$$

End of Section I

Section II

85 marks
Attempt all questions.
Allow about 2 hours and 5 minutes for this section.
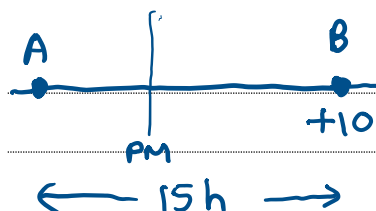Answer each question in the space provided.
Show all relevant working in questions involving calculations.

Marks

16   There is a 15-hour time difference between City *A* and City *B*.
City *B* is 10 hours ahead of Coordinated Universal Time (UTC $+10$).
City *A* is west of City *B*.

(a)   What is the UTC for City *A*?   **1**

A ──●────┼──────●── B

+10

PM

←─ 15h ─→

City A = 10 − 15
UTC = −5 ✓

(b)   A plane leaves city *B* at 10:30 pm on Tuesday and flies non-stop to city *A*.   **2**
The flight takes 20 hours and 24 minutes.
What time and day is it in city *A* when the plane lands?

Time difference = 15 hours

Departure time (city A) = 10:30pm − 15h   ✓ or equivalent
= 7:30am Tuesday

Arrival time (city A) = 7:30am Tuesday + 20h 24min
= 3:54am Wednesday ✓
(½)   (½)

12

17 Solve $x + \dfrac{2x-1}{4} = 3$.   **2**

$$x + \frac{2x-1}{4} = 3$$

$$4 \times x + {}^{4\times}\left(\frac{2x-1}{4}\right) = 3 \times 4 \qquad \text{(multiply both sides by 4)} \quad \overset{\text{each term}}{\uparrow}$$

$$4x + 2x - 1 = 12 \qquad \text{(collect like terms)}$$

$$6x - 1 = 12$$

$$6x - 1 + 1 = 12 + 1 \qquad \text{(add 1 to both sides)}$$

$$6x = 13$$

$$\frac{6x}{6} = \frac{13}{6} \qquad \text{(divide both sides by 6)}$$

$$x = \frac{13}{6} \qquad \text{or} \quad 2\tfrac{1}{6}$$

18 The table shows the types of customer complaints received by an online business in a month.

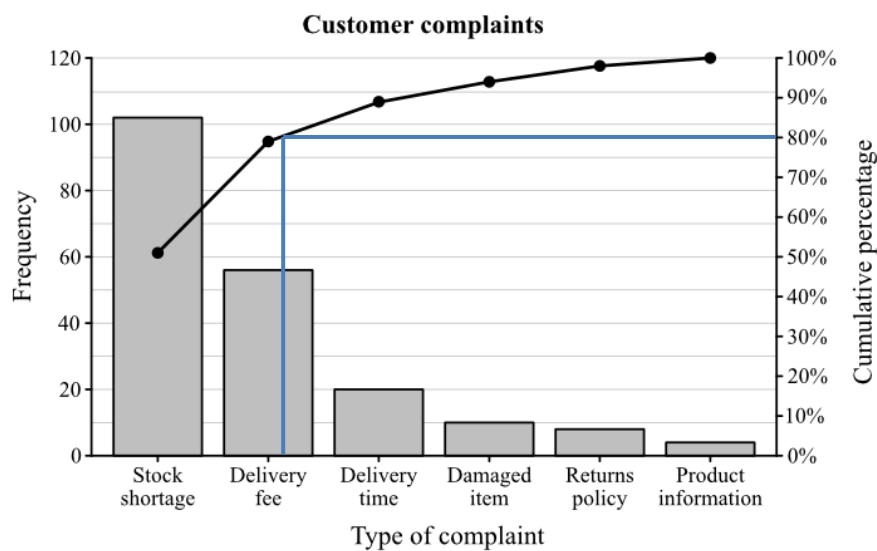| Type of complaint	Frequency	Cumulative frequency	Cumulative percentage
Stock shortage	102	102	51
Delivery fee	56	*A*	79
Delivery time	20	178	89
Damaged item	10	188	*B*
Returns policy	8	196	98
Product information	4	200	100
Total	200		

(a) What are the values of *A* and *B*? **2**

$$A = 102 + 56$$
$$= 158 ✓$$

$$B = \frac{188}{200} \times 100$$
$$= 94 ✓$$

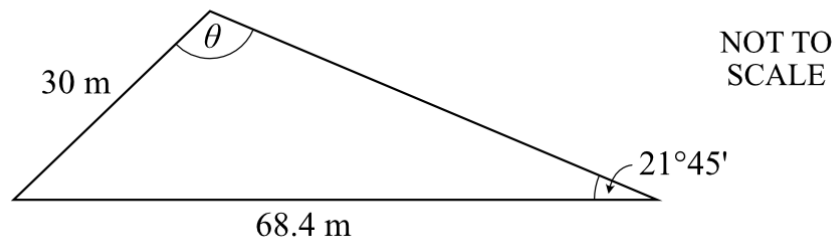(b) The data from the table are shown in the following Pareto chart. **1**

Customer complaints

The manager will address 80% of the complaints.
Which types of complaints will the manager address?

Stock shortage and Delivery Fee
½   ½

14

19   In the following triangle, θ is an obtuse angle.   **3**

30 m

NOT TO
SCALE

21°45'

68.4 m

Find the value of θ, correct to the nearest minute.

$$\frac{\sin \theta}{68.4} = \frac{\sin 21°45'}{30} \qquad \text{(sine rule)}$$

$$\sin \theta = \frac{68.4 \times \sin 21°45'}{30} \checkmark$$
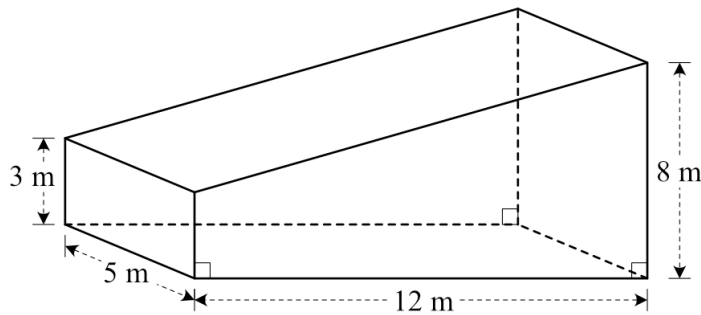
$$= 0.844...$$
$$\theta = \sin^{-1}(0.844...)$$
$$= 57.658...$$
$$= 57°39'29.21'' \checkmark$$
$$= 57°39' \quad \text{(nearest minute)}$$

since θ is obtuse
$$\theta = 180° - 57°39' \checkmark$$
$$= 122°21' \quad \text{(nearest minute)}$$

Find the total surface area of the trapezoidal prism in m^2.

3 m

8 m

NOT TO
SCALE

5 m

12 m

Trapezoidal face

$A = \frac{h}{2}(a+b)$

8m

3m

12m

$= \frac{12}{2}(3+8)$

$= 66 \ m^2$

x

8m

3m

12m
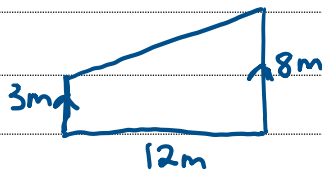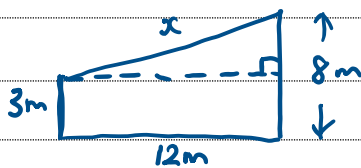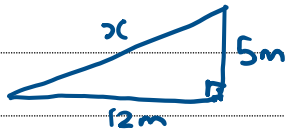
let length of sloping side be x

$x^2 = 5^2 + 12^2$ (Pythagoras)

x

5m

12m

$= 169$

$x = \sqrt{169}$

$= 13m$

$SA = (2 \times 66) + (13 \times 5) + (3 \times 5) + (8 \times 5) + (12 \times 5)$

$= 132 + 65 + 15 + 40 + 60$

$= 312 \ m^2$

21 Frankie plans to invest $25\,000$ for 2 years. She is offered two different investment options.

Option *A*: Interest is paid at 7.2% per annum, compounded monthly.
Option *B*: Interest is paid at r% per annum simple interest.

(a) Calculate the future value of Frankie's investment after 2 years if she chooses Option *A*.   **2**

$$r = 7.2\% \text{ p.a.} \qquad n = 2 \text{ years}$$
$$= 0.6\% \text{ per month} \qquad = 24 \text{ months}$$
$$= 0.006$$

✓ correct formula and values for r and n

$$FV = PV(1+r)^n$$
$$= 25000(1+0.006)^{24}$$
$$= \$28859.68 \quad ✓$$

(b) Find the value of r in Option *B* that would give Frankie the same future value after 2 years as for Option *A*. Give your answer correct to two decimal places.   **2**

interest:
$$I = FV - PV$$
$$= 28859.68 - 25000$$
$$= \$3859.68 \quad ✓$$

$$I = Prn$$
$$3859.68 = 25000 \times r \times 2$$
$$\frac{3859.68}{50000} = r$$
$$r = 0.0771... \quad ✓$$
$$= 7.72\% \text{ p.a. } (2dp)$$

17

22 A school installs 12 new Interactive Classroom Boards that each have a power rating of 220 watts. All the Boards are on for 6 hours a day, for 185 days of the year.
If electricity costs 34 cents per kWh, how much do the Boards cost to run for a year?

$$220\,W = 0.22\,kW \checkmark$$

Energy used per board per year $= 0.22 \times 6 \times 185$
$$= 244.2 \; kWh$$

Energy used by all boards per year $= 12 \times 244.2$
$$= 2930.4 \; kWh \checkmark \text{ or equivalent}$$

Cost to run all boards per year $= 2930.4 \times 0.34$
$$= \$996.34 \checkmark$$

23 A box contains 14 red apples and 6 green apples. Sandra randomly takes an apple from the box and eats in. Harry then randomly takes an apple from the box and eats it.

(a) What is the probability that Sandra takes a red apple from the box and eats it?

1

Total apples = 14 + 6 = 20

$$P(\text{red apple}) = \frac{14}{20} = \frac{7}{10} \quad\checkmark \quad \text{accept either}$$

(b) Complete the probability tree diagram by writing the correct probability on each branch.

2

Sandra   Harry

$\frac{13}{19}$ — Red

$\frac{14}{20}$ — Red

$\frac{6}{19}$ — Green

$\frac{14}{19}$ — Red

$\frac{6}{20}$ — Green

$\frac{5}{19}$ — Green
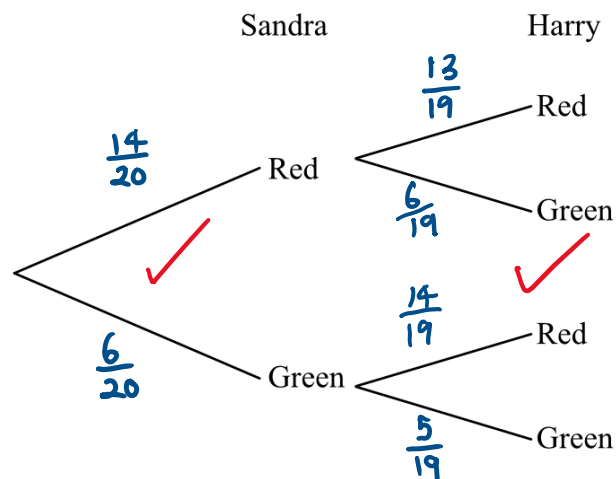
(c) Calculate the probability that Sandra and Harry eat an apple of the same colour.

2

$$P(\text{same colour}) = P(\text{Red, Red}) + P(\text{Green, Green})$$

$$= \left(\frac{14}{20} \times \frac{13}{19}\right) + \left(\frac{6}{20} \times \frac{5}{19}\right) \checkmark$$
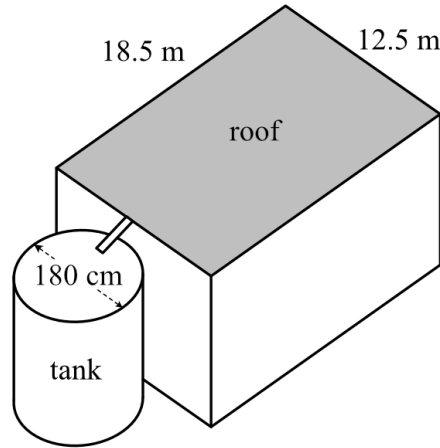
$$= \frac{91}{190} + \frac{3}{38}$$

$$= \frac{53}{95} \checkmark$$

24   During a storm, 15 mm of rain falls onto a rectangular roof with dimensions   **4**
18.5 m × 12.5 m.

The rainfall is collected in a cylindrical tank with a diameter of 180 cm and a
capacity of 3600 litres.

Assuming the tank was empty before the rainfall and that all of the rainfall is
directed into the tank, what is the height of the water in the tank after the rainfall?
Answer correct to the nearest centimetre.

$\text{Area of roof:} \qquad A = 18.5 \times 12.5 \qquad\qquad h = 15\text{ mm}$

$\qquad\qquad\qquad\qquad\quad = 231.25 \text{ m}^2$

$\qquad\qquad\qquad\qquad\quad (\text{or } 2312500 \text{ cm}^2) \qquad = 0.015\text{ m}$

$\text{Volume of water} \qquad V = Ah$
collected

$\qquad\qquad\qquad\qquad\quad = 231.25 \times 0.015$

$\qquad\qquad\qquad\qquad\quad = 3.46875 \text{ m}^3$

$\qquad\qquad\qquad\qquad\quad (\text{or } 3468750 \text{ cm}^3)$

$\text{height of water in tank} \qquad\qquad V = \pi r^2 h \quad \text{m}$

$\qquad\qquad\qquad r = 180 \div 2 \qquad 3.46875 = \pi \times 0.9^2 \times h$

$\qquad\qquad\qquad\quad = 90\text{cm} \qquad\qquad h = \dfrac{3.46875}{\pi \times 0.9^2}$

$\qquad\qquad\qquad\quad = 0.9\text{m}$
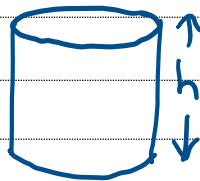
$\qquad\qquad\qquad\qquad\qquad\qquad\qquad = 1.363... \text{ m}$

$\qquad\qquad\qquad\qquad\qquad\qquad\qquad = 136\text{ cm (nearest cm)}$

25 A new car is bought for $36 850. Each year the value of the car is depreciated by the same percentage. **3**

The table shows the value of the car, based on the declining-balance method of depreciation, for the first three years.

End of year	Value
1	$30 954.00
2	$26 001.36
3	$21 841.14

What is the value of the car at the end of 8 years?

Calculate rate of depreciation, r

$$r = \frac{30954 - 26001.36}{30954}$$

$$= 0.16 \checkmark$$

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

$$= 36850(1 - 0.16)^8$$

$$= \$9134.23 \checkmark$$

26 A city's transportation department is studying the correlation between the number of bicycles used from a city bike-share program and the number of kilometres of bike lanes in the city.

The diagram shows the dataset used in the investigation and the least-squares regression line.
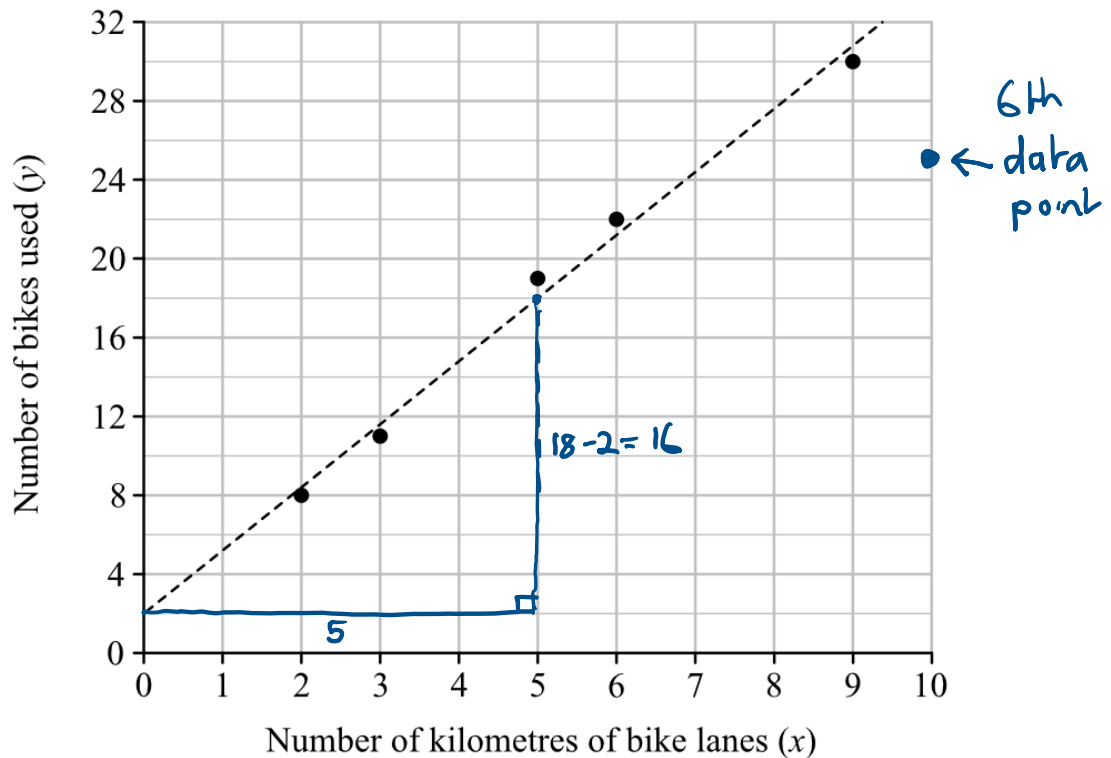
(a) Find the equation of the least-squares regression line relating to the dataset. **2**

y-intercept = 2

gradient = $\frac{\text{rise}}{\text{run}}$

$= \frac{18-2}{5}$

$= 3.2$

$\therefore y = 3.2x + 2$

alternative – enter data into calculator and use STATS to find equation

(b) Suppose a sixth data point was collected for a city which had 10 kilometres **1** of bike lanes. In that city, 25 bikes were used. What would happen to the gradient found in part (a)?

The gradient would decrease

22

In the circle below, with centre O, the area of the quadrant is 100 cm^2.
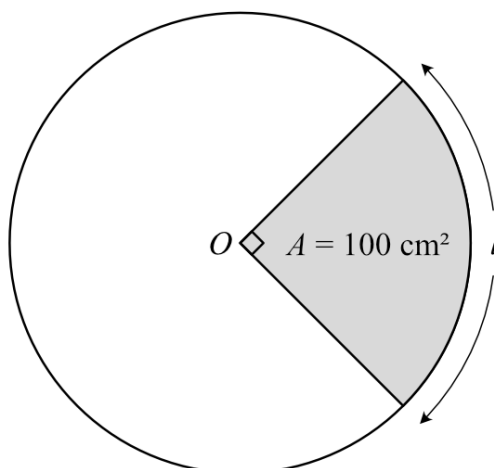
Calculate the length of the arc l, correct to one decimal place.

Area of a sector : $\qquad A = \dfrac{\theta}{360}\, \pi r^2$

$$100 = \dfrac{90}{360} \times \pi \times r^2$$

✓ correct use of both formulas

$$100 = \dfrac{1}{4} \times \pi r^2$$

$$400 = \pi r^2$$

$$r^2 = \dfrac{400}{\pi}$$

$$r = \sqrt{\dfrac{400}{\pi}} \approx 11.28\ldots \text{ cm}$$

Arc length of a sector : $\qquad l = \dfrac{\theta}{360} \times 2\pi r$

$$= \dfrac{1}{4} \times 2 \times \pi \times \sqrt{\dfrac{400}{\pi}}$$

$$= 17.724\ldots$$

$$= 17.7 \text{ cm (1dp)}\ \checkmark$$

28 A female person's blood alcohol content (*BAC*) can be estimated using the formula:

$$BAC = \frac{10N - 7.5H}{5.5M}$$

Where *N* is the number of standard drinks consumed in *H* hours, and *M* is the person's weight in kilograms.

After drinking a number of standard drinks over a period of 4 hours, Maree has a *BAC* of 0.06.

(a) If Maree weighs 60.6 kg, approximately how many standard drinks did she consume during the 4 hours? **2**

$$BAC = \frac{10N - 7.5H}{5.5M}$$

$$0.06 = \frac{10N - 7.5 \times 4}{5.5 \times 60.6} \checkmark$$

$$0.06 = \frac{10N - 30}{333.3}$$

$$19.998 = 10N - 30$$

$$49.998 = 10N$$

$$N = 4.9998$$

$$\approx 5 \text{ standard drinks } \checkmark$$

Question 28 continues on page 25

(b) After a person stops drinking alcohol, the time T, in hours, it takes for their *BAC* to return to zero can be determined using the formula:

$$T = \frac{BAC}{0.015}$$

Maree had reached a *BAC* of zero at 3:00 am on Sunday morning after her drinking the night before.

At approximately what time on Saturday did Maree begin drinking alcohol?
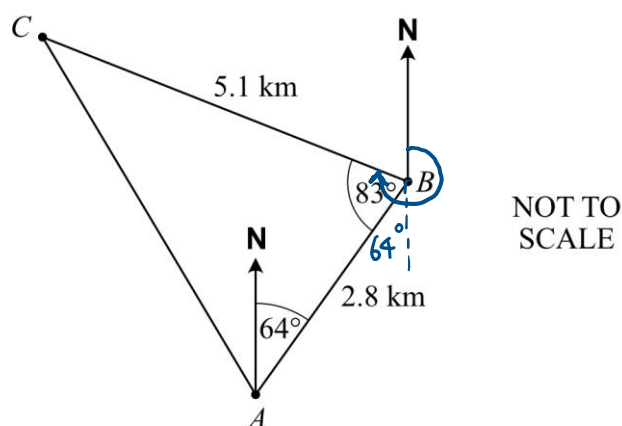
$T = \dfrac{0.06}{0.015}$

$= 4$ hours ✓

time she stopped drinking = 3 am - 4 hours
 = 11 pm on Saturday
time she started drinking = 11 pm - 4 hours
 = 7 pm on Saturday ✓

End of question 28

29 A yacht race follows the triangular course shown in the diagram. The course from *A* to *B* is 2.8 km on a true bearing of 064°. At *B* the course changes direction. The course from *B* to *C* is 5.1 km and $\angle ABC = 83°$.

(a) What is the bearing of *C* from *B*? **1**

$$bearing = 180° + 64° + 83°$$
$$= 327° ✓$$

(b) Use the cosine rule to determine the distance from *C* to *A*. **2**
Give your answer correct to one decimal place.

$$CA^2 = 5.1^2 + 2.8^2 - 2 \times 5.1 \times 2.8 \times \cos 83°$$
$$= 30.369..$$
$$CA = \sqrt{30.369..}$$
$$= 5.5108...$$
$$= 5.5 \text{ km } (1dp) ✓$$

26

30 Charlotte opens a new credit card account on 1 January. She uses it for the first time, on 15th January to buy a pair of shoes. She uses it again on 24th January to buy some new clothes. She makes no further purchases or repayments during the month of January. The details of her purchases are outlined in the credit card statement below.

Credit card statement

Date	Transaction	Amount
15 January	Shoes	$220.00
24 January	Clothing	$415.00

Charlotte's credit card has an interest rate of 16.5% per annum, compounded daily. The card does not have an interest-free period. Interest is calculated to include the day of the transaction and the day on which the account balance is paid.

(a) Calculate the daily interest rate, as a percentage, correct to four decimal places. This value can be used in part (b).   **1**

$$\text{daily rate} = 16.5 \div 365$$
$$= 0.045205...$$
$$= 0.0452 \% \quad (4dp) \checkmark$$

(b) Charlotte intends to pay her account balance in full, including interest, on 5 February. How much will Charlotte pay in total?   **2**
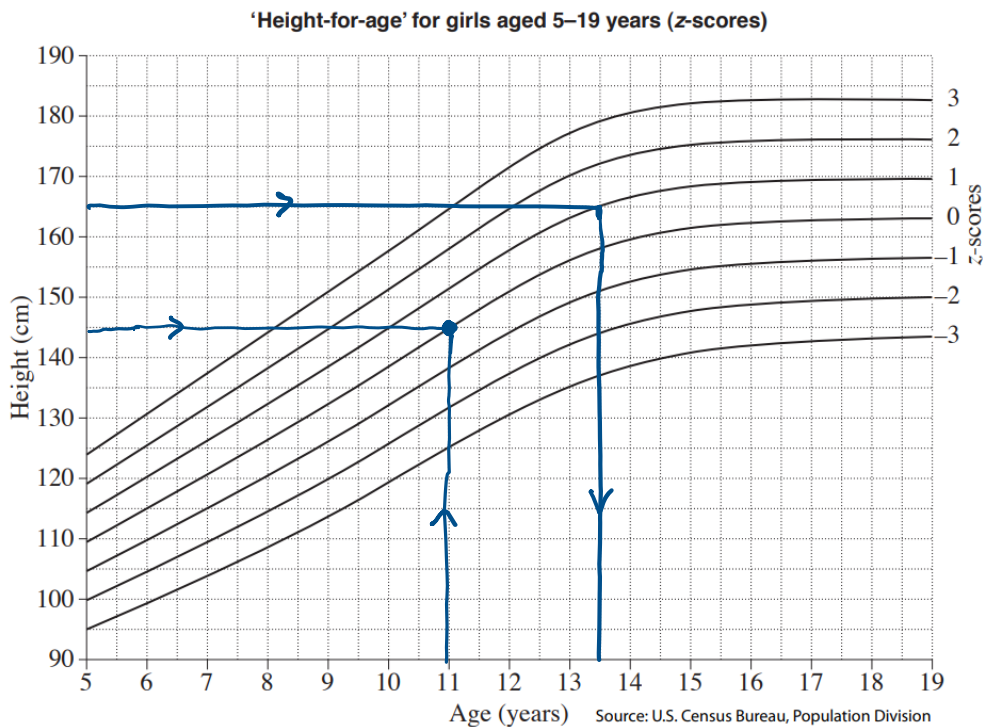
Calculate days accruing interest for each purchase
Shoes purchase : 15th Jan to 5th Feb is 22 days ✓
Clothing purchase : 24th Jan to 5th Feb is 13 days

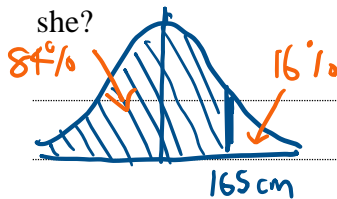$$FV = 220(1 + 0.000452)^{22} + 415(1 + 0.000452)^{13}$$

$$= \$639.64 \checkmark$$

31   The following graph indicates *z*-scores of 'height-for-age' for girls aged 5–19 years.

'Height-for-age' for girls aged 5–19 years (*z*-scores)

Source: U.S. Census Bureau, Population Division

(a)   What is the *z*-score for an 11-year-old girl of height 145 cm?   **1**

$$Z\text{-Score} = 0 \checkmark$$

(b)   Mirabel is 165 cm tall. She is taller than 84% of girls her age. How old is she?   **1**

84%   16%

165 cm

$$50\% + \frac{68\%}{2} = 84\%$$

∴ 165 cm is 1 standard dev above the mean

∴ *z*-score for 165 cm = 1. ✓

∴ Mirabel is 13.5 years old (from graph)

(c)   The interquartile range (IQR) contains the middle 50% of heights. Does Mirabel's height fall within the IQR? Explain your reasoning.   **2**

Mirabel's height does **not** ✓ fall within the IQR as her height is 1 standard deviation above the mean which is greater than 84% of girls her age. To be within the IQR her height would have to be greater than 25% or less than 75% of girls her age. ✓

28

32 A team project requires the completion of eight activities, *A* to *H*.
The directed network diagram shows the activities and their completion time, in hours.

X(2) ✓
8 8
4 5   C(3)
F(3)   11 11
A(4)
0 0
D(6)   G(4)   H(2)
Start   13 13
Finish
B(2)   E(5)
2 2
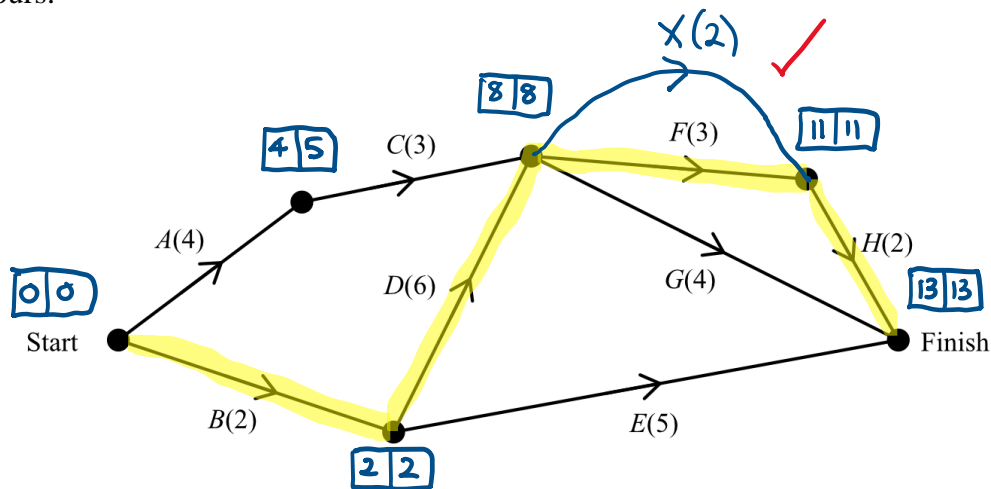
(a) List the immediate prerequisite(s) of activity *G*. **1**

C and D ✓

(b) List the activities which make up the critical path for this project and state **2**
the minimum completion time.

critical path : B - D - F - H ✓
critical time : 13 hours ✓

4 5   C 3   8 8

(c) What is the float time for activity *C*? **2**

float time = 8 - 4 - 3   ✓ for EST, LFT
= 1 hour ✓   working

(d) The team is considering adding an additional activity (*X*) to the project. **1**
It would have a completion time of 2 hours, an earliest start time (EST) of
8 hours and a latest start time (LST) of 9 hours.
Add a directed edge to show activity *X* on the diagram above.

29

33 The table shows income tax rates for the 2022-2023 financial year.

Taxable income	Tax on this income
0 – $18 200	Nil
$18 201 – $45 000	19c for each $1 over $18 200
$45 001 – $120 000	$5092 plus 32.5c for each $1 over $45 000
$120 001 – $180 000	$29 467 plus 37c for each $1 over $120 000
$180 001 and over	$51 667 plus 45c for each $1 over $180 000

Rosa has a gross annual salary of $164 500. She has allowable tax deductions of $5200 for work-related expenses and $660 in union fees.
Rosa must also pay a Medicare Levy of 2% of her taxable income.

Calculate the total tax payable by Rosa including the Medicare Levy.

taxable income = gross income − allowable deductions
= $164500 − $5200 − $660
= $158640   ½

income tax = 29467 + 0.37(158640 − 120000)
= $43763.80   ✓

Medicare levy = 2% of taxable income
= 0.02 × 158640
= $3172.80   ½

Total tax payable = income tax + Medicare levy
= 43763.80 + 3172.80
= $46936.60   ✓

34   Tom builds a model of a fighter aircraft. The model is made to a scale of 1:72.

NOT TO
SCALE
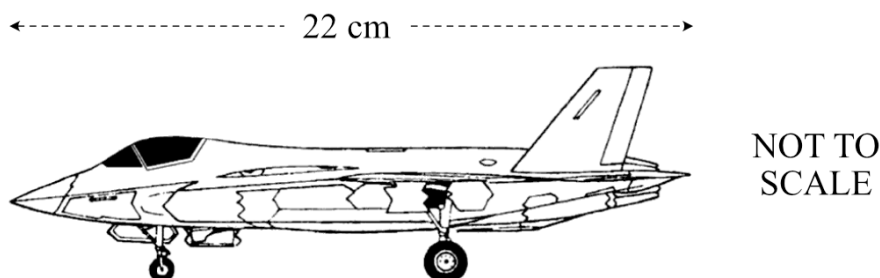
(a)   The length of the model is 22 cm.   **1**
What is the length of the real aircraft in metres?

actual length = 22 × 72
              = 1584 cm   ½
              = 15.84 m   ½

(b)   The real aircraft has a wingspan of 10.7 metres.   **1**
What is the wingspan of the model, correct to the nearest centimetre?

10.7 m = 1070 cm

model wingspan = 1070 ÷ 72
               ≈ 14.861... ½
               = 15 cm ½ (nearest cm)

(c)   The real aircraft can hold 8200 kg of fuel in its fuel tanks when full.   **1**
Assuming the aircraft uses fuel at a constant rate of 40 kg/min, for how
many minutes can the plane fly on a full tank of fuel?

maximum flight time = 8200 ÷ 40
                    = 205 minutes ✓ (or 3h 25 min)

35   A company stocks two different grades of timber.   **5**

Grade *A* sells for $6 per square metre. Grade *B* sells for $2 per square metre.

Harry, a carpenter, purchases 30 m^2 of timber, including some of each grade.
The total cost is $84.

Let x represent the number of square metres of grade *A* timber purchased and
y represent the number of square metres of grade *B* timber purchased.

Using the information above, write down two equations for x and y, then solve
these simultaneous equations graphically on the number plane on the next page. Do
not solve the equations algebraically. From your graph determine how many square
metres of each grade of timber was purchased.

$$x + y = 30 \quad \checkmark$$
$$6x + 2y = 84 \quad \checkmark$$

Graphing $x + y = 30$ Graphing $6x + 2y = 84$

let $x = 0$ ∴ $y = 30$ let $x = 0$: $2y = 84$
∴ point 1: $(0, 30)$ $y = 42$
let $y = 0$ ∴ $x = 30$ ∴ point 1: $(0, 42)$
point 2: $(30, 0)$ let $x = 10$: $6 \times 10 + 2y = 84$
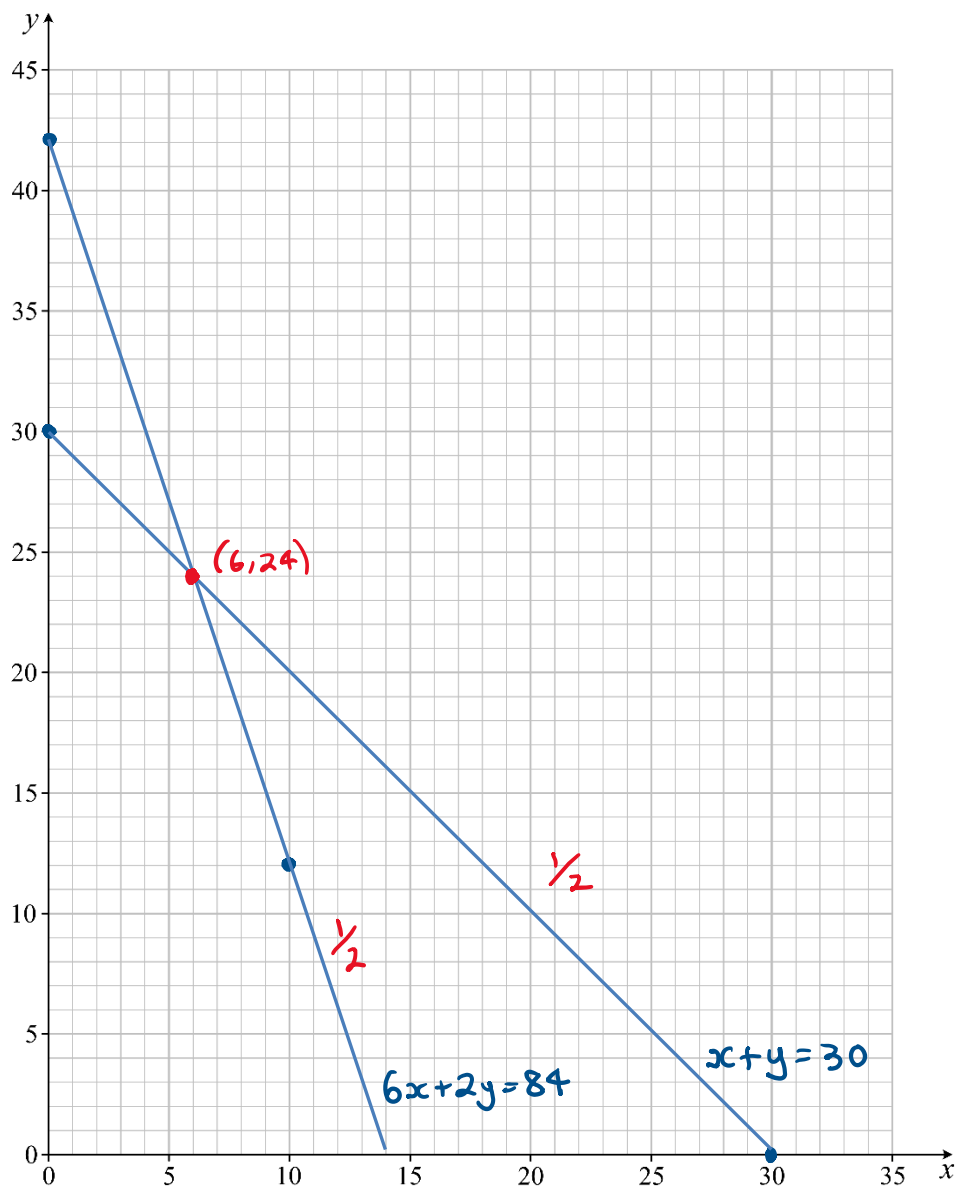 $60 + 2y = 84$
             $2y = 24$
              $y = 12$
       ∴ point 2: $(10, 12)$

Question 35 continues on page 33

32

Number of square metres of grade A = ...6...... ✓

Number of square metres of grade B = ...24...... ✓

End of Question 35

36 Lucas borrows \$300 000 from a bank. The loan is repaid over 25 years at a rate of 7.2% per annum, compounded monthly. The repayments have been set at \$2160 per month.

The interest charged and the balance owing for the first three months of the loan are shown in the spreadsheet below.

Month	Principal (at start of month)	Interest charged	Monthly repayment	Balance (at end of month)
1	\$300 000	\$1800	\$2160	\$299 640
2	\$299 640	*A*	\$2160	\$299 277.84
3	\$299 277.84	\$1795.67	\$2160	*B*

(a) What are the values of *A* and *B*?　　　　　　　　　　　　　　　　　　　**2**

$r = 7.2\%$ p.a.　　　　　　$A = 0.006 \times \$299640$

　$= 0.6\%$ per month　　　　　$= \$1797.84$ ✓

　$= 0.006$　　　　　　$B = \$299\,277.84 + \$1795.67 - \$2160$

　　　　　　　　　　　　$= \$298913.51$ ✓

(b) After 100 months of paying the loan, Lucas decides to make a lump sum payment of \$30 000 and to continue making the monthly repayments of \$2160. The loan will then be fully paid after a further 160 monthly repayments.　　　**3**

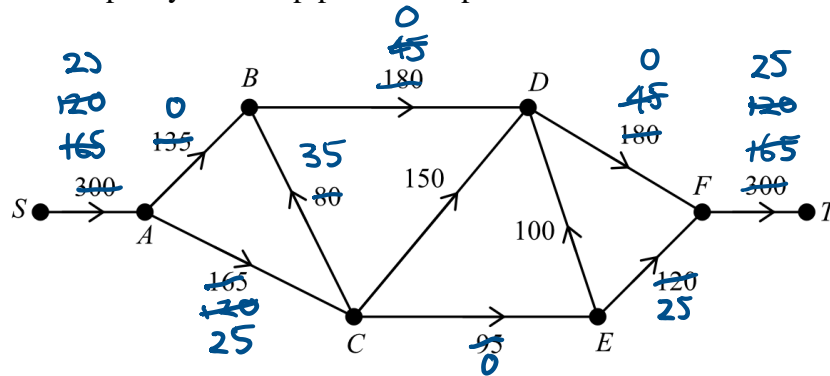How much less will Lucas pay overall by making the lump sum payment?

Total paid without lump sum $= \$2160 \times 25 \times 12$

　　　　　　　　　　　$= \$648000$ ✓

Total paid with lump sum $= \$2160 \times 260 + \$30000$

　　　　　　　　　　$= \$561\,600 + \$30000$

　　　　　　　　　　$= \$591\,600$ ✓

difference $= 648000 - 591600$

　　　　　　$= \$56400$ ✓

∴ Lucas will pay \$56400 less

37 The flow of water through a series of pipes is shown in the network below. The water flows from the source (*S*) to the sink (*T*) and the numbers on the edges show the maximum capacity of each pipe in litres per hour.

(a) In the diagram below, an invalid cut has been marked on the network. Explain why it is invalid.

1

min cut = 180 + 95
= 275
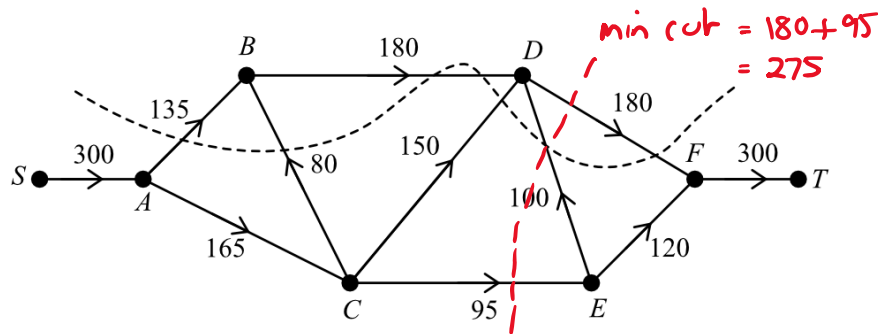
The cut does not separate the source from the sink. ✓

(b) Determine the maximum flow of the network.

2

SBDFT   135   *or equivalent by minimum cut*
SACBDFT 45   ✓ ∴ maximum flow = 275 L/h ✓
SACEFT   95 ✓
         275

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

Table of future value interest factors

Number of periods	Interest rate per period					
	1%	2%	3%	4%	5%	6%
2	2.0100	2.0200	2.0300	2.0400	2.0500	2.0600
4	4.0604	4.1216	4.1836	4.2465	4.3101	4.3746
6	6.1520	6.3081	6.4684	6.6330	6.8019	6.9753
8	8.2857	8.5830	8.8923	9.2142	9.5491	9.8975
10	10.4622	10.9497	11.4639	12.0061	12.5779	13.1808

Eva deposits $5000 into a savings account at the end of each year for 6 years. The interest rate for these 6 years is 4% per annum, compounded annually.

After the 6th deposit, Eva stops making deposits but leaves the money in the savings account. The money in her savings account then earns interest at 2.75% per annum, compounded annually, for a further four years.

Find the amount of money in Eva's savings account at the end of ten years.

Table value for $n = 6$ and $r = 4\%$ is 6.6330 ½

FV after 6th deposit: FV = a × table value

= $5000 × 6.6330

= $33165 ✓

Growth from compound interest: $r = 2.75\%$ p.a. $n = 4$ years

= 0.0275

$FV = PV(1+r)^n$ ½

= 33165 × 1.0275^4

= $36966.41

39 A random variable is normally distributed with mean 0 and standard deviation 1. The table gives the probability that this random variable lies between $-z$ and z for different values of z.

z	Probability
0.00	0.0000
0.25	0.1974
0.50	0.3829
0.75	0.5467
1.00	0.6827
1.25	0.7887
1.50	0.8664
1.75	0.9199
2.00	0.9545
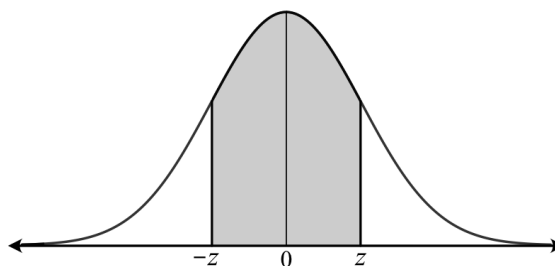
The probability values given in the table for different values of z are represented by the shaded area in the diagram next to the table.

(a) Using the table, determine the probability that this random variable will lie between $z = -0.75$ and $z = 1.5$. **2**

$$P(-0.75 < z < 1.5) = \frac{0.5467}{2} + \frac{0.8664}{2}$$

$$= 0.27335 + 0.4332$$

$$= 0.70655$$

(b) The arm span (in metres) for a group of 1800 residents of a town are normally distributed with a mean of 1.63 metres and a standard deviation of 0.26 metres. **2**

By first calculating the z-score, use the table above to determine how many of the residents will have an arm span greater than 1.5 metres.

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

$$= \frac{1.5 - 1.63}{0.26}$$

$$= -0.5$$

$$P(z > -0.5) = 0.5 + \frac{0.3829}{2}$$

$$= 0.69145$$

number of residents $= 0.69145 \times 1800$

$$= 1244.61$$

$$\approx 1245 \text{ residents}$$

37