Neap

Final Examination 2022

NSW Year 11 Mathematics Standard

General Instructions

- Reading time – 10 minutes
- Working time – 2 hours
- Write using black pen
- Calculators approved by NESA may be used
- A reference sheet is provided at the back of this paper
- For questions in Section II, show relevant mathematical reasoning and/or calculations

Total Marks: 80

SECTION I – 15 marks (pages 2–7)

- Attempt Questions 1–15
- Allow about 25 minutes for this section

SECTION II – 65 marks (pages 9–27)

- Attempt Questions 16–33
- Allow about 1 hour and 35 minutes for this section

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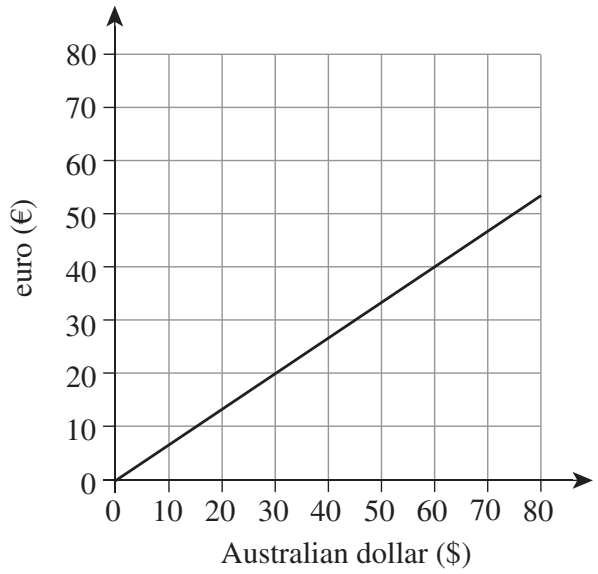
SECTION I

15 marks
Attempt Questions 1–15
Allow about 25 minutes for this section

Use the multiple-choice answer sheet for Questions 1–15.

1 Conversion graphs can be used to convert one currency to another. Phil uses the conversion graph shown to convert Australian dollars ($) to euros (€).



How many euros is $60 is equal to?

A. €20

B. €40

C. €60

D. €80

2 What is 0.002859 expressed in standard form to two significant figures?

A. 2.9×10^{-3}

B. 2.8×10^{-3}

C. 2.9×10^{-2}

D. 2.8×10^{-2}

3 Yasmin works at a local restaurant. She is paid her normal rate of pay on Saturday at $14.50 per hour and time-and-a-half on Sunday.

How much does Yasmin earn if she works from 1:00 pm until 10:00 pm on Saturday and from 11:00 am until 7:00 pm on Sunday?

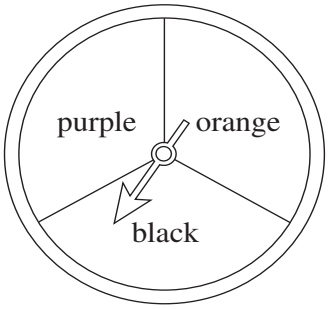
A. $232

B. $246.50

C. $304.50

D. $391.50

4 The diagram shows a spinner. The arrow is spun and the colour that the arrow points to is recorded.



If the spinner was spun 600 times, how many times would the arrow be expected to point to purple?

A. 100

B. 200

C. 300

D. 400

5 Phoebe lives in Perth, Australia (UTC +8) and wants to watch an international hockey match live on television. The hockey match will be played in Los Angeles, United States (UTC –7), and will begin at 7:00 pm on Wednesday local time.

What day and time will the hockey match begin in Perth, Australia?

A. Wednesday, 6:00 pm

B. Wednesday, 8:00 pm

C. Thursday, 8:00 am

D. Thursday, 10:00 am

6 The total price paid when purchasing music online directly varies with the number of songs purchased. Laura purchases 15 songs and pays a total of $24.

How many songs can Laura purchase for $51.20?

A. 20

B. 30

C. 32

D. 40

7 Ahmed would like to purchase car insurance that will cover damage to his car if he were found to be at fault in an accident.

What type of car insurance would cover this claim?

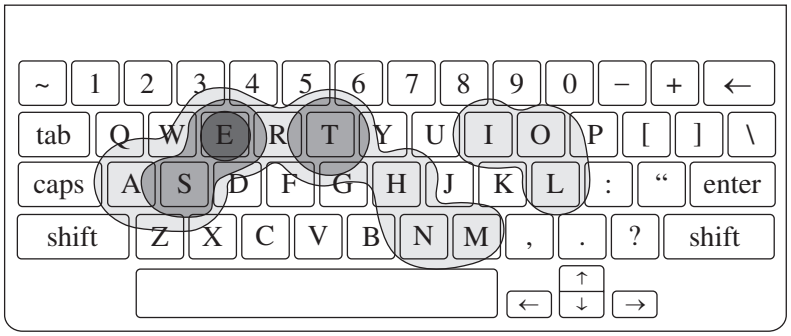
A. compulsory third-party insurance

B. non-compulsory third-party insurance

C. comprehensive insurance

D. fire and theft insurance

8 The following heat map shows the frequency of keys used on a laptop keyboard.



The frequency distribution table shows the number of times each letter was pressed on the keyboard. The frequency for the letter S is missing.

Letter	*Frequency*
E	45
T	41
S	?
I	22

How many times was the letter S pressed on the keyboard?

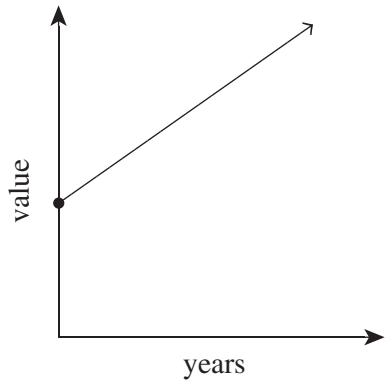
A. 18

B. 24

C. 38

D. 46

9 Consider the graph shown.



What could the graph represent?

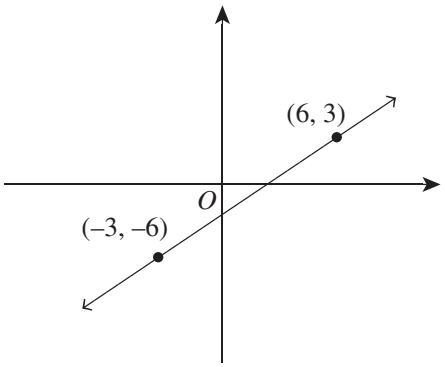
A. the value of a savings account as it earns simple interest

B. the value of a savings account as it earns compound interest

C. the value of a car as it depreciates using the straight-line method of depreciation

D. the value of a computer as it depreciates using the straight-line method of depreciation

10 The graph of an equation is shown.



Which of the following represents the equation of the line?

A. $y = x - 3$

B. $y = x - 2$

C. $y = 3x - 6$

D. $y = 6x + 3$

11 The coordinates of Panama City are (9°N, 80°W). A town is located 12° south and 30° west of Panama City.

What are the coordinates of the town?

A. (9°S, 68°W)

B. (21°N, 68°W)

C. (21°N, 110°W)

D. (3°S, 110°W)

12 Which of the following correctly expresses l as the subject of the equation $n = \frac{8 - l}{m} + p$?

A. $l = 8 + p - mn$

B. $l = 8 + pm - mn$

C. $l = 8 + pm - n$

D. $l = 8 - p - mn$

13 Sarina plays two tennis matches. The probability that she wins her first match is 0.3. If she wins her first match, the probability that she wins her second match is 0.7. If she does not win her first match, the probability that she wins her second match is 0.2.

What is the probability that Sarina wins at least one match?

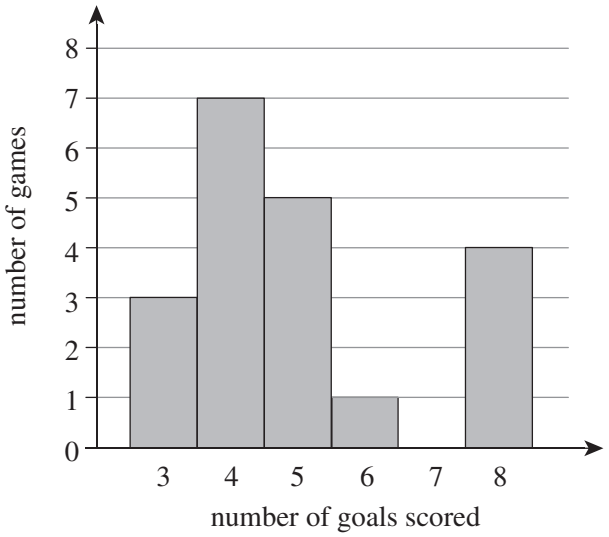
A. 0.21

B. 0.23

C. 0.25

D. 0.44

14 Sarah recorded the number of goals that she scored over a series of games. She recorded her results in the frequency histogram shown. She did not draw the column for seven goals scored. The mean number of goals scored was 5.4.



Sarah scored seven goals in

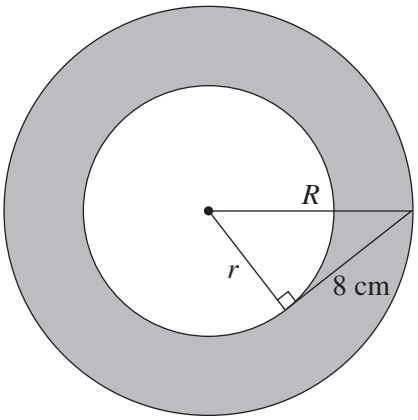
A. two games.

B. three games.

C. four games.

D. five games.

15 The shaded area in the diagram is called an annulus. The formula for the area of an annulus is $\pi\left(R^2 - r^2\right)$.



NOT TO SCALE

What is the area of the annulus, correct to the nearest square centimetre?

A. 25 cm^2

B. 64 cm^2

C. 201 cm^2

D. 256 cm^2

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Section II Answer Booklet 1

SECTION II

65 marks
Attempt Questions 16–33
Allow about 1 hour and 35 minutes for this section

Booklet 1 — Attempt Questions 16–25 (32 marks)
Booklet 2 — Attempt Questions 26–33 (33 marks)

Instructions

- Answer the questions in the spaces provided. These spaces provide guidance for the expected length of response.
- Your responses should include relevant mathematical reasoning and/or calculations.
- Extra writing space is provided on pages 17–18 of Booklet 1. If you use this space, clearly indicate which question you are answering.

Please turn over

Question 16 (2 marks)
The number of students absent from school each day was recorded over one week. The results are shown.

3 5 7 9 11

(a) Calculate the mean number of students that were absent each day. **1**

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(b) Calculate the range of the number of students that were absent each day. **1**

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Question 17 (4 marks)

A camera is purchased for $7500. The value of the camera depreciates at a rate of $500 per year.

(a) What is the value of the camera after four years? **1**

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(b) How many years will it take for the camera to be worth $4500? **1**

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(c) After eight years, the camera depreciates at a rate of $350 per year. **2**
How many years after the camera was purchased will the camera to be worth $0?

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Question 18 (3 marks)

Viki owns a local coffee shop and sells coffee in three different sizes. The sales of coffee over a one-hour period are recorded in the table.

Coffee cup size	*Number sold*
small	86
medium	204
large	90

(a) Why are the coffee cup sizes categorised as categorical ordinal? **1**

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(b) Viki wants to order 1900 coffee cups for her shop. **1**

Using the data provided, calculate the number of small coffee cups Viki should order so that her order is in proportion to the sales during the one-hour period shown.

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(c) The energy in a small coffee is 514 kilojoules. 1 kilocalorie is equal to 4.184 kilojoules. **1**

How many kilocalories are in a small coffee, correct to the nearest whole number?

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Question 19 (2 marks)

The blood alcohol content (BAC) of a male can be calculated using the formula **2**

$$\text{BAC}_{\text{male}} = \frac{10N - 7.5H}{6.8M},$$

where N is the number of drinks consumed, M is the weight of the person in kilograms and H is the number of hours spent drinking.

Matthew attended a party. At the party, he consumed four standard drinks over two hours. Matthew weighs 82 kg.

Calculate Matthew's BAC after he consumed the drinks, correct to three significant figures.

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Question 20 (4 marks)

The length of a netball court is measured and found to be 30.5 m, to the nearest tenth of a metre.

(a) Calculate the lower bound of the measurement. **2**

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(b) Calculate the percentage error of the measurement, correct to two decimal places. **2**

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Question 21 (3 marks)

Ruby builds three model boats within a two-hour period. Each boat takes the same amount of time to build. She begins building the first boat at 13:43. **3**

At what time does Ruby finish building the first boat?

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Question 22 (5 marks)

George purchases a new car for $50 000. George is also charged:

- $450 on-road costs
- stamp duty at a rate of 3% of the purchase value of the car up to $45 000 and 5% for the purchase value of the car above $45 000.

(a) Calculate the total amount of money that George paid for the car. **2**

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(b) The average fuel consumption rate of George's car is 7.9 L per 100 km. On average, George travels 420 km per week. Fuel costs 165.9 cents per litre. **3**

Calculate how much George will pay for fuel each year.

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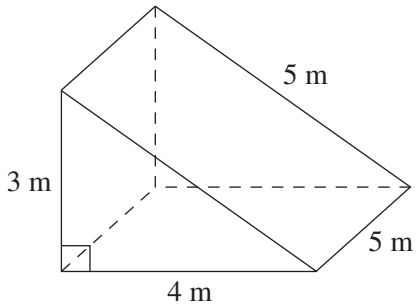
Question 23 (5 marks)

A new camping tent is being designed. The tent will be in the shape of a triangular prism. It will have five faces made of synthetic material, which costs \$15 per square metre. The tent will be supported by nine poles, which are represented by the edges in the triangular prism shown. The poles cost \$2 per metre. **5**



NOT TO SCALE

Calculate the total cost to construct the tent.

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Question 24 (2 marks)

The Austudy payment is an income support payment available for eligible students over the age of 25. If an individual who receives Austudy payments is employed, payments are reduced by 50 cents for each dollar earned over $452 per fortnight. Austudy payments also vary based on the situation of the individual, as shown in the table. **2**

Situation	*Maximum fortnightly payment*
single, no children	$530.40
single, with children	$679.00
couple, no children	$530.40
couple, with children	$577.40

Hamish is a university student and is single with no children. He is eligible for Austudy. He earns $520 per fortnight from his part-time job.

Calculate Hamish's fortnightly Austudy payment.

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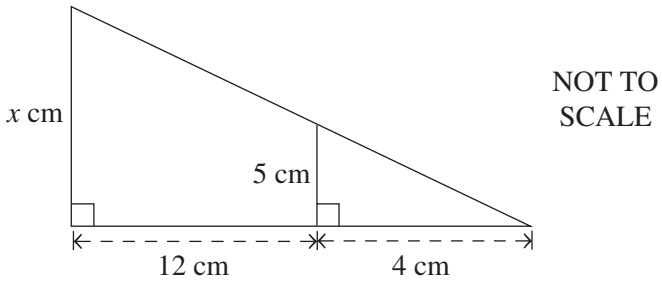
Question 25 (2 marks)

Consider the triangle shown. **2**



Calculate the value of x, correct to the nearest centimetre.

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Section II extra writing space

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Section II extra writing space

If you use this space, clearly indicate which question you are answering.

NSW Year 11 Mathematics Standard

Section II Answer Booklet 2

Booklet 2 — Attempt Questions 26–33 (33 marks)

Instructions

- Answer the questions in the spaces provided. These spaces provide guidance for the expected length of response.
- Your responses should include relevant mathematical reasoning and/or calculations.
- Extra writing space is provided on pages 28–29 of Booklet 2. If you use this space, clearly indicate which question you are answering.

Please turn over

Question 26 (5 marks)

Sandra has a gross annual salary of $60 970. Her allowable taxable deductions total $3020. Her tax payable can be calculated using the table. **5**

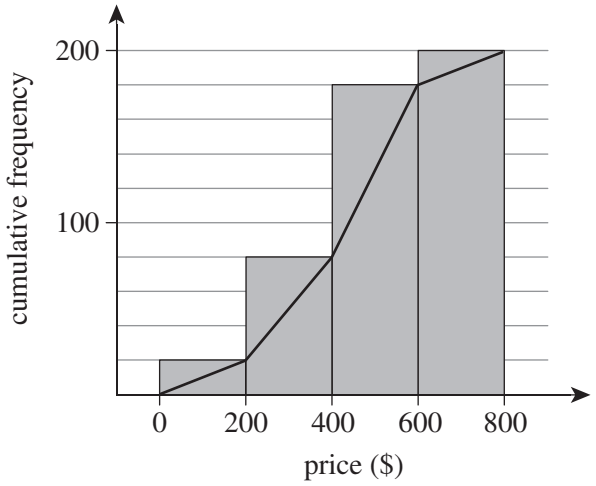
Taxable income	*Tax on this income*
0–$18 200	Nil
$18 201–$45 000	19 cents for each $1 over $18 200
$45 001–$120 000	$5092 plus 32.5 cents for each $1 over $45 000
$120 001–$180 000	$29 467 plus 37 cents for each $1 over $120 000
$180 001 and over	$51 667 plus 45 cents for each $1 over $180 000

The Medicare levy is charged at a rate of 2% of taxable income. Sandra has paid $12 550 in PAYG tax for the year.

Determine whether Sandra will have a tax debt or refund and calculate the amount.

Question 27 (5 marks)

The cumulative frequency histogram and polygon represents the prices of 200 different televisions sold by shop *A*.



(a) Identify the skew of the dataset. **1**

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(b) Using the graph, determine the approximate median cost of a television from shop *A*. **1**

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(c) Shop *B* also sells televisions. The median price of a television from shop *B* is $350 and the interquartile range is $300. **3**

Compare and contrast the price of televisions at shop *A* and shop *B*. In your answer, refer to measures of location and spread.

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Question 28 (4 marks)

An esky contains 24 cans of drinks. There are five cans of cola, five cans of lemonade and the remaining cans are either ginger ale or tonic water. Larry selects a can from the esky at random.

(a) What is the relative frequency of Larry selecting a can of cola? **1**

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(b) What is the relative frequency of Larry NOT selecting a can of lemonade? **1**

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(c) The relative frequency of selecting a ginger ale is 0.125. **2**

How many cans of tonic water are in the esky?

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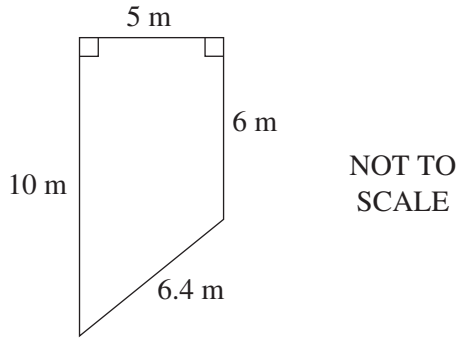
Question 29 (4 marks)

Jonathon is landscaping his backyard and needs to remove a 10 cm layer of dirt. The diagram shows the measurements of Jonathon's backyard. **4**



Jonathon needs to load the dirt into skip bins. Skip bins can hold 1.5 m^3 of dirt.

How many skip bins will Jonathon need to hold all the dirt?

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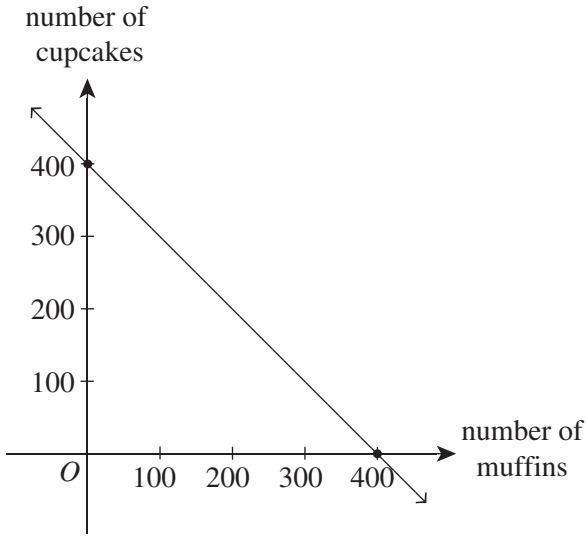
Question 30 (4 marks)

Paul and Mary own a bakery. Each day, they make a total of 400 items to sell, which are a mix of cupcakes and muffins. They agree that, due to popular demand, they must always make at least 50 cupcakes.
The following graph represents the equation $y = 400 - x$, where x is the number of muffins made and y is the number of cupcakes made.



(a) What does the y-intercept represent in this context? **1**

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(b) What does the gradient represent in this context? **1**

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(c) For what values of x would the graph $y = 400 - x$ NOT be applicable for Paul and Mary? Briefly explain your answer. **2**

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Question 31 (3 marks)

The scores achieved by students in a Visual Arts class are shown. If a student's score is greater than 45, it is considered an outlier. **3**

12 x 15 19 23 27 40

Determine the value of x.

Question 32 (3 marks)

A total of 700 individuals take a government employment exam. Carmela scores 618 out of 800 marks. There are 520 individuals who score 618 marks or less. The median score was 570 marks and the lowest score was 0.

To gain employment in a job with the government, an individual must score in the top 20% of people completing the exam.

(a) What percentile does an individual need to be in to be employed by the government? **1**

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(b) Will Carmela be employed by the government? Briefly explain your answer. **1**

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(c) Identify the shape of the distribution of this dataset. Briefly explain your answer. **1**

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Question 33 (5 marks)

A company makes and sells scented wax candles. The mass of wax needed to make a candle, in grams, can be calculated using **5**

$$W = v \times \left(\frac{100 - f}{100} \right) \times 0.83,$$

where W is the mass of candle in grams, v is the volume of the candle in cubic centimetres and f is the percentage of fragrance in the candle.

Each candle is in the shape of a cylinder with a radius of 4.5 cm and a height of 12 cm, and contains 10% fragrance. The company sells each candle for 2 cents per gram, inclusive of GST.

Calculate the price of one candle, excluding GST.

End of paper

Section II extra writing space

If you use this space, clearly indicate which question you are answering.

Section II extra writing space

If you use this space, clearly indicate which question you are answering.

REFERENCE SHEET

Measurement

Limits of accuracy

$$\text{absolute error} = \frac{1}{2} \times \text{precision}$$

upper bound = measurement + absolute error

lower bound = measurement – absolute error

Length

$$l = \frac{\theta}{360} \times 2\pi r$$

Area

$$A = \frac{\theta}{360} \times \pi r^2$$

$$A = \frac{h}{2}(a+b)$$

$$A \approx \frac{h}{2}(d_f + d_l)$$

Surface area

$$A = 2\pi r^2 + 2\pi rh$$

$$A = 4\pi r^2$$

Volume

$$V = \frac{1}{3}Ah$$

$$V = \frac{4}{3}\pi r^3$$

Trigonometry

$$\sin A = \frac{\text{opp}}{\text{hyp}},\ \cos A = \frac{\text{adj}}{\text{hyp}},\ \tan A = \frac{\text{opp}}{\text{adj}}$$

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

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

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

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

Financial Mathematics

$$FV = PV(1+r)^n$$

Straight-line method of depreciation

$$S = V_0 - Dn$$

Declining-balance method of depreciation

$$S = V_0(1-r)^n$$

Statistical Analysis

An outlier is a score

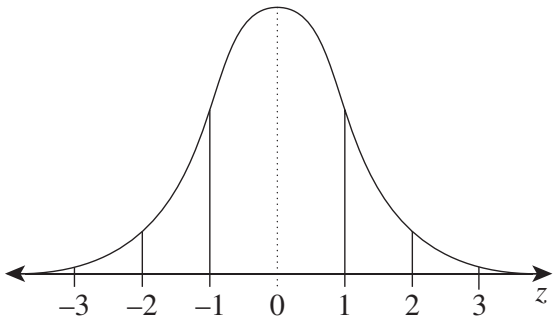
less than $Q_1 - 1.5 \times IQR$

or

more than $Q_3 + 1.5 \times IQR$

$$z = \frac{x - \mu}{\sigma}$$

Normal distribution



- 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

Final Examination 2022

NSW Year 11 Mathematics Standard

DIRECTIONS:

Write your name in the space provided.
Write your student number in the boxes provided below. Then, in the columns of digits below each box, fill in the oval which has the same number as you have written in the box. Fill in **one** oval only in each column.
Read each question and its suggested answers. Select the alternative A, B, C, or D that best answers the question. Fill in the response oval completely, using blue or black pen. Mark only **one oval** per question.

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 change your mind and have crossed out what you consider to be the correct answer, then indicate this by writing the word *correct* and draw an arrow as follows.

correct ↓

A ⊗ B ⊗ C ○ D ○

STUDENT NAME: _____

STUDENT NUMBER:

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

SECTION I
MULTIPLE-CHOICE ANSWER SHEET

1.	A ○	B ○	C ○	D ○
2.	A ○	B ○	C ○	D ○
3.	A ○	B ○	C ○	D ○
4.	A ○	B ○	C ○	D ○
5.	A ○	B ○	C ○	D ○
6.	A ○	B ○	C ○	D ○
7.	A ○	B ○	C ○	D ○
8.	A ○	B ○	C ○	D ○
9.	A ○	B ○	C ○	D ○
10.	A ○	B ○	C ○	D ○
11.	A ○	B ○	C ○	D ○
12.	A ○	B ○	C ○	D ○
13.	A ○	B ○	C ○	D ○
14.	A ○	B ○	C ○	D ○
15.	A ○	B ○	C ○	D ○

STUDENTS SHOULD NOW CONTINUE WITH SECTION II