Neap

Final Examination 2023

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 2–6)

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

Section II – 65 marks (pages 7–23)

- Attempt Questions 16– 32
- Allow about 1 hour and 35 minutes for this section

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.

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1 Which of the following is NOT an allowable tax deduction?

A. work uniform
B. superannuation
C. travel expenses
D. office supplies

2 Amy and Julian are playing a game with a 20-sided die. The die has five blue sides, nine red sides and six yellow sides. The player who rolls a yellow side first wins the game.

How many elements are in the sample space for this experiment?

A. 3
B. 6
C. 14
D. 20

3 Six students go bowling together. Their scores at the end of the first game are shown.

71 80 40 79 78 71

One of the students' scores is an outlier.

Which statistical measure will NOT change if the outlier is removed from the data?

A. mean
B. median
C. mode
D. range

4 Ava's refrigerator depreciates by $750 per year.

If its salvage value after 7 years is $3000, how much did the refrigerator originally cost?

A. $5250
B. $7500
C. $8250
D. $9000

5 A city has the coordinates (60°N, 135°W).
What is the Coordinated Universal Time (UTC) of this city?

A. UTC–3
B. UTC+3
C. UTC–9
D. UTC+9

6 The table shows details from Claire's 2021–2022 tax return.

Income tax	\$5472
Medicare levy	\$465
PAYG paid	\$5612

Which of the following statements is correct?

A. Claire owes the Australian Taxation Office \$325.
B. Claire owes the Australian Taxation Office \$605.
C. The Australian Taxation Office will refund \$325 to Claire.
D. The Australian Taxation Office will refund \$605 to Claire.

7 Jenny buys a rectangular picture frame with a length that is twice its width. She determines it has a perimeter of 48 cm. The perimeter of the picture frame can be found using the formula

$$P = 2l + 2w,$$

where l is the length and w is the width.
What is the length of the picture frame?

A. 8 cm
B. 12 cm
C. 16 cm
D. 24 cm

8 Andy and his friend Byron both have part-time jobs. The table shows the amount of money that Andy has earned at various times during a 6-hour shift from 12:00 pm to 6:00 pm.

Time	*Total earned*
12:00 pm	\$0
1:30 pm	\$18
4:00 pm	\$48
5:30 pm	\$66
6:00 pm	\$72

Byron is paid according to the equation $p = 24t$, where p is the total amount of money he gets paid after completing a t-hour shift.

Which of the following statements is correct?

A. Andy's part-time job does not pay a fixed hourly wage.

B. Andy and Byron have the same hourly wage.

C. Andy's hourly wage is double Byron's hourly wage.

D. Andy's hourly wage is half Byron's hourly wage.

9 The surface area of a cube is 121.5 m^2.

What is the cube's side length?

A. 4.05 m

B. 4.5 m

C. 4.95 m

D. 5 m

10 Sanjay noted the number of minutes he spent on social media for a 4-day period.

Day	1	2	3	4
Minutes	126	113	130	135

On the fifth day, he spent 116 minutes on social media.

When compared to the 4-day mean, the 5-day mean

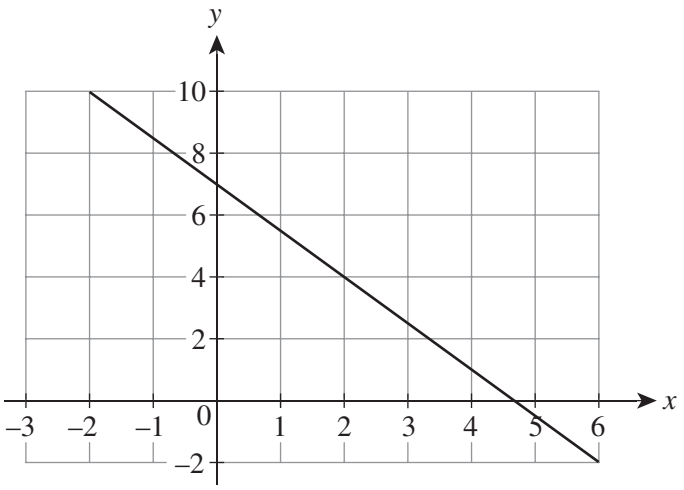
A. did not change.

B. increased by 3.

C. decreased by 2.

D. decreased by 10.

11 Consider the graph.



What is the gradient of the graph?

A. $-\frac{14}{9}$

B. $-\frac{7}{9}$

C. $-\frac{3}{2}$

D. $-\frac{2}{3}$

12 Luka borrowed $\$x$ at 4% per annum simple interest for 18 months.
Which of the following expressions represents the total Luka owes at the end of the 18 months?

A. $\$(x \times 0.04 \times 18)$

B. $\$(x + (x \times 0.04 \times 18))$

C. $\$(x \times 0.04 \times 1.5)$

D. $\$(x + (x \times 0.04 \times 1.5))$

13 The volume of a pyramid is given by the formula

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

where A is the area of the pyramid's base and h is its perpendicular height.

The edges of the base of a square pyramid have a length of b units.

Which of the following expressions gives the square pyramid's volume if $b = 2h$?

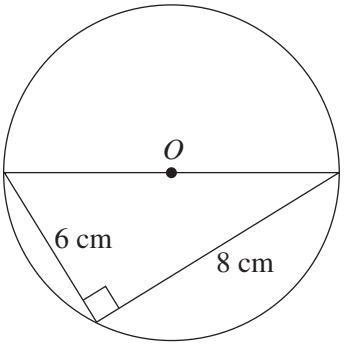
A. $\frac{1}{3}h^3$

B. $\frac{4}{3}h^3$

C. $4h^3$

D. $\frac{8}{3}h^3 - \frac{4}{3}h$

14 The diagram shows a right-angled triangle placed inside a circle with centre O.



What is the circumference of the circle, correct to the nearest whole number?

A. 16 cm

B. 31 cm

C. 44 cm

D. 79 cm

15 A bag contains six balls numbered 1 to 6. Two balls are drawn from the bag and then replaced.

Which of the following outcomes is LEAST likely to occur?

A. The two balls drawn have a sum of 5.

B. One ball drawn is odd and the other is even.

C. The two balls drawn are the same number.

D. The two balls drawn differ in value by 2.

NSW Year 11 Mathematics Standard

Section II Answer Booklet

65 marks
Attempt Questions 16–32
Allow about 1 hours and 35 minutes for this section

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

Please turn over

Question 16 (2 marks)

A car insurance company offers a no-claim discount on their insurance premiums that increases for each year that a claim is not made. The table shows the different no-claim discounts. **2**

Number of years without a claim	*No-claim discount*
3	9%
2	6%
1	3%
0	0%

Seiya receives a quote of $76.81 per fortnight for a car insurance policy from this company. However, Seiya has not made any claims for two years and is eligible for a no-claim discount.

Calculate his annual savings, correct to two decimal places.

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Question 17 (3 marks)

On average, the ocean is about 3.795×10^3 metres deep. The deepest point of the ocean is 11.033×10^3 m deep.

(a) Which of the two measurements is written in scientific notation? **1**

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(b) Convert the measurement from part (a) into kilometres, correct to one significant figure. **2**

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Question 18 (3 marks)

City *A* has a longitude of 20°W. City *B* is west of city *A* and has a time difference of 5 hours.

(a) Which city is ahead in time? **1**

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(b) What is the longitude of city *B*? **2**

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Question 19 (3 marks)

A dishwasher with a 3.5-star energy rating consumes 384 kWh of energy per year.

(a) If electricity is charged at \$0.3221 per kWh, what is the annual cost of electricity for using the dishwasher? Give your answer correct to two decimal places. **1**

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(b) A more efficient version of the dishwasher consumes 153 kWh of energy per year. **2**

Calculate the percentage decrease in the annual cost of running this dishwasher, correct to the nearest whole percent.

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Question 20 (3 marks)

Janet earns \$3998.40 per month.

(a) Calculate Janet's weekly income, correct to two decimal places. **1**

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(b) Annual leave loading is an additional payment that is equivalent to 17.5% of 4 weeks' pay. **2**

Calculate Janet's total holiday pay.

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Question 21 (6 marks)

A line has the equation $y = \frac{1}{2}x - 2$.

(a) Identify the gradient and y-intercept of the line. **2**

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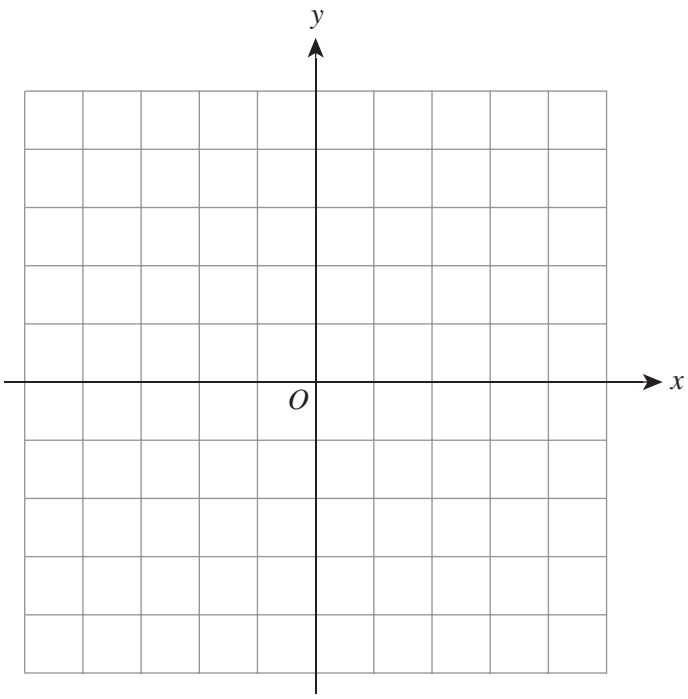
(b) Sketch the line on the grid provided. **2**



(c) Write the equation of a line that has the same y-intercept but is twice as steep. **1**

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(d) Determine whether the equation found in part (c) represents direct variation. **1**

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Question 22 (2 marks)

Ellis sold a pair of sneakers for $112.50 and made a 25% profit. **2**

How much did Ellis originally pay for the sneakers?

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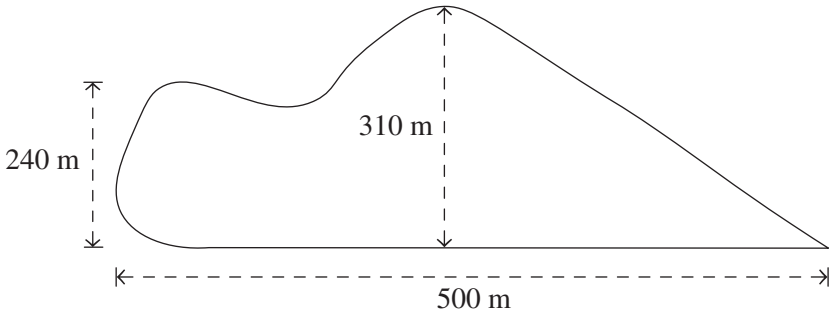
Question 23 (4 marks)

An irregularly shaped pond has dimensions as shown below.



(a) Use two applications of the trapezoidal rule to estimate the surface area of the pond. **2**

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(b) If its average depth is 80 cm, what is the capacity of the pond in kilolitres? **2**

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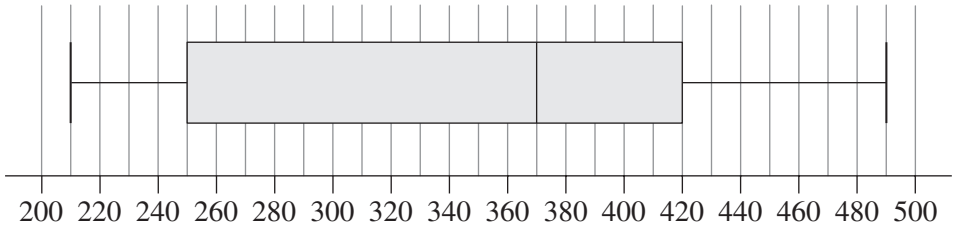
Question 24 (8 marks)

The box-plot shows the number of calories contained in 20 different types of muffins.



(a) Classify this data as numerical or categorical. **1**

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(b) Identify the shape of the data. **1**

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(c) Find the five-number summary and interquartile range (IQR) of the data. **2**

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(d) How many types of muffins contained at least 250 calories? 1

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(e) Jogging for 30 minutes burns approximately 21 kJ of energy per kilogram of body weight. Gavin weighs 60 kg and eats the muffin with the highest calorie content. **3**

If 1 calorie = 4.184 kJ, how many minutes of jogging would it take for Gavin to burn off the energy from the muffin?

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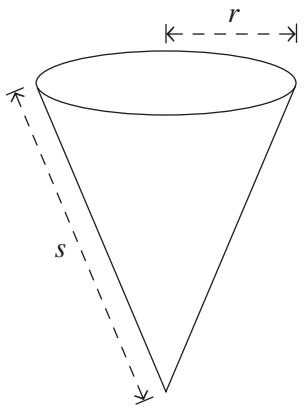
Question 25 (3 marks)

The surface area of a cone is given by the formula

$$A = \pi rs + \pi r^2,$$

where r is the radius of the cone and s is the slant height, as shown in the diagram.



(a) Make s the subject of the formula. **2**

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(b) Using the formula from part (a), find the slant height of a cone that has a surface area of 270 cm^2 and a radius of 4.8 cm. Give your answer correct to one decimal place. **1**

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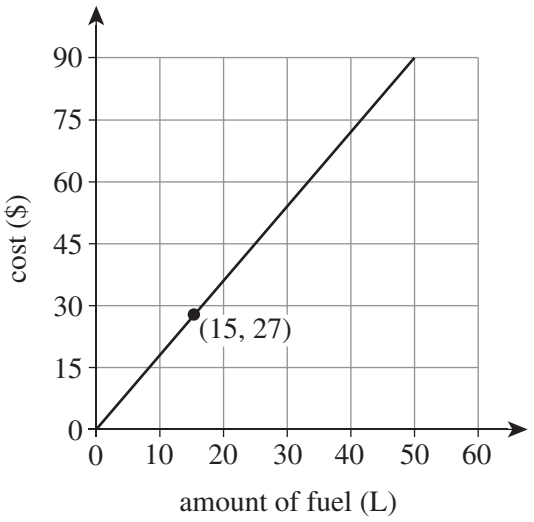
Question 26 (3 marks)

The graph shows the cost of buying fuel at a particular service station in New South Wales.



The cost of fuel can be modelled by the equation

$$C = kF,$$

where C is the cost of fuel and F is the amount of fuel purchased.

(a) Determine the value of k. **1**

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(b) What does the value of k represent in this context? **1**

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(c) Use the value of k found in part (a) to determine the amount of fuel that can be purchased for $54. **1**

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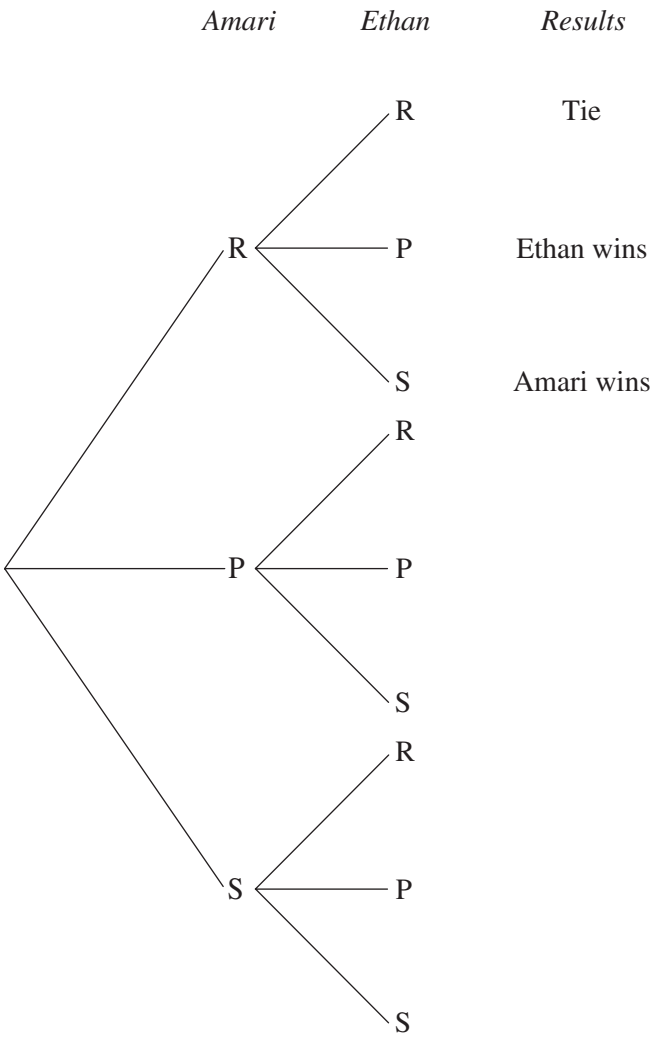
Question 27 (5 marks)

Amari and Ethan play a game of rock-paper-scissors. In the game, rock (R) beats scissors (S), paper (P) beats rock and scissors beats paper. The tree diagram shows the possible outcomes for the game.



(a) Complete the *Results* section of the tree diagram and label the branches with the appropriate probabilities. **2**

(b) Which outcomes determine the event 'Ethan wins'? **1**

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(c) Calculate the expected number of times that Ethan will win, if the game is played 30 times. **2**

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Question 28 (4 marks)

Taj deposits $1000 into a new bank account. The account pays interest at a rate of 3.5% per annum, compounded every three months. He leaves the money in the account for five years and does not make any additional deposits or withdrawals.

The total amount of money in Taj's account over time can be calculated using the formula

$$A = 1000\left(1+\frac{r}{n}\right)^{nt},$$

where A is the amount of money in the account; r is the interest rate per annum as a decimal; n is the number of times the interest is compounded per annum; and t is the number of years the money is invested.

(a) Calculate the total amount of interest Taj's account earns after five years. Give your answer correct to two decimal places. **3**

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(b) What simple interest rate (% per annum) would generate the same amount of interest over five years? Give your answer correct to one decimal place. **1**

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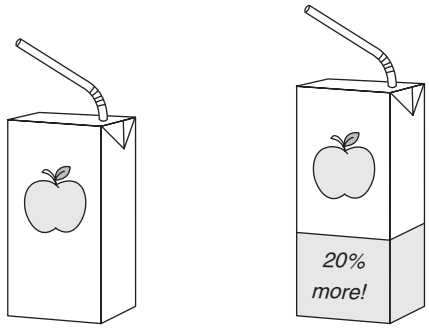
Question 29 (5 marks)

A juice company is planning to produce a new juice box that has a 20% larger volume than previous juice boxes.



original juice box new juice box

(a) The original juice box has a length of 5 cm, a width of 2.5 cm and a height of 16 cm. **3**
If the company wants the base to be the same size, what is the height of the new juice box?

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(b) The company wants to charge $7.50 per litre for the new juice box. **2**
Determine the selling price of each juice box after a 10% GST is applied.

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Question 30 (4 marks)

Barry sells \$10 000 worth of goods in a month. There are two options for earning a commission on these sales at his company. **4**

- Option A is a commission that equals 7.5% of goods sold.
- Option B is a commission that equals 8% of the first \$$x$ of goods sold and 6% of any goods sold thereafter.

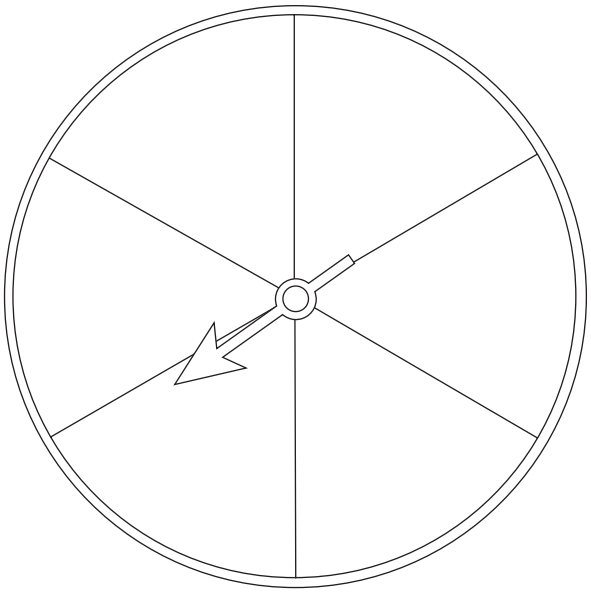
Determine the value of x that would allow Barry to earn the same commission from both options.

Question 31 (3 marks)

A spinner has six sections of equal size that are each labelled with a different positive integer. The following information is known about the spinner.

- The probability of spinning a number less than 8 is 1.
- The probability of spinning a multiple of 3 is $\frac{1}{3}$.
- The probability of spinning a multiple of 4 is $\frac{1}{6}$.
- The probability of spinning an odd number is $\frac{2}{3}$.

(a) Using the information provided, label the spinner with the correct integers. **2**



(b) Billie spins the spinner n times. She calculates that the expected frequency of spinning a multiple of 4 OR an odd number is 120 spins. **1**

Find n.

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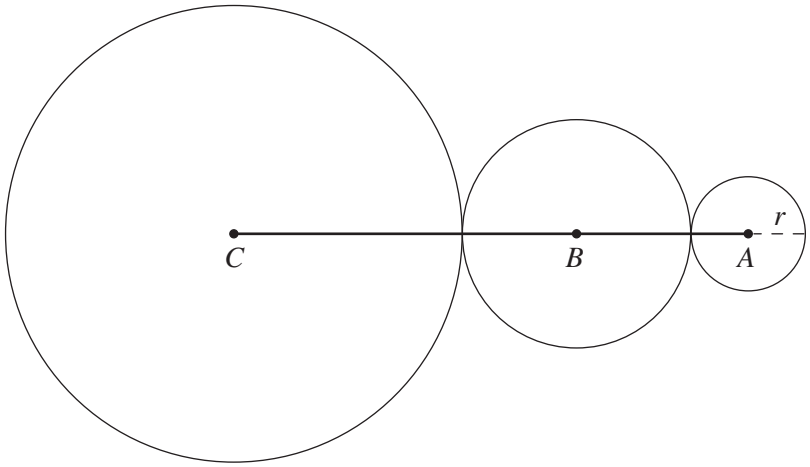
Question 32 (4 marks)

The diagram shows three circles. The radius of circle A (r) is half the radius of circle B and a quarter of the radius of circle C. The sum of the circumferences of the three circles is 42π. **4**



Find the length of line AC.

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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.

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

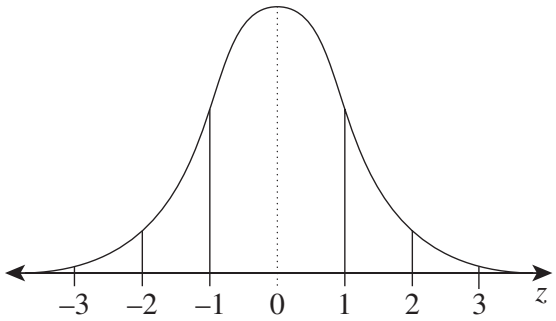
less than $Q_1 - 1.5 \times IQR$

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 2023

Neap 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