



CATHOLIC SECONDARY SCHOOLS
ASSOCIATION OF NSW

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Centre Number

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Student Number

2016
TRIAL HIGHER SCHOOL CERTIFICATE
EXAMINATION

Mathematics General 2

Morning Session
Thursday, 4 August 2016

General Instructions

- Reading time – 5 minutes
- Working time – 2½ hours
- Write using black pen
- Calculators may be used
- A formulae and data sheet is provided on a SEPARATE sheet
- In Questions 26 - 30, show relevant mathematical reasoning and/or calculations
- Write your Centre Number and Student Number on the top of this page and on each question where indicated.

Total marks – 100

Section I Pages 3 - 13

25 marks

- Attempt Questions 1 - 25
- Allow about 35 minutes for this section

Section II Pages 15 - 33

75 marks

- Attempt Questions 26 - 30
- Allow about 1 hour and 55 minutes for this section

Section I

25 marks

Attempt Questions 1–25

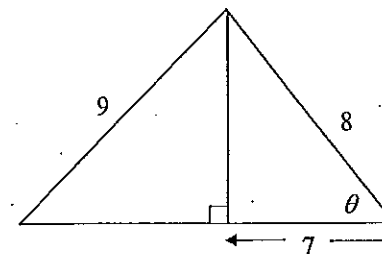
Allow about 35 minutes for this section

Use the Multiple Choice Answer Sheet for Questions 1–25.

- Which type of graph would be most appropriate for continuous data?
 - Line Graph
 - Bar Graph
 - Sector Graph
 - Divided Bar Graph

- Which of the following is $7x - 3x^0 + 2x$ in its simplest form?
 - $6x$
 - $9x - 1$
 - $9x - 3$
 - $9x^2 - 3$

- From the information contained in the diagram below, find the size of angle θ correct to the nearest degree.
 - 29°
 - 41°
 - 61°
 - 73°



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Disclaimer

Every effort has been made to prepare these Trial Higher School Certificate Examinations in accordance with the NSW Board of Studies documents, Principles for Setting HSC Examinations in a Standards-Referenced Framework (www.boardofstudies.nsw.edu.au/learning-for-setting-exams.html), and Principles for Developing Marking Guidelines Examinations in a Standards-Referenced Framework (www.boardofstudies.nsw.edu.au/manuals/for-exams_hsc.html). No guarantee or warranty is made or implied that the Trial Examination papers mirror in every respect the actual HSC Examination question paper in any or all courses to be examined. These papers do not constitute 'advice' nor can they be construed as authoritative interpretations of Board of Studies intentions. The CSSA accepts no liability for any reliance use or purpose related to these Trial question papers. Advice on HSC examination issues is only to be obtained from the NSW BOS.

- 4 A new issue of car registration plates is being designed. The new plates will display 2 digits then 2 alphabetical characters followed by another digit. Numbers and letters may be repeated.

All plates will end with the letter N.

An example is shown here.



Which of the following represents the number of different plates that can be created in this format?

- (A) $9^3 \times 26^3$
(B) $9^3 \times 26^2$
(C) $10^3 \times 26^2$
(D) $10^3 \times 26^3$
- 5 Convert 12 m/s to a speed in km/h.
- (A) 3.3 km/h
(B) 43.2 km/h
(C) 200 km/h
(D) 720 km/h
- 6 A fisherman used the 'capture-recapture' technique to estimate the number of fish in a lake. He caught 50 fish and then tagged and released them. Later, he caught 30 fish at random and found that 10 were tagged.

What is the best estimate for the total fish population of the lake?

- (A) 80
(B) 90
(C) 150
(D) 250

- 7 Jonah is planning for an overseas trip in 4 years' time. Use the Present Value formula given to calculate how much he should invest now, at 6% p.a. interest compounded annually, if he requires \$12 500 for the trip?

$$PV = \frac{FV}{(1+r)^n}$$

- (A) \$9 500
(B) \$9 759
(C) \$9 879
(D) \$9 901
- 8 Which of the following is NOT likely to affect a person's blood alcohol content (BAC)?
- (A) Reaction time
(B) Liver function
(C) Fitness
(D) Weight
- 9 The declining balance method of depreciation, $S = V_0(1-r)^n$, is best described by which type of equation?
- (A) Linear
(B) Quadratic
(C) Exponential
(D) Simultaneous

- 10 The information below is displayed on a customer's electricity account. The customer receives a rebate for the solar power that her home returns to the network. She also receives a guaranteed discount for signing up with this electricity company.

New charges and credits			
Usage and supply charges	Units	Price	Amount
Peak	1 586 kWh	\$0.241	\$382.23
Supply charge	95 days	\$0.7586	\$72.16
Other charges			
Payment processing fee			\$1.60
Total charges			\$455.99
Credits			
Solar Buyback	942 kWh	\$0.08	\$75.36cr
11% Guaranteed Discount			\$42.05cr
Total Credits			\$117.41
Total GST			\$41.39
Total due (including GST)			XXXXX

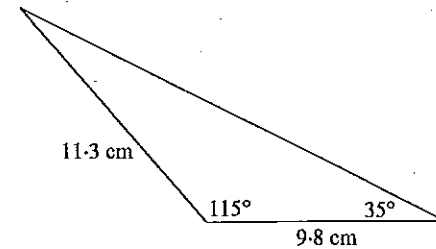
If the account is paid by the due date, how much will she pay?

- (A) \$338.58
 (B) \$379.97
 (C) \$573.40
 (D) \$614.79
- 11 The ages of women in a netball team are: 18, 19, 19, 20, 21, 22, 22. Another woman, aged 23, joins the team.

What effect does this have on the mean and standard deviation of the team's ages?

- (A) The mean increases and the standard deviation increases.
 (B) The mean decreases and the standard deviation increases.
 (C) The mean increases and the standard deviation decreases.
 (D) The mean decreases and the standard deviation decreases.

- 12 To the nearest square centimetre, what is the area of the triangle shown?



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- (A) 33
 (B) 36
 (C) 50
 (D) 52

- 13 Hassan's monthly charges for his phone bill are shown in the table.

Service	Cost
Monthly fee	\$40
Call connection fee	\$0.15
Call rate per 30-second block	\$0.55
Free call value \$100	Nil

Last month Hassan made 185 calls, all of which were less than 30 seconds.

What was Hassan's monthly cost?

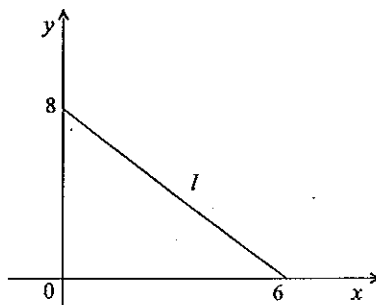
- (A) \$69.50
 (B) \$129.50
 (C) \$140.70
 (D) \$169.50

- 14 \$6 000 is invested at 8% p.a. for 5 years with interest compounded quarterly.

What is the final value of this investment?

- (A) \$7 313.97
 (B) \$8 400.00
 (C) \$8 815.97
 (D) \$8 915.68

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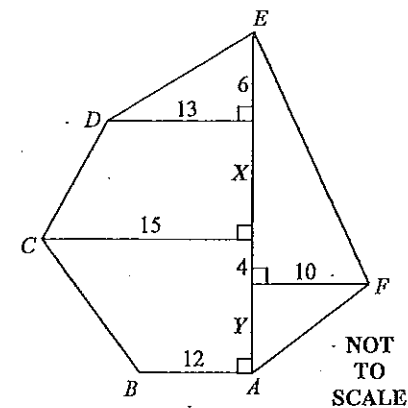
What is the equation of the line l ?

- (A) $y = \frac{4}{3}x + 8$
 (B) $y = -\frac{4}{3}x + 8$
 (C) $y = -\frac{3}{4}x + 8$
 (D) $y = 6x + 8$

- 16 The offset survey diagram on the right was created from the notebook entry shown.

	E	
	36	
D 13	30	
C 15	14	
	10	
B 12	0	
	A	

$10 F$



What are the values labelled X and Y in the diagram?

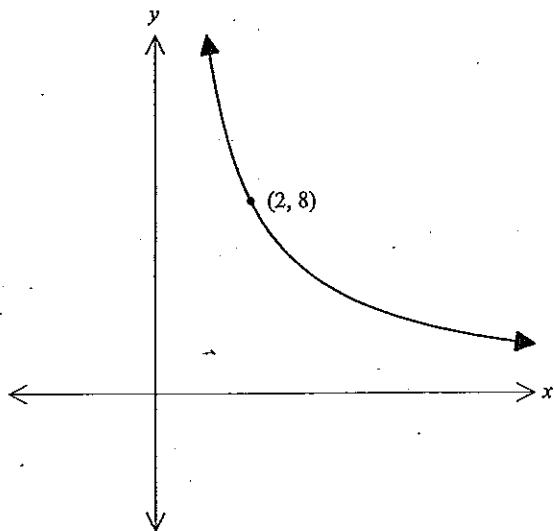
- (A) $X = 16$ and $Y = 12$
 (B) $X = 14$ and $Y = 10$
 (C) $X = 14$ and $Y = 12$
 (D) $X = 16$ and $Y = 10$

- 17 Emma has been prescribed antibiotic syrup with a concentration of 25 mg/mL.

What is the number of grams of antibiotic in a 500 mL bottle of the syrup.

- (A) 1.25 grams
 (B) 12.5 grams
 (C) 20 grams
 (D) 12 500 grams

- 18 The graph of the equation $y = \frac{a}{x}$ is shown below.



The point $(2, 8)$ lies on the graph $y = \frac{a}{x}$.

What is the value of a ?

- (A) 2
- (B) 4
- (C) 8
- (D) 16

- 19 The city of Casablanca in Morocco is located $(34^\circ\text{N } 8^\circ\text{W})$.

Johannesburg, in South Africa, is found 60° to the south and 36° to the west of Casablanca.

What are the coordinates of Johannesburg?

- (A) $(26^\circ\text{S } 44^\circ\text{W})$
- (B) $(26^\circ\text{S } 28^\circ\text{E})$
- (C) $(2^\circ\text{S } 52^\circ\text{E})$
- (D) $(2^\circ\text{S } 28^\circ\text{E})$

- 20 Thomas borrows \$15 000 to buy a new car. A flat rate of interest is charged at 9.6% p.a. for 4 years. He repays the loan plus interest in equal monthly payments.

How much does Thomas pay each month?

- (A) \$342.50
- (B) \$360.00
- (C) \$432.50
- (D) \$612.50

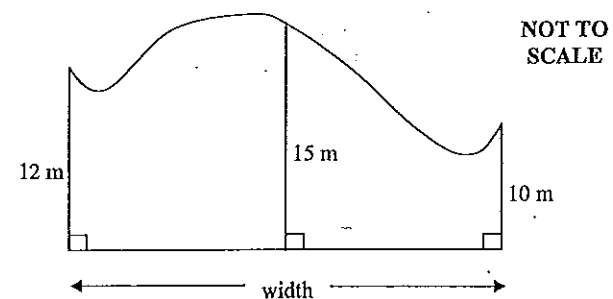
- 21 Kayla conducted an experiment in which she recorded the outcome of repeatedly tossing two coins. The table shows the number of times each of the possible outcomes occurred over 80 coin tosses.

Outcome	Frequency
Two heads	20
Two tails	18
One head and one tail	42

Use this information to find the experimental probability of an outcome of two tails.

- (A) $\frac{1}{4}$
- (B) $\frac{1}{2}$
- (C) $\frac{9}{20}$
- (D) $\frac{9}{40}$
- 22 Which of the following would be most likely to have a strong positive correlation?
- (A) The age of a child and the size of their t-shirt.
- (B) The outside temperature and the number of layers of clothing worn.
- (C) The price of petrol and the amount of petrol sold at a petrol station.
- (D) The speed of a train and the time it takes the train to reach the final destination.
- 23 Four 75 W ceiling fans in a classroom are replaced by one 2.6 kW air conditioner. If the cost of electricity is 25.8 cents per kWh, what is the additional cost of cooling the room for 6 hours?
- (A) \$0.59
- (B) \$3.56
- (C) \$3.91
- (D) \$35.60

- 24 The diagram shows a piece of land that has been surveyed.



Using one application of Simpson's rule, Rusty calculated the area of the land to be 410 square metres.

What is the width of the land?

- (A) 5 metres
- (B) 10 metres
- (C) 15 metres
- (D) 30 metres
- 25 Madeline works a 40 hour week at a fixed hourly rate. She receives a holiday loading that is $17\frac{1}{2}\%$ of four weeks' wages. Her holiday loading last year was \$602.
- What is her hourly rate of pay?
- (A) \$7.00
- (B) \$21.50
- (C) \$26.34
- (D) \$105.35

Section II

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75 marks
 Attempt Questions 26 - 30
 Allow about 1 hour and 55 minutes for this section

Answer the questions in the spaces provided.

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

Extra writing space is provided on page 35. If you use this space, clearly indicate which question you are answering.

Question 26 (15 marks)

- (a) Ellie is paid a retainer of \$350 per week and a commission of 5% on all sales. Last week she earned \$875. 2

What was the value of her sales last week?

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- (b) Sam attends Mount Cook Secondary School. He wants to know how much money the students in his school spend at the canteen in a week. Sam decides to randomly sample 20 students from Year 12 and ask them how much money they spent at the canteen that week.

- (i) Identify the target population. 1

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- (ii) What could be a possible source of bias in Sam's sample? 1

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Question 26 (continued)

- (c) The radius of a circle is found to be 30 cm correct to the nearest centimetre. 2
 Between what limits must the area of the circle lie?

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- (d) Isla places an empty bucket under a dripping garden tap to collect water. 2
 After 5 hours, there is 3.6 litres of water in the bucket.

At this rate, how many millilitres of water will be collected in the bucket in 20 minutes?

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- (e) It takes Qiyun 6 minutes 20 seconds to download an MP3 file which is 4.2 MB in size.

- (i) How many bytes are in 4.2 MB? 1

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- (ii) Calculate Qiyun's download speed to the nearest kbps. 2

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Question 26 (continued)

- (f) The following table shows the life expectancies at birth, of both males and females born in 1990, 2000 and 2008, from seven countries.

Country	Life Expectancy at Birth					
	Male			Female		
	1990	2000	2008	1990	2000	2008
China	68	70	72	69	73	76
Australia	74	77	79	80	82	84
Afghanistan	42	41	40	44	44	44
New Zealand	72	76	78	78	81	83
Papua New Guinea	57	60	61	61	63	64
Lebanon	63	68	70	69	73	74
Greece	75	76	78	79	81	83

Source: World Health Organisation

- (i) In which country would a baby girl born in 2008 be most likely live the longest? 1

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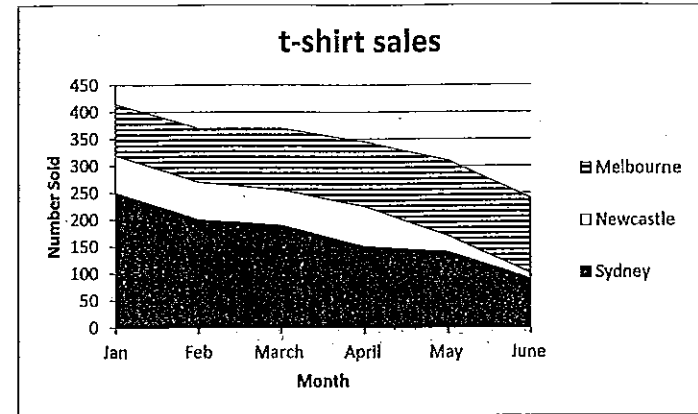
- (ii) In 2008, the life expectancy at birth of males born in Afghanistan was 40. 1

Give one reason why this age might be so low.

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Question 26 (continued)

- (g) A company sells t-shirts in Sydney, Melbourne and Newcastle. The area chart below shows the monthly sales of t-shirts in each city from January to June.



- (i) In which month did two locations sell the same number of t-shirts? 1

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- (ii) Describe the pattern of sales in Melbourne for the period shown. 1

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Question 27 (15 marks)

- (a) Data collected over a number of weeks at a local ice cream parlour is used to find the relative frequency of customers selecting each of the company's five gourmet flavours. This information is shown in the table below.

Gourmet Flavour	Relative Frequency
Triple Chockie Chippchip	0.3
Cookie Crumbs Galore	0.18
Strawberry Cream Divine	0.27
Vanilla Sunset Whirl	0.16
Pine Passionfruit Perfection	0.09

Edith serves 150 customers during her weekend shift.

Based on the data collected, how many of these customers would be expected to order Cookie Crumbs Galore? 1

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- (b) A home entertainment system was purchased for \$3 650 using a credit card on 17 March. The interest rate is 18.75% p.a. and interest is charged daily to include the date of purchase and the date of payment. There is no interest free period. 2

There are no other purchases made in the period.

Calculate the amount required to pay the account in full on 15 April.

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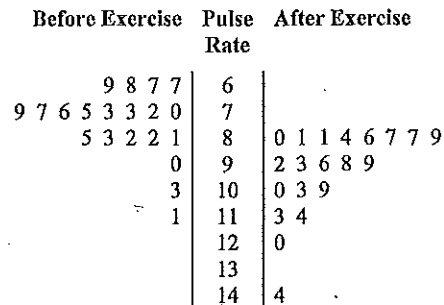
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Question 27 (continued)

- (c) The stem and leaf plot below displays the distribution of pulse rates, measured in beats per minute, of 20 students before and after exercise.



- (i) Find the median pulse rate of the students before exercise. 1

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- (ii) After exercise, one of the students had a heart rate of 144 beats per minute. 3

Is this student's measurement an outlier for this set of data? Justify your answer with calculations.

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- (iii) Compare and contrast the distribution of pulse rates, making reference to the shape of the distributions, and the measures of spread and location. 3

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Question 27 (continued)

- (d) Juanita is landscaping her garden.

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She calculates that five friends will take six hours to complete the job. Use inverse proportionality to determine how many friends will need to work to landscape the garden in 2 hours.

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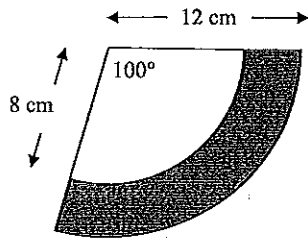
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- (e) A sector is cut from a circle of radius 12 centimetres. The sector angle measures 100°.

2

The arc of another circle with the same centre and a radius of 8 centimetres is used to create the shaded area shown in the diagram.



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Calculate the shaded area correct to the nearest square centimetre.

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Question 28 (15 marks)

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- (a) A new TV has a selling price of \$483. This price includes \$63 in GST. At what percentage was the GST charged?

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- (b) The following formula can be used to calculate the number of standard drinks in a container of alcoholic beverage:

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$$N = \frac{VA}{1.27}$$

where :

N = number of standard drinks

V = volume of the container in litres

A = the percentage of alcohol in the drink (% alc / vol)

White wine has 11.5% alc / vol.

How many millilitres of white wine is equivalent to one standard drink? Answer to the nearest millilitre.

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Question 28 (continued)

- (c) Stacey's annual petrol costs for 2015 were \$2 028. The average price of petrol in 2015 was 150 c/L. Stacey's car uses 6.5 L/100 km. 3

On average, how many kilometres did she drive each week in 2015?

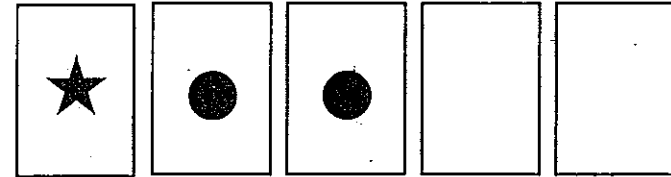
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- (d) Solve for x : $\frac{2x-1}{5} = \frac{x}{3} - 1$ 3

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Question 28 (continued)

- (e) Indiana plays a game in which she chooses one of these five cards which have been shuffled and placed face down on a table. 2



If she chooses the 'star' card (★), she wins \$10. If either of the 'circle' (●) cards are her choice then she will win \$4.

Should Indiana choose one of the blank cards, she will lose \$5.

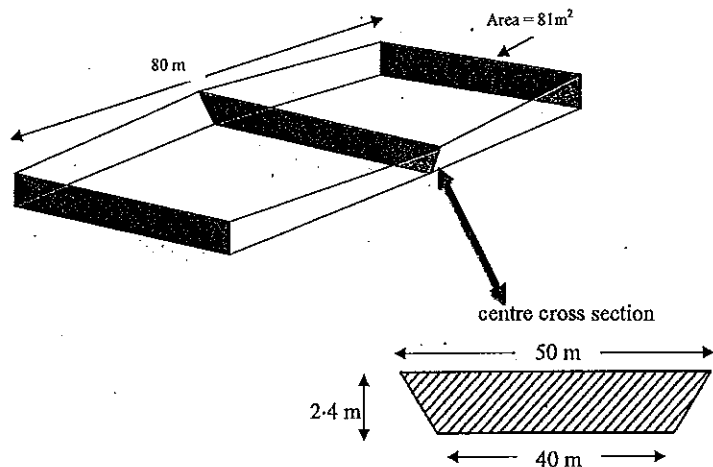
Each game, consisting of one choice, will cost her \$1 to play.

Calculate Indiana's financial expectation for each game.

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Question 28 (continued)

- (f) An artificial lake is constructed in a park. The lake is 80 metres long and the ends of the lake are identical rectangular cross sections, each with area 81 m^2 . The cross section at the centre of the lake is a trapezium with measurements shown on the diagram.



- (i) Calculate the area of the middle cross section. 1

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- (ii) Use Simpson's rule to calculate the capacity of the artificial lake in kilolitres. 3

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Question 29 (15 marks)

- (a) A class is divided into two groups, X and Y, each containing 12 students. 2
 Group X has equal numbers of boys and girls while group Y has 7 boys and 5 girls. The teacher randomly chooses one of the groups and then selects one student from that group to be the class representative.

Using a tree diagram, or otherwise, calculate the probability that the selected class representative is a girl.

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- (b) Erin and Oliver board a flight in London ($52^\circ\text{N } 0^\circ$) at 1 pm on Tuesday, London time. Their flight lands in New York ($41^\circ\text{N } 74^\circ\text{W}$) at 3.34 p.m. local time on Tuesday. 2

Calculate the total time taken for the flight.

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Question 29 (continued)

- (c) Donna needs to replace the fences in her vineyard. The following are charges from two fencing companies, Frankie's Fences and FabFences-4-Less.

Frankie's Fences	FabFences-4-Less
<ul style="list-style-type: none"> Flat fee of \$1 500 <p>plus</p> <ul style="list-style-type: none"> \$10 per metre of fencing 	<ul style="list-style-type: none"> \$25 per metre of fencing

Donna's cost is \$ C for x metres of fencing, and the above information can be represented by the following equations:

Frankie's Fences : $C = 10x + 1500$

FabFences-4-Less: $C = 25x$

- (i) Solve these equations simultaneously to find C and x . 2

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- (ii) Explain the significance of the value of x found in (i). 1

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- (iii) Donna chooses Frankie's Fences and pays \$4 300. How many metres of fencing were replaced? 1

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Question 29 (continued)

- (d) A hospital conducted a study to determine the relationship between the age and blood pressure of its patients. The table shows the information collected.

Age (x)	43	48	56	61	67	70
Blood Pressure (y)	128	120	135	143	141	152

- (i) The correlation coefficient for this data is $r = 0.9$ (rounded to 1 decimal place). 1

What does this strong positive correlation indicate about the relationship between age and blood pressure?

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- (ii) The mean and standard deviation for both the age and blood pressure of these patients are displayed in the table. 2

	Age (x)	Blood Pressure (y)
Mean	57.5	136.5
Standard Deviation	9.7	10.4

Using this information, show that the least-squares line of best fit is:

$$y = 0.96x + 81.3$$

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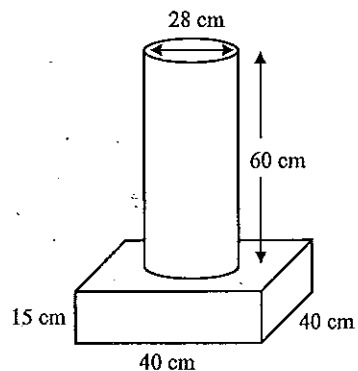
- (iii) Use the equation of the least-squares line of best fit, $y = 0.96x + 81.3$, to estimate the blood pressure of a newly admitted patient who is 50 years old. 1

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- (e) Greg's Gorgeous Garden Supplies want to make 100 concrete pedestals to sell. Each pedestal is in the shape of a cylinder attached to a square prism base. 3

The dimensions are shown in the diagram.



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After calling the concrete supply company, Greg learns that one concrete truck can deliver 6 cubic metres of concrete.

Given that $1 \text{ m}^3 = 1\,000\,000 \text{ cm}^3$, determine whether or not one truckload of concrete will be enough for Greg to make 100 pedestals. Support your response with appropriate mathematical calculations.

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Question 30 (15 marks)

- (a) The HSC marks for a particular course are normally distributed with a mean of 65 and a standard deviation of 8.

- (i) What percentage of results lie between 65 and 73? 1

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- (ii) Tranh's mark in this course was 84. Zac's z-score was 2.5. Zac claims that he has achieved a better mark than Tranh. 2

Is Zac correct? Use mathematical calculations to justify your answer.

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- (b) The catchment area on a rural property is 30 000 square metres. During a storm 65 mm of rain fell on the catchment area and 20% of this rain flowed into an underground storage tank. The underground tank is in the shape of a prism with a uniform cross-sectional area of 85.2 m^2 . What was the rise in the water level in the tank after the storm? 3

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Question 30 (continued)

- (c) Jessica is saving for a deposit to buy a home unit. Her annual salary is \$108 600 and she decides to pay 5% of her salary into an annuity every six months for five years. Interest on her investment is paid at 6% p.a. and is compounded every half year. The table below gives the future value of an annuity for every contribution of \$1 per period.

Future value interest factors										
Future value of an annuity with a contribution of \$1 at the end of each period.										
Period	1%	2%	3%	4%	5%	6%	8%	10%	12%	
1	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
2	2.0100	2.0200	2.0300	2.0400	2.0500	2.0600	2.0800	2.1000	2.1200	
3	3.0301	3.0604	3.0909	3.1216	3.1525	3.1836	3.2464	3.3100	3.3744	
4	4.0604	4.1216	4.1836	4.2465	4.3101	4.3746	4.5061	4.6410	4.7793	
5	5.1010	5.2040	5.3091	5.4163	5.5256	5.6371	5.8666	6.1051	6.3528	
6	6.1520	6.3081	6.4684	6.6330	6.8019	6.9753	7.3359	7.7156	8.1152	
7	7.2135	7.4343	7.6625	7.8983	8.1420	8.3938	8.9228	9.4872	10.0890	
8	8.2857	8.5830	8.8923	9.2142	9.5491	9.8975	10.6366	11.4359	12.2997	
9	9.3685	9.7546	10.1591	10.5828	11.0266	11.4913	12.4876	13.5795	14.7757	
10	10.4622	10.9497	11.4639	12.0061	12.5779	13.1808	14.4866	15.9374	17.5487	
11	11.5668	12.1687	12.8078	13.4864	14.2068	14.9716	16.6455	18.5312	20.6546	
12	12.6825	13.4121	14.1920	15.0258	15.9171	16.8699	18.9771	21.3843	24.1331	

- (i) How much will Jessica invest every six months? 1
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-
- (ii) What is the value of her investment after 5 years? 2
-
-
- (iii) After 3 years Jessica decides to open a second account with a savings target of \$12 000 in two years. She has also received a salary increase of \$5 000 per annum at this time and hopes to use this to cover her new payments. 2

Will the salary increase be enough to meet her new savings goal? Justify your answer.

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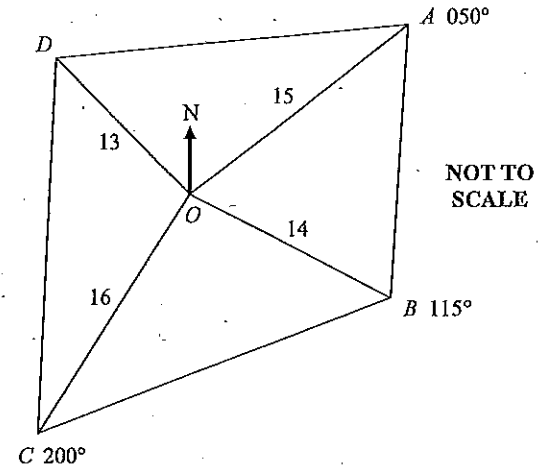
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Question 30 (continued)

- (d) The diagram shows part of the information obtained from a radial survey of a block of land. All linear measurements are in metres and three of the four corner points of the block are described using bearings taken from the point O .



The boundary from D to A was measured to be 17.1 metres in length.

Using the length of AD and the information given in the diagram, determine the bearing of D from O . Answer to the nearest degree.

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End of paper



CATHOLIC SECONDARY SCHOOLS ASSOCIATION OF NSW
2016 TRIAL HIGHER SCHOOL CERTIFICATE EXAMINATION
MATHEMATICS GENERAL 2

Section I
25 marks

Questions 1-25 (1 mark each)

Question	Answer	Content	Syllabus Assessed	Targeted Performance Bands
1	A	DS2 : Types of graphs	MGP-7	2-3
2	C	AM3 : Algebraic manipulation	MG2H-3	2-3
3	A	MM3 : Right-angled triangle Trigonometry	MGP-4	2-3
4	C	PB2 : Counting techniques	MG2H-8	2-3
5	B	FSDr3 : Converting units of speed	MGP-5	3-4
6	C	DS6 : Capture-Recapture	MG2H-8	3-4
7	D	FM5 : Present value by formula	MG2H-6	3-4
8	A	FSDr3 : Blood Alcohol Content	MGP-5	2-3
9	C	AM5 : identifying non-linear relations	MG2H-3	2-3
10	B	FSRe3 : Electricity charges	MG2H-5	3-4
11	A	DS4 : Interpreting sets of data	MG2H-7	3-4
12	C	MM5 : Trigonometry	MG2H-5	3-4
13	A	FSCo1 : Mobile phone costs	MGP-6	3-4
14	D	FM2 : Compound Interest	MGP-6	3-4
15	B	AM2 : Equations of straight lines	MGP-3	3-4
16	D	MM2 : Offset surveys	MGP-4	3-4
17	B	FSHe2 : Concentration of medication	MG2H-5	3-4
18	D	AM1 : interpreting non-linear graph	MG2H-3	3-4
19	A	MM6 : Latitude and Longitude	MG2H-5	3-4
20	C	FM4 : Loan repayments	MG2H-6	3-4
21	D	PB1 : Experimental probability	MGP-8	3-4
22	A	FSHe1 : Describing correlation	MG2H-3	4-5
23	B	FSRe2 : Electricity use	MG2H-5	4-5
24	D	MM4 : Simpson's Rule for area	MG2H-5	4-5
25	B	FMI : Leave loading	MGP-6	5-6

Section II
Question 26

26(a) (2 marks)
Content: FMI
Outcomes assessed: MGP-6
Targeted Performance Bands: 2-3

Solution	Criteria	Marks
$\$875 - 350 = \525 $\$525 \div 5 \times 100 = \$10\,500$	1 mark calculating commission	2
	2 marks for correct answer	

26(b)(i) (1 mark)
Content: DSI
Outcomes assessed: MGP-7
Targeted Performance Bands: 2-3

Solution	Criteria	Marks
The students of Mount Cook Secondary School	1 mark – must be specific	1

26(b)(ii) (1 mark)
Content: DSI
Outcomes assessed: MGP-7, MGP-10
Targeted Performance Bands: 3-4

Solution	Criteria	Marks
Responses may include, but are not limited to : He only sampled Year 12 students – not representative of whole student population Not sure which day he samples on – Monday could give very different results than Friday	1 mark for any valid source of bias described for this scenario	1

26(c) (2 marks)
Content: MMA
Outcomes assessed: MG2H-5
Targeted Performance Bands: 3-4

Solution	Criteria	Marks
Limits of radius measurement : 29.5 cm and 30.5 cm Limits of area : $\pi \times 29.5^2 = 2\,733.97 \text{ cm}^2$ $\pi \times 30.5^2 = 2\,922.47 \text{ cm}^2$	1 mark for correct limits of radius 2 marks for correct limits of area	2

26(d) (2 marks)

Content: MMI

Outcomes assessed: MGP-3

Targeted Performance Bands: 3-4

Solution	Criteria	Marks
3.6 L in 5 hours is a rate of 0.72 L/h 20 minutes = 1/3 hour 1/3 of 0.72 L = 240 mL. (or 0.24 L)	1 mark for correct rate in L/h or mL/h or equivalent working 2 marks for correct answer	2

26(e)(i) (1 mark)

Content: FSCo2

Outcomes assessed: MGP-5

Targeted Performance Bands: 2-3

Solution	Criteria	Marks
$4.2 \times 1024^2 = 4\,404\,019.2$ Bytes	1 mark correct answer	1

26(e)(ii) (2 marks)

Content: FSCo2

Outcomes assessed: MGP-5

Targeted Performance Bands: 3-4

Solution	Criteria	Marks
$\text{speed} = \left(\frac{4.2 \times 1024^2 \times 8}{1000} \right) \div 380$ $= 92.71619368$ $= 93 \text{ kbps}$	1 mark file size \div 380 seconds. 2 marks for correct solution.	2

26(f)(i) (1 mark)

Content: FSHe3

Outcomes assessed: MG2H-1

Targeted Performance Bands: 2-3

Solution	Criteria	Marks
Australia	1 mark for correct answer	1

26(f)(ii) (1 mark)

Content: FSHe3

Outcomes assessed: MG2H-1

Targeted Performance Bands: 3-4

Solution	Criteria	Marks
Reasons may include, but are not limited to, references to higher mortality rate as a result of war/conflict; limited access to medical/health care; etc	1 mark for a valid reason in this scenario	1

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26(g)(i) (1 mark)

Content: DS4

Outcomes assessed: MG2H-2

Targeted Performance Bands: 3-4

Solution	Criteria	Marks
May	1 mark for correct answer	1

26(g)(ii) (1 mark)

Content: MM4

Outcomes assessed: MG2H-2

Targeted Performance Bands: 3-4

Solution	Criteria	Marks
Melbourne's sales are fairly consistent from January to June with a slight increase over the six months	1 mark for correct response	1

Question 27

27(a) (1 mark)

Content: PB2

Outcomes assessed: MG2H-8

Targeted Performance Bands: 2-3

Solution	Criteria	Marks
$0.18 \times 150 = 27$ orders	1 mark for correct answer	1

27(b) (2 marks)

Content: FM4

Outcomes assessed: MG2H-6

Targeted Performance Bands: 3-4

Solution	Criteria	Marks
No. of days = 30 Interest rate per day : 18.75/365 % $\text{Interest} = 3\,650 \times 18.75/365 + 100 \times 30$ $= \$56.25$ (n.b. accept interest calculated as either simple or compound) $\text{Amount owing} = \$3\,650 + \56.25 $= \$3\,706.25$	1 mark for correct calculation of interest owing. 2 marks for correct solution	2

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27(c)(i) (1 mark)

Content: DS2

Outcomes assessed: MGP-1

Targeted Performance Bands: 2-3

Solution	Criteria	Marks
76.5	1 mark correct answer	1

27(c)(ii) (3 marks)

Content: DS4

Outcomes assessed: MG2H-2

Targeted Performance Bands: 3-4

Solution	Criteria	Marks
Upper quartile UQ = 106 Lower quartile = 86.5 IQR = 19.5 $106 + 1.5 \times 19.5 = 135.25$ The score 144 is greater than 135.25 therefore it is considered an outlier	1 mark calculating the UQ, LQ and IQR 2 marks correct substitution into the outlier result leading to 135.25 3 marks for correct conclusion from supporting calculations	3

27(c)(iii) (3 marks)

Content: DS4

Outcomes assessed: MG2H-10

Targeted Performance Bands: 3-4

Solution	Criteria	Marks												
<table border="1"> <thead> <tr> <th></th> <th>Before Exercise</th> <th>After Exercise</th> </tr> </thead> <tbody> <tr> <td>Shape</td> <td>Positively skewed</td> <td>Positively skewed</td> </tr> <tr> <td>Centre</td> <td>Median = 76.5</td> <td>Median = 94.5</td> </tr> <tr> <td>Spread</td> <td>Range = 44 IQR = 11.5</td> <td>Range = 64 IQR = 19.5</td> </tr> </tbody> </table> <p>This table is a suggestion only. The information contained reflects correct calculations/analysis</p>		Before Exercise	After Exercise	Shape	Positively skewed	Positively skewed	Centre	Median = 76.5	Median = 94.5	Spread	Range = 44 IQR = 11.5	Range = 64 IQR = 19.5	1 mark comparison of shape 1 mark for comparison of centre 1 mark for comparison of spread Each of these comparisons requires correct analysis/calculations for the data	3
	Before Exercise	After Exercise												
Shape	Positively skewed	Positively skewed												
Centre	Median = 76.5	Median = 94.5												
Spread	Range = 44 IQR = 11.5	Range = 64 IQR = 19.5												

27(d) (3 marks)

Content: AM5

Outcomes assessed: MG2H-3

Targeted Performance Bands: 4-5

Solution	Criteria	Marks
Let t represent time and f be the number of friends $t = \frac{k}{f} \quad 6 = \frac{k}{5} \quad \therefore k = 30$ $2 = \frac{30}{f} \quad \therefore f = 15$ 15 friends are required to complete the job in 2 hours	1 mark for recognition of the inverse proportionality by setting up a correct equation 2 marks for correct calculation of the constant, k 3 marks for a correct solution with supporting calculations	3

27(e) (2 marks)

Content: MM4

Outcomes assessed: MG2H-4

Targeted Performance Bands: 3-4

Solution	Criteria	Marks
Shaded area $A = \frac{100}{360} \pi (12^2 - 8^2)$ $= 69.81317008$ $= 70 \text{ cm}^2 \text{ (nearest square centimetre)}$	1 mark progress towards correct solution such as area of annulus with sector angle or one partial annulus area correct 2 marks correct solution	2

Question 28

28(a) (1 mark)

Content: FM3

Outcomes assessed: MGP-6

Targeted Performance Bands: 3-4

Solution	Criteria	Marks
$\frac{63}{420} \times 100 = 15\%$ GST charged at 15%.	1 mark correct answer	1

28(b) (2 marks)

Content: FSDr3

Outcomes assessed: MGP-5

Targeted Performance Bands: 3-4

Solution	Criteria	Marks
$N = \frac{VA}{1.27}$	1 mark for correct substitution into the given formula	2
$1 = \frac{V \times 11.5}{1.27}$ $V = 0.1104347826$ $V = 110 \text{ mL (nearest mL)}$	2 marks for correct solution	

28(c) (3 marks)

Content: FSDr2

Outcomes assessed: MGP-5

Targeted Performance Bands: 4-5

Solution	Criteria	Marks
$\$2\,028 \div 1.50 = 1\,352\text{L used.}$	1 mark calculating number of litres of petrol purchased	3
$1\,352 \div 6.5 = 208$	2 marks for total kilometres travelled in the year or equivalent progress	
$208 \times 100 = 20\,800 \text{ km travelled}$ $20\,800 \div 52 = 400 \text{ km / week}$	3 marks correct solution	

28(d) (3 marks)

Content: AM3

Outcomes assessed: MGP-3

Targeted Performance Bands: 5-6

Solution	Criteria	Marks
$3(2x - 1) = 5x - 15$	1 mark for an attempt to create a common denominator	3
$6x - 3 = 5x - 15$	2 marks significant progress towards the correct answer	
$x = -12$	3 marks for correct solution with working	

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28(e) (2 marks)

Content: PB2

Outcomes assessed: MG2H-8

Targeted Performance Bands: 3-4

Solution	Criteria	Marks
Financial Expectation : $FE = \frac{1}{5} \times 10 + \frac{2}{5} \times 4 - \frac{2}{5} \times 5 - 1$ $= \$0.60$	1 mark for correct probabilities for all three outcomes 2 marks for correct solution	2

28(f)(i) (1 mark)

Content: FSRe2

Outcomes assessed: MG2H-4

Targeted Performance Bands: 3-4

Solution	Criteria	Marks
$Area = \frac{2.4}{2} (40 + 50)$ $= 108 \text{ m}^2$	1 mark correct answer	1

28(f)(ii) (3 marks)

Content: FSRe2

Outcomes assessed: MG2H-4

Targeted Performance Bands: 3-4

Solution	Criteria	Marks
$V = \frac{h}{3} \{A_L + 4A_M + A_R\}$ $V = \frac{40}{3} \{81 + 4 \times 108 + 81\}$ $= 7\,920 \text{ m}^3$ $= 7\,920 \text{ kL}$	1 mark for correct substitution of values into Simpson's rule for volume 2 marks for correct answer in cubic metres 3 marks for correct solution in kL	3

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Question 29

29(a) (2 marks)

Content: PB2

Outcomes assessed: MG2H-8

Targeted Performance Bands: 3-4

Solution	Criteria	Marks
<p> $P(\text{girl}) = \frac{1}{2} \times \frac{1}{2} + \frac{1}{2} \times \frac{5}{12}$ $= \frac{11}{24}$ </p>	<p>1 mark for tree diagram that indicates the choice of group followed by the choice of person</p> <p>2 marks for correct solution with supporting working or correct tree diagram</p>	2

29(c)(i) (2 marks)

Content: AM3

Outcomes assessed: MG2H-3

Targeted Performance Bands: 4-5

Solution	Criteria	Marks
$C = 10x + 1\,500$ $C = 25x$ $\therefore 25x = 10x + 1\,500$ $15x = 1\,500$ $x = 100$ $C = 25x$ $C = 2\,500$	<p>1 mark for a correct process that leads to one correct value of either C or x</p> <p>2 marks for a correct solution</p>	2

29(c)(ii) (1 mark)

Content: AM4

Outcomes assessed: MG2H-3

Targeted Performance Bands: 5-6

Solution	Criteria	Marks
<p>x represents the number of metres of fencing that will give the same cost for both companies</p>	<p>1 mark for a correct response</p>	1

29(b) (2 marks)

Content: MM6

Outcomes assessed: MG2H-5

Targeted Performance Bands: 4-5

Solution	Criteria	Marks
<p>Angular distance = 74° Time difference = 74×4 minutes = 296 minutes = 4 hours and 56 minutes</p> <p>London local time on arrival of plane in New York is 4 hours and 56 minutes later than New York time.</p> <p>3.34 pm plus 4 h 56 min = 8.30 pm</p> <p>Flight time is 7.5 hours or 7 hours 30 minutes</p>	<p>1 mark for correct calculation of time difference between London and New York (or equivalent)</p> <p>2 marks for correct solution indicating flight time</p>	2

29(c)(iii) (1 mark)

Content: AM4

Outcomes assessed: MG2H-3

Targeted Performance Bands: 4-5

Solution	Criteria	Marks
$C = 10x + 1\,500$ $4\,300 = 10x + 1\,500$ $10x = 2\,800$ $x = 280 \text{ metres}$	<p>1 mark for a correct solution</p>	1

29(d)(i) (1 mark)

Content: FSHe1

Outcomes assessed: MG2H-7

Targeted Performance Bands: 3-4

Solution	Criteria	Marks
The strong positive correlation indicates that, as age increases, so does blood pressure reading	1 mark response must allude to the increase of one value with the other, making specific mention of age and blood pressure	1

29(d)(ii) (2 marks)

Content: FSHe1

Outcomes assessed: MG2H-7

Targeted Performance Bands: 4-5

Solution	Criteria	Marks
$\text{Gradient} = 0.9 \times \frac{10.4}{9.7}$ $= 0.9649484536$	1 mark for correct gradient or y-intercept	2
$y\text{-intercept} = 136.5 - (0.96 \times 57.5)$ $= 81.3$ $\therefore y = mx + b$ $y = 0.96x + 81.3$	2 marks for correct solution that clearly indicates the calculations required to find both the gradient and the y-intercept	

29(d)(iii) (1 mark)

Content: FSHe1

Outcomes assessed: MG2H-7

Targeted Performance Bands: 2-3

Solution	Criteria	Marks
$y = 0.96x + 81.3$ $y = 0.96 \times 50 + 81.3$ $y = 129.3$	1 mark for correct answer.	1

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29(e) (3 marks)

Content: MM4

Outcomes assessed: MG2H-5, MG2H-10

Targeted Performance Bands: 4-5

Solution	Criteria	Marks
Volume of each pedestal : $V = \pi \times 14^2 \times 60 + 40^2 \times 15$ $= 60\,945.12961 \text{ cm}^3$ $= 0.06094512961 \text{ m}^3$	1 mark correct volume of pedestal in cubic centimetres	3
Volume of 100 pedestals : $V = 6.094512961 \text{ m}^3$	2 marks correct volume of one pedestal, converted to cubic metres	
Concrete truck will deliver 6 m^3 which is NOT enough	3 marks for a correct conclusion drawn from correct and complete working	

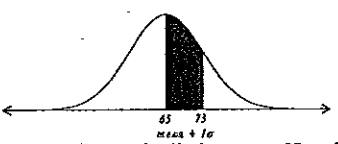
Question 30

30(a)(i) (1 mark)

Content: DS5

Outcomes assessed: MG2H-7

Targeted Performance Bands: 3-4

Solution	Criteria	Marks
	1 mark for correct answer	1

30(a)(ii) (2 marks)

Content: DS5

Outcomes assessed: MG2H-7, MG2H-10

Targeted Performance Bands: 4-5

Solution	Criteria	Marks
Zac's score (using his z-score) is $65 + 2.5 \times 8 = 85$. or Tranh's z score is $z = \frac{85 - 64}{8}$ $= 2.375$	1 mark for either calculating Zac's result or Tranh's z-score	2
Zac is correct in saying that his result is better	2 marks for a correct response to the statement made, with supporting calculation	

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30(b) (3 marks)

Content: FSRe2

Outcomes assessed: MG2H-5

Targeted Performance Bands: 4-5

Solution	Criteria	Marks
Volume of rainfall : $V = 30\,000 \times 0.065$ $= 1\,950\text{ m}^3$ Rainfall flowing into tank : 20% of $1\,950 = 390\text{ m}^3$ Rise in level of water in tank : $390 \div 85.2 = 4.577464789$ $= 4.58\text{ m}$ (nearest centimetre)	1 mark correct calculation of amount of rain that fell in the catchment area 2 marks calculating volume of rain flowing into the tank 3 marks for correct solution	3

30(c)(i) (1 mark)

Content:

Outcomes assessed: MG2H-6

Targeted Performance Bands: 2-3

Solution	Criteria	Marks
5% of \$108 600 = \$5 430	1 mark correct answer	1

30(c)(ii) (2 marks)

Content:

Outcomes assessed: MG2H-6

Targeted Performance Bands: 3-4

Solution	Criteria	Marks
$\$5\,430 \times 11.4639 = \$62\,248.98$	1 mark correct choice of value from table or 1 mark for multiplying \$5 430 by 5.6371 \rightarrow \$30 609.45 (i.e. compounding annually, not every 6 months) 2 marks correct solution (include CFP from (i))	2

30(c)(iii) (2 marks)

Content: FM5

Outcomes assessed: MG2H-6, MG2H-10

Targeted Performance Bands: 4-5

Solution	Criteria	Marks
$\$12\,000 \div 4.1836 = \$2\,868.34$ needed every 6 months to meet the savings goal $\$2\,868.34 \times 2 = \$5\,736.69$ per year needed \therefore No – her \$5 000 increase will not cover the new savings goal	1 mark calculating the amount required for each deposit 2 marks for correct response to the scenario given based on calculations	2

30(d) (4 marks)

Content: MMS

Outcomes assessed: MG2H-4

Targeted Performance Bands: 5-6

Solution	Criteria	Marks
$\angle DOA :$ $\cos \angle DOA = \frac{13^2 + 15^2 - 17^2}{2 \times 13 \times 15}$ $= 0.2604871795$ $\angle DOA = 74.90102839$ $\angle DOA = 75^\circ$ $\angle DON = 75^\circ - 50^\circ$ $= 25^\circ$ The bearing of D from O is $360^\circ - 25^\circ = 335^\circ$	1 mark for a correct substitution of appropriate values into the cosine rule (either form) in order to calculate $\angle DOA$ 2 marks for correct value of $\angle DOA$ 3 marks for correctly establishing the angle $\angle DON$ 4 marks for correct bearing with sufficient correct working.	4