

MATHEMATICS APPLICATIONS

UNIT 2 - YEAR 11

TEST 5 - 2021



unit (-1)
rounding (-1)

SECTION ONE – CALCULATOR FREE

STUDENT'S NAME: _____

CIRCLE YOUR TEACHER'S NAME:

Dr Duan

Mr Galbraith

Mr Hamilton-Brown

Mr Riemer

Mrs Thompson

Mr Stillitano

MARKS: _____ / 24

TIME: 20 mins

- No calculators are allowed during this section of the test.
- Show all necessary working in order to obtain full marks.
- A formula sheet will be provided.

QUESTION 1

[1, 1, 1, 1, = 4 mark]

Using the diagram shown on the right to determine:

i) The true bearing

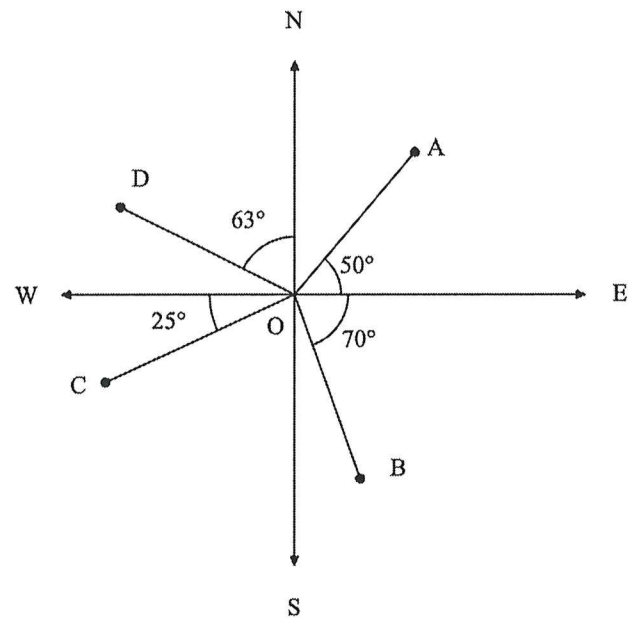
a) From O to A: 040°T ✓

b) From O to B: 160°T ✓

ii) The compass bearing

a) From O to C: S65°W ✓

b) From O to D: N63°W ✓



QUESTION 2

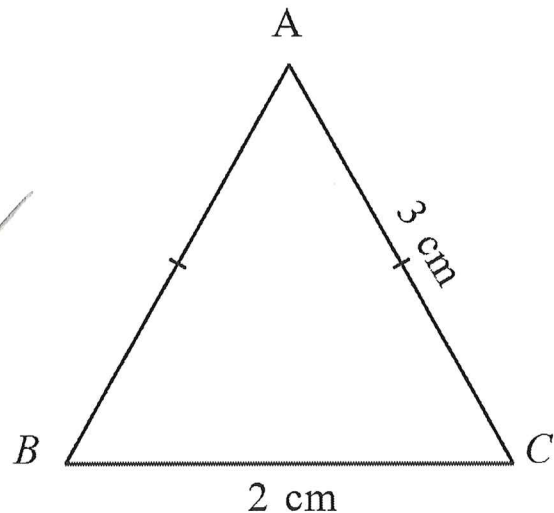
[3 mark]

Find the area of the triangle on the right.

$$s = \frac{2+3+3}{2} = 4 \quad \checkmark$$

$$A = \sqrt{4(4-2)(4-3)(4-3)} \quad \checkmark$$

$$= \sqrt{8} \text{ cm}^2 \quad \checkmark$$



QUESTION 3

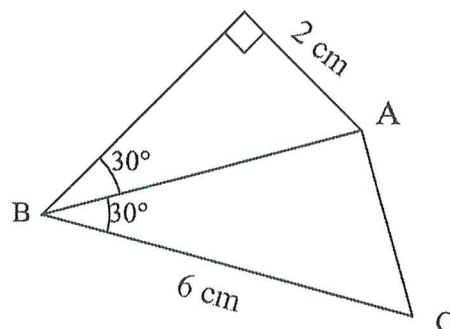
[2, 2 = 4 marks]

Given $\sin 30^\circ = \frac{1}{2}$

a) find the length of AB

$$\sin 30^\circ = \frac{2}{AB} \quad \checkmark$$

$$AB = 4 \text{ cm} \quad \checkmark$$



b) hence, find the area of $\triangle ABC$

$$A_{\triangle ABC} = \frac{1}{2} \sin 30^\circ (4)(6) \quad \checkmark$$

$$= 6 \text{ cm}^2 \quad \checkmark$$

QUESTION 4

[2, 2 = 4 marks]

Tim wants to represent WSHS in a swimming competition. He enters the 100 m freestyle and 100 m butterfly qualification trials. The results for the competitors are normally distributed and shown below:

100 m free style:	mean of 90 seconds,	and a standard deviation of 5 seconds
100 m butterfly:	mean of 100 seconds,	and a standard deviation of 7 seconds

Tim recorded a time of 85 seconds for freestyle, and a standard score of -2 for butterfly, determine:

a) Tim's 100 m butterfly time.

$$Z = \frac{x - \mu}{\sigma} \quad \checkmark$$

$$-2 = \frac{x - 100}{7} \Rightarrow x = 86 \text{ seconds} \quad \checkmark$$

b) In which swimming stroke did Tim perform better? Justify mathematically.

$$Z_{FS} = \frac{85 - 90}{5} = -1 \quad \checkmark$$

\therefore Butterfly is better, as $-2 < -1$ \checkmark

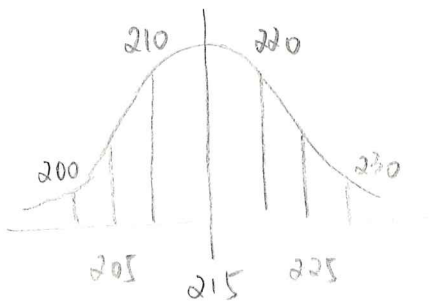
meaning he's more faster than the average.

QUESTION 5

[2, 2, 3, 2 = 9 marks]

Tim needs to buy a special swimming cap for the competition. A local factory produces this type of swimming cap. The diameter of a medium size cap is normally distributed with a mean of 215 mm, and a standard deviation of 5 mm. Use the 68%, 95%, and 99.7% rule to answer the following:

- a) What percentage of swimming caps have a diameter greater than 210 mm?



$$50\% + \frac{68\%}{2} = 84\% \checkmark$$

- b) A medium size swimming cap with diameter less than 200 mm or more than 230 mm is clarified as faulty. What is the percentage of faulty products?

$$1 - 99.7\% = 0.3\% \checkmark$$

- c) Tim knows that he can wear any cap as long as it falls between 205 mm and 220 mm in diameter. If there are 1000 caps produced in this factory, how many would fit Tim?

$$\frac{95\%}{2} + \frac{68\%}{2} = 81.5\% \checkmark$$

$$81.5\% \times 1000 = 815 \checkmark$$

- d) The largest 0.15% of the Medium size cap will be labelled as Large size. What is the smallest diameter of the Large size?

$$\frac{0.3\%}{2} = 0.15\% \checkmark$$

$$\therefore 230 \text{ mm} \checkmark$$

END OF SECTION ONE

MATHEMATICS APPLICATIONS

UNIT 2 - YEAR 11

TEST 5 - 2021



SECTION TWO – CALCULATOR ALLOWED

STUDENT'S NAME: _____

CIRCLE YOUR TEACHER'S NAME:

Dr Duan

Mr Galbraith

Mr Hamilton-Brown

Mr Riemer

Mrs Thompson

Mr Stillitano

MARKS: _____ / 27

TIME: 30 mins

- A scientific calculator and/or Classpad is allowed.
- 1 × A4 sheet (single-sided) of notes is allowed.
- A formula sheet will be provided.
- Show all necessary working in order to obtain full marks.

QUESTION 6

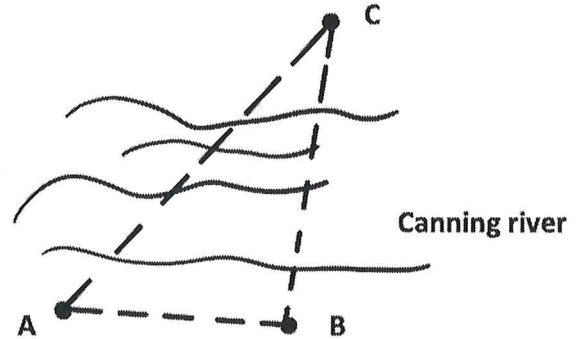
[3 marks]

Tim has been selected to represent WSHS in a Triathlon. He started early morning endurance training with his teammates. They need to jog for 5 km along the Canning River from points A to B, and then swim across the river to point C. If $\angle CAB = 45^\circ$, and $\angle ACB = 30^\circ$, determine the distance Tim has to swim.

$$\frac{BC}{\sin 45} = \frac{5}{\sin 30} \quad \checkmark$$

$$BC = \frac{5}{\sin 30} \times \sin 45 \quad \checkmark$$

$$= 7.07 \text{ km} \quad \checkmark$$



QUESTION 7

[4 marks]

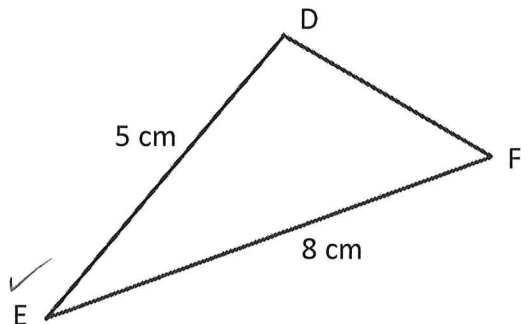
If the area of triangle EDF , shown below, is 10 cm^2 , find the length of DF .

$$10 = \frac{1}{2} (5)(8) \sin \theta \quad \checkmark$$

$$\theta = 30^\circ \quad \checkmark$$

$$x^2 = 5^2 + 8^2 - 2(5)(8) \cos 30^\circ \quad \checkmark$$

$$x = 4.44 \text{ cm} \quad \checkmark$$

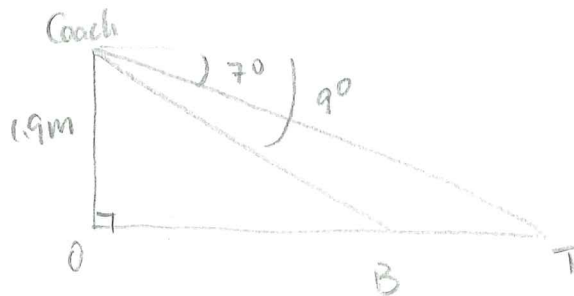


QUESTION 8

[2, 5 = 7 marks]

Tim's coach stood on top of the diving block at the end of a lane. She watched Tim and his teammate, Bruce, swimming towards her in the same lane. She saw Tim at an angle of depression of 7° and Bruce, in ahead of Tim, at an angle of depression of 9° . The vertical distance from the water level to the coach's eyes is 1.9m.

a) Draw a diagram to represent the situation above.



label ✓

Graph (must have the 90° marked) ✓

b) What is the distance between Tim and Bruce?

$$\tan 9 = \frac{1.9}{OB} \Rightarrow OB \doteq 11.9961 \text{ m} \quad \checkmark$$

$$\tan 7 = \frac{1.9}{OT} \Rightarrow OT \doteq 15.4743 \text{ m} \quad \checkmark$$

$$BT = 15.4743 - 11.9961$$

$$\doteq 3.48 \text{ m} \quad \checkmark$$

QUESTION 10⁹**[1, 1, 2, 3 = 7 marks]**

At a hardware store, the lengths of a certain type of power extension cord, marked as 2 metres long, were normally distributed with a mean of 202 cm and a standard deviation of 3 cm.

- a) Find the probability that the length of a randomly chosen cord is less than 200 cm.

$$\Pr(X < 200) = 25.25\% \quad \checkmark$$

- b) What is the probability that the length of randomly chosen cord is between 196 cm and 208 cm.

$$\Pr(196 < X < 208) = 95.45\% \quad \checkmark$$

- c) To the nearest centimetre, determine the 40th percentile.

$$\Pr(X < k) = 40\% \quad \checkmark$$

$$k \hat{=} 201.24 \text{ cm}$$

$$\hat{=} 201 \text{ cm} \quad \checkmark$$

- d) What percentage of cord is within 2.5 standard deviations of the mean size?

$$202 + 2.5 \times 3 = 209.5$$

$$202 - 2.5 \times 3 = 194.5$$

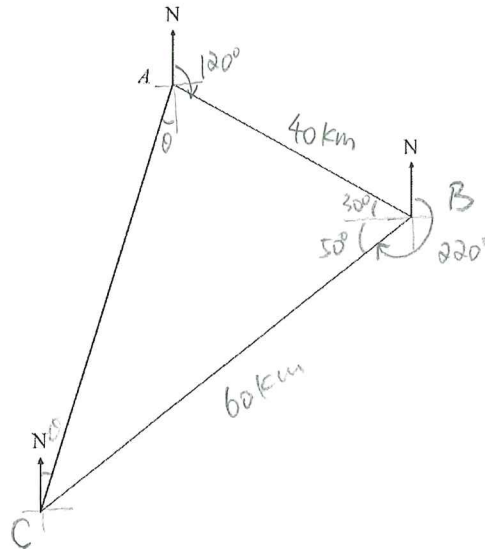
$$\Pr(194.5 < X < 209.5) = 98.76\% \quad \checkmark \quad \checkmark \quad \checkmark$$

QUESTION 10

[3, 2, 4 = 8 marks]

A rescue ship leaves the base, represented by point A, and travels for 40 kilometres on a bearing of 120° to point B. Then it received a distress signal from point C, which is 60 kilometres away from B on a bearing of 220° from B to C.

- a) Label the diagram below and showing all the given information.



distance ✓
Bearing ✓
graph ✓

- b) Find the distance from point A to point C.

$$\angle ABC = 30 + 50 = 80^\circ$$

$$AC^2 = 40^2 + 60^2 - 2(40)(60)\cos 80^\circ$$

$$= 4366.4887$$

$$AC = 66.08 \text{ km}$$

- c) Find the bearing of point A from point C to the nearest degree.

$$\frac{60}{\sin CAB} = \frac{66.08}{\sin 80}$$

$$\sin CAB = 0.8945$$

$$\angle CAB = 63.41^\circ$$

$$\theta = 63.41 + 120 - 180$$

$$= 3.41^\circ$$

$$\therefore \text{Bearing is } 003^\circ \text{ T}$$

END OF SECTION TWO

