



ST AUGUSTINE'S
COLLEGE - SYDNEY

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Student Number

2014
HIGHER SCHOOL CERTIFICATE
TRIAL EXAMINATION

General Mathematics 2

General Instructions

- Reading time – 5 minutes
- Working time – 2.5 hours
- Attempt ALL questions
- Write using black or blue pen
- Board-approved calculators may be used
- A formula sheet is provided at the back of this paper
- Write your Student Number at the top of the page

Total marks: 100

Section I Pages 2-12

25 marks

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

Section II Pages 13-31

75 marks

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

Section I

25 marks

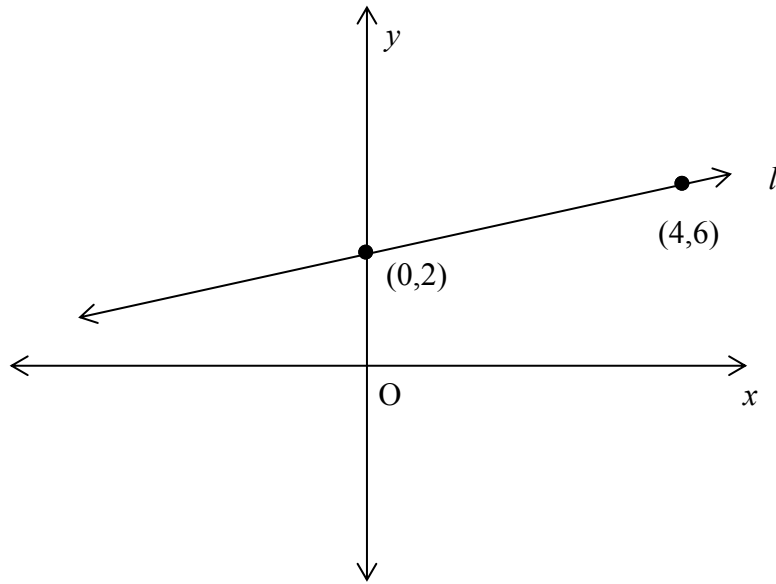
Attempt Questions 1 - 25

Allow about 35 minutes for this section

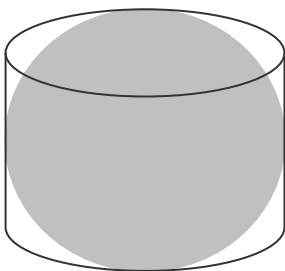
Use the multiple-choice answer sheet for Questions 1-25

- 1 Fifty tickets are sold in a raffle. There are two prizes. Mandy buys 5 tickets. Which expression gives the probability that Mandy wins both prizes?
- (A) $\frac{5}{50} + \frac{4}{50}$
- (B) $\frac{5}{50} + \frac{4}{49}$
- (C) $\frac{5}{50} \times \frac{4}{50}$
- (D) $\frac{5}{50} \times \frac{4}{49}$
- 2 If $w = \frac{15y}{y+12}$ and $y = 11$, find the value of w (correct to two decimal places).
- (A) 6.89
- (B) 27.01
- (C) 8.12
- (D) 7.17
- 3 Sino measured his height to be 173 cm, correct to the nearest centimetre. What is the percentage error in his measurement?
- (A) $\pm 0.26\%$
- (B) $\pm 0.29\%$
- (C) $\pm 0.0029\%$
- (D) $\pm 0.0026\%$

- 4 Find the equation of line l .

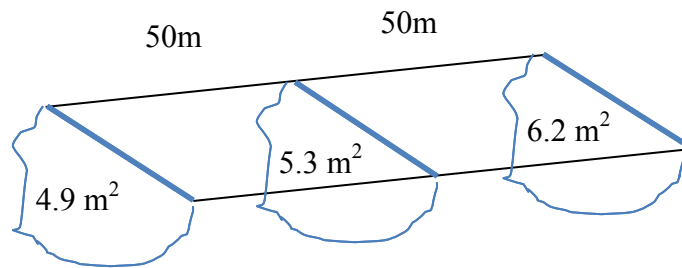


- (A) $y = 3x + 2$
- (B) $y = x + 2$
- (C) $y = 6x + 2$
- (D) $y = 6x + 2$
- 5 A sphere fits exactly inside a cylindrical container as shown below. The diameter of the sphere is 28 cm. Calculate the volume of the cylinder to 3 significant figures.



- (A) 17200 cm^3
- (B) 8620 cm^3
- (C) 16800 cm^3
- (D) 12600 cm^3

6



The volume of the reservoir shown, when using one application of Simpson's rule, is approximately

- (A) 538 m²
 - (B) 1077 m²
 - (C) 808 m²
 - (D) 239m²
7. In NSW, most postcodes have four digits and begin with the number 2. How many different postcodes of this type are possible?
- (A) 10
 - (B) 30
 - (C) 1000
 - (D) 10 000

- 8 Stephanie and Amien each received \$2000 from their uncle. Stephanie invested her \$2000 in Fixed Term Bonds and Amien invested his \$2000 in an investment account. Both investments were for a 3 year term. The details of their investment are given below.

| <i>FIXED TERM BONDS</i> | <i>INVESTMENT ACCOUNT</i> |
|--|---|
| \$ 250 each After 3 years each Bond can be cashed in for \$285 | 6% p.a. interest Compounding monthly |

How much more than Stephanie's investments will Amien's investment be worth at the end of the 3 year term?

- (A) \$115.98
 (B) \$120.23
 (C) \$134.67
 (D) \$113.36
9. The following table shows the income tax rate for a particular country.

| Taxable Income | Tax Payable on Taxable Income |
|--------------------|--|
| \$0 – \$8 000 | Nil |
| \$8001 – \$23600 | 16¢ for each \$1 over \$8000 |
| \$23601 – \$65000 | \$2496 plus 30¢ for each \$1 over \$23 600 |
| \$65001 – \$97 000 | \$14 916 plus 42¢ for each \$1 over \$65 000 |
| Over \$97 000 | \$28 356 plus 48¢ for each \$1 over \$97 000 |

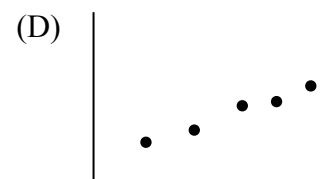
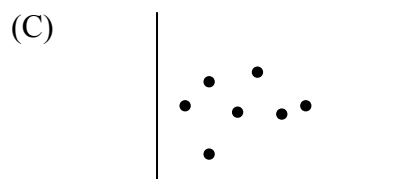
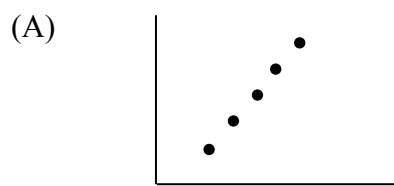
At the end of the last financial year Lana was required to pay income tax of \$25 416. Her taxable income was:

- (A) \$76 867
 (B) \$89 500
 (C) \$90 000
 (D) \$107 450

10 A train trip costs \$6.80 including 10% GST. Which of the following is the train trip's price before GST, (correct to the nearest cent)?

- (A) \$6.18
- (B) \$6.70
- (C) \$5.90
- (D) \$7.48

11 Which graph shows a negative correlation?



12 The times (in minutes), spent in a shop for both men and women are recorded below. Determine the difference between the median scores of both the men and women.

| TIME SPENT SHOPPING | | | |
|---------------------|-------|---------------|--|
| MEN | Women | | |
| 9 8 8 | 0 | 6 | |
| 5 4 4 2 2 | 1 | 2 2 5 8 | |
| 9 3 1 1 | 2 | 1 3 3 4 5 5 6 | |
| 5 4 2 | 3 | 2 2 4 | |

- (A) 8
- (B) 9
- (C) 7
- (D) 266

- 13 The area of a sector is given by the formula $A = \frac{\theta}{360} \pi r^2$. Rearranging this formula to make r the subject gives:

(A) $r = \sqrt{A - \frac{\pi\theta}{360}}$

(B) $r = \sqrt{360A - \pi\theta}$

(C) $r = \sqrt{\frac{360A}{\pi\theta}}$

(D) $r = \frac{\sqrt{360A}}{\pi\theta}$

- 14 Young's rule can be used to calculate a child's medicine dose.

Young's rule is: $C = \frac{nA}{n+12}$ where C is the child's dose (in mL), n is the age of the child (in years) and A is the adult dose (in mL). For a particular medicine, the child dose for a 3 year old is 12 mL. Calculate the adult dose.

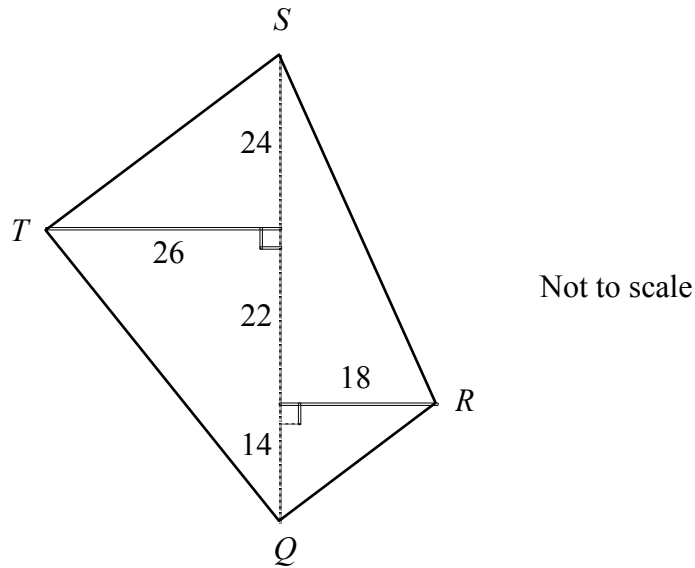
- (A) 50 mL
(B) 60 mL
(C) 70 mL
(D) 80 mL

- 15 Use the table of future values of \$1 to find the future value of \$1480 invested per year at 3% p.a. for 9 years, with interest compounded annually.

| Future values of \$1 | | | | | | | | |
|----------------------|----------------------------|---------|---------|---------|---------|---------|---------|---------|
| Period | Interest rate (per period) | | | | | | | |
| | 1% | 2% | 3% | 4% | 5% | 6% | 7% | 8% |
| 1 | 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 | 2.0700 | 2.0800 |
| 3 | 3.0301 | 3.0604 | 3.0909 | 3.1216 | 3.1525 | 3.1836 | 3.2149 | 3.2464 |
| 4 | 4.0604 | 4.1216 | 4.1836 | 4.2465 | 4.3101 | 4.3746 | 4.4399 | 4.5061 |
| 5 | 5.1010 | 5.2040 | 5.3091 | 5.4163 | 5.5256 | 5.6371 | 5.7507 | 5.8666 |
| 6 | 6.1520 | 6.3081 | 6.4684 | 6.6330 | 6.8019 | 6.9753 | 7.1533 | 7.3359 |
| 7 | 7.2135 | 7.4343 | 7.6625 | 7.8983 | 8.1420 | 8.3938 | 8.6540 | 8.9228 |
| 8 | 8.2857 | 8.5380 | 8.8923 | 9.2142 | 9.5491 | 9.8975 | 10.2598 | 10.6366 |
| 9 | 9.3685 | 9.7546 | 10.1591 | 10.5828 | 11.0266 | 11.4913 | 11.9780 | 12.4876 |
| 10 | 10.4622 | 10.9497 | 11.4639 | 12.0061 | 12.5779 | 13.1808 | 13.8164 | 14.4866 |

- (A) \$14270.80
- (B) \$15035.47
- (C) \$13890.34
- (D) \$16408.67

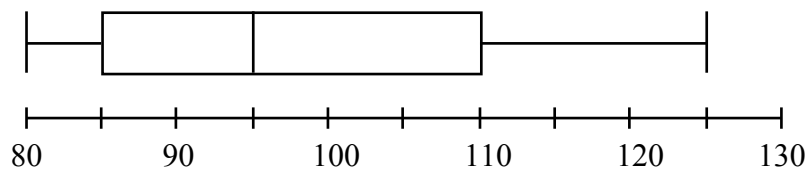
- 16 The diagram shows a surveyor's sketch of an offset survey of a field $QRST$. All dimensions are in metres.



The area of the field, in square metres, is:

- (A) 186
- (B) 210
- (C) 1320
- (D) 2850

- 17



Paulo and Yan make the following statements about the box-and-whisker plot above.

Paulo: "The interquartile range is 25 and the mean is 95"

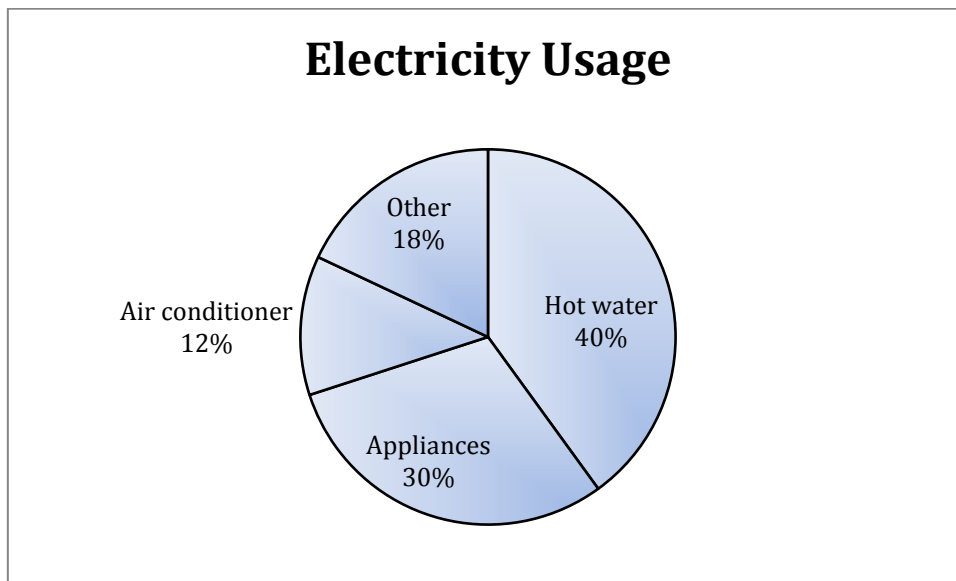
Yan: "The range is 25 and the median is 95"

Which of the students made a correct statement?

- (A) Paulo only
- (B) Yan only
- (C) Paulo and Yan
- (D) Both statements were incorrect

- 18** Eight people enter a train in which there are 5 seats available. The number of ways in which 8 people can be chosen to fill the seats is:
- (A) 56
 - (B) 1344
 - (C) 4032
 - (D) 6720
- 19** How many committees of three people can be chosen from eight people
- (A) 24
 - (B) 56
 - (C) 201
 - (D) 336
- 20** The lifetime of a certain brand of batteries is normally distributed, with an average lifetime of 60 hours and a standard deviation of 3.4 hours. Approximately what proportion of these batteries has a lifetime between 53.2 hours and 60 hours?
- (A) 2.5%
 - (B) 4%
 - (C) 13.5%
 - (D) 47.5%
- 21** Wagga Wagga in NSW has coordinates (35°S, 147°E). Port Moresby in Papua New Guinea is due north of Wagga Wagga.
- Which of the following could be the coordinates of Port Moresby?
- (A) (10°S, 135°E)
 - (B) (42°S, 147°E)
 - (C) (10°S, 135°E)
 - (D) (10°S, 147°E)

- 22 This sector graph shows the energy used by the Huon family in a 90 day period.



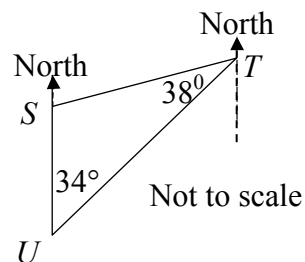
If the hot water cost \$360 in this bill, how much did it cost to run the air conditioner?

- (A) \$120
 (B) \$432
 (C) \$108
 (D) \$360
- 23 Solve the equation $2x - 6 = \frac{x + 4}{2}$

- (A) $x = -\frac{7}{3}$
 (B) $x = -\frac{2}{3}$
 (C) $x = \frac{10}{3}$
 (D) $x = \frac{16}{3}$

- 24 Determine the true bearing of S from T .

- (A) $072^\circ T$
 (B) $108^\circ T$
 (C) $252^\circ T$
 (D) $34^\circ T$



- 25 The equation $C = 4n + 140$ models a hamburgers shop's costs. The 140 could represent:
- (A) Number of hamburgers made
 - (B) Number of hamburgers sold
 - (C) The cost per hamburger
 - (D) Fixed daily cost
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End of Section I

Mathematics General 2

Section II

| | | | | | | | | | |
|--|--|--|--|--|--|--|--|--|--|
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Student Number

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 at the back of this paper. If you use this space, clearly indicate which question you are answering.

Question 26 (15 marks)

- (a) In a game of dice, two dice are rolled together and the score is found by multiplying the resulting numbers on each die. The table below shows the possible scores in any game.

| | | 1 st Die | | | | | |
|---------------------|---|---------------------|----|----|----|----|----|
| | | 1 | 2 | 3 | 4 | 5 | 6 |
| 2 nd Die | 1 | 1 | 2 | 3 | 4 | 5 | 6 |
| | 2 | 2 | 4 | 6 | 8 | 10 | 12 |
| | 3 | 3 | 6 | 9 | 12 | 15 | 18 |
| | 4 | 4 | 8 | 12 | 16 | 20 | 24 |
| | 5 | 5 | 10 | 15 | 20 | 25 | 30 |
| | 6 | 6 | 12 | 18 | 24 | 30 | 36 |

In this game the prizes are as follows:

| SCORE | PRIZE |
|--------------|----------|
| 36 | Win \$15 |
| 18-35 | Win \$8 |
| Less than 18 | Lose \$2 |

- (i) Calculate the financial expectation of the game.

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Question 26 continues on the next page

- (ii) If the cost of the game was \$1 would you continue playing the game for an extended period. Explain your answer. **1**

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- (b) Calculate the average daily balance for the month of December using the information in this credit card statement? **3**

| December statement | | |
|--------------------|-------------------|-------------|
| Date | Details | Amount (\$) |
| 1 December | Opening balance | 87 |
| 10 December | Electricity rates | 345 |
| 14 December | Purchase | 230 |
| 22 December | Payment | -167 |
| 26 December | Purchase | 217 |

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Question 26 continues on the page 15

Question 26 (Continued)

- (c) A biologist captures a random sample of 140 fish from a lake. Each fish is tagged and released back into the lake. One month later another random sample of 60 fish is caught and it is found that 5 of them have tags. Estimate how many fish there are in the lake. 2

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- (d) Solve these equations simultaneously, showing all working. 2

$$6x - 2y = 6$$

$$5x + 4y = 22$$

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Question 26 continues on page 16

Question 26 (continued)

- (e) A patient is to receive 1.08 L of fluid over 3 hours through an IV drip. There are 16 drops/ml. How many drops per minute are required? 2

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- (f) Pippa took out a \$20 000 loan to renovate her kitchen. She drew up a spreadsheet to show the progress of her loan repayments. The table below is produced from the spreadsheet.

| Pippa's Loan Amount of Loan \$20 000 Interest rate 6% pa compounded monthly Monthly Repayment \$1200 | | | | | |
|---|------------------|--------------|---------------|-----------|-----------|
| Month No | Amount Owing (P) | Interest (I) | Repayment (R) | P+I | P+I-R |
| 1 | 20 000.00 | 100.00 | 1200.00 | 20 100.00 | 18 900.00 |
| 2 | 18900.00 | 94.50 | 1200.00 | 18 994.50 | 17 794.50 |
| 3 | 17794.50 | 88.97 | 1200.00 | 17 883.47 | 16 683.47 |
| 4 | 16 683.47 | A | 1200.00 | B | C |

- Calculate the values that would appear in the table at the points A, B and C 3

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Question End of Question 26

Question 27 (15 marks)

- (a) Make y the subject: $\frac{x}{p-k} = \frac{w}{y}$ **1**

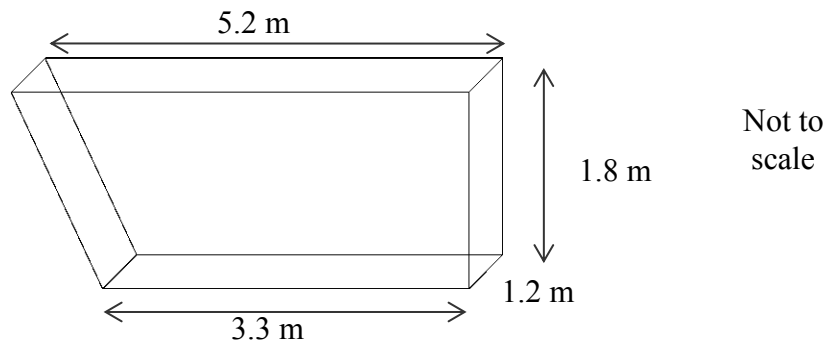
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- (b) A company has small skip bins for domestic use to hire. A diagram of the small skip bin is shown below.



- The company decided to provide large skips for industrial use to hire. These bins are exactly three times the dimensions of the domestic skip bins. Find the volume of an industrial bin, correct to the nearest m^3 . **3**

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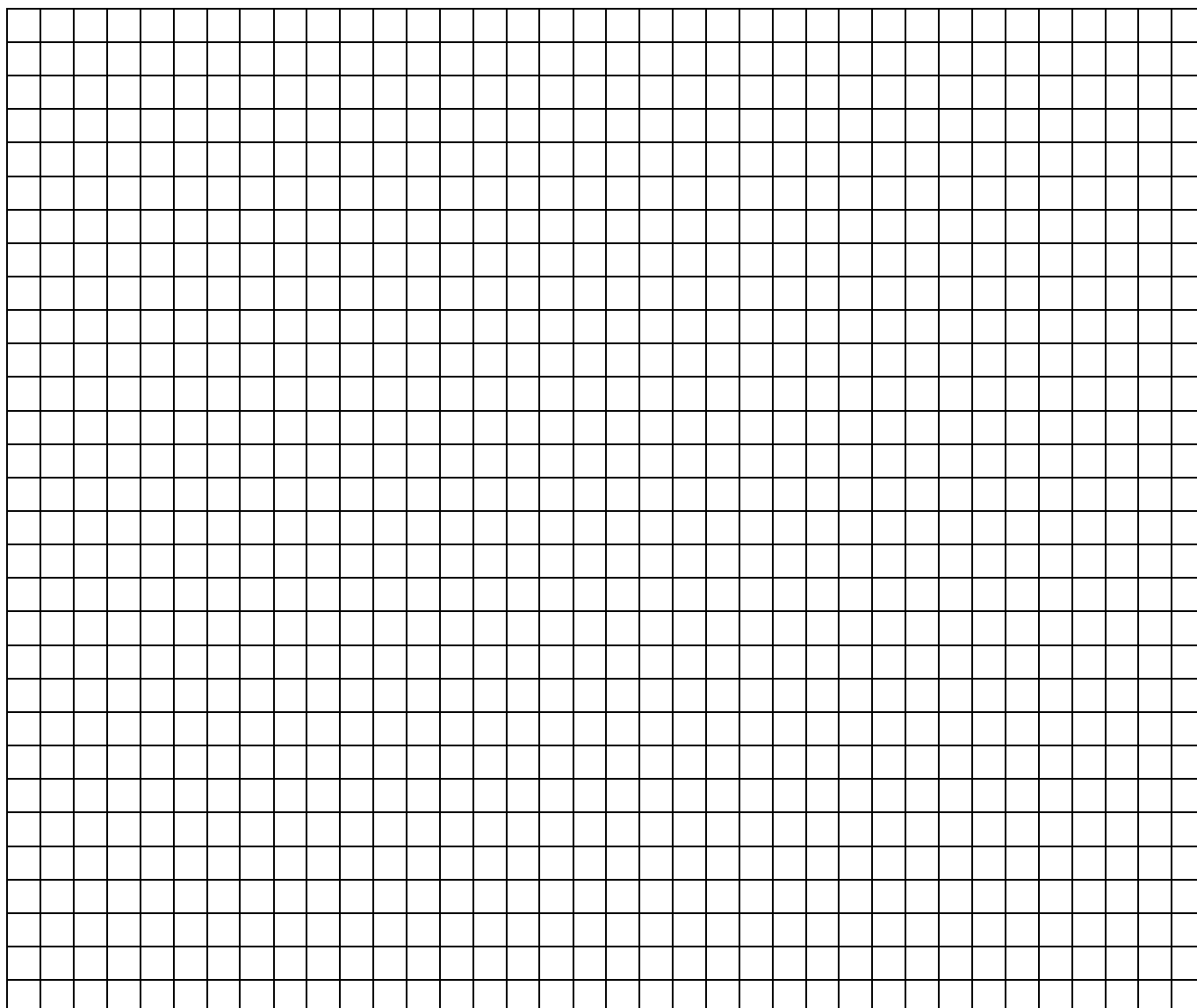
Question 27 continues on the next page

Question 27 (continued)

- (c) The heights of a group of year 6 boys and their mothers were collected and the results tabulated below.

| | Height in cm | | | | | | | | |
|---------------------------|--------------|-----|-----|-----|-----|-----|-----|-----|-----|
| Year 6 Boys | 105 | 109 | 112 | 115 | 117 | 121 | 123 | 125 | 130 |
| Mothers of year 6 Boys | 158 | 161 | 165 | 164 | 172 | 175 | 172 | 172 | 175 |

- (i) On the graph provided, draw a scatter plot. **2**
- (ii) Hence draw a line of best fit. **1**



Question 27 (continued)

- (d) The table shows the mean and standard deviation of the results in PDHPE and French exams.

| Subject | Mean | Standard Deviation |
|---------|------|--------------------|
| PDHPE | 72 | 7 |
| French | 65 | 11 |

Anna scored 76 in PDHPE and 69 in French.

- (i) Calculate Anna's z-score for PDHPE and French. 2

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- (ii) In which of the two exams was her result better? Justify your answer. 2

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- (e) Expand and simplify: $x(x-y) - y(y-x)$ 2

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Question 27 continues on the next page

Question 27 (continued)

- (f) A person saving for retirement decides to invest \$3000 at the end of each year for 5 years into an account that pays interest of 8% p.a. Find the values of A, B, C and D which are used to find the final value of the annuity. Write your answers in the following table. 2

| Payment | Amount | Number of years invested | Amount |
|---------|--------|--------------------------|-----------|
| 1 | \$3000 | 4 | \$4081.47 |
| 2 | \$3000 | 3 | \$3779.14 |
| 3 | \$3000 | 2 | A = |
| 4 | \$3000 | 1 | B = |
| 5 | \$3000 | 0 | C = |
| | | Total | D = |

End of Question 27

Question 28 (15 marks)

(a) The probability that a particular infection will be cured when treated with an antibiotic is 0.9. If two patients with an infection are treated with this antibiotic, find the probability that:

(i) One will be cured but not the other. 2

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(ii) At least one will be cured. 2

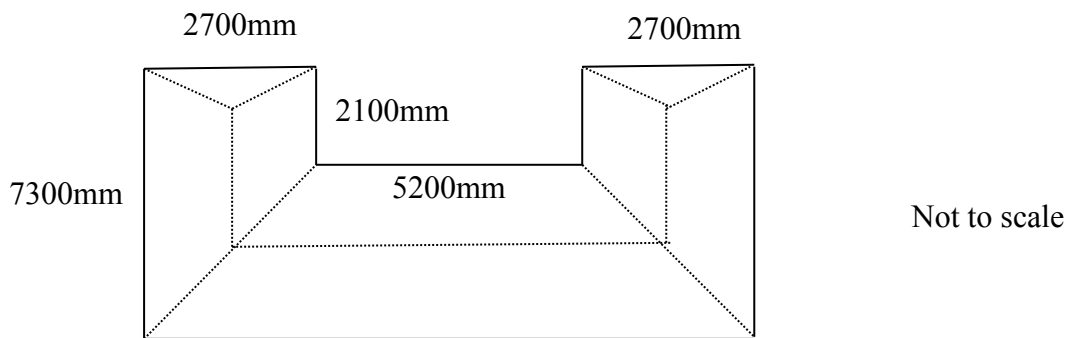
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(b)



(i) Calculate the plan-view area of the roof of the house shown, in m^2 , to 2 decimal places. 2

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Question 28 (continued)

- (ii) This house is situated in a place called Drist. The average rainfall for Drist in July is 86.4 mm. How much water, in litres, could be expected to be collected from this roof in July next year, allowing 12% wastage? **2**

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- (c) Osaka in Japan has position coordinates (34°N, 135°E) and Alice Springs, Australia is (23°S, 135°E).

- (i) Is there a time difference between Osaka and Alice Springs? **1**
Give reasons.

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- (ii) Find the angular distance between these two cities. **1**

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- (iii) Find the distance, in kilometres, between Osaka and Alice Springs, Given that the radius of the earth is 6400km. **1**

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Question 28 continues on the next page

Question 28 (c) continued

- (iv) Joo's father is in a city in Europe, which is located at (12°N, 40°E). He wants to call Joo, who lives in Alice Springs, for his excellent marks in a recent mathematics test. Joo can take the call at 9 am, at what time did Joo's father make the call in Europe? **2**

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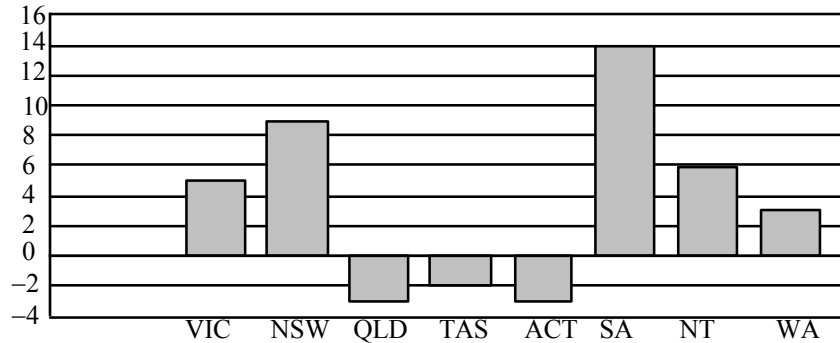
- (d) A patient is prescribed 600 mg of a painkiller. The medication available contains 40 mg in 5 ml. What volume should be given to the patient? **2**

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End of Question 28

Question 29 (15 marks)

- (a) The following graph shows the percentage swing to and from the Liberals. It also shows Queensland has a negative value. Explain what this means. **2**



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- (b) The following are standard drinks:
- * Low alcohol beer 425 ml (Schooner);
 - * Beer 285 ml (Middy);
 - * Table wine 115 ml;
 - * Fortified wines 55 ml;
 - * Spirit liquers 30 ml;
 - * Mixed drink 30 ml spirit plus mixer.

In a period of one hour a female who weighs 68 kg, consumes the following standard drinks:

- 2 schooners of low alcohol beer (425 ml each)
- 1 mixed spirit drink (30 ml spirit + mixer)
- 3 tablewines (115 ml each)

What is her highest BAC level likely to be, assuming she ate on an empty stomach? **2**

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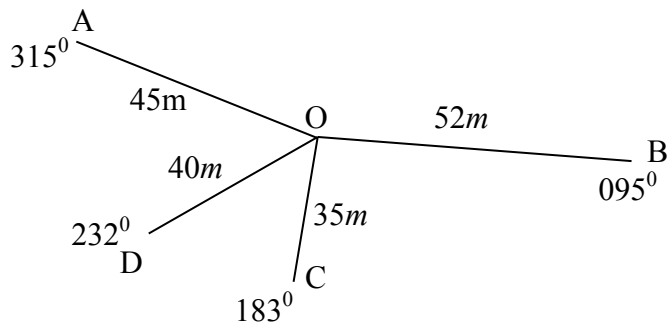
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Question 29 continues on the next page

Question 29 (continued)

(c) A radial survey of a paddock is drawn below. All measurements are in metres



(i) What is the size of the obtuse $\angle AOB$. 1

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(ii) Calculate the length of AB to 1 decimal place. 2

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(iii) Calculate the area of triangle AOB to the nearest m^2 . 2

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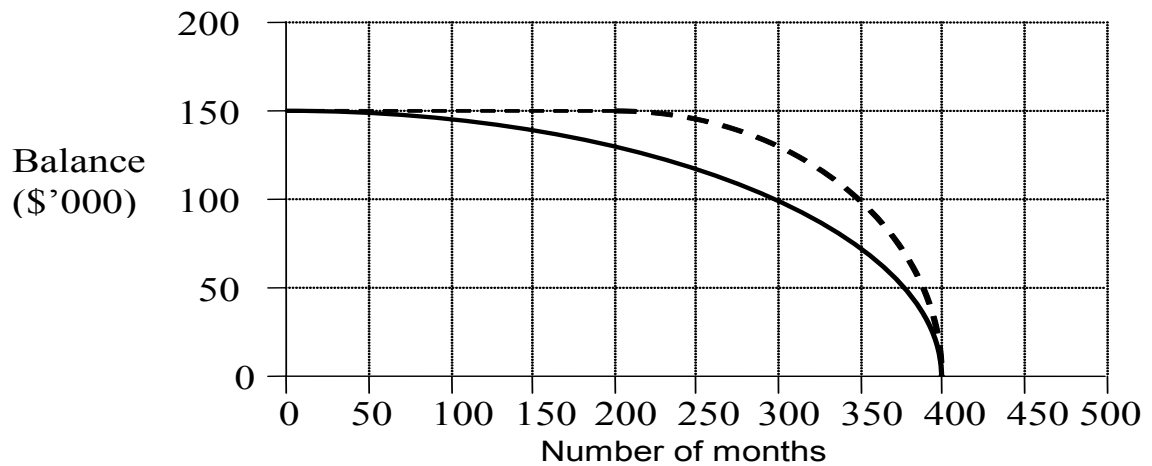
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Question 29 continues on the next page

Question 29 (continued)

- (d) Ying and Wang both receive loans at the same time and for the same amount. Graphs of their loans are shown.



Identify TWO differences between the graphs, and provide a possible explanation for each difference, making reference to interest rates and/or loan repayments. 2

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Question 29 continues on the next page

Question 29 (continued)

- (e) A small construction company has 30 employees with the following annual salaries:

| | |
|----------------|-----------|
| CEO: | \$170 000 |
| Surveyor: | \$100 000 |
| 3 supervisors: | \$70 000 |
| 10 tradesmen: | \$50 000 |
| 15 drivers: | \$28 000 |

- (i) Calculate the mean, median and modal salary for the employees of this firm. **3**

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- (ii) Which measure of central tendency is the most appropriate to represent the salaries of the employees? Give reasons for your answer. **1**

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End of Question 29

Question 30 (15 marks)

- (a) Given H is directly proportional to j^2 and $H = 80$ when $j=2$, find the equation connecting H and j . **1**

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- (b) Calculate the cost of running a 2600-watt fan heater for seven hours per day for 31 days. Assume electricity is charged at \$0.17/kWh. **1**

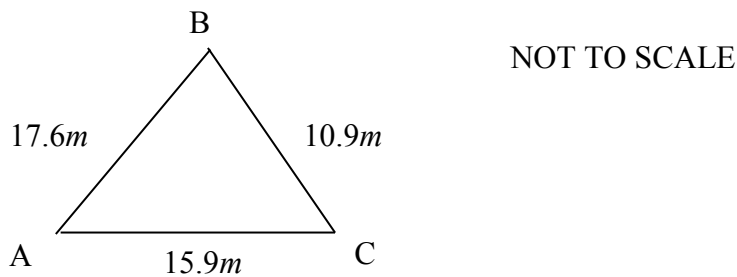
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- (c)



- Find the largest angle in $\triangle ABC$. Give your answer to the nearest degree. **3**

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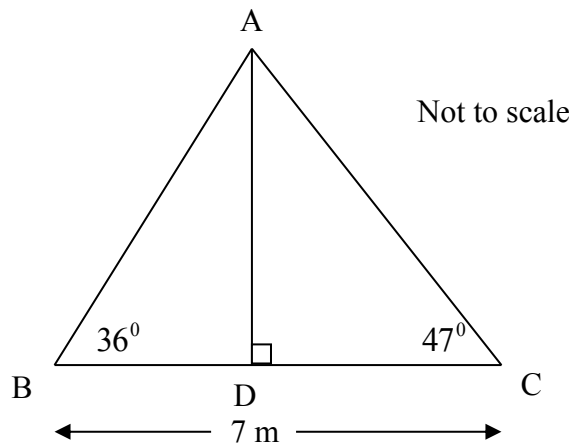
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Question 30 continues on the next page

Question 30 (continued)

(d)



In the above diagram, $\angle ABC = 36^\circ$, $\angle ACB = 47^\circ$, $BC = 7\text{m}$. The foot of the perpendicular from A to BC is D.

- (i) Write down an expression for the length of AC. 1

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- (ii) Show that $AD = \frac{7 \sin 36^\circ \sin 47^\circ}{\sin 97^\circ}$ 2

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Question 30 continues on the next page

Question 30 (continued)

- (e) (i) In how many ways can you answer the first six questions on a True/False test? **1**

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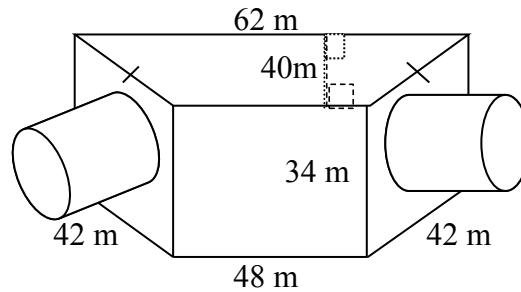
- (ii) If you guess the answer to each question, what is the probability of getting all the answers correct? **1**

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Question 30 continues on the next page

Question 30 (continued)

- (f) The following solid has two identical closed cylinders attached to a trapezoidal prism. Each cylinder is 26 m long and diameter of 18 m.



- (i) Find the surface area of the solid, including the bottom, correct to the nearest m^2 . **3**

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- (ii) If a 10-litre can of paint covers 160 m^2 , find the number of 10-litre cans of paint needed to paint the outside of the solid with one coat. **1**

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- (iii) Paint costs \$145.50 per 10 litre can. Find the cost of painting the object. **1**

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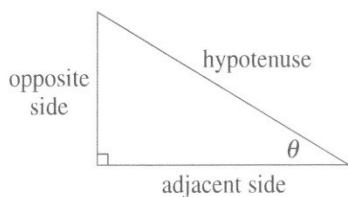
End of Examination

FORMULAE AND DATA SHEET

| Financial Mathematics | Data Analysis |
|---|---|
| <p>Simple interest</p> $I = Prn$ <p>P is initial amount r is interest rate per period, expressed as a decimal n is number of periods</p> <p>Compound interest</p> $A = P(1 + r)^n$ <p>A is final amount P is initial amount r is interest rate per period, expressed as a decimal n is number of compounding periods</p> <p>Present value and future value</p> $PV = \frac{FV}{(1 + r)^n}, \quad FV = PV(1 + r)^n$ <p>r is interest rate per period, expressed as a decimal n is number of compounding periods</p> <p>Straight-line method of depreciation</p> $S = V_0 - Dn$ <p>S is salvage value of asset after n periods V_0 is initial value of asset D is amount of depreciation per period n is number of periods</p> <p>Declining-balance method of depreciation</p> $S = V_0(1 - r)^n$ <p>S is salvage value of asset after n periods V_0 is initial value of asset r is depreciation rate per period, expressed as a decimal n is number of periods</p> | <p>Mean of a sample</p> $\bar{x} = \frac{\text{sum of scores}}{\text{number of scores}}$ <p>z-score For any score x,</p> $z = \frac{x - \bar{x}}{s}$ <p>\bar{x} is mean s is standard deviation</p> <p>Outlier(s)</p> <p>score(s) less than $Q_L - 1.5 \times IQR$ or score(s) more than $Q_U + 1.5 \times IQR$</p> <p>Q_L is lower quartile Q_U is upper quartile IQR is interquartile range</p> <p>Least-squares line of best fit</p> $y = \text{gradient} \times x + y\text{-intercept}$ $\text{gradient} = r \times \frac{\text{standard deviation of } y \text{ scores}}{\text{standard deviation of } x \text{ scores}}$ $y\text{-intercept} = \bar{y} - (\text{gradient} \times \bar{x})$ <p>r is correlation coefficient \bar{x} is mean of x scores \bar{y} is mean of y scores</p> <p>Normal distribution</p> <ul style="list-style-type: none"> • approximately 68% of scores have z-scores between -1 and 1 • approximately 95% of scores have z-scores between -2 and 2 • approximately 99.7% of scores have z-scores between -3 and 3 |

| Spherical Geometry | Surface Area |
|---|---|
| <p>Circumference of a circle</p> $C = 2\pi r \text{ or } C = \pi D$ <p>r is radius D is diameter</p> <p>Arc length of a circle</p> $l = \frac{\theta}{360} 2\pi r$ <p>r is radius θ is number of degrees in central angle</p> <p>Radius of Earth (taken as) 6400 km</p> <p>Time differences For calculation of time differences using longitude: $15^\circ = 1$ hour time difference</p> | <p>Sphere</p> $A = 4\pi r^2$ <p>r is radius</p> <p>Closed cylinder</p> $A = 2\pi r^2 + 2\pi rh$ <p>r is radius h is perpendicular height</p> |
| | Volume |
| | <p>Prism or cylinder</p> $V = Ah$ <p>A is area of base h is perpendicular height</p> <p>Pyramid or cone</p> $V = \frac{1}{3}Ah$ <p>A is area of base h is perpendicular height</p> <p>Volume and capacity unit conversion: $1 \text{ m}^3 = 1000 \text{ L}$</p> |
| Area | Approximation Using Simpson's Rule |
| <p>Circle</p> $A = \pi r^2$ <p>r is radius</p> <p>Sector</p> $A = \frac{\theta}{360} \pi r^2$ <p>r is radius θ is number of degrees in central angle</p> <p>Annulus</p> $A = \pi(R^2 - r^2)$ <p>R is radius of outer circle r is radius of inner circle</p> <p>Trapezium</p> $A = \frac{h}{2}(a + b)$ <p>h is perpendicular height a and b are the lengths of the parallel sides</p> <p>Area of land and catchment areas unit conversion: $1 \text{ ha} = 10\,000 \text{ m}^2$</p> | <p>Area</p> $A \approx \frac{h}{3}(d_f + 4d_m + d_l)$ <p>h is distance between successive measurements d_f is first measurement d_m is middle measurement d_l is last measurement</p> <p>Volume</p> $V \approx \frac{h}{3}\{A_L + 4A_M + A_R\}$ <p>h is distance between successive measurements A_L is area of left end A_M is area of middle A_R is area of right end</p> |

Trigonometric Ratios



$$\sin \theta = \frac{\text{opposite side}}{\text{hypotenuse}}$$

$$\cos \theta = \frac{\text{adjacent side}}{\text{hypotenuse}}$$

$$\tan \theta = \frac{\text{opposite side}}{\text{adjacent side}}$$

Sine rule

In $\triangle ABC$,

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

Area of a triangle

In $\triangle ABC$,

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

Cosine rule

In $\triangle ABC$,

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

or

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

Units of Memory and File Size

$$1 \text{ byte} = 8 \text{ bits}$$

$$1 \text{ kilobyte} = 2^{10} \text{ bytes} = 1024 \text{ bytes}$$

$$1 \text{ megabyte} = 2^{20} \text{ bytes} = 1024 \text{ kilobytes}$$

$$1 \text{ gigabyte} = 2^{30} \text{ bytes} = 1024 \text{ megabytes}$$

$$1 \text{ terabyte} = 2^{40} \text{ bytes} = 1024 \text{ gigabytes}$$

Blood Alcohol Content Estimates

$$BAC_{\text{male}} = \frac{10N - 7.5H}{6.8M}$$

or

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

N is number of standard drinks consumed

H is number of hours of drinking

M is person's mass in kilograms

Distance, Speed and Time

$$D = ST, \quad S = \frac{D}{T}, \quad T = \frac{D}{S}$$

$$\text{average speed} = \frac{\text{total distance travelled}}{\text{total time taken}}$$

$$\text{stopping distance} = \left\{ \begin{array}{l} \text{reaction-time} \\ \text{distance} \end{array} \right\} + \left\{ \begin{array}{l} \text{braking} \\ \text{distance} \end{array} \right\}$$

Probability of an Event

The probability of an event where outcomes are equally likely is given by:

$$P(\text{event}) = \frac{\text{number of favourable outcomes}}{\text{total number of outcomes}}$$

Straight Lines

Gradient

$$m = \frac{\text{vertical change in position}}{\text{horizontal change in position}}$$

Gradient-intercept form

$$y = mx + b$$

m is gradient

b is y-intercept