



Centre Number

Student Number

2016 HIGHER SCHOOL CERTIFICATE TRIAL EXAMINATION MATHEMATICS GENERAL 2

Section I – 25 marks

Attempt Questions 1-25

Allow about 35 minutes for this part

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

2016 HIGHER SCHOOL CERTIFICATE TRIAL EXAMINATION

Mathematics General 2

General Instructions

- Reading time – 5 minutes
- Working time – 2 ½ hours
- Write using black or blue pen
- Board-approved calculators may be used
- A formulae and data sheet is provided at the back of this paper
- In Questions 26-30, show relevant mathematical reasoning and/or calculations
- Use the multiple-choice answer sheet provided
- Write your Centre Number and Student Number at the top of this page and page 13.

Total marks – 100

Section I Pages 2-11

25 marks

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

Section II Pages 13-29

75 marks

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

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

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

A B C D

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

A B C D

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

A B C D
correct

1 Fully simplify $2x^2 - 3x + 5x$:

(A) $2x^2 - 2x$

(B) $x(x+1)$

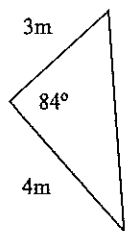
(C) $2x^2 + 2x$

(D) $x^2 + x$

Disclaimer

Every effort has been made to prepare this Examination in accordance with the Board of Studies documents. No guarantee or warranty is made or implied that the Examination paper mirrors in every respect the actual HSC Examination question paper in this course. This paper does not constitute 'advice' nor can it be construed as an authoritative interpretation of Board of Studies intentions. No liability for any reliance, use or purpose related to this paper is taken. Advice on HSC examination issues is only to be obtained from the NSW Board of Studies. The publisher does not accept any responsibility for accuracy of papers which have been modified.

- 2 The area of the triangle below is closest to:



NOT TO SCALE

- (A) 3.5 m²
(B) 4.4 m²
(C) 6.0 m²
(D) 11.9 m²
- 3 Mr Lee has 5 shirts, 3 ties and 4 pairs of pants. Each morning he picks an outfit consisting of one shirt, one tie and one pair of pants.
- How many different outfits can he choose?
- (A) 12
(B) 30
(C) 32
(D) 60
- 4 What is 0.00506 in scientific notation, written to 2 significant figures?
- (A) 5.06×10^{-3}
(B) 5.1×10^{-3}
(C) 5.1×10^{-4}
(D) 5.06×10^{-4}

- 5 A bag contains 12 red marbles, 14 blue marbles, 10 yellow marbles and 5 green marbles. If one marble is picked out of the bag at random, what is the probability that it is red or green?

- (A) $\frac{17}{41}$
(B) $\frac{12}{41}$
(C) $\frac{5}{12}$
(D) $\frac{12}{17}$

- 6 The solution to the equation $\frac{x-7}{2} = 4 - 2x$ is:

- (A) $x = 15$
(B) $x = 5$
(C) $x = 3$
(D) $x = -3$

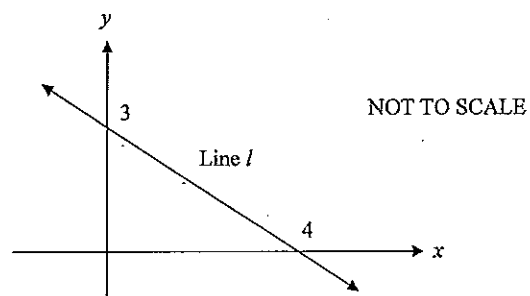
- 7 \$6 000 is invested in an account earning interest at 6% p.a., compounded monthly. The amount of interest earned after five years is closest to:

- (A) \$151.51
(B) \$2 029.35
(C) \$2 093.10
(D) \$2 590.73

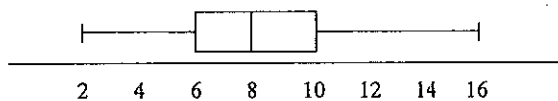
- 8 A student's height is measured to be 174cm.
What is the percentage error in this measurement?

- (A) 0.057%
(B) 0.287%
(C) 0.575%
(D) 3.48%

- 9 What is the equation of line l ?

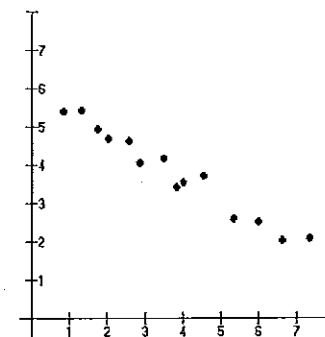


- (A) $y = \frac{3}{4}x + 3$
(B) $y = -\frac{3}{4}x + 3$
(C) $y = \frac{4}{3}x + 3$
(D) $y = -\frac{3}{4}x - 3$
- 10 How many outliers are in the data represented by the box and whisker plot below?



- (A) 0
(B) 1
(C) 2
(D) There is not enough information.

- 11 The diagram below shows a scatterplot.



The correlation is best described as:

- (A) No correlation
(B) Strong positive
(C) Weak negative
(D) Strong negative
- 12 Tom drove on a journey of 253km, at an average speed of 72km/h.
How long did his journey take, to the nearest minute?
- (A) 3 hours, 31 minutes
(B) 3 hours, 51 minutes
(C) 5 hours, 6 minutes
(D) 17 hours, 5 minutes

- 13 Simplify: $17x^0 + (17x)^0$

- (A) 0
(B) 17
(C) 18
(D) 34

- 14 The surface area of a cube is 150 cm^2 .
What is the volume of this cube?

- (A) 28 cm^3
(B) 125 cm^3
(C) 150 cm^3
(D) 531 cm^3

- 15 Five scores have a mean of 62. When a sixth score is added, the mean becomes 63.
What is the sixth score?

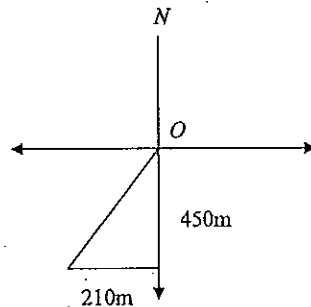
- (A) 62
(B) 63
(C) 68
(D) 72

- 16 Which of the following events is LEAST likely to occur?

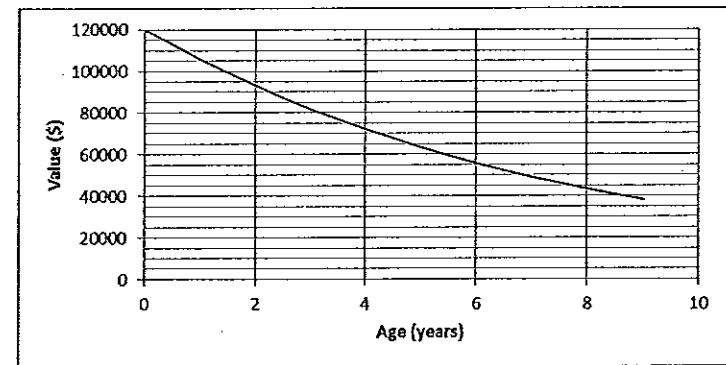
- (A) Obtaining a head when tossing a fair coin once
(B) Obtaining a '4' from rolling a standard six-sided die
(C) Winning first prize in a raffle of 100 tickets in which you have 5 tickets
(D) Randomly selecting the letter 'S' from the 26 letters of the alphabet

- 17 Tara walks 450m south and then 210m west. Her bearing from her original position is:

- (A) 025°
(B) 155°
(C) 205°
(D) 245°



- 18 Gillian wanted to sell her truck. She used a declining balance model to calculate the salvage value of the truck.

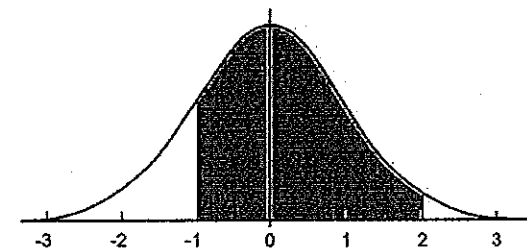


From the graph, the salvage value of the truck after six years was approximately:

- (A) \$50 000
(B) \$55 000
(C) \$65 000
(D) \$120 000

- 19 The diagram below shows data that is in the shape of a normal distribution, with z-scores labelled on the x-axis.

The percentage of scores represented by the shaded region is closest to:



- (A) 95 %
(B) 82 %
(C) 75 %
(D) 68 %

20 An Internet connection downloads data at a rate of 5 megabits per second.
How long would it take to download a file that has a size of 12 582 912 bytes?

- (A) 0.21 seconds
- (B) 1.68 seconds
- (C) 11.7 seconds
- (D) 20.1 seconds

21 Sydney and Melbourne are 713km apart.
They are represented on a map which has a scale of 1:2 000 000.
How far apart are Sydney and Melbourne on the map?

- (A) 1.4 cm
- (B) 3.6 cm
- (C) 14 cm
- (D) 36 cm

22 Dave's credit card has a 30 day interest-free period and a simple interest rate of 25% per annum. He has made a purchase as shown in the table below. The interest is calculated including the date of purchase but not the day of payment.

Date purchased	Item	Cost
May 12	Textbooks	\$180.50

Dave wants to pay off his credit card with a single payment on June 30.
What should this payment be?

- (A) \$385.19
- (B) \$385.45
- (C) \$385.48
- (D) \$385.71

23 The table below shows the present value of an annuity with a contribution of \$1 per period.

<i>N periods</i>	Interest Rate			
	1%	2%	3%	4%
1	0.9901	0.9804	0.9709	0.9615
2	1.9704	1.9416	1.135	1.8861
3	2.941	2.8839	2.8286	2.7751
4	3.9020	3.8077	3.7171	3.6299
5	4.8534	4.7135	4.5797	4.4518
6	5.7955	5.6014	5.4172	5.2421
7	6.7282	6.4720	6.2303	6.0021
8	7.6517	7.3255	7.0197	6.7327
9	8.5660	8.1622	7.7861	7.4353
10	9.4713	8.9826	8.5302	8.1109

Using the table, the quarterly repayment for a loan of \$20 000 at an interest rate of 8% p.a. compounded quarterly, over a period of 2 years is:

- (A) \$2 730.19
- (B) \$2 970.58
- (C) \$5 252.51
- (D) \$10 300.78

24 For a certain phone plan, the cost of a phone call is \$0.49 for every 30 seconds or part thereof, plus a fixed cost for flag fall.
If a call lasting 12 minutes and 15 seconds costs \$12.57, what is the flag fall cost?

- (A) \$0.32
- (B) \$0.81
- (C) \$6.20
- (D) \$6.69

25 Income tax is calculated according to the table below.

Taxable income	Tax on this income
0 – \$18,200	Nil
\$18,201 – \$37,000	19c for each \$1 over \$18,200
\$37,001 – \$80,000	\$3,572 plus 32.5c for each \$1 over \$37,000
\$80,001 – \$180,000	\$17,547 plus 37c for each \$1 over \$80,000
\$180,001 and over	\$54,547 plus 45c for each \$1 over \$180,000

Benjamin paid a total of \$22 541 in income tax.

His taxable income is closest to:

- (A) \$81 848
- (B) \$84 994
- (C) \$91 098
- (D) \$93 497

**2016 HIGHER SCHOOL CERTIFICATE
TRIAL EXAMINATION**

--	--	--	--	--	--

Centre Number

--	--	--	--	--	--	--	--	--	--	--

Student Number

Mathematics General 2

Section II – 75 marks

Attempt Questions 26-30

Allow about 1 hour and 55 minutes for this part

Answer the questions in the spaces provided.

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

Extra writing space is provided on page 30 and 31. If you use this space, clearly indicate which question you are answering.

Write your Centre Number and Student Number at the top of this page.

Question 26 (15 marks)

- (a) Jane buys a car with a market value of \$45 000. The GST payable on the car purchase is 10% of the market value of the car.

(i) Find the GST-inclusive price of the car.

1

.....

.....

.....

- (ii) Stamp duty is then calculated as 3% of the GST-inclusive price of the car up to \$34 000, and then 5% for every dollar over \$34 000.

Find the stamp duty payable on the car.

2

.....

.....

.....

.....

Question 26 continues on the next page

Question 26 (continued)

- (iii) Registration costs are \$330 and the CTP green slip insurance is \$1 430. Find the total cost of the car including all of these on-road costs.

1

.....

.....

.....

- (b) John takes out a loan of \$6 000. The loan has a reducible interest rate of 9% p.a. and the monthly repayments are \$250.

The table below summarises this information for the first three months.

Month	Principal (P)	Interest (I)	Amount Owing ($P + I$)	Balance Owing ($P + I - R$)
1	\$6 000	\$45	\$6 045	\$5 795
2	\$5 795	A	\$5 838.46	\$5 588.46
3	B	\$41.91	\$5 630.37	C

- (i) Find the values of A , B and C .

4

.....

.....

.....

.....

.....

- (ii) Explain why the amounts in the Interest (I) column decrease over time.

1

.....

.....

.....

.....

.....

Question 26 continues on the next page

Question 26 (continued)

- (c) Phillipa, a piano sales agent, is paid according to the following table.

Pianos sold per week (x)	0	5	10	15
Phillipa's pay (y)	450	570	690	810

- (i) If this table were graphed, what could the vertical intercept represent?

1

.....

.....

- (ii) Find the formula for Phillipa's pay in the form $y = mx + b$.

2

.....

.....

.....

.....

- (iii) According to the formula in part (ii), how much is she paid in a week where she sells 12 pianos?

1

.....

.....

- (iv) Phillipa sells an average of 12 pianos per week. Her employer offers to replace her pay with a fixed salary of \$45 000 p.a. instead. Should she take the salary offer? Justify your answer.

2

.....

.....

.....

.....

.....

.....

.....

.....

End of Question 26

Question 27 (15 marks)

(a) Simplify fully: $6m^2 \times \frac{2p}{9mp^2}$

2

.....

.....

.....

(b) The time it takes for a pendulum to complete one full cycle is given by the equation $T = 2\pi \times \sqrt{\frac{l}{g}}$. Find l if $g = 10$ and $T = 0.25$.
Give your answer to 2 significant figures.

2

.....

.....

.....

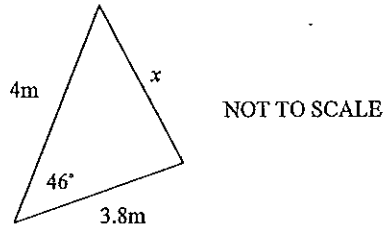
.....

.....

.....

.....

(c) Find the value of x in the diagram below, giving your answer to 1 decimal place. 2



.....

.....

.....

.....

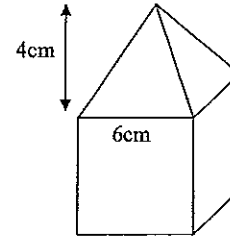
.....

Question 27 continues on the next page

Question 27 (continued)

(d) A square pyramid of height 4cm is attached to a cube of side length 6cm. Find the volume of the combined solid. 2

2



.....

.....

.....

.....

.....

(e) Solve these equations simultaneously:

2

$$x - 4y = 3$$

$$x + 2y = -9$$

.....

.....

.....

.....

.....

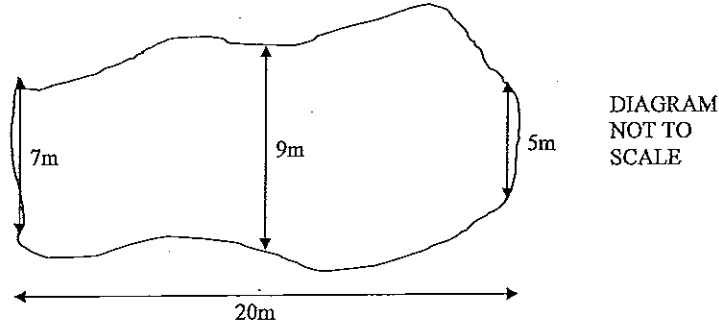
.....

.....

Question 27 continues on the next page

Question 27 (continued)

(f) Below is the diagram of a lake with measurements.



Use Simpson's Rule to estimate the area of the lake. 2

.....

.....

.....

.....

.....

.....

(g) Make x the subject: $y = 2 - \frac{5x^3}{4}$ 3

.....

.....

.....

.....

.....

.....

.....

.....

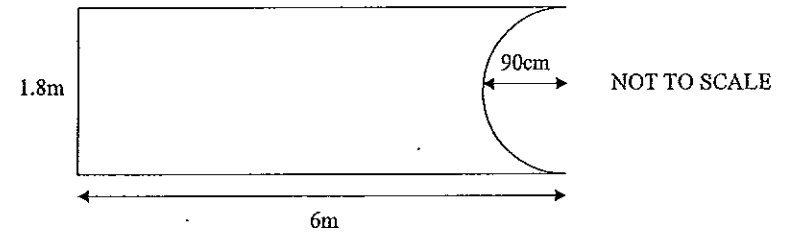
.....

.....

End of Question 27

Question 28 (15 marks)

(a) The diagram below shows a bird's eye view of a roof. The curved edge is in the shape of a semicircle.



(i) What is the area of the roof? Give your answer to 2 decimal places. 2

.....

.....

.....

.....

(ii) During the night, 13mm of rain falls on the roof. What volume of water has fallen on the roof? Give your answer in litres. 2

.....

.....

.....

.....

(iii) The water from the roof drains into a tall cylindrical tank of radius 0.3m. Assuming that the tank was empty before it rained, how high is the water level in the tank? 3

.....

.....

.....

.....

.....

Question 28 continues on the next page

Question 28 (continued)

(b) Seattle's latitude and longitude are $48^\circ N$, $122^\circ W$ and Salzburg's are $48^\circ N$, $13^\circ E$.

- (i) How many degrees of longitude are between these two cities, if you travel through the Greenwich Meridian? 1
Give your answer to the nearest kilometre.

.....
.....
.....

- (ii) Aaron used the radius of the Earth as 6400km to try and calculate the distance between the two cities. Why would this give an incorrect answer? 1

.....
.....
.....
.....

- (iii) Salzburg is 9 hours ahead of Seattle. It takes 13 hours to fly from Salzburg to Seattle.
If a flight leaves Salzburg at 10:00 pm on Wednesday, what day and time would it arrive in Seattle? 2

.....
.....
.....
.....
.....

Question 28 continues on the next page

Question 28 (continued)

(c) Emily is at a party that lasts from 8pm to midnight. She has a mass of 60kg. During the party, she has 6 standard drinks. She is a P-plater with a BAC limit of zero for driving.

- (i) What is her BAC at midnight? Give your answer to 2 significant figures. 2

.....
.....
.....
.....
.....

- (ii) The next morning, Emily needs to drop off her younger brother at the station at 7am. Assuming that she can reduce her BAC by 0.015 per hour, would she be able to legally drive her brother to the station? Justify your answer. 2

.....
.....
.....
.....
.....

End of Question 28

Question 29 (15 marks)

- (a) John's marks in Maths and English are listed below, along with the mean and standard deviation for each course.

Subject	John's Mark	Mean	Standard deviation
Maths	86	75	10
English	84	72	8

In which subject has John's performed the best? Justify your answer.

2

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

Question 29 continues on the next page

Question 29 (continued)

- (b) A survey was conducted at the local park during a weekday at 10am, asking people whether they regularly exercised for 30 minutes per day or not. The results are displayed in the two-way table below.

	Men	Women
Exercise	89	110
No exercise	59	68

- (i) Of all the participants in the survey, what percentage of them exercise?

2

.....

.....

.....

.....

.....

- (ii) Give TWO reasons why this survey could give biased data.

2

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

Question 29 continues on the next page

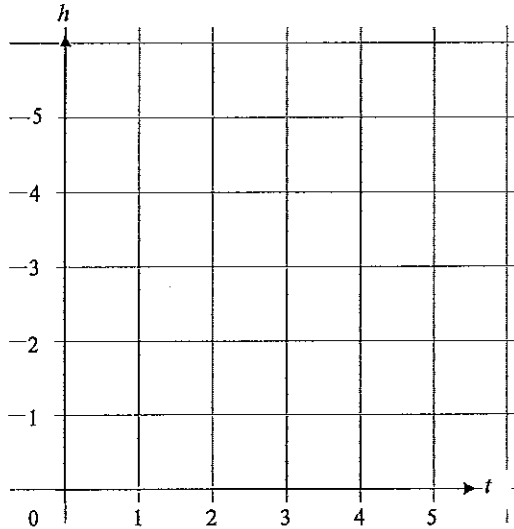
Question 29 (continued)

(c) A ball is thrown vertically into the air and its height h metres above the ground after t seconds is given by the parabolic equation $h = 6t - 2t^2$.

(i) Complete the table of values below. 2

t	0	1	2	3
h				

(ii) On the grid provided below, sketch a graph of $h = 6t - 2t^2$.
Remember to consider carefully the type of graph you are sketching. 1



(iii) What is the maximum height of the ball? 1

.....

.....

.....

Question 29 continues on the next page

Question 29 (continued)

(d) A game of chance involves rolling two dice.
If a double is rolled, the player wins \$6.
If only one of the dice rolls a six, the player wins \$12.
Any other outcome results in a loss of \$7.

(i) Find the probability of only one of the dice rolling a six. 2

.....

.....

.....

.....

.....

(ii) Calculate the financial expectation of playing this game once. 3

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

End of Question 29

Question 30 (15 marks)

(a) A truck driver has a reaction time of 1.2 seconds. When he was travelling at 70km/h, he applied his brakes and travelled 80m before stopping.

(i) Use the braking distance formula $d = kv^2$ (where v is the velocity in km/h) to find k correct to 4 decimal places.

2

.....

.....

.....

.....

.....

(ii) Find the total stopping distance if he were instead travelling at 100km/h. Give your answer to the nearest metre.

3

.....

.....

.....

.....

.....

.....

.....

.....

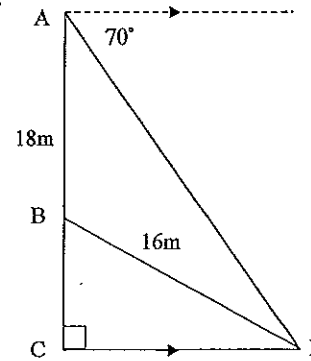
.....

.....

Question 30 continues on the next page

Question 30 (continued)

(b) The angle of depression from A to D is 70° . The length of AB is 18m and the length of BD is 16m.



NOT TO SCALE

(i) Find the angle of elevation from D to B. Give your answer to the nearest degree.

3

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

(ii) Hence or otherwise find the length of AC. Give your answer to the nearest metre.

2

.....

.....

.....

.....

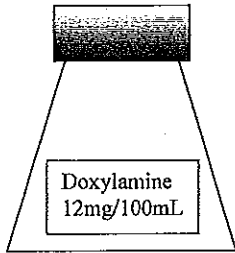
.....

Question 30 continues on the next page

Question 30 (continued)

- (c) Kevin is given liquid doxylamine which has a concentration of 12mg/100mL. He would like the doxylamine to be equivalent to a concentration of 5mg/100mL. He will need to add water to dilute the solution to obtain his desired concentration. How much water should he add?

3



.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

Question 30 continues on the next page

Question 30 (continued)

- (d) A bag contains six coins, one of each denomination (\$2, \$1, 50c, 20c, 10c, 5c). Two coins are simultaneously drawn from the bag at random. Find the probability that the total value of the two coins is equal to or greater than \$1.

[Hint: You may wish to use a grid, table, or other diagram to help you]

2

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

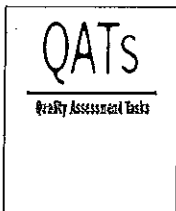
.....

.....

.....

.....

End of Paper



2016 HIGHER SCHOOL CERTIFICATE
TRIAL EXAMINATION

MATHEMATICS GENERAL 2
Marking Guidelines

Section I

Question	Answer
1	C
2	C
3	D
4	B
5	A
6	C
7	C
8	B
9	B
10	A
11	D
12	A
13	C
14	B
15	C
16	D
17	C
18	B
19	B
20	D
21	D
22	C
23	A
24	A
25	D

Disclaimer

Every effort has been made to prepare this Examination in accordance with the Board of Studies documents. No guarantee or warranty is made or implied that the Examination paper mirrors in every respect the actual HSC Examination question paper in this course. This paper does not constitute "advice" nor can it be construed as an authoritative interpretation of Board of Studies intentions. No liability for any reliance, use or purpose related to this paper is taken. Advice on HSC examination issues is only to be obtained from the NSW Board of Studies. The publisher does not accept any responsibility for accuracy of papers which have been modified.

Section II

Question 26 (a) (i)

Criteria	Mark
• Correct answer	1

Sample answer
 $45000 \times 1.1 = \$49\,500$

Question 26 (a) (ii)

Criteria	Marks
• Correct answer with appropriate working	2
• Calculations where one section of the commission is calculated correctly	1

Sample answer
 $34\,000 \times 0.03 = 1020$
 $(49\,500 - 34\,000) \times 0.05 = 775$
 Therefore total stamp duty = $1\,020 + 775 = \$1\,795$

Question 26 (a) (iii)

Criteria	Mark
• Correct answer	1

Sample answer
 $49\,500 + 1\,795 + 330 + 1\,430 = \$53\,055$

Question 26 (b) (i)

Criteria	Marks
• Correct answers for A (1 mark), B (1 mark), C (1 mark) and appropriate working for A (1 mark)	4
• As above, with one mark missing	3
• As above, with two marks missing	2
• As above, with three marks missing	1

Sample answer
 $A = 5\,795 \times \frac{0.09}{12} \times 1 = 43.46$
 $B = 5\,588.46$
 $C = 5\,630.37 - 250 = 5\,380.37$

Question 26 (b) (ii)

Criteria	Mark
• An answer indicating an awareness of the changing principal	1

Sample answer
 The reducible interest decreases because the principal that the interest is calculated on is also decreasing.

Question 26 (c) (i)

Criteria	Mark
• An answer indicating the idea of a 'retainer' or the amount paid when no pianos are sold	1

Sample answer

The vertical intercept could represent her retainer.

Question 26 (c) (ii)

Criteria	Marks
• Correct answer with appropriate working for the gradient	2
• Gradient only OR incorrect gradient, but equation is expressed in $y = mx + b$ form with correct intercept	1

Sample answer

$$m = \frac{570 - 450}{5 - 0} = 24$$

$$b = 450$$

$$y = 24x + 450$$

Question 26 (c) (iii)

Criteria	Mark
• Correct answer	1

Sample answer

$$y = 24 \times 12 + 450 = 738$$

Question 26 (c) (iv)

Criteria	Marks
• Correct conclusion (take the salary) with appropriate calculations	2
• Correct conclusion with no working OR some correct working attempting to compare current pay with salary offer	1

Sample answer

$$\text{Weekly salary is } 45\,000 \div 52.18 = 862.40$$

She should take the salary as this is higher than \$738 per week from part (iii).

Question 27 (a)

Criteria	Marks
• Correctly obtains fully simplified answer with appropriate working	2
• Shows evidence of understanding with some correct multiplication or division	1

Sample answer

$$6m^2 \times \frac{2p}{9mp^2}$$

$$= \frac{12m^2 p}{9mp^2}$$

$$= \frac{4m}{3p}$$

Question 27 (b)

Criteria	Marks
• Correctly obtains answer with appropriate working	2
• Substitution AND some correct rearranging of terms or vice versa	1

Sample answer

$$0.25 = 2\pi \times \sqrt{\frac{l}{10}}$$

$$\frac{0.25}{2\pi} = \sqrt{\frac{l}{10}}$$

$$\left(\frac{0.25}{2\pi}\right)^2 = \frac{l}{10}$$

$$l = 10 \left(\frac{0.25}{2\pi}\right)^2$$

$$l = 0.016 \quad (2 \text{ s.f.})$$

Question 27 (c)

Criteria	Marks
• Correct answer with appropriate working	2
• Attempt to apply the Cosine Rule	1

Sample answer

$$x^2 = 4^2 + 3.8^2 - 2(4)(3.8)\cos(46)$$

$$x^2 = 9.322385538\dots$$

$$x = 3.1$$

Question 27 (d)

Criteria	Marks
• Correct answer with appropriate working	2
• Correctly applies strategies to find volume of square pyramid	1

Sample answer

$$(6 \times 6 \times 6) + \left(\frac{1}{3} \times 6^2 \times 4\right) = 264 \text{ cm}^3$$

Question 27 (e)

Criteria	Marks
• Correct answers for both x and y with appropriate working	2
• Attempt at substitution or elimination which results in correct answer for one of x or y	1

Sample answer

$$x - 4y = 3 \rightarrow (1)$$

$$x + 2y = -9 \rightarrow (2)$$

Elimination method (1) - (2)

$$-6y = 12$$

$$y = -2$$

Find x :

$$x - 4(-2) = 3$$

$$x + 8 = 3$$

$$x = -5$$

Question 27 (f)

Criteria	Marks
• Correct answer with appropriate working	2
• Evidence of attempt to apply Simpson's Rule (e.g. correct formula with one incorrect value for substitution)	1

Sample answer

$$A \approx \frac{10}{3}(7 + 4 \times 9 + 5)$$

$$A \approx 160 \text{ m}^2$$

Question 27 (g)

Criteria	Marks
• Correct answer with appropriate working	3
• As above with one error in reorganisation	2
• Some correct reorganising involving at least two progressive steps towards the solution	1

Sample answer

$$0 = 2 - \frac{5x^3}{4} - y$$

$$\frac{5x^3}{4} = 2 - y$$

$$5x^3 = 8 - 4y$$

$$x^3 = \frac{8 - 4y}{5}$$

$$x = \sqrt[3]{\frac{8 - 4y}{5}}$$

Question 28 (a) (i)

Criteria	Marks
• Correct answer with appropriate working	2
• Applies strategy involving subtraction from rectangle	1

Sample answer

$$1.8 \times 6.0 - \frac{\pi \times 0.7^2}{2}$$

$$= 10.03^2 \text{ (2 d.p.)}$$

Question 28 (a) (ii)

Criteria	Marks
• Correct answer with appropriate working	2
• Correct volume without converting into litres OR similar numerical answer but incorrect use of units or conversions	1

Sample answer

$$10.03 \times 0.013 = 0.13039 \text{ m}^3$$

$$0.13039 \text{ m}^3 = 130.39 \text{ L}$$

Question 28 (a) (iii)

Criteria	Marks
• Correct answer with appropriate working	3
• Similar numerical answer but incorrect use of units or conversions OR appropriate application of volume of a cylinder using the volume of rainfall with a calculation error	2
• Evidence of volume of a cylinder in problem solving process	1

Sample answer

$$0.13039 = \pi(0.3^2)h$$

$$h = \frac{0.13039}{\pi(0.3^2)}$$

$$h = 0.46117\dots$$

$$h \approx 46\text{cm}$$

Question 28 (b) (i)

Criteria	Marks
• Correct answer with appropriate working	2
• Evidence of application of arc length formula	1

Sample answer

$$122 + 13 = 135^\circ$$

$$\frac{135}{360} \times 2\pi(6400) = 15\,080\text{ km}$$

Question 28 (b) (ii)

Criteria	Marks
• Correct answer with appropriate working	2
• Evidence of calculation involving flight time OR time difference	1

Sample answer

Wednesday 22:00 Salzburg = Wednesday 13:00 Seattle.

$$13:00 + 13\text{ hours} = 0:200\text{ Thursday.}$$

Question 28 (c) (i)

Criteria	Marks
• Correct answer with appropriate working	2
• Evidence of application of BAC OR correct application of BAC but with the male formula instead	1

Sample answer

$$\frac{10 \times 6 - 7.5 \times 4}{5.5 \times 60} \approx 0.091$$

Question 28 (c) (ii)

Criteria	Marks
• Correct conclusion with appropriate working	2
• Working involving reduction of BAC calculations	1

Sample answer

$$7 \times 0.015 = 0.105$$

This is greater than Emily's BAC of 0.091 so she can legally drive her brother.

Question 29 (a)

Criteria	Marks
• Correct conclusion with appropriate working	2
• Evidence of some calculation of z-scores	1

Sample answer

Compare using z-scores.

$$\frac{86 - 75}{10} = 1.1$$

$$\frac{84 - 72}{8} = 1.5$$

Therefore his English mark is better as the z-score is higher.

Question 29 (b) (i)

Criteria	Marks
• Correct answer with appropriate working	2
• Correct answer only OR correct percentage of men exercising or percentage of women exercising	1

Sample answer

$$\frac{89 + 110}{89 + 110 + 59 + 68} = 61\%$$

Question 29 (b) (ii)

Criteria	Marks
• Two valid reasons for bias	2
• One valid reason for bias	1

Sample answer

- 1: The survey was at the local park, so more likely to get people who exercise and go outdoors.
 2: Weekday at 10am means it is unlikely to include people who work during the day.

Question 29 (c) (i)

Criteria	Marks
• All values correct in table	2
• One incorrect value, all others correct	1

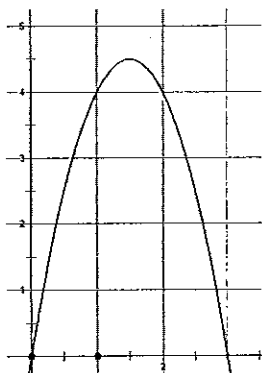
Sample answer

<i>h</i>	0	1	2	3
<i>t</i>	0	4	4	0

Question 29 (c) (ii)

Criteria	Mark
• Graph displays correct parabolic shape including vertex	1

Sample answer



Question 29 (c) (iii)

Criteria	Mark
• Correct conclusion from graph drawn OR correct height (4.5m) drawn from equation	1

Sample answer

Maximum height = 4.5m.

Question 29 (d) (i)

Criteria	Marks
• Correct answer with appropriate working	2
• Evidence of systematic/counting methods	1

Sample answer

	1	2	3	4	5	6
1						X
2						X
3						X
4						X
5						X
6	X	X	X	X	X	

Probability $\frac{10}{36} = \frac{5}{18}$

Question 29 (d) (ii)

Criteria	Marks
• Correct answer with appropriate working	3
• Appropriate probability calculations including attempt to apply financial expectation	2
• Appropriate probability calculations	1

Sample answer

$P(\text{double}) = \frac{6}{36} = \frac{1}{6}$

$P(\text{only one six}) = \frac{5}{18}$ (from part (i))

Therefore, $P(\text{any other outcome}) = 1 - \frac{1}{6} - \frac{5}{18} = \frac{5}{9}$

Total financial expectation is $\frac{1}{6} \times 6 + \frac{5}{18} \times 12 - \frac{5}{9} \times 7 = \0.44

Question 30 (a) (i)

Criteria	Marks
• Correct answer with appropriate working	2
• Some evidence of correct substitution and manipulation of formula	1

Sample answer

$$80 = k(70^2)$$

$$k = \frac{80}{4900}$$

$$k = 0.0163$$

Question 30 (a) (ii)

Criteria	Marks
• Correct answer with appropriate working	3
• Reaction distance	2
• Breaking distance	1

Sample answer

For breaking distance,

$$d = 0.0163 \times 100^2$$

$$d = 163$$

For reaction distance,

$$d = 1.2 \times \frac{100 \times 1000}{3600}$$

$$d = 33m$$

Therefore the total stopping distance is

$$163 + 33 = 196m$$

Question 30 (b) (i)

Criteria	Marks
• Correct answer with appropriate working	3
• Application of the Sine Rule or equivalent strategy	2
• Labelling of angle CAD	1

Sample answer

Note angle BAD = 20 degrees. This allows us to use the Sine Rule.

$$\frac{16}{\sin 20} = \frac{18}{\sin \angle ADB}$$

$$\sin \angle ADB = \frac{18 \sin 20}{16}$$

$$\angle ADB = \sin^{-1} \left(\frac{18 \sin 20}{16} \right)$$

$$\angle ADB = 23^\circ$$

Since

$$\angle ACD = 70^\circ$$

The angle of depression from D to B is $70^\circ - 23^\circ = 47^\circ$.

Question 30 (b) (ii)

Criteria	Marks
• Correct answer with appropriate working	2
• Application of trigonometry to find length BC	1

Sample answer

$$\sin 47^\circ = \frac{BC}{16}$$

$$BC = 16 \sin 47$$

$$BC = 11.701659...$$

$$AC = 18 + 11.701659...$$

$$AC = 30$$

Question 30 (c)

Criteria	Marks
• Correct answer with appropriate working	3
• Correct manipulation of ratios that would lead to a correct final answer	2
• Appropriate strategies involving ratios	1

Sample answer

We need to find what a concentration of 5mg/100mL would translate to if you had 12mg.

$\frac{12}{5} = 2.4$, therefore multiply both sides of 5mg/100mL by 2.4.

5mg/100mL is equivalent to 12mg/240mL.

Therefore 140mL of water needs to be added to the 12mg/100mL solution.

Question 30 (d)

Criteria	Marks
• Correct answer with appropriate working	2
• Evidence of a systematic approach involving counting methods and/or diagrams	1

Sample answer

	\$2	\$1	50c	20c	10c	5c
\$2	X	Yes	Yes	Yes	Yes	Yes
\$1	Yes	X	Yes	Yes	Yes	Yes
50c	Yes	Yes	X			
20c	Yes	Yes		X		
10c	Yes	Yes			X	
5c	Yes	Yes				X

Note that outcomes marked X cannot happen (only one of each coin type).

Total outcomes = 30, total desired outcomes = 18.

Therefore probability is $\frac{18}{30} = \frac{9}{15}$.