

Student Name: _____

Practice Paper 5

YEAR 12

YEARLY EXAMINATION

Mathematics General 2**General Instructions**

- Reading time - 5 minutes
- Working time - 2.5 hours
- Write using black or blue pen
- Board-approved calculators may be used
- A formula and data sheet is provided at the back of this paper
- In Questions 26-30, show relevant mathematical reasoning and/or calculations

Total marks - 100**Section I**

25 marks

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

Section II

75 marks

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

Section I

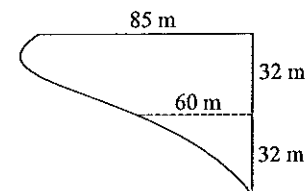
25 marks

Attempt Questions 1 - 25

Allow about 35 minutes for this section

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

- 1 The scale on an aerial photograph is given as $1 \text{ mm} = 200 \text{ m}$. If the length of a field is 500 m, what is its map length?
 - (A) 0.25 mm
 - (B) 2.5 mm
 - (C) 4 mm
 - (D) 40 mm
- 2 Use Simpson's rule to estimate the area of this field to the nearest square metre.



Not to scale

- (A) 1547 m^2
 - (B) 3467 m^2
 - (C) 4267 m^2
 - (D) 6933 m^2
- 3 What is the best description between the colour of a person's hair and their weight?
 - (A) Zero correlation.
 - (B) Positive correlation.
 - (C) Constant correlation
 - (D) Negative correlation.
 - 4 A cone has a diameter of 5 cm and a height of 13 cm. What is its volume?
 - (A) 85 cm^3
 - (B) 255 cm^3
 - (C) 340 cm^3
 - (D) 1021 cm^3

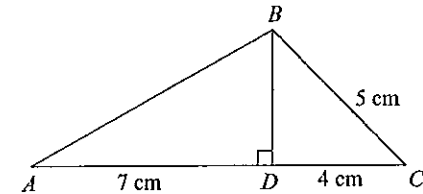
5

Present value of \$1				
End of year	2%	3%	4%	5%
4	4.5797	4.4518	4.3295	4.2124
5	5.4172	5.2421	5.0757	4.9173
6	6.2303	6.0021	5.7864	5.5824

Use the table above to calculate the present value of an annuity where \$12,000 is contributed each year for five years into an account earning 2% per annum compound interest.

- (A) \$15,183.83
 - (B) \$54,956.40
 - (C) \$65,006.40
 - (D) \$72,000.00
- 6 Sydney has a latitude of 34°S and a longitude of 151°E. Glenelg is 12° west of Sydney and 1° south of Sydney. What are the coordinates of Glenelg?
- (A) 33°S, 139°E
 - (B) 33°S, 163°E
 - (C) 35°S, 139°E
 - (D) 35°S, 163°E
- 7 Simplify $8 - 2(3x - 4)$
- (A) $-6x$
 - (B) $4 - 6x$
 - (C) $18x - 24$
 - (D) $16 - 6x$
- 8 Patrick borrows \$45 000 and agrees to repay the loan and the interest in monthly instalments over 7 years. The interest charged is at a flat rate of 11.25% p.a. What is the total amount to be repaid on the loan?
- (A) \$9 562.50
 - (B) \$32 200.00
 - (C) \$35 437.50
 - (D) \$80 437.50

9 What is the length of AB ?

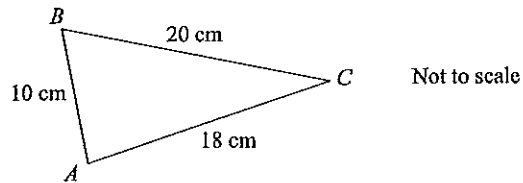


Not to scale

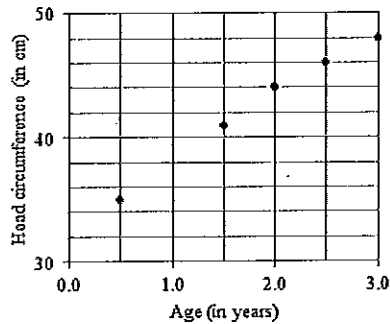
- (A) 6 cm
 - (B) 7.1 cm
 - (C) 7.6 cm
 - (D) 9.8 cm
- 10 The probability that it will rain in Hay on any particular day in June is 0.1. Ryan will spend 3 days in Hay. What is the probability that it will rain on at least one of those 3 days?
- (A) 0.001
 - (B) 0.271
 - (C) 0.3
 - (D) 0.729
- 11 Amelia spent the following amounts on the given food in one week.
- | | |
|----------------------|------|
| Groceries | \$98 |
| Meat and fish | \$67 |
| Milk and dairy | \$53 |
| Fruit and vegetables | \$27 |
| Other | \$25 |
- Amelia would like to display the information in a sector graph. What size angle is needed to represent fruit and vegetables?
- (A) 9°
 - (B) 18°
 - (C) 27°
 - (D) 36°
- 12 Solve $\sqrt{m} - 8 = 17$
- (A) $m = 3$
 - (B) $m = 5$
 - (C) $m = 81$
 - (D) $m = 625$

- 13 Ella is given 1.8 litres of fluid over 10 hours by intravenous drip. The fluid is delivered at a rate of 30 drops per mL. What is the required drip rate, in drops per minute?
- (A) 0.15
 (B) 3.6
 (C) 15
 (D) 90

- 14 What is the size of $\angle BAC$ to the nearest degree?



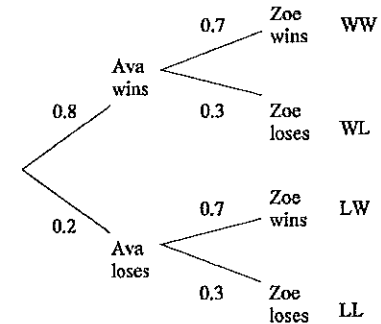
- (A) 30°
 (B) 64°
 (C) 80°
 (D) 86°
- 15 The age of a child and their head circumference is shown in the scatterplot.



What is the correlation between the variables in this scatterplot?

- (A) High positive
 (B) High negative
 (C) Low positive
 (D) Low negative

- 16 Ava and Zoe are competing in two different cycling races. The probability that Ava wins her race is 0.8 and the probability that Zoe wins her race is 0.7. The probability tree diagram shows this information.



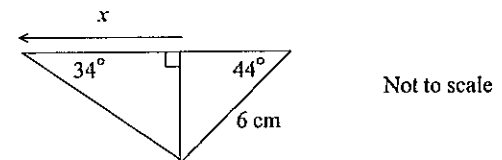
What is the probability that only one of Ava and Zoe will be successful?

- (A) 0.14
 (B) 0.24
 (C) 0.38
 (D) 0.62

- 17 Michael invests \$3125 at 6% per annum compounding quarterly. How much will he have after 4 years? Answer to the nearest dollar.

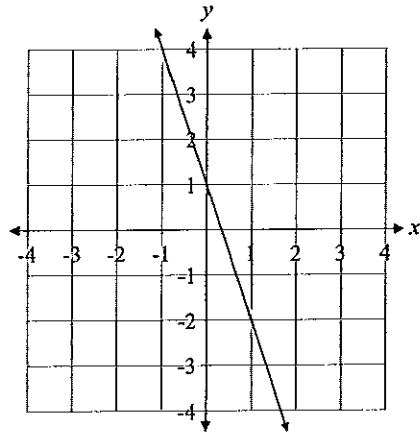
- (A) \$3317
 (B) \$3945
 (C) \$3966
 (D) \$7939

- 18 What is the value of x ?



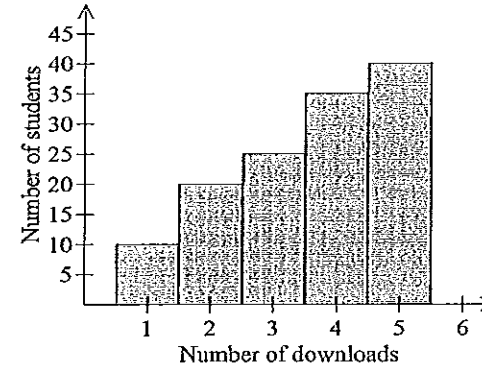
- (A) $\frac{6 \sin 44^\circ}{\tan 34^\circ}$
 (B) $6 \sin 44^\circ \sin 34^\circ$
 (C) $\frac{6 \tan 34^\circ}{\sin 44^\circ}$
 (D) $\frac{6}{\sin 34^\circ \sin 44^\circ}$

19 What is the correct equation of the line shown below?



- (A) $y = -3x + 1$
 - (B) $y = -\frac{1}{3}x + 1$
 - (C) $y = \frac{1}{3}x + 1$
 - (D) $y = 3x + 1$
- 20 A water tank is in the shape of a closed cylinder with a radius of 1.4 m and height of 2.8 m. What is the capacity of the tank to the nearest litre?
- (A) 17 L
 - (B) 34 L
 - (C) 17 241 L
 - (D) 34 482 L
- 21 Riley bought a new car for \$40 500. In the first year the value of the car depreciated by 25%. In the second and third year the value depreciated by 10% per year. What was the value of the car at the end of the third year, to the nearest dollar?
- (A) \$15 897
 - (B) \$22 275
 - (C) \$24 300
 - (D) \$24 604

22 Students were surveyed about the number of downloads they did last week. The results are shown in this cumulative frequency histogram.



- How many students completed four downloads last week?
- (A) 5
 - (B) 10
 - (C) 20
 - (D) 35
- 23 What is the point of intersection of the lines $y = x + 4$ and $y = -x + 4$?
- (A) (0, 0)
 - (B) (0, 4)
 - (C) (4, 0)
 - (D) (3, 4)
- 24 A set of nine scores has a median of 8. The scores 7, 7, 13 and 18 are added to the data set. What is the median of the data set now?
- (A) 7
 - (B) 8
 - (C) 9
 - (D) 10
- 25 The heights of a group of friends are normally distributed with a mean of 160 cm and a standard deviation of 15 cm. What percentage of the group are more than 190 cm tall?
- (A) 1%
 - (B) 2.5%
 - (C) 5%
 - (D) 95%

Section II

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.

Question 26 (15 marks)

Marks

- (a) What is the y -intercept of the least-squares regression line given $m = 0.5$, $\bar{x} = 41.7$ and $\bar{y} = 58.4$? 1

- (b) During a flood, 2.3 hectares of land was covered by water to a depth of 14 centimetres. How many kilolitres covered the land? 2

- (c) Solve these equations. 1
- (i) $5e + 6 = 19$

- (ii) $\frac{3y+2}{5} - \frac{y}{4} = \frac{5}{2}$ 2

- (d) The two-way table shows the gender of drivers whether their headlights are on or off at sunset.

	Headlights on	Headlights off	Total
Female drivers	15	A	80
Male drivers	12	93	105
	B	158	

- (i) What are the values of A and B? 1

- (ii) How many cars were included in this data? 1

- (iii) What fraction of the cars had male drivers? 1

- (iv) What percentage of the cars driven by males had their headlights on? 1

- (e) The average flow rate of a normal shower head is 14 litres per minute. Harvey has one 5-minute shower each day. Calculate the annual cost of Harvey's showers given the water usage charge is \$2.05 per kilolitre. 1

(f) An energy company charges for gas over a 3-month period are shown below.

Usage charge	First 2000 MJ	\$0.02580 per MJ
	Additional MJ over 2000	\$0.01620 per MJ

(i) Savannah used 5000 MJ of gas in this period. What is the charge? 1

(ii) Gabriel has decided to reduce his energy bills. He has a target of \$80 for gas. What is the maximum number of MJ he is allowed in this period? Answer correct to the nearest megajoule. 2

(g) Add these algebraic fractions. 1

$$\frac{4x}{2} + \frac{x}{10}$$

Question 27 (15 marks)

Marks

(a) Leo plays a game by throwing two unbiased dice. The rules of the game are:

- Leo wins \$50 if there are two 6's.
- Leo wins \$8 if there is only one 6.
- Leo loses \$2 if there are no 6's.

(i) What is the probability throwing no 6's? 1

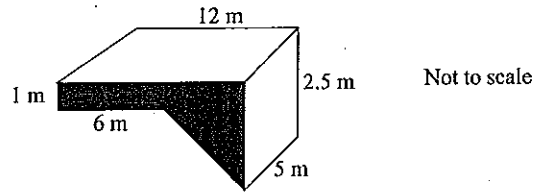
(ii) What is the financial expectation of this game? 2

(b) Claire gained a standardised score (z-score) of 2.5 for a class test out of 100.

(i) Describe Claire's result in terms of mean and standard deviation of the class test. 1

(ii) The class test has a mean of 56% and a standard deviation of 9.5. What is the actual mark scored by Claire? 1

- (c) The diagram shows an in-ground swimming pool that is 12 metres long and 5 metres wide. The depth at the shallow end is 1 metre and at the deep end the depth is 2.5 metres. The depth begins to increase halfway along the pool.



- (i) What is the area of the shaded wall? 2
- _____
- _____
- _____
- (ii) Find the volume of water that the pool can hold when full to the top. 1
- _____
- _____
- (iii) The inside walls of the pool were painted with a sealing paint. The cost of the sealing paint is \$48 per square metre. What is the cost to paint the walls? (Floor is not painted) 2
- _____
- _____
- _____
- (d) A strong correlation exists between white bread intake at meals and increased glucose and insulin levels among people with type-2 diabetes.
- (i) Is the correlational coefficient for this relationship positive or negative? Explain. 1
- _____
- _____
- (ii) Does the statement suggest that white bread directly affects glucose and insulin in the body? Explain 1
- _____
- _____

- (e) The table below shows the shoe size of four men.

Name	Aaron	Beau	Caleb	Darcy
Shoe size (cm)	9.5	8.0	10.5	9.0

- (i) Calculate the population mean. 1
- _____
- _____
- _____
- (ii) A sample of three people is chosen at random. How many samples are possible? 1
- _____
- _____
- _____
- (iii) List all the possible samples. 1
- _____
- _____
- _____
- _____

Question 28 (15 marks)

Marks

(a) Audrey owns a credit card that has no annual fee and charges 16.3% p.a. interest on all purchases. The interest is charged on the date of purchase and the date of payment.

(i) Show that the daily interest rate is 0.04466%

1

(ii) On the 27th of January, Audrey bought a TV for \$1029 using her credit card. Audrey paid her credit card account on the 7th of February. What was the total amount she paid for the TV, including interest? Answer correct to the nearest cent.

2

(b) The weight (in kilograms) of twelve bags is listed below.

9 10 11 11 16 19 23 26 30 36 39 42

(i) A bag is chosen at random. What is the probability that the chosen bag weighs more than 30 kg?

1

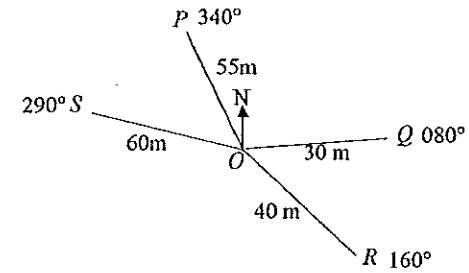
(ii) What is the five-number summary for this data?

2

(iii) Construct a box-and-whisker plot for this data.

2

(c) A radial survey of a field is shown below.



(i) What is the size of $\angle POQ$?

1

(ii) Calculate the length of PQ , correct to the nearest metre.

2

(iii) The triangular area ROQ is going to be planted with barley. What is the size of this area? Answer correct to 2 decimal places.

1

(d) Young's rule is used to prescribe medicine for children. The formula is:

$$\text{Young's rule: } D = \frac{yA}{y+12}$$

Owen buys a prescription for 1200 mg of medicine. The adult dose is 50 mg and the recommended dose for Owen's child is 10 mg.

(i) How old is Owen's child using Young's rule? 1

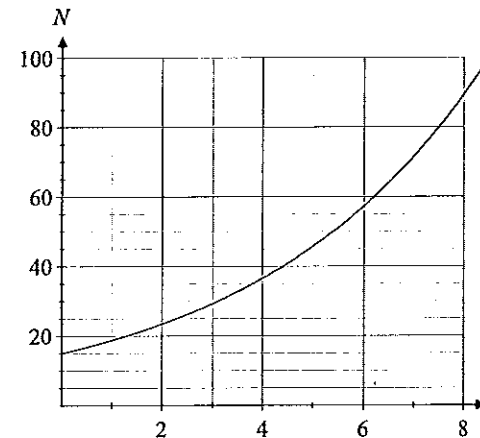
(ii) How many doses for Owen's child are contained in the prescription? 1

(iii) It is recommended the medicine be taken at most 4 times a day. How many days will the prescription last at this rate for Owen's child? 1

Question 29 (15 marks)

Marks

(a) The graph below shows the exponential increase in bacteria where N is the number of bacteria in thousands after t hours.



(i) What is the initial number of bacteria? 1

(ii) Estimate the time taken for the number of bacteria to reach 45 000. 1

(iii) Estimate the time taken for the number of bacteria to double its initial size. 1

(b) Chelsea uses an iron with a rating of 450 W for an average of 7 hours per week. Find the cost of electricity used to do the weekly ironing if it is charged at a rate of 24.62 cents per kWh. 1

(c) The table of home loan repayments is shown below over 3 months.

Amount borrowed		\$300 000	This table assumes the same number of days in each month. $I = Prn$ or $I = P \times \frac{r}{12}$	
Annual interest rate (r)		7%		
Monthly repayment (R)		\$2000		
Month n	Principal P	Interest I	$P + I$	$P + I - R$
1	\$300 000.00	\$1750.00	\$301 750.00	\$299 750.00
2	\$299 750.00	\$1748.54	\$301 498.54	\$299 498.54
3	\$299 498.54	A	B	

(i) What is the balance owing after one month? 1

(ii) How much of the repayment in the second month was interest? 1

(iii) Complete the table by calculating the amounts marked A and B. 2

(iv) How much has the principal been reduced during the first three months? 1

(d) Data was collected from 16 students on the number of text messages they sent in the past day. The set of data is displayed in the stem-and-leaf plot.

Stem	Leaf
0	7 8
1	1 1 2 3 5 5 6
2	0 3 5 9
3	0 4
4	
5	2

(i) What is the interquartile range of the data? 1

(ii) Is 52 an outlier for this set of data? Justify your answer using suitable calculations. 1

(e) Gold Coast is located at (28°S, 153°E) and Bali is located at (8°S, 116°E).

(i) What is the time in Bali if the time in the Gold Coast is 9.00 am? 3

(ii) A flight leaves Bali at 11.00 am and flies non-stop to the Gold Coast. The flight is in the air for 3 hours. What time does the flight arrive in Bali? 1

Question 30 (15 marks)

Marks

- (a) The petrol consumption (p litres per 100 km) and the speed of a car (s km/h) are modelled by the formula:

$$p = 0.01s^2 - s + 33$$

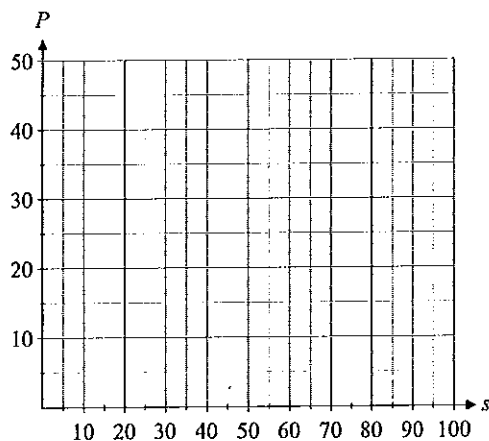
- (i) Complete the following table of values.

1

s	0	20	40	50	60	80	100
p							

- (ii) Draw the graph of $p = 0.01s^2 - s + 33$ using the number plane below.

1



- (iii) A car was driven at 30 km/h for 40 km. How many litres of petrol did it use?

1

- (iv) Why is the formula $p = 0.01s^2 - s + 33$ not a good model if $s = 0$?

1

- (b) A business sells mobile phones to retail outlets. The income received is calculated using the formula $I = 75n$ where n is the number of mobile phones sold. Costs associated with selling the mobile phones are calculated using the formula $C = 15n + 1500$.

- (i) What are the fixed costs if there are no mobile phones sold?

1

- (ii) What profit does the business make if 3000 mobile phones are sold?

2

- (iii) How many mobile phones need to be sold to break even?

2

- (c) An asteroid reached earth and exploded in the pacific ocean. The distance (in km) it travelled through the earth's atmosphere varied directly as the square of the time (t sec) it had been travelling. The asteroid travelled 384 kilometres in the first 16 seconds.

- (i) How far did the asteroid travel in the first 10 seconds?

2

- (ii) How long will it take for the asteroid to travel 294 kilometres?

1

(d) Edward borrows \$220 000 over 7 years at an interest rate of 9.5% p.a. reducible. He pays \$1910 per fortnight.

(i) How much will Edward pay back altogether?

1

(ii) What is the interest paid for this loan?

1

(iii) What is the equivalent flat interest rate charged per annum on this loan? Answer correct to 1 decimal place.

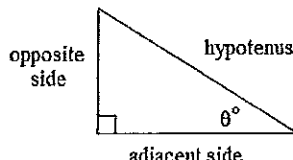
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End of paper

FORMULAE AND DATA SHEET

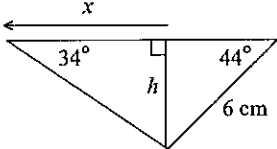
Financial Mathematics	Data Analysis
<p>Simple interest</p> $I = Prn$ <p><i>P</i> is initial amount <i>r</i> is interest rate per period, expressed as a decimal <i>n</i> is number of periods</p>	<p>Mean of a sample</p> $\bar{x} = \frac{\text{sum of scores}}{\text{number of scores}}$ <p>z-score</p> <p>For any score <i>x</i>,</p> $z = \frac{x - \bar{x}}{s}$
<p>Compound interest</p> $A = P(1+r)^n$ <p><i>A</i> is final amount <i>P</i> is initial amount <i>r</i> is interest rate per period, expressed as a decimal <i>n</i> is number of compounding periods</p>	<p><i>x</i> is mean <i>s</i> 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><i>Q_L</i> is lower quartile <i>Q_U</i> is upper quartile <i>IQR</i> is interquartile range</p>
<p>Present value and future value</p> $PV = \frac{FV}{(1+r)^n}, FV = PV(1+r)^n$ <p><i>r</i> is interest rate per period, as expressed as a decimal <i>n</i> is number of compounding periods</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><i>r</i> is correlation coefficient \bar{x} is mean of <i>x</i> score \bar{y} is mean of <i>y</i> scores</p>
<p>Straight-line method of depreciation</p> $S = V_0 - Dn$ <p><i>S</i> is salvage value of asset after <i>n</i> periods <i>V₀</i> is initial value of asset <i>D</i> is amount of depreciation per period <i>n</i> is number of periods</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
<p>Declining-balance method of depreciation</p> $S = V_0(1-r)^n$ <p><i>S</i> is salvage value of asset after <i>n</i> periods <i>V₀</i> is initial value of asset <i>r</i> is depreciation rate per period, expressed as a decimal <i>n</i> is number of periods</p>	

Spherical Geometry	Surface Area
<p>Circumference of a circle $C = 2\pi r$ or $C = \pi d$ r is radius d is diameter</p> <p>Arc length of a circle $l = \frac{\theta}{360} 2\pi r$ 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 $A = 4\pi r^2$ r is radius</p> <p>Closed cylinder $A = 2\pi r^2 + 2\pi rh$ r is radius h is perpendicular height</p>
	Volume
	<p>Prism or cylinder $V = Ah$ r is radius h is perpendicular height</p> <p>Pyramid or cone $V = \frac{1}{3} Ah$ A is area of the base h is perpendicular height</p>
	Volume and capacity
	unit conversion: $1 \text{ m}^3 = 1000 \text{ L}$
	Approximation Using Simpson's Rule
	<p>Area $A \approx \frac{h}{3}(d_f + 4d_m + d_l)$ h distance between successive measurements d_f is first measurement d_m is middle measurement d_l is last measurement</p> <p>Volume $V \approx \frac{h}{3}(A_L + 4A_M + A_R)$ h 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>
<p style="text-align: center;">Area</p> <p>Circle $A = \pi r^2$ r is radius</p> <p>Sector $A = \frac{\theta}{360} \pi r^2$ r is radius θ is number of degrees in central angle</p> <p>Annulus $A = \pi(R^2 - r^2)$ R is radius of outer circle r is radius of inner circle</p> <p>Trapezium $A = \frac{h}{2}(a + b)$ 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>	

Trigonometric Ratios	Blood Alcohol Content Estimates
 <p>$\sin \theta = \frac{\text{opposite side}}{\text{hypotenuse}}$ $\cos \theta = \frac{\text{adjacent side}}{\text{hypotenuse}}$ $\tan \theta = \frac{\text{opposite side}}{\text{adjacent side}}$</p> <p>Sine rule In $\triangle ABC$ $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$</p> <p>Cosine rule In $\triangle ABC$ $c^2 = a^2 + b^2 - 2ab \cos C$ or $\cos C = \frac{a^2 + b^2 - c^2}{2ab}$</p>	<p>$BAC_{Male} = \frac{(10N - 7.5H)}{6.8M}$ or $BAC_{Female} = \frac{(10N - 7.5H)}{5.5M}$</p> <p>$N$ is number of standard drinks consumed H is number of hours of drinking M is person's mass in kilograms</p>
	Distance, Speed and Time
	<p>$D = ST, S = \frac{D}{T}, T = \frac{D}{S}$</p> <p>average speed = $\frac{\text{total distance travelled}}{\text{total time taken}}$</p> <p>stopping distance = $\left\{ \begin{array}{l} \text{reaction-time} \\ \text{distance} \end{array} \right\} + \left\{ \begin{array}{l} \text{braking} \\ \text{distance} \end{array} \right\}$</p>
	Probability of an Event
	<p>The probability of an event where outcomes are equally likely is given by:</p> <p>$P(\text{event}) = \frac{\text{number of favourable outcomes}}{\text{total number of outcomes}}$</p>
	Straight Lines
	<p>Gradient $m = \frac{\text{vertical change in position}}{\text{horizontal change in position}}$</p> <p>Gradient-intercept form $y = mx + b$ m is gradient b is y-intercept</p>
	Units of Memory and File Size
	<p>1 byte = 8 bits 1 kilobyte = 2^{10} bytes = 1024 bytes 1 megabyte = 2^{20} bytes = 1024 kilobytes 1 gigabyte = 2^{30} bytes = 1024 megabytes 1 terabyte = 2^{40} bytes = 1024 gigabytes</p>

ACE Examination Practice Paper 5
HSC Mathematics General 2 Yearly Examination
Worked solutions and marking guidelines

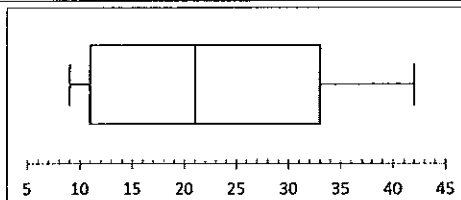
Section 1		
	Solution	Criteria
1	200 m = 1 mm 100 m = 0.5 mm 500 m = 2.5 mm Map length is 2.5 mm	1 Mark: B
2	$A = \frac{h}{3}(d_f + 4d_n + d_t)$ $= \frac{32}{3}(0 + 4 \times 60 + 85)$ $= 3466.66666\dots$ $\approx 3467 \text{ m}^2$	1 Mark: B
3	No relationship between these quantities. Zero correlation.	1 Mark: A
4	$V = \frac{1}{3}\pi r^2 h$ $= \frac{1}{3} \times \pi \times 2.5^2 \times 13$ $= 85.08480103\dots \approx 85 \text{ cm}^3$	1 Mark: A
5	$PV = 5.4172 \times 12000$ $= \$65006.40$ Present value of the annuity is \$65 006.40	1 Mark: C
6	Glenelg is (35°S, 139°E)	1 Mark: C
7	$8 - 2(3x - 4) = 8 - 6x + 8$ $= 16 - 6x$	1 Mark: D
8	$I = Prn$ $= \$45000 \times 0.1125 \times 7$ $= \$35 437.50$ Total Paid = \$45000 + \$35437.50 $= \$80 437.50$	1 Mark: D

9	Pythagoras theorem $BD^2 = 5^2 - 4^2 = 9$ $BD = 3 \text{ cm}$ $AB^2 = 7^2 + 3^2 = 58$ $AB = \sqrt{58} = 7.615773\dots \approx 7.6 \text{ cm}$	1 Mark: C
10	$P(\text{No rain}) = 1 - P(\text{Rain})$ (complementary event) $= 1 - 0.1 = 0.9$ $P(E) = 1 - P(\text{Not raining on 3 days})$ $= 1 - 0.9 \times 0.9 \times 0.9 = 0.271$	1 Mark: B
11	Total spent = \$98 + \$67 + \$53 + \$27 + \$25 = \$270 Angle size = $\frac{27}{270} \times 360^\circ = 36^\circ$	1 Mark: D
12	$\sqrt{m} - 8 = 17$ $\sqrt{m} = 25$ $m = 625$	1 Mark: D
13	Drip rate = $\frac{1.8 \times 1000 \times 30 \text{ drops}}{10 \times 60 \text{ min}} = 90 \text{ drops per minute}$	1 Mark: D
14	$\cos A = \frac{b^2 + c^2 - a^2}{2bc}$ $= \frac{18^2 + 10^2 - 20^2}{2 \times 18 \times 10}$ $\angle BAC = 86.17744627\dots \approx 86^\circ$	1 Mark: D
15	Strong positive relationship between the quantities. High positive correlation.	1 Mark: A
16	$P(E) = 0.8 \times 0.3 + 0.2 \times 0.7$ $= 0.38$	1 Mark: C
17	$FV = PV(1+r)^n$ $= \$3125 \times \left(1 + \frac{0.06}{4}\right)^{16}$ $= \$3965.5798\dots \approx \3966	1 Mark: C
18	Find the height of the triangle $\sin 44^\circ = \frac{h}{6}$ or $h = 6 \sin 44^\circ$ $\tan 34^\circ = \frac{h}{x}$ $x = \frac{h}{\tan 34^\circ} = \frac{6 \sin 44^\circ}{\tan 34^\circ}$ 	1 Mark: A

19	$m = \frac{\text{Vertical rise}}{\text{Horizontal run}} = -\frac{3}{1} = -3$ $y = mx + b$ $y = -3x + 1$	1 Mark: A														
20	$V = \pi r^2 h$ $= \pi \times 1.4^2 \times 2.8$ $= 17.24106048 \dots \text{ m}^3$ $\text{Capacity} = 17.24106048 \times 1000 \text{ L}$ $= 17\,241.06048 \dots$ $\approx 17\,241 \text{ L}$	1 Mark: C														
21	<p>First year $S = V_0(1-r)^n$</p> $= \$40500 \times (1-0.25)^1 = \30375 <p>After 3 years $S = V_0(1-r)^n$</p> $= \$30375(1-0.10)^3 \approx \24604	1 Mark: D														
22	<p>Reading the frequency from the cumulative frequency graph. (1 download = 10, 2 downloads = 10, 3 downloads = 5, 4 downloads = 10 and 5 downloads = 5).</p> <p>There were 10 students who completed 4 downloads.</p>	1 Mark: B														
23	$x + 4 = -x + 4$ $2x = 0, \text{ or } x = 0$ <p>When $x = 0$ then $y = x + 4 = 0 + 4 = 4$</p> <p>Point of intersection is (0, 4)</p>	1 Mark: B														
24	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: center;">7</td> <td style="text-align: center;">7</td> <td style="text-align: center;">4 scores</td> <td style="text-align: center;">8</td> <td style="text-align: center;">4 scores</td> <td style="text-align: center;">13</td> <td style="text-align: center;">18</td> </tr> <tr> <td style="text-align: center;">New</td> <td style="text-align: center;">New</td> <td style="text-align: center;">Old</td> <td style="text-align: center;">Median</td> <td style="text-align: center;">Old</td> <td style="text-align: center;">New</td> <td style="text-align: center;">New</td> </tr> </table> <p>Median is unchanged (2 new scores above/below the median)</p> <p>Median is 8</p>	7	7	4 scores	8	4 scores	13	18	New	New	Old	Median	Old	New	New	1 Mark: B
7	7	4 scores	8	4 scores	13	18										
New	New	Old	Median	Old	New	New										
25	$z = \frac{x - \bar{x}}{s}$ $= \frac{190 - 160}{15}$ $= 2$ <p>95% of scores have a z-score between -2 and 2.</p> <p>5% + 2 = 2.5% have a z-score greater than 2.</p>	1 Mark: B														

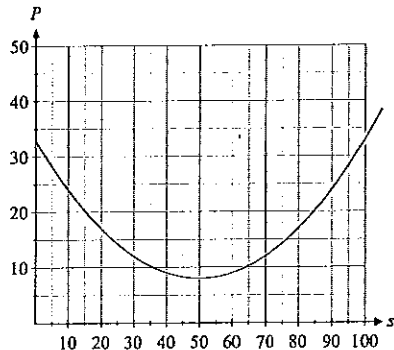
Section II		
	Solution	Criteria
26(a)	$b = \bar{y} - m\bar{x}$ $= 58.4 - 0.5 \times 41.7$ $= 37.55$	1 Mark: Correct answer.
26(b)	<p>$A = 2.3 \text{ ha}$ $\text{Depth} = 14 \text{ cm}$</p> <p>$= 23000 \text{ m}^2$ $= 0.14 \text{ m}$</p> $V = Ah$ $= 23000 \times 0.14$ $= 3220 \text{ m}^3 \text{ or } 3220 \text{ kL}$ <p>3220 kilolitres covered the land during the flood.</p>	2 Marks: Correct answer. 1 Mark: Uses volume formula with some understanding.
26(c)(i)	$5e + 6 = 19$ $5e = 13$ $e = \frac{13}{5} = 2\frac{3}{5}$	1 Mark: Correct answer.
26(c)(ii)	$20 \times \left(\frac{3y+2}{5} - \frac{y}{4} \right) = \frac{5}{2} \times 20$ $4(3y+2) - 5y = 50$ $12y + 8 - 5y = 50$ $7y = 42$ $y = 6$	2 Marks: Correct answer. 1 Mark: Multiplies both sides by 20.
26(d)(i)	$A = 80 - 15 = 65$ $B = 15 + 12 = 27$	1 Mark: Correct answer.
26(d)(ii)	<p>Total number of cars = $80 + 105$</p> $= 185$	1 Mark: Correct answer.
26(d)(iii)	$\text{Fraction male} = \frac{105}{185} = \frac{21}{37}$	1 Mark: Correct answer.
26(d)(iv)	$\text{Percentage} = \frac{12}{105} \times 100$ $= 11.42857143 \dots \approx 11\%$	1 Mark: Correct answer.
26(e)	$\text{Water used} = 5 \times 14 \times 365$ $= 25550 \text{ L} = 25.550 \text{ kL}$ $\text{Annual cost} = 25.550 \times \2.05 $= \$52.3775$ $\approx \$52.38$	1 Mark: Correct answer.

26(f) (i)	Cost = $2000 \times \$0.02580 + 3000 \times \0.01620 = \$100.20 Savannah's gas charge was \$100.20	1 Mark: Correct answer.
26(f) (ii)	To find the cost of 2000 MJ Cost = $2000 \times \$0.02580$ = \$51.60 Gabriel's target of \$80 is greater than \$51.60 $\$80 - \$51.60 = x \times 0.01620$ $x = \frac{\$28.40}{0.01620}$ = 1753.08642... ≈ 1753 MJ Gabriel's maximum usage is 3753 MJ (2000 MJ + 1753 MJ)	2 Marks: Correct answer. 1 Mark: Shows some understanding.
26(g)	$\frac{4x}{2} + \frac{x}{10} = \frac{20x}{10} + \frac{x}{10} = \frac{21x}{10}$	1 Mark: Correct answer.
27(a) (i)	$P(E) = \frac{5}{6} \times \frac{5}{6} = \frac{25}{36}$	1 Mark: Correct answer.
27(a) (ii)	Financial expectation $= \left(\frac{1}{36} \times \$50\right) + \left(\frac{10}{36} \times \$8\right) + \left(\frac{25}{36} \times -\$2\right)$ $\approx \$2.22$ Financial expectation is \$2.22	2 Marks: Correct answer. 1 Mark: Calculates the financial expectation.
27(b) (i)	A z-score of 2.5 is 2.5 standard deviations above the mean.	1 Mark: Correct answer.
27(b) (ii)	$z = \frac{x - \bar{x}}{s}$ $2.5 = \frac{x - 56}{9.5}$ $23.75 = x - 56$ $x = 79.75$ Claire scored 79.25 in the class test.	1 Mark: Correct answer.
27(c) (i)	$A = lb + \frac{1}{2}bh$ $= 12 \times 1 + \frac{1}{2} \times 6 \times 1.5$ $= 16.5 \text{ m}^2$	2 Marks: Correct answer. 1 Mark: Shows some understanding.
27(c) (ii)	$V = Ah$ $= 16.5 \times 5$ $= 82.5 \text{ m}^3$	1 Mark: Correct answer.

27(c) (iii)	$SA = (16.5 \times 2) + (5 \times 2.5) + (5 \times 1) = 50.5 \text{ m}^2$ Cost = $50.5 \times \$48$ = \$2424 The cost to paint the walls is \$2424.	2 Marks: Correct answer. 1 Mark: Finds the surface area.
27(d) (i)	Positive correlation. Increasing white bread increases the amount of glucose and insulin in the body.	1 Mark: Correct answer.
27(d) (ii)	No. The statement states there is a correlation not causality.	1 Mark: Correct answer.
27(e) (i)	$\mu = \frac{9.5 + 8 + 10.5 + 9}{4} = 9.25$ Population mean is 9.25	1 Mark: Correct answer.
27(e) (ii)	${}^4C_3 = 4$ There are 4 samples possible.	1 Mark: Correct answer.
27(e) (iii)	Possible samples {ABC, ABD, ACD, BCD}	1 Mark: Correct answer.
28(a) (i)	Dailey Interest Rate = $\frac{16.3\%}{365}$ $= 0.04465753425...$ $\approx 0.04466\%$	1 Mark: Correct answer.
28(a) (ii)	Interest = $\$1029 \times 0.04466\% \times 12$ (12 days) $= \$5.51461... \approx \5.51 Total Paid = $\$1029 + \5.51 $= \$1034.51$ Total amount paid for the TV is \$1034.51	2 Marks: Correct answer. 1 Mark: Calculates the interest
28(b) (i)	$P(E) = \frac{3}{12} = \frac{1}{4}$	1 Mark: Correct answer.
28(b) (ii)	9 10 11 11 16 19 23 26 30 36 39 42 Min Q_1 Med Q_3 Max Min = 9, $Q_1 = 11$, Median = 21, $Q_3 = 33$, Max = 42	2 Mark: Correct answers 1 Mark: Finds one of the statistics.
28(b) (iii)		2 Mark: Correct answers 1 Mark: Draws a box plot with some correct values.

28(c) (i)	$\angle POQ = 20 + 80$ $= 100^\circ$	1 Mark: Correct answer.
28(c) (ii)	$PQ^2 = 30^2 + 55^2 - 2 \times 30 \times 55 \times \cos 100^\circ$ $PR^2 = 4498.038986\dots$ $PR = 67.0674212\dots$ $\approx 67 \text{ m}$	2 Marks: Correct answer. 1 Mark: Substitutes one correct value into the cosine rule.
28(c) (iii)	$A = \frac{1}{2} ab \sin C$ $= \frac{1}{2} \times 30 \times 40 \times \sin 80^\circ$ $= 590.8846518\dots$ $\approx 590.88 \text{ m}^2$	1 Mark: Correct answer.
28(d) (i)	$D = \frac{yA}{y+12}$ $10 = \frac{y \times 50}{y+12}$ $10(y+12) = 50y$ $y+12 = 5y$ $4y = 12$ $y = 3$ Owen's child is 3 years old.	1 Mark: Correct answer.
28(d) (ii)	$\text{Doses} = \frac{1200}{10} = 120$	1 Mark: Correct answer.
28(d) (iii)	$\text{Days} = \frac{120}{4} = 30 \text{ days}$	1 Mark: Correct answer.
29(a) (i)	Initially $t = 0$ and $N = 15000$ Initial number of bacteria is 15 000	1 Mark: Correct answer.
29(a) (ii)	Using the graph when $N = 45000$ then $t \approx 4.9$ (Acceptable range 4.8 to 5.0)	1 Mark: Correct answer.
29(a) (iii)	Using the graph when $N = 30000$ then $t \approx 3.1$ (Acceptable range 3.0 to 3.2)	1 Mark: Correct answer.

29(b)	$\text{Electricity} = 0.45 \times 7$ $= 3.15 \text{ kWh}$ $\text{Cost} = \$0.2462 \times 3.15$ $= \$0.77553 \approx \0.78	1 Mark: Correct answer.
29(c) (i)	Balance owing is \$299 750.00	1 Mark: Correct answer.
29(c) (ii)	Interest paid in the 2 nd month was \$1748.54 out of a repayment of \$2000.	1 Mark: Correct answer.
29(c) (iii)	$I = Prn$ $P + I = 299498.54 + 1747.07$ $= 299498.54 \times \frac{0.07}{12}$ $= 1747.074817\dots$ $\approx \$1747.07$ $A = \$1747.07$ and $B = \$301\,245.61$	2 Marks: Correct answer. 1 Mark: Calculates one value correctly.
29(c) (iv)	To calculate the new principal. $P + I - R = \$299498.54 + \$1747.07 - \$2000$ $= \$299\,245.61$ Reduction in principal $= \$300\,000 - \$299\,245.61$ $= \$754.39$	1 Mark: Correct answer.
29(d) (i)	$IQR = Q_3 - Q_1$ $= 27 - 11.5$ $= 15.5$	1 Mark: Correct answer.
29(d) (ii)	Outliers above median are greater than $Q_3 + 1.5 \times IQR$ $Q_3 + 1.5 \times IQR = 27 + 1.5 \times 15.5$ $= 50.25$ Therefore 52 is an outlier.	1 Mark: Correct answer.
29(e) (i)	$\text{Longitude difference} = 153 - 116$ $= 37^\circ$ $\text{Time difference} = 37 \times 4$ $= 148 \text{ minutes}$ $= 2 \text{ h } 28 \text{ min}$ <div style="text-align: center; margin-top: 10px;"> $\begin{matrix} \text{Bali} & & \text{Gold Coast} \\ 116^\circ \text{ E} & & 153^\circ \text{ E} \\ \leftarrow \text{West} & & \text{East} \rightarrow \end{matrix}$ </div> $\text{Time Bali} = 9 \text{ a.m.} \quad 2 \text{ h } 28 \text{ min} = 6.32 \text{ a.m.}$	3 Marks: Correct answer. 2 Marks: Calculates the time difference. 1 Mark: Calculates the longitude difference.

29(e) (ii)	Time Gold Coast = 11 a.m. + 2 h 28 min = 1.28 p.m. Flight takes 3 hours. Time Bali = 1.28 p.m. + 3 h = 4.28 p.m.	1 Mark: Correct answer.																
30(a) (i)	<table border="1"> <tr> <td>s</td> <td>0</td> <td>20</td> <td>40</td> <td>50</td> <td>60</td> <td>80</td> <td>100</td> </tr> <tr> <td>p</td> <td>33</td> <td>17</td> <td>9</td> <td>8</td> <td>9</td> <td>17</td> <td>33</td> </tr> </table>	s	0	20	40	50	60	80	100	p	33	17	9	8	9	17	33	1 Mark: Correct answer.
s	0	20	40	50	60	80	100											
p	33	17	9	8	9	17	33											
30(a) (ii)		1 Mark: Correct answer.																
30(a) (iii)	When $s = 30$ then $p = 0.01 \times 30^2 - 30 + 33$ = 12 litres per 100 km Litres of petrol = 12L for 100 km = 1.2L for 10 km = 4.8L for 40 km	1 Mark: Correct answer.																
30(a) (iv)	When $s = 0$ then $p = 0.01 \times 0^2 - 0 + 33$ = 33 Litres per 100 km However the car is not moving so no petrol is being used.	1 Mark: Correct answer.																
30(b) (i)	Costs when no phones sold or $n = 0$ $C = 20n + 1500$ = $20 \times 0 + 1500 = \$1500$	1 Mark: Correct answer.																
30(b) (ii)	$I = 75n$ = $75 \times 3000 = \$225\ 000$ $C = 15n + 1500$ = $15 \times 3000 + 1500 = \$46\ 500$ Profit = $\$225\ 000 - \$46\ 500$ = $\$178\ 500$	2 Marks: Correct answer. 1 Mark: Finds the income or costs for 3000 mobile phones.																

30(b) (iii)	Break even occurs when $I = C$ $75n = 15n + 1500$ $60n = 1500$ $n = 25$ 25 mobile phones must be sold to break even.	2 Marks: Correct answer. 1 Mark: Recognises that income equals costs.
30(c) (i)	$d = kt^2$ $384 = k \times 16^2$ $k = \frac{384}{16^2}$ = 1.5 $d = 1.5t^2$ = 1.5×10^2 = 150 km Asteroid travelled 150 km	2 Marks: Correct answer. 1 Mark: Finds the value of k or shows some understanding.
30(c) (ii)	$d = 1.5t^2$ $294 = 1.5 \times t^2$ $t^2 = \frac{294}{1.5}$ $t = \sqrt{196}$ = 14 sec It takes the asteroid 14 seconds to travel 294 km	1 Mark: Correct answer.
30(d) (i)	Total paid = $\$1910 \times 26 \times 7$ = $\$347\ 620$	1 Mark: Correct answer.
30(d) (ii)	Interest = $\$347\ 620 - \$220\ 000$ = $\$127\ 620$	1 Mark: Correct answer.
30(d) (iii)	$I = Prn$ $\$127620 = \$220000 \times r \times 7$ $r = \frac{\$127620}{\$220000 \times 7}$ = 0.082870129... $\approx 8.3\%$ Equivalent flat interest rate is 8.3%	1 Mark: Correct answer.