

Student's Name: _____ Teacher's Code: _____



Saint Ignatius' College, Riverview
Mathematics Assessment Task
2023

Year 12
Mathematics Standard 2
HSC Trial Assessment Task
Date: Thursday 17 th August 2023

General Instructions:

- **Reading time:** 10 minutes
- **Time Allowed:** 2 hours 30 minutes
- Write using black or blue pen.
- Calculators approved by NESA may be used.
- A NESA reference sheet is provided.
- Attempt all questions in the space provided on the paper.
- Write **your name** and **your teacher's code** in the positions indicated.
- Marks may not be awarded for missing or carelessly arranged working.
- Diagrams are not drawn to scale.

Teachers:

- Mr A Chan AZC
- Mr C Wright CDW
- Mr J Myles JMM
- Mrs N Collaros NCG

Section 1 Multiple Choice	15 Marks
Section 2 Extended Response	23 Marks
Section 3 Extended Response	22 Marks
Section 4 Extended Response	20 Marks
Section 5 Extended Response	20 Marks
Total	100 Marks

Section 1

15 Marks

Questions 1 – 15 are multiple choice

Select the best response and shade your answer on the corresponding answer sheet provided.

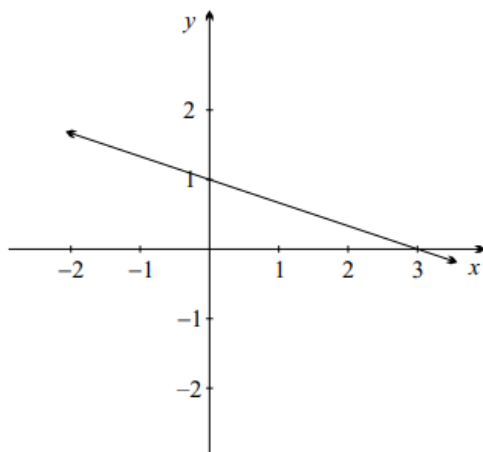
Question 1

Alex, Ben and Cody invested \$30 000, \$25 000 and \$15 000 respectively in a new business. At the end of the first year the business made a total profit of \$42 000. The profit was divided in the same ratio as the amounts they had invested. How much profit did Alex receive?

- A. \$3000
- B. \$14 000
- C. \$18 000
- D. \$30 000

Question 2

What is the equation of the line shown?



- A. $y = 3x + 1$
- B. $y = -3x + 1$
- C. $y = \frac{1}{3}x + 1$
- D. $y = -\frac{1}{3}x + 1$

Question 3

Danny's truck has a fuel consumption of 8.5 L/100 km. How much will it cost him to travel 350 km if the price of fuel is 120.4 cents per litre? (correct to 2 decimal places)

- A. \$38.52
- B. \$40.15
- C. \$42.80
- D. \$35.82

Question 4

City A has coordinates (50°N, 15°W). City B is 10° South and 40° East of City A.

What are the coordinates of City B?

- A. (10°S, 15°W)
- B. (40°N, 15°W)
- C. (40°N, 25°E)
- D. (40°S, 55°E)

Question 5

The power consumption of a microwave in standby mode is 60 W. If electricity is charged at 26.675 c/kWh, what is the cost of leaving the microwave continuously in standby mode for one year correct to 2 decimal places?

- A. \$14.02
- B. \$5.84
- C. \$100.42
- D. \$140.20

Question 6

A set of assessment results is normally distributed. A mark of 15 has a z-score of -1 and a mark of 27 has a z-score of +2.

What is the mean of the scores?

- A. 16
- B. 19
- C. 21
- D. 25

Question 7

The map below shows seven countries within Central America.



A network diagram is drawn with seven vertices to represent each of the countries, and edges are drawn to represent a border shared between two countries. How many edges will this network diagram have?

- A. 5
- B. 6
- C. 7
- D. 8

Question 8

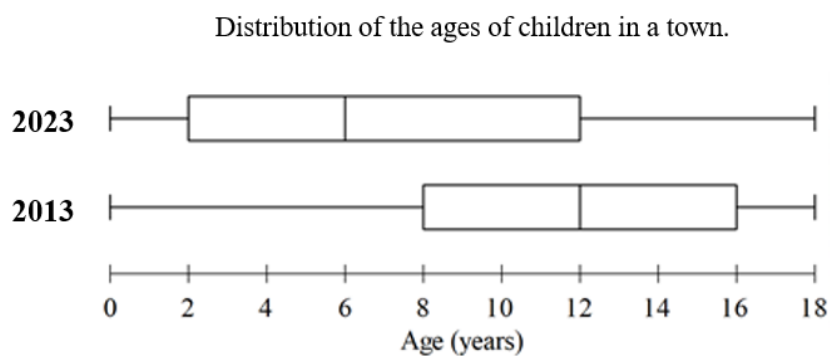
Fred takes out a loan of \$540 over 2 years to buy a washing machine. He will repay the loan in equal monthly repayments. The simple interest rate is 12% p.a.

What is Fred's monthly repayment?

- A. \$27.90
- B. \$55.80
- C. \$26.10
- D. \$25.20

Question 9

The box plot shows the distribution of the ages of children in a town in 2013 and 2023.



In 2013 there were 2700 children aged 0-18 years.

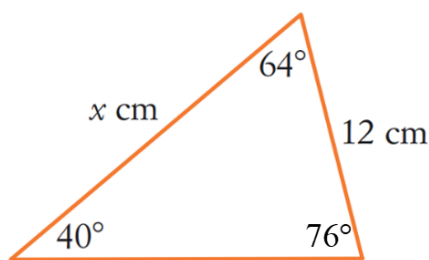
The number of children aged 12-18 is the same in both 2013 and 2023.

How many children ages 0 – 18 years are there in 2023?

- A. 1350
- B. 2700
- C. 4200
- D. 5400

Question 10

Calculate the value of x correct to 2 decimal places.



A. 16.78

B. 18.11

C. 19.34

D. 20.77

Question 11

Scientists are investigating the relationship between the gestation (in days) of various animals and their brain weight at birth. A sample of the data collected is shown below.

Gestation (days)	31	218	60	128	123	128	151	150
Brain (g)	9.6	219	53	45	76	40	106	125

What is Pearson's correlation coefficient (r) correct to three decimal places?

A. $r = 0.785$

B. $r = 0.804$

C. $r = 0.867$

D. $r = 0.912$

Question 12

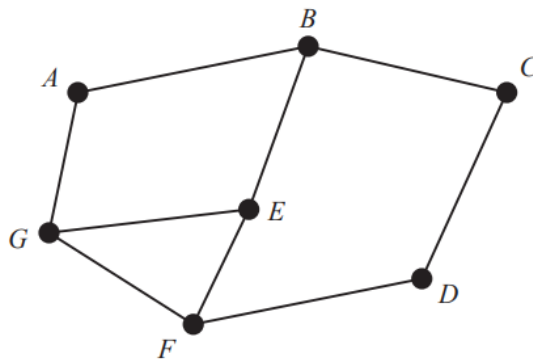
Scott stops drinking alcohol with friends at 6pm and has a Blood Alcohol Content (BAC) of 0.08. Scott's BAC reduces at a rate of 0.015 per hour and he must have a BAC of zero before being able to drive home.

The time that Scott can drive again is

- A. 11.33pm
- B. 11.20pm
- C. 9.54pm
- D. 9.20pm

Question 13

Which of the following is **NOT** a circuit for the network diagram shown?



- A. EFGE
- B. ABEGA
- C. GEFGABEG
- D. ABCDFEGA

Question 14

The table below gives the present value (in dollars) of an annuity with a contribution of \$1 per period.

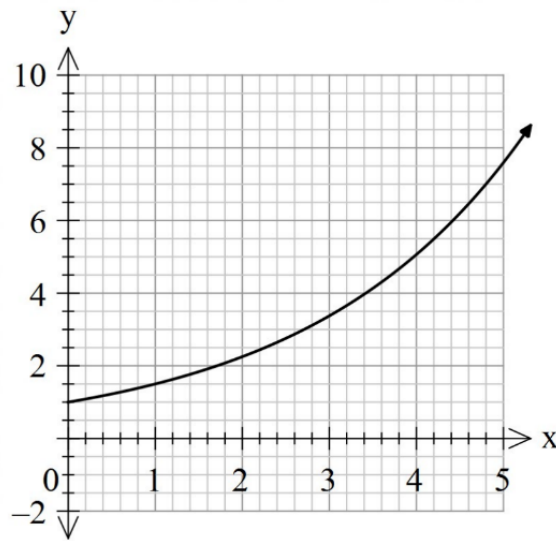
Period	Interest rate per period								
	1%	2%	3%	4%	5%	6%	8%	10%	12%
1	0.9901	0.9804	0.9709	0.9615	0.9524	0.9434	0.9259	0.9091	0.8929
2	1.9704	1.9416	1.9135	1.8861	1.8594	1.8334	1.7833	1.7355	1.6901
3	2.9410	2.8839	2.8286	2.7751	2.7232	2.6730	2.5771	2.4869	2.4018
4	3.9020	3.8077	3.7171	3.6299	3.5460	3.4651	3.3121	3.1699	3.0373
5	4.8534	4.7135	4.5797	4.4518	4.3295	4.2124	3.9927	3.7908	3.6048
6	5.7955	5.6014	5.4172	5.2421	5.0757	4.9173	4.6229	4.3553	4.1114
7	6.7282	6.4720	6.2303	6.0021	5.7864	5.5824	5.2064	4.8684	4.5638
8	7.6517	7.3255	7.0197	6.7327	6.4632	6.2098	5.7466	5.3349	4.9676
9	8.5660	8.1622	7.7861	7.4353	7.1078	6.8017	6.2469	5.7590	5.3282
10	9.4713	8.9826	8.5302	8.1109	7.7217	7.3601	6.7101	6.1446	5.6502

Kevin borrows \$4500 at 12% p.a. repayable quarterly over 2 years. How much (to the nearest cent) will he repay per quarter?

- A. \$1210.62
- B. \$704.25
- C. \$641.05
- D. \$905.87

Question 15

The graph of $y = a^x$ is shown below, where $a > 1$.



Which would be the closest to the value of $0.25(a^{4.8})$?

- A. 1.75
- B. 3.5
- C. 4.5
- D. 7

END OF SECTION 1

BLANK PAGE

BLANK PAGE

BLANK PAGE

Student's Name: _____

Teacher's Code: _____

Section 2 (23 marks)

QUESTION 16 (4 marks)

a) Solve $3x + 8 = 2(x - 10)$

1

.....

.....

.....

.....

.....

b) The volume (V) of a sphere is found using the formula $V = \frac{4}{3}\pi r^3$ where r is the radius in cm.

Find the volume of a sphere with a radius 8 cm, correct to 2 decimal places.

1

.....

.....

.....

.....

c) Make h the subject of the formula

2

$$e = 3f + \frac{g}{h}$$

.....

.....

.....

.....

.....

.....

.....

.....

QUESTION 17 (2 marks)

The nutrition information for TimTam Chocolate Biscuits Original is shown below.

NUTRITION INFORMATION		
Servings per package: 11		
Serving size: 18.3g (1 biscuit)		
	Quantity per serving	Quantity per 100g
Energy	399kJ	2180kJ
Protein	0.8g	4.5g
Fat, total	4.9g	26.9g
- Saturated fat	2.7g	15.0g
Carbohydrates	11.8g	64.4g



- a) Martin ate 3 TimTams.
Given that 1 calorie (Cal) = 4.184 kJ, calculate how many calories Martin has consumed.
Write your answer correct to the nearest whole calorie. 1

.....

.....

.....

.....

- b) Martin goes swimming later that day and this activity burns 535 calories per hour.
How long must he swim to burn off the calories from the 3 TimTams?
Write your answer to the nearest whole minute. 1

.....

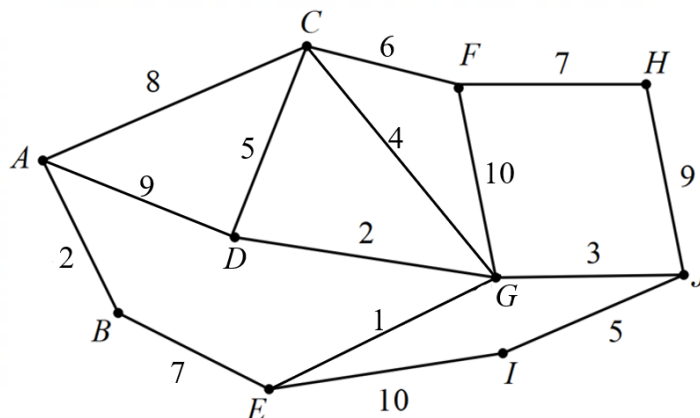
.....

.....

.....

QUESTION 18 (2 marks)

Consider the network diagram below.



- a) What is the degree of Vertex G?

1

.....

- b) What length is the shortest path from A to J?

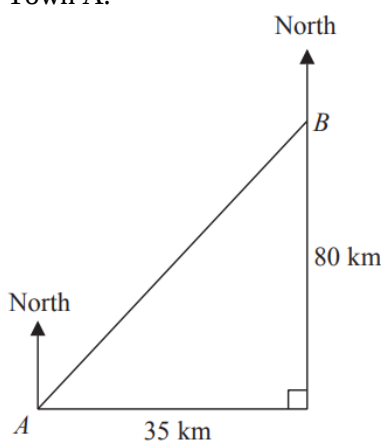
1

.....

.....

QUESTION 19 (2 marks)

Town B is 35 km East and 80 km North of Town A.



Calculate the bearing of Town A from Town B correct to the nearest degree.

2

.....

.....

.....

.....

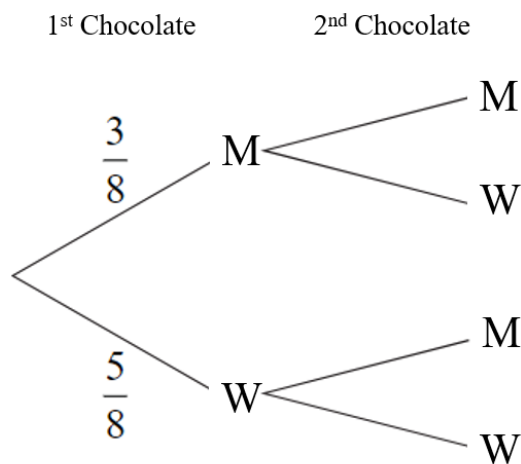
.....

.....

QUESTION 20 (4 marks)

John has a bag containing three milk chocolates (M) and 5 white chocolates (W).

John randomly selects 2 chocolates from the bag to eat. A partially completed probability tree is shown.



a) Complete the tree diagram by writing the correct probability on each branch. 1

b) Calculate the probability that John selects two milk chocolates. Write your answer as a fraction. 1

.....

.....

.....

c) Calculate the probability that John selects at least 1 milk chocolate. Write your answer as a fraction. 2

.....

.....

.....

.....

.....

.....

.....

.....

.....

QUESTION 21 (4 marks)

Ken earns an income of \$88 000 from his job as a journalist. He has a second job which pays \$900 gross income per month.

- a) What is Ken’s total annual taxable income from both jobs, assuming that he has no allowable deductions? **1**

.....

.....

.....

b)

Taxable Income	Tax payable
\$0 to \$18 200	Nil
\$18 201 to \$37 000	19c for each \$1 over \$18 200
\$37 001 to \$90 000	\$3 572 plus 32.5c for each \$1 over \$37 000
\$90 001 to \$180 000	\$20 797 plus 37c for each \$1 over \$90 000
\$180 001 and over	\$54 097 plus 45c for each \$1 over \$180 000

Use the tax table above to calculate the tax payable on Ken’s total income. **1**

.....

.....

.....

.....

- c) Ken pays \$20 147 in tax on his income from the journalist job.
Calculate the monthly net income from Ken’s second job assuming that he has no other deductions. **2**

.....

.....

.....

.....

.....

.....

.....

.....

QUESTION 22 (2 marks)

Sarah purchased shares in Quickcash Limited at a price of \$3.20/share.

The 4% dividend yield amounted to a profit of \$192 for Sarah.

How many shares did Sarah buy? 2

.....

.....

.....

.....

.....

.....

.....

.....

.....

QUESTION 23 (3 marks)

A plane departs Sydney airport [GMT +10] on Tuesday 11th at 5.30pm and flies to Los Angeles [GMT -8].

The flight lasts 16 hours. What is the date and time in Los Angeles when the plane arrives? 3

.....

.....

.....

.....

.....

.....

.....

END OF SECTION 2

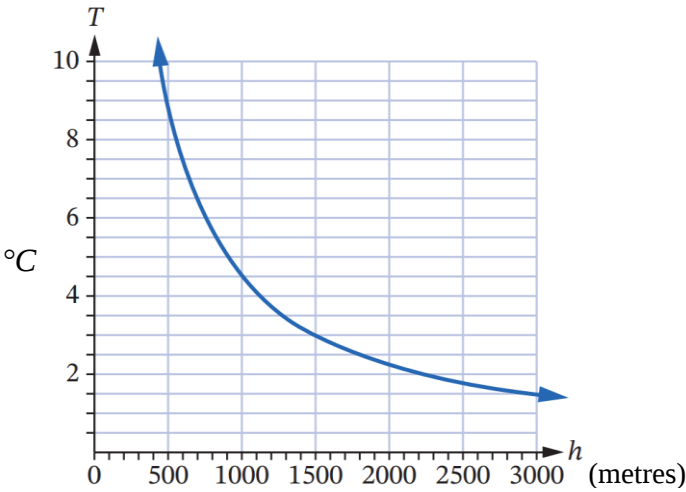
BLANK PAGE

BLANK PAGE

Section 3 (22 marks)

QUESTION 24 (3 marks)

The temperature, T (in degrees Celsius) of the air, varies inversely with the height, h (in metres), above the sea level. This is represented in the graph below.



- a) Use the graph to find the temperature of the air at 1km above sea level. 1

.....

.....

- b) Find the variation equation showing the relationship between T and h . 2

.....

.....

.....

.....

.....

.....

.....

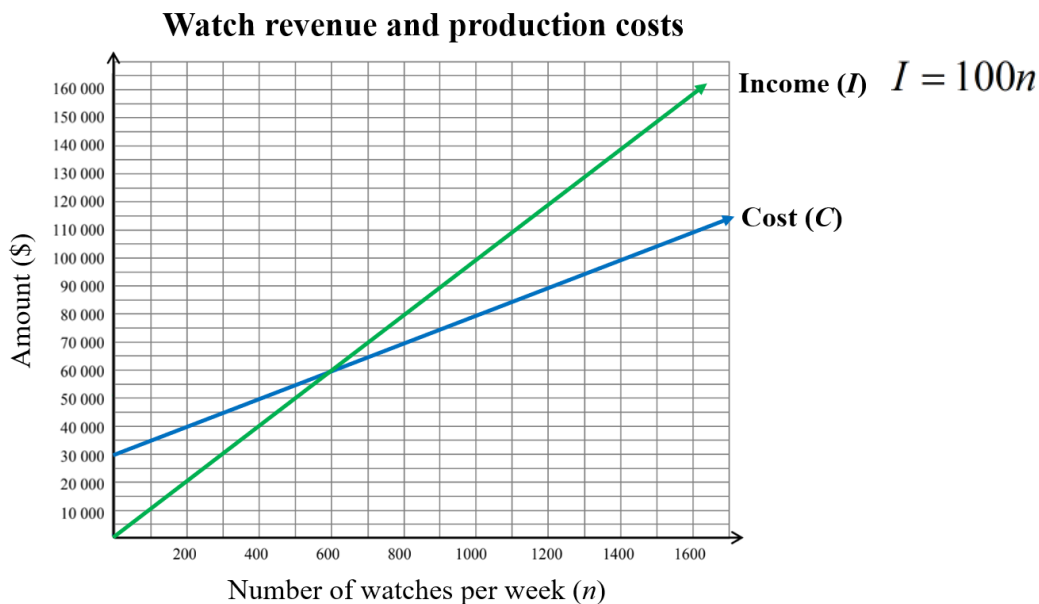
.....

.....

.....

QUESTION 25 (5 marks)

The graph below shows the weekly cost, C , and income from sales, I , for a watch manufacturing company. Watches are sold for \$100 each.



- a) How many watches must be sold for the company to break even?

1

.....

.....

- b) Write the equation for cost, C when n watches are sold.

2

.....

.....

.....

.....

- c) The company expects that their weekly fixed costs will increase by \$4250 next year.

If the selling price remains the same, how many watches will they need to sell in order to break even next year?

2

.....

.....

.....

.....

.....

.....

QUESTION 26 (3 marks)

The table below compares a person's nose length in centimetres with their height in centimetres.

Nose length (cm) (N)	4.3	4.8	5.8	4.5	4.5	4.7	4.3	5.2
Height (cm) (H)	160	151	158	148	164	175	151	173

- a) Pearson's Correlation Co-efficient (r) for this data is 0.236 correct to 3 decimal places.
Use this information to describe the direction and strength of the relationship between nose length and height.

1

.....

.....

.....

.....

- b) Determine the equation of the least squares regression line.
Write all values correct to 3 decimal places.

2

.....

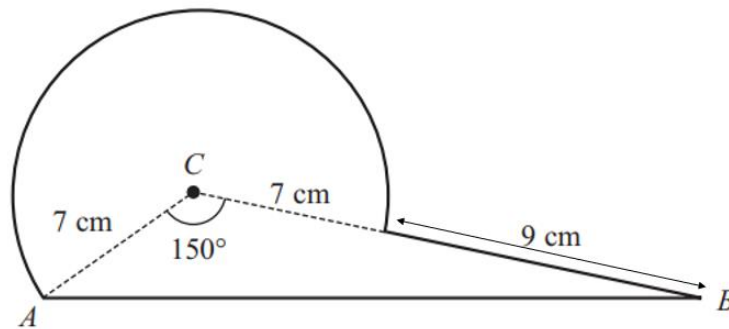
.....

.....

.....

QUESTION 27 (3 marks)

A shape is made from triangle ABC and a sector of a circle with a centre C . The radius CA is 7 cm and $\angle ACB = 150^\circ$ as shown in the diagram.



Calculate the total area of the shape correct to 2 decimal places.

3

.....

.....

.....

.....

.....

.....

.....

.....

.....

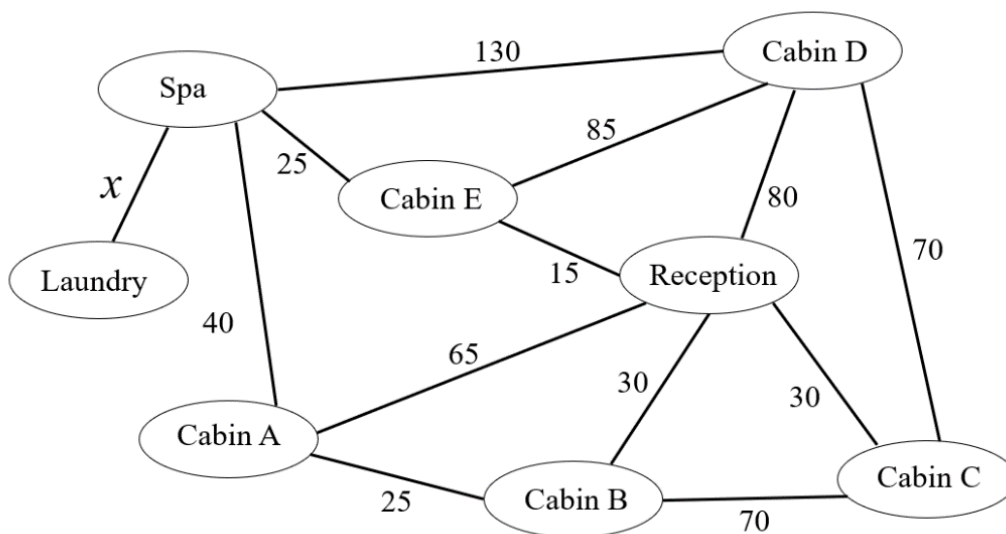
.....

.....

.....

QUESTION 28 (3 marks)

A holiday park is upgrading a speaker system and cables need to be installed so that all buildings are connected. The owner, Jack, draws a network diagram of the park showing all the possible cables which could be installed between buildings. Weights on the edges indicate the length of cable in metres.



- a) Jack finds a minimum spanning tree for the network and calculates that the minimum length of cable he needs for the holiday park is 217m. Hence, find the value of x , the length of cable between the Laundry and Spa.

2

.....

.....

.....

.....

.....

.....

- b) The cable connecting Cabin E to Reception cannot be installed so Jack must use the next shortest option. If it costs \$100 to install each metre of cable, by how much has the total cost now increased?

1

.....

.....

.....

.....

.....

.....

QUESTION 29 (5 marks)

Screws are made in a factory by a machine. The length of the screws is normally distributed with a mean of 4.5 cm and a standard deviation of 0.25 cm.

An extract from the probability table for z-scores is shown below. The values in the table represent the area under the normal curve to the left of the z-score. Row labels show the z-score to one decimal place. Column labels show the second decimal place.

z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
2.0	0.9772	0.9778	0.9783	0.9788	0.9793	0.9798	0.9803	0.9808	0.9812	0.9817
2.1	0.9821	0.9826	0.9830	0.9834	0.9838	0.9842	0.9846	0.9850	0.9854	0.9857
2.2	0.9861	0.9864	0.9868	0.9871	0.9875	0.9878	0.9881	0.9884	0.9887	0.9890
2.3	0.9893	0.9896	0.9898	0.9901	0.9904	0.9906	0.9909	0.9911	0.9913	0.9916
2.4	0.9918	0.9920	0.9922	0.9925	0.9927	0.9929	0.9931	0.9932	0.9934	0.9936
2.5	0.9938	0.9940	0.9941	0.9943	0.9945	0.9946	0.9948	0.9949	0.9951	0.9952
2.6	0.9953	0.9955	0.9956	0.9957	0.9959	0.9960	0.9961	0.9962	0.9963	0.9964
2.7	0.9965	0.9966	0.9967	0.9968	0.9969	0.9970	0.9971	0.9972	0.9973	0.9974
2.8	0.9974	0.9975	0.9976	0.9977	0.9977	0.9978	0.9979	0.9979	0.9980	0.9981
2.9	0.9981	0.9982	0.9982	0.9983	0.9984	0.9984	0.9985	0.9985	0.9986	0.9986
3.0	0.9987	0.9987	0.9987	0.9988	0.9988	0.9989	0.9989	0.9989	0.9990	0.9990
3.1	0.9990	0.9991	0.9991	0.9991	0.9992	0.9992	0.9992	0.9992	0.9993	0.9993
3.2	0.9993	0.9993	0.9994	0.9994	0.9994	0.9994	0.9994	0.9995	0.9995	0.9995

6000 screws are manufactured each hour and any screw that measures less than 3.76 cm or more than 5.24 cm must be discarded.

Using the standardised scores and the probability table provided, find the number of screws that are expected to be discarded in 1 hour?

5

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

END OF SECTION 3

BLANK PAGE

BLANK PAGE

Student's Name: _____ Teacher's Code: _____

Section 4 (20 marks)

QUESTION 30 (3 marks)

- a) Simplify fully $4\frac{1}{2} : 2.7$ 1

.....

.....

.....

- b) A hospital patient requires 750 mL of medication to be delivered through a drip over 5 hours. 2
Each mL of fluid is equivalent to 14 drops.
How many drops per minute need to be delivered?

.....

.....

.....

.....

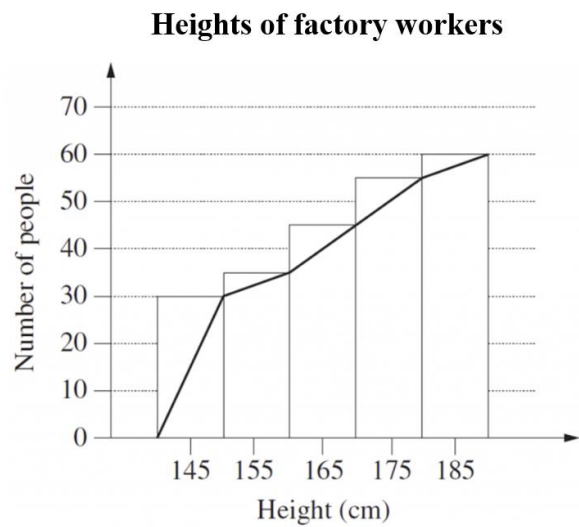
.....

.....

.....

QUESTION 31 (3 marks)

The heights of all staff on a factory floor were recorded. The data was grouped and displayed as a **cumulative frequency** histogram and polygon as shown below.



a) How many staff are on the factory floor? 1

.....

.....

b) Calculate the Interquartile Range. 2

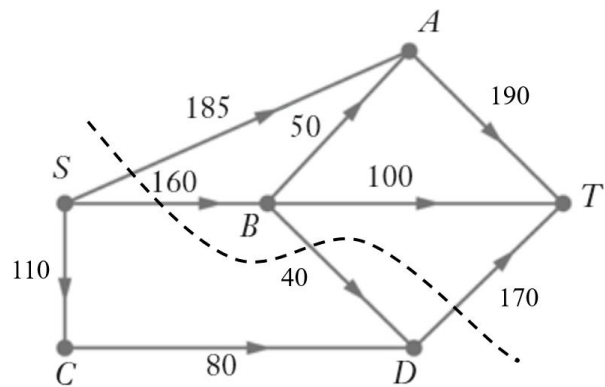
.....

.....

.....

QUESTION 32 (4 marks)

The network diagram shows the flow capacities of traffic (in cars per 10 minutes) along roads between a suburb at *S* and a suburb at *T*.



a) Determine the capacity of the cut shown. 1

.....

.....

b) Find the maximum number of cars that can travel from *S* to *T* in 10 minutes. 2

.....

.....

.....

c) The local council plans to increase the traffic flow between *S* and *T*. There are enough funds to widen only one road. **Which road** should be widened to achieve the largest increase in traffic flow **and by how much** will it increase the flow between *S* and *T* in 10 minutes? 1

.....

.....

.....

.....

.....

.....

QUESTION 33 (4 marks)

A flat roof of a house has an area of 65 m^2 .
Any rainwater that falls on the roof is collected into an **empty** cylindrical tank.
One day there was 15 mm of rainfall on the roof.

- a) Show that the volume of water collected is 0.975 m^3 . 1

.....

.....

.....

.....

- b) State the capacity of the water collected in litres. 1

.....

.....

.....

- c) The tank has a radius of 0.8m. How high up the tank does the collected rainwater reach? 2
Write your answer in metres correct to 2 decimal places.

.....

.....

.....

.....

.....

.....

.....

.....

.....

QUESTION 34 (3 marks)

Justin used his credit card to buy a new camera for \$1700 on 17th April 2023. He made no other purchases with his credit card and there was no interest-free period. Interest was compounded daily at a rate of 18.99% per annum, **including the date of purchase and the date of payment.**

- a) Show that the daily interest rate of Justin's credit card is 0.052% to 3 decimal places. 1

.....

.....

.....

- b) Justin pays the balance of the account in full on 8th May 2023. 2
How much did he pay altogether?

.....

.....

.....

.....

.....

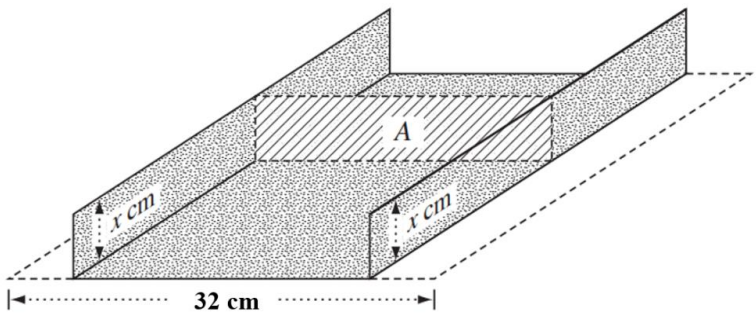
.....

.....

.....

QUESTION 35 (3 marks)

A long rectangular sheet of metal 32 cm wide is to be made into a gutter by turning up sides of equal height x cm, perpendicular to the base as shown in the diagram.



- a) Show that a formula for the cross-sectional area, A , of the gutter is 1

$$A = 32x - 2x^2$$

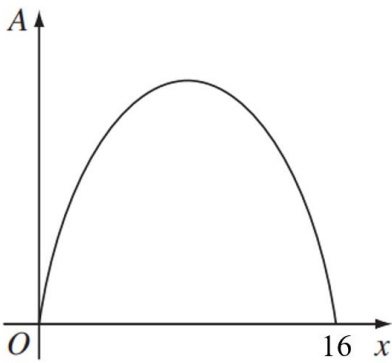
.....

.....

.....

.....

- b) The graph of A against x , for values of x between 0 and 16, is a parabola, as shown.



What is the maximum value of A ? 2

.....

.....

.....

.....

.....

.....

END OF SECTION 4

BLANK PAGE

BLANK PAGE

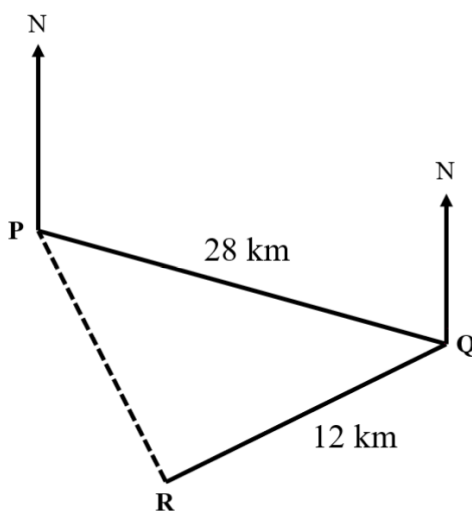
Section 5 (20 marks)

QUESTION 36 (3 marks)

A ship sails from P to Q and then from Q to R.

Q is 28km from P, on a bearing of 115° .

R is 12km from Q on a bearing of 240° .



- a) Show that $\angle PQR = 55^\circ$.

1

.....

.....

.....

.....

- b) Hence, calculate the distance PR correct to 2 decimal places.

2

.....

.....

.....

.....

.....

.....

QUESTION 37 (3 marks)

The table below shows the future value of an annuity with a contribution of \$1.

Future value interest factors (Future value of an annuity with a contribution of \$1 at the end of each period)										
Period	Interest rate per period									
	0.25%	0.50%	0.75%	1.00%	1.50%	2.00%	2.50%	3.00%	4.00%	5.00%
1	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
2	2.0025	2.0050	2.0075	2.0100	2.0150	2.0200	2.0250	2.0300	2.0400	2.0500
3	3.0075	3.0150	3.0226	3.0301	3.0452	3.0604	3.0756	3.0909	3.1216	3.1525
4	4.0150	4.0301	4.0452	4.0604	4.0909	4.1216	4.1525	4.1836	4.2465	4.3101
5	5.0251	5.0503	5.0756	5.1010	5.1523	5.2040	5.2563	5.3091	5.4163	5.5256
6	6.0376	6.0755	6.1136	6.1520	6.2296	6.3081	6.3877	6.4684	6.6330	6.8019
7	7.0527	7.1059	7.1595	7.2135	7.3230	7.4343	7.5474	7.6625	7.8983	8.1420
8	8.0704	8.1414	8.2132	8.2857	8.4328	8.5830	8.7361	8.8923	9.2142	9.5491
9	9.0905	9.1821	9.2748	9.3685	9.5593	9.7546	9.9545	10.1591	10.5828	11.0266
10	10.1133	10.2280	10.3443	10.4622	10.7027	10.9497	11.2034	11.4639	12.0061	12.5779
11	11.1385	11.2792	11.4219	11.5668	11.8633	12.1687	12.4835	12.8078	13.4864	14.2068
12	12.1664	12.3356	12.5076	12.6825	13.0412	13.4121	13.7956	14.1920	15.0258	15.9171

- a) Harry contributes \$5000 into an account at the end of every year for 6 years. The account pays interest at 4% p.a. compounding annually.
Use the table to calculate the future value of Harry's annuity at the end of 6 years.

1

.....

.....

.....

- b) Michael deposits \$2500 into an account at the end of every quarter for 3 years and the interest is compounded quarterly. Use the table to calculate the annual interest rate for the investment if the future value is \$31 269.

2

.....

.....

.....

.....

.....

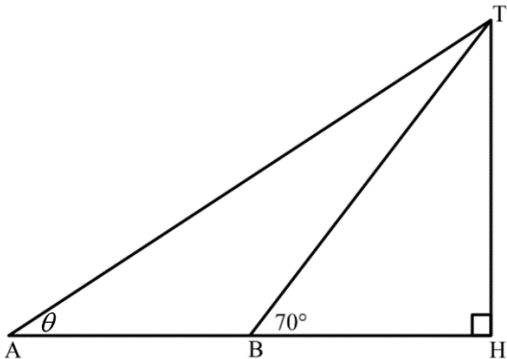
.....

.....

QUESTION 38 (2 marks)

The diagram shows a pole TH standing upright on level ground.
TA and TB are support wires and TA is twice as long as TB.
TB makes an angle of 70° with the ground as shown.
Calculate the angle that wire TA makes with the ground correct to the nearest degree.

2



.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

QUESTION 39 (3 marks)

Max borrowed \$300 000 to purchase an apartment.

The table below shows the repayments for the first 3 months.

P represents the principal, I represents the interest and R represents the monthly repayment.

Month	Principal (P)	Interest (I)	Repayment (R)	Balance at end of month $P + I - R$
1	\$300 000.00	\$1750.00	\$2000	\$299 750.00
2	\$299 750.00	\$1748.54	\$2000	\$299 498.54
3	\$299 498.54	A	\$2000	B

- a) How much of the principal was paid off in the first month?

1

.....

.....

.....

- b) The interest rate is 7% p.a., compounded monthly.
Find the values of A and B correct to the nearest cent.

2

.....

.....

.....

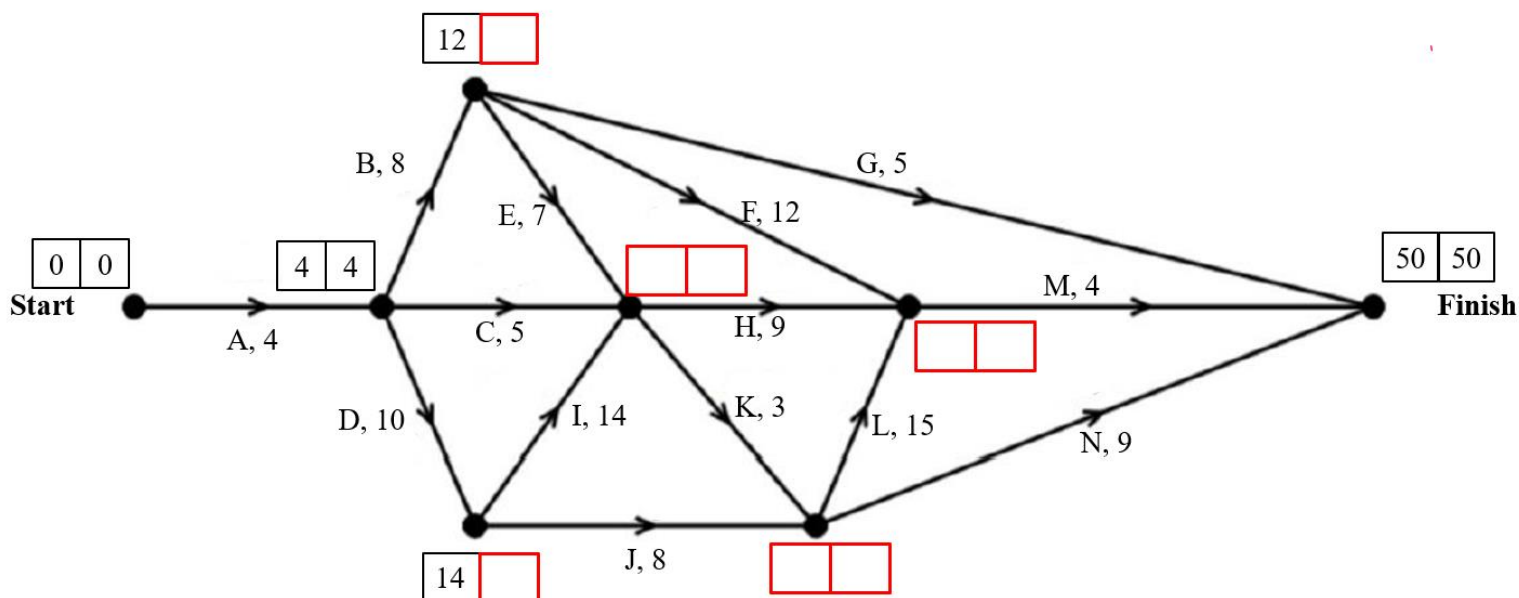
.....

.....

.....

QUESTION 40 (5 marks)

The network below shows the activities and duration in days to construct a garage.



- a) Complete the network to show the Earliest Start Time (EST) and Latest Start Time (LST) for each activity.

2

- b) What is the critical path?

1

.....

.....

- c) What is the float time of activity G?

1

.....

.....

- d) Activity C had a delay due to an issue with ordering materials which caused the whole project to be delayed by 1 day. Assuming there are no further delays in any other activities, by how many days was activity C delayed?

1

.....

.....

.....

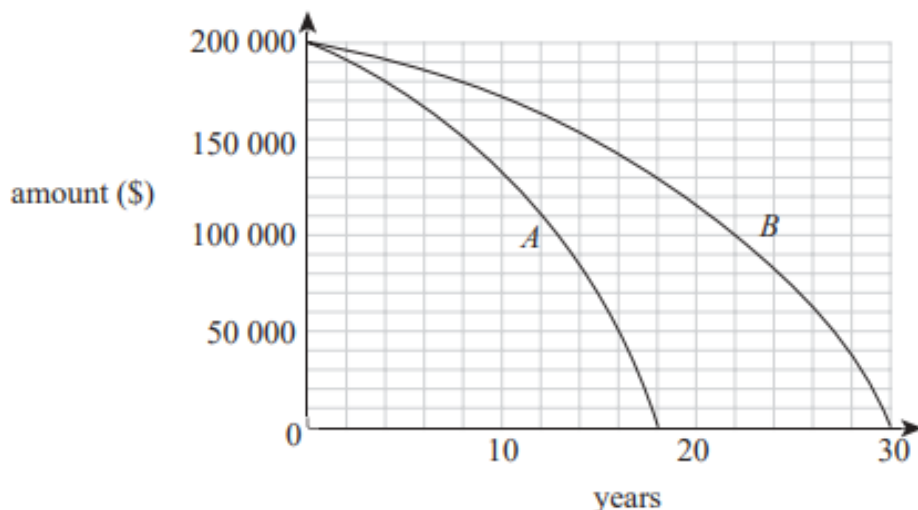
.....

.....

QUESTION 41 (4 marks)

Xavier is borrowing \$200 000 at an agreed reducible interest rate with the bank. The bank has given him two different monthly repayment options to consider.

The graph below shows the amount owing at the end of each year on both loan repayment options; Option A and Option B.



- a) How many years would it take Xavier to pay off his loan if he selected Option A? 1

.....

.....

- b) If he selected Option B, after how many years would the amount owing be half the amount borrowed? 1

.....

.....

- c) The monthly repayments for Option A are \$1450. If Xavier selected Option A, how much interest would he have paid on the loan after 12 years of repayments? 2

.....

.....

.....

.....

.....

.....

.....

.....

END OF SECTION 5

BLANK PAGE

BLANK PAGE

Student's Name: _____ Teacher's Code: _____



Suggested
solutions

Saint Ignatius' College, Riverview
Mathematics Assessment Task
2023

Year 12
Mathematics Standard 2
HSC Trial Assessment Task
Date: Thursday 17 th August 2023

General Instructions:

- **Reading time:** 10 minutes
- **Time Allowed:** 2 hours 30 minutes
- Write using black or blue pen.
- Calculators approved by NESA may be used.
- A NESA reference sheet is provided.
- Attempt all questions in the space provided on the paper.
- Write **your name** and **your teacher's code** in the positions indicated.
- Marks may not be awarded for missing or carelessly arranged working.
- Diagrams are not drawn to scale.

Teachers:

- Mr A Chan AZC
- Mr C Wright CDW
- Mr J Myles JMM
- Mrs N Collaros NCG

Section 1 Multiple Choice	15 Marks
Section 2 Extended Response	23 Marks
Section 3 Extended Response	22 Marks
Section 4 Extended Response	20 Marks
Section 5 Extended Response	20 Marks
Total	100 Marks

Section 1

15 Marks

Questions 1 – 15 are multiple choice

Select the best response and shade your answer on the corresponding answer sheet provided.

Question 1

Alex, Ben and Cody invested \$30 000, \$25 000 and \$15 000 respectively in a new business. At the end of the first year the business made a total profit of \$42 000. The profit was divided in the same ratio as the amounts they had invested. How much profit did Alex receive?

A. \$3000

B. \$14 000

C. \$18 000

D. \$30 000

$$30 : 25 : 15$$

$$6 : 5 : 3$$

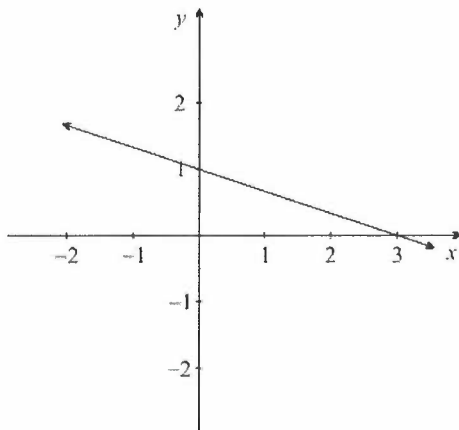
$$6 + 5 + 3 = 14$$

$$42000 \div 14 = 3000$$

$$3000 \times 6 = 18000$$

Question 2

What is the equation of the line shown?



A. $y = 3x + 1$

B. $y = -3x + 1$

C. $y = \frac{1}{3}x + 1$

D. $y = -\frac{1}{3}x + 1$

Question 3

Danny's truck has a fuel consumption of 8.5 L/100 km. How much will it cost him to travel 350 km if the price of fuel is 120.4 cents per litre? (correct to 2 decimal places)

A. \$38.52

B. \$40.15

C. \$42.80

D. \$35.82

$$8.5 \times 3.5 \times 1.204 \\ = 35.819$$

Question 4

City A has coordinates (50°N, 15°W). City B is 10° South and 40° East of City A.

What are the coordinates of City B?

A. (10°S, 15°W)

B. (40°N, 15°W)

C. (40°N, 25°E)

D. (40°S, 55°E)

Question 5

The power consumption of a microwave in standby mode is 60 W. If electricity is charged at 26.675 c/kWh, what is the cost of leaving the microwave continuously in standby mode for one year correct to 2 decimal places?

A. \$14.02

B. \$5.84

C. \$100.42

D. \$140.20

$$60 \times 24 \times 365 = 525600$$

$$525600 \div 1000 = 525.6$$

$$525.6 \times 0.26675 = 140.20$$

Question 6

A set of assessment results is normally distributed. A mark of 15 has a z-score of -1 and a mark of 27 has a z-score of +2.

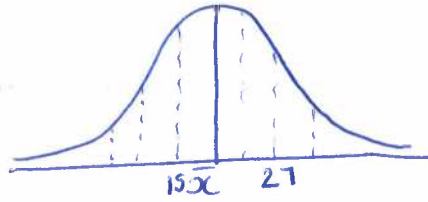
What is the mean of the scores?

A. 16

B. 19

C. 21

D. 25



$$\begin{aligned} 27 - 15 &= 12 \\ \frac{12}{3} &= 4 \end{aligned}$$

$$15 + 4 = 19$$

Question 7

The map below shows seven countries within Central America.



A network diagram is drawn with seven vertices to represent each of the countries, and edges are drawn to represent a border shared between two countries. How many edges will this network diagram have?

A. 5

B. 6

C. 7

D. 8

Question 8

Fred takes out a loan of \$540 over 2 years to buy a washing machine. He will repay the loan in equal monthly repayments. The simple interest rate is 12% p.a.

What is Fred's monthly repayment?

A. \$27.90

B. \$55.80

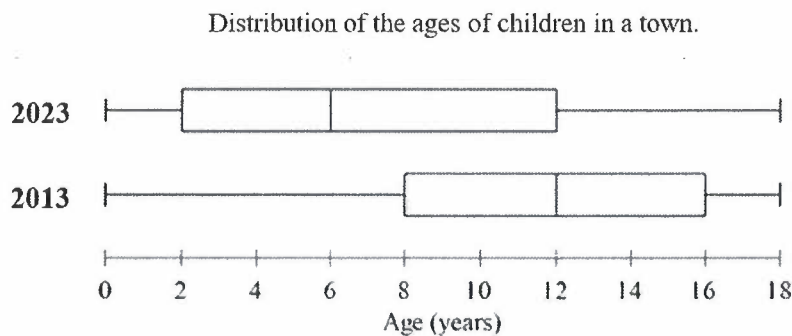
C. \$26.10

D. \$25.20

$$\begin{aligned} I &= 540 \times 12\% \times 2 \\ &= 129.60 \\ 540 + 129.60 &= 669.60 \\ 669.60 \div 24 &= 27.90 \end{aligned}$$

Question 9

The box plot shows the distribution of the ages of children in a town in 2013 and 2023.



In 2013 there were 2700 children aged 0-18 years.

The number of children aged 12-18 is the same in both 2013 and 2023.

How many children ages 0 – 18 years are there in 2023?

A. 1350

B. 2700

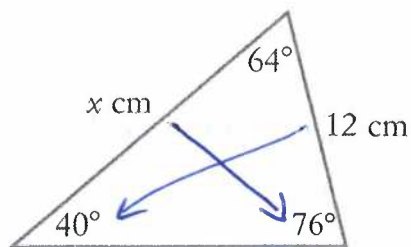
C. 4200

D. 5400

$$\begin{aligned} 2013 \quad 12-18 &= 50\% \\ &= 1350 \text{ children} \\ 2023 \quad 12-18 &= 25\% \\ 25\% &= 1350 \\ 100\% &= 5400 \end{aligned}$$

Question 10

Calculate the value of x correct to 2 decimal places.



A. 16.78

B. 18.11

C. 19.34

D. 20.77

$$\begin{aligned}\frac{x}{\sin 76} &= \frac{12}{\sin 40} \\ x \sin 40 &= 12 \sin 76 \\ x &= \frac{12 \sin 76}{\sin 40} \\ x &= 18.11\end{aligned}$$

Question 11

Scientists are investigating the relationship between the gestation (in days) of various animals and their brain weight at birth. A sample of the data collected is shown below.

Gestation (days)	31	218	60	128	123	128	151	150
Brain (g)	9.6	219	53	45	76	40	106	125

What is Pearson's correlation coefficient (r) correct to three decimal places?

A. $r = 0.785$

B. $r = 0.804$

C. $r = 0.867$

D. $r = 0.912$

Question 12

Scott stops drinking alcohol with friends at 6pm and has a Blood Alcohol Content (BAC) of 0.08. Scott's BAC reduces at a rate of 0.015 per hour and he must have a BAC of zero before being able to drive home.

The time that Scott can drive again is

A. 11.33pm

B. 11.20pm

C. 9.54pm

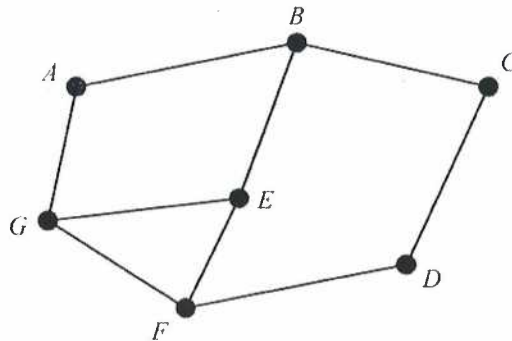
D. 9.20pm

$$0.08 \div 0.015 = 5 \text{ hours } 20 \text{ mins}$$

$$6 \text{ pm} + 5 \text{ hours } 20 \text{ mins} = 11.20 \text{ pm}$$

Question 13

Which of the following is **NOT** a circuit for the network diagram shown?



A. EFGE

B. ABEGA

C. GEFGABEG

D. ABCDFEGA

Question 14

The table below gives the present value (in dollars) of an annuity with a contribution of \$1 per period.

Period	Interest rate per period								
	1%	2%	3%	4%	5%	6%	8%	10%	12%
1	0.9901	0.9804	0.9709	0.9615	0.9524	0.9434	0.9259	0.9091	0.8929
2	1.9704	1.9416	1.9135	1.8861	1.8594	1.8334	1.7833	1.7355	1.6901
3	2.9410	2.8839	2.8286	2.7751	2.7232	2.6730	2.5771	2.4869	2.4018
4	3.9020	3.8077	3.7171	3.6299	3.5460	3.4651	3.3121	3.1699	3.0373
5	4.8534	4.7135	4.5797	4.4518	4.3295	4.2124	3.9927	3.7908	3.6048
6	5.7955	5.6014	5.4172	5.2421	5.0757	4.9173	4.6229	4.3553	4.1114
7	6.7282	6.4720	6.2303	6.0021	5.7864	5.5824	5.2064	4.8684	4.5638
8	7.6517	7.3255	7.0197	6.7327	6.4632	6.2098	5.7466	5.3349	4.9676
9	8.5660	8.1622	7.7861	7.4353	7.1078	6.8017	6.2469	5.7590	5.3282
10	9.4713	8.9826	8.5302	8.1109	7.7217	7.3601	6.7101	6.1446	5.6502

Kevin borrows \$4500 at 12% p.a. repayable quarterly over 2 years. How much (to the nearest cent) will he repay per quarter?

A. \$1210.62

B. \$704.25

C. \$641.05

D. \$905.87

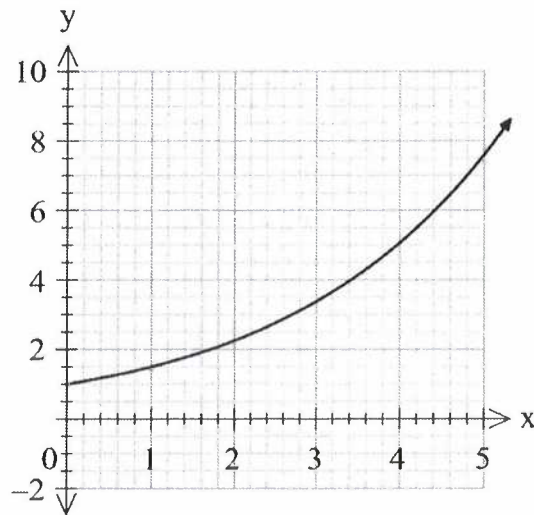
3% per quarter

2x4 = 8 quarters

$$4500 \div 7.0197 = \$641.05$$

Question 15

The graph of $y = a^x$ is shown below, where $a > 1$.



Which would be the closest to the value of $0.25(a^{4.8})$?

A. 1.75

B. 3.5

C. 4.5

D. 7

END OF SECTION 1

Student's Name: _____

Teacher's Code: _____

Section 2 (23 marks)

QUESTION 16 (4 marks)

- a) Solve $3x + 8 = 2(x - 10)$

1

$$3x + 8 = 2x - 20$$

$$3x - 2x = -20 - 8$$

$$x = -28$$

Well done.

- b) The volume (V) of a sphere is found using the formula $V = \frac{4}{3}\pi r^3$ where r is the radius in cm.

Find the volume of a sphere with a radius 8 cm, correct to 2 decimal places.

1

$$V = \frac{4}{3}\pi(8)^3$$

$$V = 2144.66\text{cm}^3$$

Well done.

- c) Make h the subject of the formula

2

$$e = 3f + \frac{g}{h}$$

$$e - 3f = \frac{g}{h}$$

$$h = \frac{g}{e - 3f}$$

mostly well done
many forgot to multiply all
terms by 'h'

QUESTION 17 (2 marks)

The nutrition information for TimTam Chocolate Biscuits Original is shown below.

NUTRITION INFORMATION		
Servings per package: 11		
Serving size: 18.3g (1 biscuit)		
	Quantity per serving	Quantity per 100g
Energy	399kJ	2180kJ
Protein	0.8g	4.5g
Fat, total	4.9g	26.9g
– Saturated fat	2.7g	15.0g
Carbohydrates	11.8g	64.4g



- a) Martin ate 3 TimTams.

Given that 1 calorie (Cal) = 4.184 kJ, calculate how many calories Martin has consumed.

Write your answer correct to the nearest whole calorie.

1

$$399 \times 3 = 1197$$

$$1197 \div 4.184 = 286 \text{ calories}$$

Well done

- b) Martin goes swimming later that day and this activity burns 535 calories per hour.

How long must he swim to burn off the calories from the 3 TimTams?

Write your answer to the nearest whole minute.

1

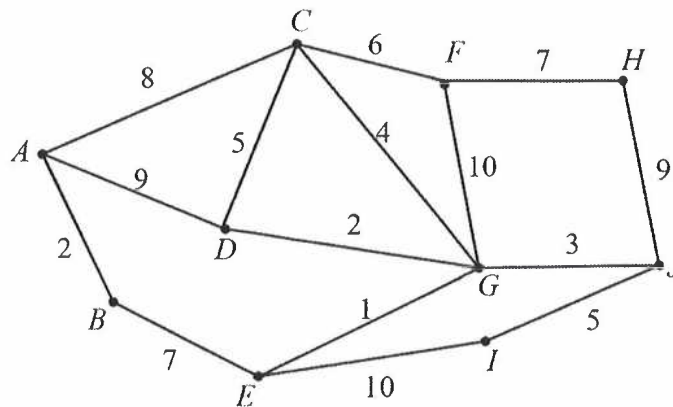
$$535 \text{ calories} = 1 \text{ hour}$$

$$1 \div \frac{535}{286} = 32 \text{ minutes}$$

Well done.

QUESTION 18 (2 marks)

Consider the network diagram below.



- a) What is the degree of Vertex G?

1

5 ✓

Well done

- b) What length is the shortest path from A to J?

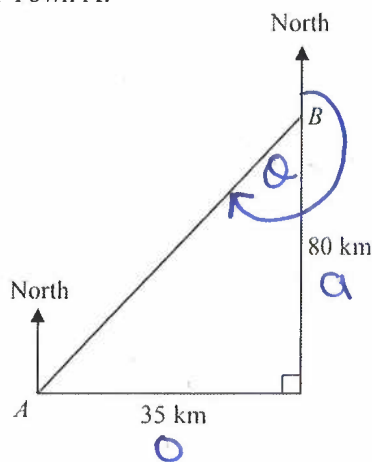
1

13 ✓

→ many listed out the path instead of stating the length.

QUESTION 19 (2 marks)

Town B is 35 km East and 80 km North of Town A.



Calculate the bearing of Town A from Town B correct to the nearest degree.

2

$$\tan Q = \frac{35}{80}$$

$$Q = 24^\circ \checkmark$$

$$180 + 24 = \boxed{204^\circ} \checkmark$$

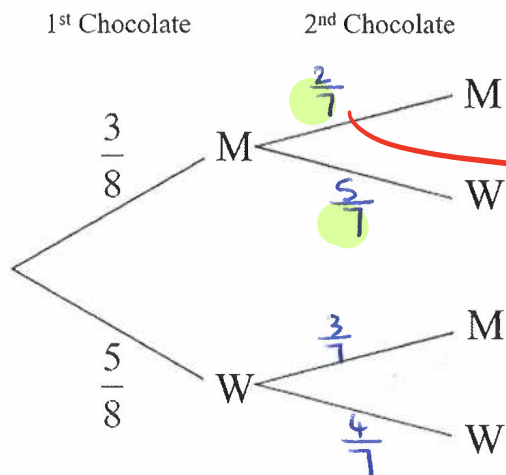
→ mostly well done

→ many overcomplicated the process by using the sine rule & pythag.

QUESTION 20 (4 marks)

John has a bag containing three milk chocolates (M) and 5 white chocolates (W).

John randomly selects 2 chocolates from the bag to eat. A partially completed probability tree is shown.



Some forget to deduct 1 from the denominator

- a) Complete the tree diagram by writing the correct probability on each branch.

1

- b) Calculate the probability that John selects two milk chocolates. Write your answer as a fraction.

1

$$P(MM) = \frac{3}{8} \times \frac{2}{7} = \frac{6}{56}$$

$$= \frac{3}{28}$$

Well done

- c) Calculate the probability that John selects at least 1 milk chocolate. Write your answer as a fraction.

2

$$P(\text{at least 1 Milk}) = 1 - P(\text{No Milk})$$

$$= 1 - \left(\frac{5}{8} \times \frac{4}{7} \right)$$

$$= \frac{9}{14}$$

Well done.

QUESTION 21 (4 marks)

Ken earns an income of \$88 000 from his job as a journalist. He has a second job which pays \$900 gross income per month.

- a) What is Ken's total annual taxable income from both jobs, assuming that he has no allowable deductions? 1

$$88000 + (900 \times 12) \\ = \$98,800 \quad \checkmark$$

Well done

- b)

Taxable Income	Tax payable
\$0 to \$18 200	Nil
\$18 201 to \$37 000	19c for each \$1 over \$18 200
\$37 001 to \$90 000	\$3 572 plus 32.5c for each \$1 over \$37 000
→ \$90 001 to \$180 000	\$20 797 plus 37c for each \$1 over \$90 000
\$180 001 and over	\$54 097 plus 45c for each \$1 over \$180 000

Use the tax table above to calculate the tax payable on Ken's total income.

1

$$20797 + 0.37(98800 - 90000) \\ \$24053 \quad \checkmark$$

Well done.

- c) Ken pays \$20 147 in tax on his income from the journalist job.

Calculate the monthly net income from Ken's second job assuming that he has no other deductions.

2

$$24053 - 20147 = 3906$$

$$3906 \div 12 = 325.50 \quad \checkmark$$

$$900 - 325.50 = \$574.50 \quad \checkmark$$

→ Some forgot to find monthly instead of yearly.

QUESTION 22 (2 marks)

Sarah purchased shares in Quickcash Limited at a price of \$3.20/share.

The 4% dividend yield amounted to a profit of \$192 for Sarah.

How many shares did Sarah buy?

2

$$\begin{aligned}4\% &= 192 \\1\% &= 48 \\100\% &= 4800\end{aligned}$$

$$4800 \div 3.20 = 1500$$

→ Well done.

QUESTION 23 (3 marks)

A plane departs Sydney airport [GMT +10] on Tuesday 11th at 5.30pm and flies to Los Angeles [GMT -8].

The flight lasts 16 hours. What is the date and time in Los Angeles when the plane arrives?

3

Time difference = 18 hours ✓

5.30pm Tue in Sydney = 11.30pm Mon in LA ✓

11.30pm + 16 hours = 3.30pm Tuesday 11th

→ mostly well done
→ Student's that draw a
diagram/timeline were more
successful.

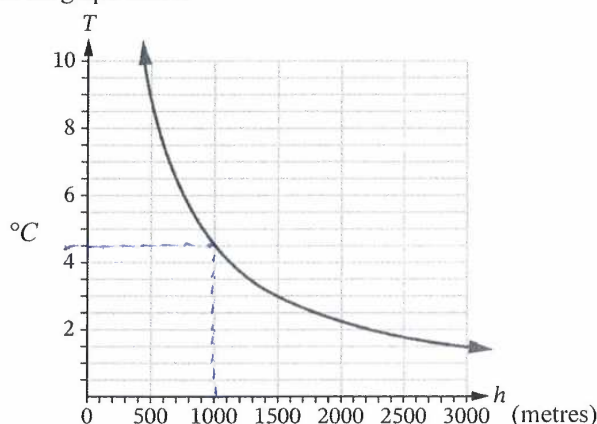
END OF SECTION 2

Student's Name: _____ Teacher's Code: _____

Section 3 (22 marks)

QUESTION 24 (3 marks)

The temperature, T (in degrees Celsius) of the air, varies inversely with the height, h (in metres), above the sea level. This is represented in the graph below.



- a) Use the graph to find the temperature of the air at 1km above sea level.

Well-answered 1

4.5°C ✓

- b) Find the variation equation showing the relationship between T and h .

Well-answered 2

$$T = \frac{k}{h}$$

$$4.5 = \frac{k}{1000}$$

$$k = 4500$$

$$T = \frac{4500}{h} \quad \checkmark$$

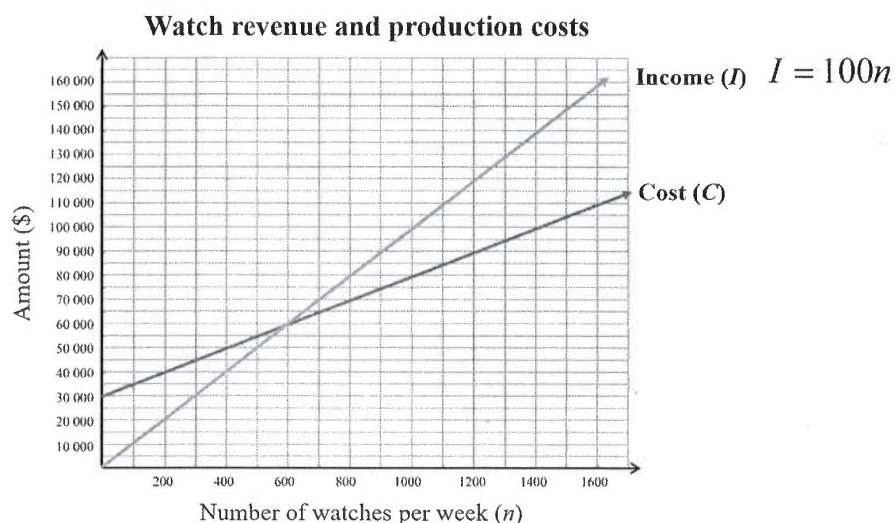
*Some candidates used other pronumerals

(m metres, c celsius, y, x)

**Ensure you are using the variables given: T and h

QUESTION 25 (5 marks)

The graph below shows the weekly cost, C , and income from sales, I , for a watch manufacturing company. Watches are sold for \$100 each.



- a) How many watches must be sold for the company to break even?

Well-answered 1

600 ✓

- b) Write the equation for cost, C when n watches are sold.

Well-answered 2

$C = 50n + 30000$ ✓

Some candidates using x and y

- c) The company expects that their weekly fixed costs will increase by \$4250 next year.

If the selling price remains the same, how many watches will they need to sell in order to break even next year?

Poorly answered 2

$30000 + 4250 = 34250$ (New weekly fixed cost)

$C = 50n + 34250$ ✓

$50n + 34250 = 100n$

$50n = 34250$

$n = 685$ ✓

QUESTION 26 (3 marks)

The table below compares a person's nose length in centimetres with their height in centimetres.

Nose length (cm) (N)	4.3	4.8	5.8	4.5	4.5	4.7	4.3	5.2
Height (cm) (H)	160	151	158	148	164	175	151	173

- a) Pearson's Correlation Co-efficient (r) for this data is 0.236 correct to 3 decimal places.
Use this information to describe the direction and strength of the relationship between nose length and height.

Approximately 50/50 1

.....
Weak positive correlation ✓
.....
.....

- b) Determine the equation of the least squares regression line.
Write all values correct to 3 decimal places.

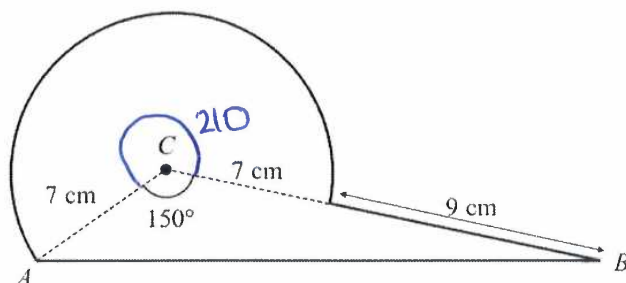
Approximately 50/50 2

Some candidates using
x and y

.....
 $H = 4.677N + 137.725$ ✓ ✓
.....
.....

QUESTION 27 (3 marks)

A shape is made from triangle ABC and a sector of a circle with a centre C . The radius CA is 7 cm and $\angle ACB = 150^\circ$ as shown in the diagram.



Calculate the total area of the shape correct to 2 decimal places.

Well-answered 3

Sector $\frac{210}{360} \times \pi \times 7^2 = 89.797$ ✓

Some candidates using cosine for Area formula
Check the formula sheet!

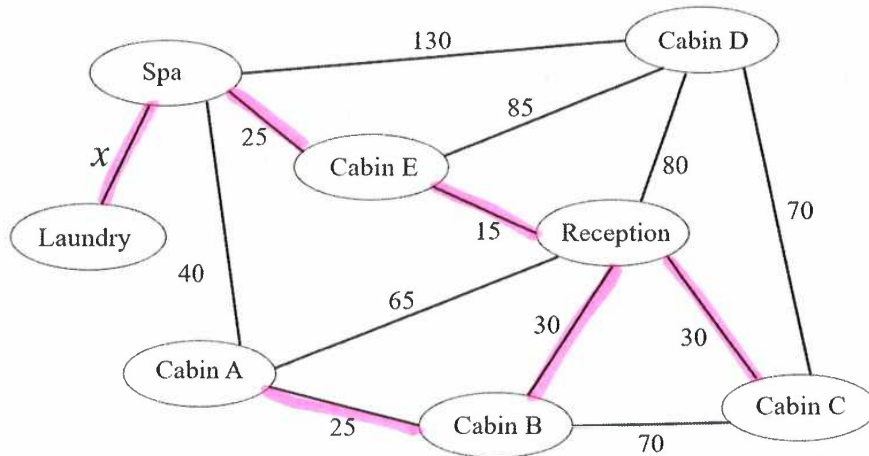
Triangle $\frac{1}{2}(7)(9)\sin 150 = 28$ ✓

Total = 117.80cm^2 ✓

If sufficient process was shown $S+T$ =Incorrect Total, consequential mark awarded.

QUESTION 28 (3 marks)

A holiday park is upgrading a speaker system and cables need to be installed so that all buildings are connected. The owner, Jack, draws a network diagram of the park showing all the possible cables which could be installed between buildings. Weights on the edges indicate the length of cable in metres.



- a) Jack finds a minimum spanning tree for the network and calculates that the minimum length of cable he needs for the holiday park is 217m. Hence, find the value of x , the length of cable between the Laundry and Spa.

2

$$15 + 25 + 25 + 30 + 30 + 70 + x = 217$$

$$195 + x = 217$$

$$x = 22$$

Approximately 50/50

- b) The cable connecting Cabin E to Reception cannot be installed so Jack must use the next shortest option. If it costs \$100 to install each metre of cable, by how much has the total cost now increased?

1

Cabin A $\rightarrow$ Spa is the next shortest option

Approximately 50/50

$$40 - 15 = 25$$

$$25 \times 100 = \$2500$$

QUESTION 29 (5 marks)

Screws are made in a factory by a machine. The length of the screws is normally distributed with a mean of 4.5 cm and a standard deviation of 0.25 cm.

An extract from the probability table for z-scores is shown below. The values in the table represent the area under the normal curve to the left of the z-score. Row labels show the z-score to one decimal place. Column labels show the second decimal place.

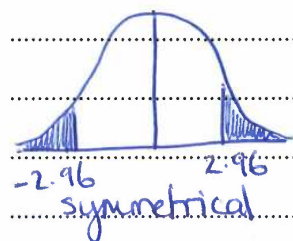
z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
2.0	0.9772	0.9778	0.9783	0.9788	0.9793	0.9798	0.9803	0.9808	0.9812	0.9817
2.1	0.9821	0.9826	0.9830	0.9834	0.9838	0.9842	0.9846	0.9850	0.9854	0.9857
2.2	0.9861	0.9864	0.9868	0.9871	0.9875	0.9878	0.9881	0.9884	0.9887	0.9890
2.3	0.9893	0.9896	0.9898	0.9901	0.9904	0.9906	0.9909	0.9911	0.9913	0.9916
2.4	0.9918	0.9920	0.9922	0.9925	0.9927	0.9929	0.9931	0.9932	0.9934	0.9936
2.5	0.9938	0.9940	0.9941	0.9943	0.9945	0.9946	0.9948	0.9949	0.9951	0.9952
2.6	0.9953	0.9955	0.9956	0.9957	0.9959	0.9960	0.9961	0.9962	0.9963	0.9964
2.7	0.9965	0.9966	0.9967	0.9968	0.9969	0.9970	0.9971	0.9972	0.9973	0.9974
2.8	0.9974	0.9975	0.9976	0.9977	0.9977	0.9978	0.9979	0.9979	0.9980	0.9981
2.9	0.9981	0.9982	0.9982	0.9983	0.9984	0.9984	0.9985	0.9985	0.9986	0.9986
3.0	0.9987	0.9987	0.9987	0.9988	0.9988	0.9989	0.9989	0.9989	0.9990	0.9990
3.1	0.9990	0.9991	0.9991	0.9991	0.9992	0.9992	0.9992	0.9992	0.9993	0.9993
3.2	0.9993	0.9993	0.9994	0.9994	0.9994	0.9994	0.9994	0.9995	0.9995	0.9995

6000 screws are manufactured each hour and any screw that measures less than 3.76 cm or more than 5.24 cm must be discarded.

Using the standardised scores and the probability table provided, find the number of screws that are expected to be discarded in 1 hour?

$$z = \frac{3.76 - 4.5}{0.25} = -2.96$$

$$z = \frac{5.24 - 4.5}{0.25} = 2.96$$



$$P(z > 2.96) = 1 - P(z < 2.96)$$

$$= 1 - 0.9985$$

$$= 0.0015$$

$$P(z < -2.96) = 0.0015$$

$$\text{Total} = 0.003$$

$$0.003 \times 6000 = 18$$

Poorly Answered
Many non-attempts

Candidates who did not use table as instructed achieved a maximum of 3

*Must calculate z-scores for full marks

END OF SECTION 3

Student's Name: _____ Teacher's Code: _____

Section 4 (20 marks)

QUESTION 30 (3 marks)

- a) Simplify fully $4\frac{1}{2} : 2.7$

1

$$4.5 : 2.7$$

$$\boxed{5 : 3}$$

simplifying

- b) A hospital patient requires 750 mL of medication to be delivered through a drip over 5 hours.
Each mL of fluid is equivalent to 14 drops.
How many drops per minute need to be delivered?

2

$$750 \times 14 = 10500 \text{ drops}$$

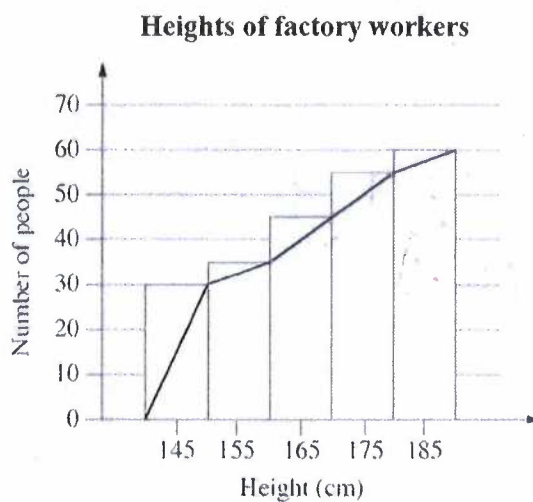
$$5 \times 60 = 300 \text{ minutes}$$

$$10500 \div 300 = \boxed{35 \text{ drops/min}}$$

well done

QUESTION 31 (3 marks)

The heights of all staff on a factory floor were recorded. The data was grouped and displayed as a **cumulative frequency** histogram and polygon as shown below.



- a) How many staff are on the factory floor?

1

60 ✓

*Cumulative frequency!
Do not add the
columns!*

- b) Calculate the Interquartile Range.

2

$UQ - LQ$

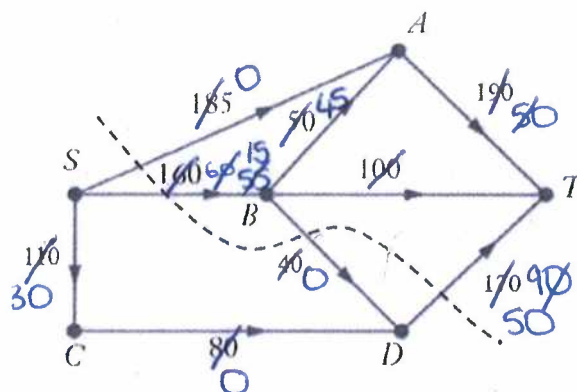
$170 - 145$ ✓

= 25 ✓

well done.

QUESTION 32 (4 marks)

The network diagram shows the flow capacities of traffic (in cars per 10 minutes) along roads between a suburb at S and a suburb at T.



- a) Determine the capacity of the cut shown.

1

$$185 + 160 + 170 = 515$$

- b) Find the maximum number of cars that can travel from S to T in 10 minutes.

2

$$185 + 100 + 5 + 80 + 40 = 410$$

- c) The local council plans to increase the traffic flow between S and T. There are enough funds to widen only one road. **Which road** should be widened to achieve the largest increase in traffic flow **and by how much** will it increase the flow between S and T in 10 minutes?

1

CD by 30 cars

QUESTION 33 (4 marks)

A flat roof of a house has an area of 65 m^2 .

Any rainwater that falls on the roof is collected into an **empty** cylindrical tank.

One day there was 15 mm of rainfall on the roof.

- a) Show that the volume of water collected is 0.975 m^3 .

1

$$\begin{aligned} 15 \text{ mm} &= 1.5 \text{ cm} \\ &= 0.015 \text{ m} \\ 65 \times 0.015 &= 0.975 \text{ m}^3 \end{aligned}$$

- b) State the capacity of the water collected in litres.

1

$$975 \text{ L}$$

If you did not answer a
you could still attempt b.

- c) The tank has a radius of 0.8m. How high up the tank does the collected rainwater reach?
Write your answer in metres correct to 2 decimal places.

2

$$\begin{aligned} V &= \pi r^2 h \\ 0.975 &= \pi (0.8)^2 \times h \\ h &= \frac{0.975}{\pi (0.8)^2} \\ h &= 0.48 \text{ m} \end{aligned}$$

Well done

QUESTION 34 (3 marks)

Justin used his credit card to buy a new camera for \$1700 on 17th April 2023. He made no other purchases with his credit card and there was no interest-free period. Interest was compounded daily at a rate of 18.99% per annum, including the date of purchase and the date of payment.

- a) Show that the daily interest rate of Justin's credit card is 0.052% to 3 decimal places.

1

$$18.99\% \div 365 = 0.052\% \quad \text{well done}$$

- b) Justin pays the balance of the account in full on 8th May 2023.
How much did he pay altogether?

2

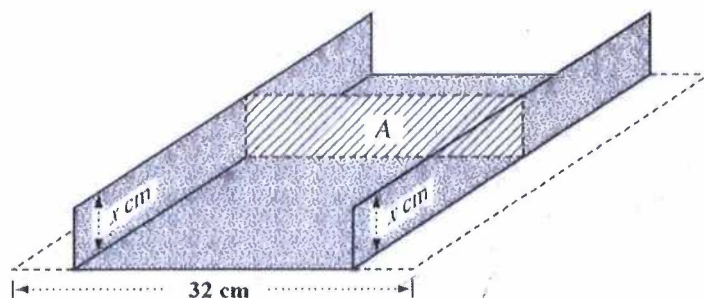
22 days

Too many used
21 or 23 days

$$1700(1 + 0.052\%)^{22} = \$1719.55$$

QUESTION 35 (3 marks)

A long rectangular sheet of metal 32 cm wide is to be made into a gutter by turning up sides of equal height x cm, perpendicular to the base as shown in the diagram.



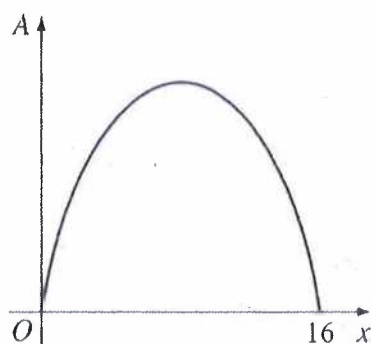
- a) Show that a formula for the cross-sectional area, A , of the gutter is

1

$$A = 32x - 2x^2$$

$$\begin{aligned} A &= x(32 - 2x) \\ A &= 32x - 2x^2 \end{aligned} \quad \checkmark$$

- b) The graph of A against x , for values of x between 0 and 16, is a parabola, as shown.



What is the maximum value of A ?

2

$$\begin{aligned} x &= 8 \quad \checkmark \\ A &= 32(8) - 2(8)^2 \\ A &= 128 \quad \checkmark \end{aligned}$$

Students did not use the formula from a).

END OF SECTION 4

Student's Name: _____ Teacher's Code: _____

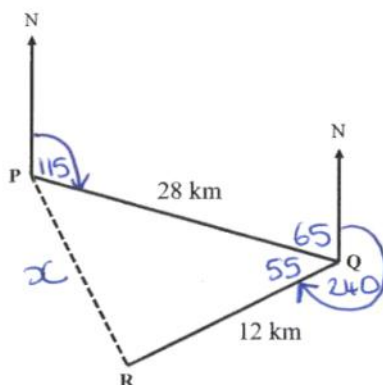
Section 5 (20 marks)

QUESTION 36 (3 marks)

A ship sails from P to Q and then from Q to R.

Q is 28km from P, on a bearing of 115° .

R is 12km from Q on a bearing of 240° .



- a) Show that $\angle PQR = 55^\circ$.

1

$$360 - 240 - 65 = 55$$

Well done!
needed to show how you
found 55°

- b) Hence, calculate the distance PR correct to 2 decimal places.

2

$$x^2 = 28^2 + 12^2 - 2(28)(12)\cos 55$$

$$x^2 = 542.5566$$

$$x = \sqrt{542.5566}$$

$$x = 23.29 \text{ km}$$

All good!

QUESTION 37 (3 marks)

The table below shows the future value of an annuity with a contribution of \$1.

Period	Future value interest factors (Future value of an annuity with a contribution of \$1 at the end of each period)									
	Interest rate per period									
	0.25%	0.50%	0.75%	1.00%	1.50%	2.00%	2.50%	3.00%	4.00%	5.00%
1	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
2	2.0025	2.0050	2.0075	2.0100	2.0150	2.0200	2.0250	2.0300	2.0400	2.0500
3	3.0075	3.0150	3.0226	3.0301	3.0452	3.0604	3.0756	3.0909	3.1216	3.1525
4	4.0150	4.0301	4.0452	4.0604	4.0909	4.1216	4.1525	4.1836	4.2465	4.3101
5	5.0251	5.0503	5.0756	5.1010	5.1523	5.2040	5.2563	5.3091	5.4163	5.5256
6	6.0376	6.0755	6.1136	6.1520	6.2296	6.3081	6.3877	6.4684	6.6330	6.8019
7	7.0527	7.1059	7.1595	7.2135	7.3230	7.4343	7.5474	7.6625	7.8983	8.1420
8	8.0704	8.1414	8.2132	8.2857	8.4328	8.5830	8.7361	8.8923	9.2142	9.5491
9	9.0905	9.1821	9.2748	9.3685	9.5593	9.7546	9.9545	10.1591	10.5828	11.0266
10	10.1133	10.2280	10.3443	10.4622	10.7027	10.9497	11.2034	11.4639	12.0061	12.5779
11	11.1385	11.2792	11.4219	11.5668	11.8633	12.1687	12.4835	12.8078	13.4864	14.2068
12	12.1664	12.3356	12.5076	12.6825	13.0412	13.4121	13.7956	14.1920	15.0258	15.9171

- a) Harry contributes \$5000 into an account at the end of every year for 6 years. The account pays interest at 4% p.a. compounding annually.

Use the table to calculate the future value of Harry's annuity at the end of 6 years.

1

$$5000 \times 6.6330 = \$33165 \quad \checkmark \quad \text{Well done!}$$

- b) Michael deposits \$2500 into an account at the end of every quarter for 3 years and the interest is compounded quarterly. Use the table to calculate the annual interest rate for the investment if the future value is \$31 269.

2

$$3 \text{ years} = 12 \text{ periods}$$

$$31269 \div 2500 = 12.5076 \quad \checkmark$$

Most got this mark.

0.75% per quarter

x4

3% per year

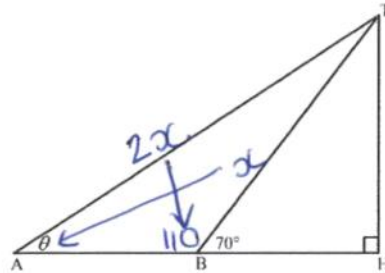
Some got 0.75% p.q but didn't put in p.a.

Do not use C.I formula if it says use Table

QUESTION 38 (2 marks)

The diagram shows a pole TH standing upright on level ground.
 TA and TB are support wires and TA is twice as long as TB.
 TB makes an angle of 70° with the ground as shown.
 Calculate the angle that wire TA makes with the ground correct to the nearest degree.

2



$$\frac{2x}{\sin 110} = \frac{x}{\sin \theta}$$

$$\sin \theta = \frac{x \sin 110}{2x}$$

$$\sin \theta = \frac{\sin 110}{2}$$

$$\theta = \sin^{-1} \left(\frac{\sin 110}{2} \right)$$

$$\theta = 28.024$$

$$\theta = 28^\circ$$

Poorly done!
 if you recognised
 the ratio and used
 $(x, 2x)$, $(4, 8)$, $(30, 60)$
 then getting this first
 mark

Most didn't continue.

QUESTION 39 (3 marks)

Max borrowed \$300 000 to purchase an apartment.

The table below shows the repayments for the first 3 months.

P represents the principal, I represents the interest and R represents the monthly repayment.

Month	Principal (P)	Interest (I)	Repayment (R)	Balance at end of month $P + I - R$
1	\$300 000.00	\$1750.00	\$2000	\$299 750.00
2	\$299 750.00	\$1748.54	\$2000	\$299 498.54
3	\$299 498.54	A	\$2000	B

- a) How much of the principal was paid off in the first month?

1

$$300000 - 299750 = \$250$$

All good.

- b) The interest rate is 7% p.a., compounded monthly.
Find the values of A and B correct to the nearest cent.

2

$$A = 299498.54 \times \frac{7\%}{12}$$

$$A = \$1747.07$$

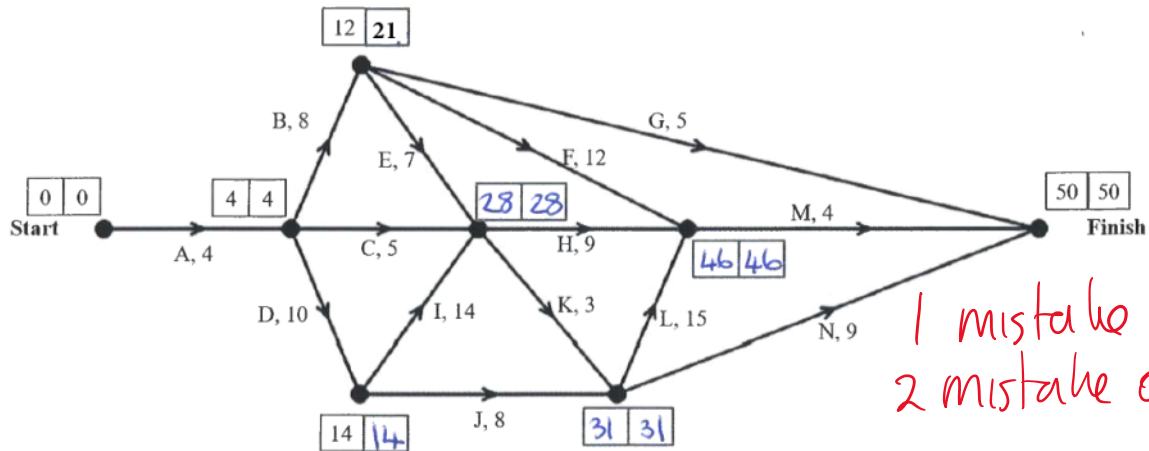
OK

$$B = 299498.54 + 1747.07 - 2000$$

$$B = \$299245.61$$

QUESTION 40 (5 marks)

The network below shows the activities and duration in days to construct a garage.



1 mistake 1/2
2 mistake 0/2

- a) Complete the network to show the Earliest Start Time (EST) and Latest Start Time (LST) for each activity.

2

- b) What is the critical path?

Needed to have your critical path supported by the network.

A, D, I, K, L, M

- c) What is the float time of activity G?

1

$$50 - 12 - 5 = 33$$

OK

- d) Activity C had a delay due to an issue with ordering materials which caused the whole project to be delayed by 1 day. Assuming there are no further delays in any other activities, by how many days was activity C delayed?

1

$$28 - 4 - 5 = 19 \rightarrow \text{Float time for activity C}$$

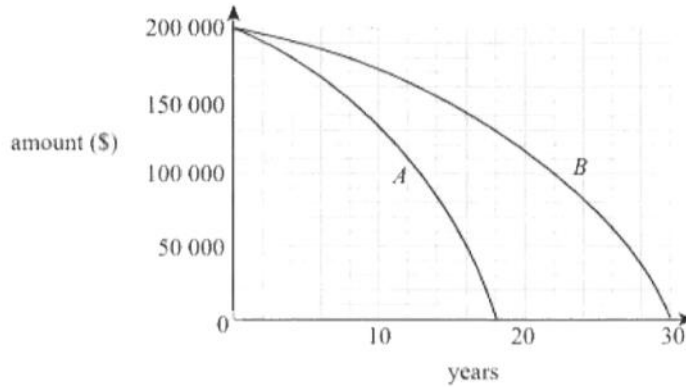
$$19 + 1 = 20$$

Poor!

QUESTION 41 (4 marks)

Xavier is borrowing \$200 000 at an agreed reducible interest rate with the bank. The bank has given him two different monthly repayment options to consider.

The graph below shows the amount owing at the end of each year on both loan repayment options; Option A and Option B.



- a) How many years would it take Xavier to pay off his loan if he selected Option A? 1

18 years ✓

OK

- b) If he selected Option B, after how many years would the amount owing be half the amount borrowed? 1

22 years ✓

OK

- c) The monthly repayments for Option A are \$1450. If Xavier selected Option A, how much interest would he have paid on the loan after 12 years of repayments? 2

$$12 \times 12 \times 1450 = 208800 \text{ paid} \checkmark$$

$$200000 - 110000 = 90000$$

$$208800 - 90000 = \$118800 \checkmark \text{ interest}$$

Most got this but didn't get below.

END OF SECTION 5