Carlingford High School

2021 YEAR 11 ASSESSMENT TASK 2

Mathematics Advanced

STUDENT NUMBER:_____

Teacher: (Please Circle)

11MAA_A (Ms Tang) 11MAA_B (Ms Blakeley) 11MAA_C (Mr Wilson) 11MAA_D (Mr Gong)

11MAA_1 (Ms Strilakos) 11MAA_2 (Ms Bennett) 11MAA_3 (Mr Cheng) 11MAA_4 (Mr Fardouly)

General Instructions

- Working time - 50 minutes
- Write using black pen
- Calculators approved by NESA may be used
- A reference sheet is provided at the back of this paper

TOPIC	**MARKS**	
Functions Questions: 1 – 7	**/22**	
Trigonometry Questions: 8 – 14	**/20**	
TOTAL	**/42**	%

42 marks
Attempt Questions 1 - 14

- 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.

Question 1 (4 marks)

Solve:

(a) $x^2 + 9x - 36 = 0$ **1**

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(b) $6x^2 = 24x$ **1**

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(c) $6x^2 + 13x - 8 = 0$ **2**

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Question 2 (3 marks)

Solve $3x^2 + x = 5$ by completing the square, giving answers correct to 3 significant figures.

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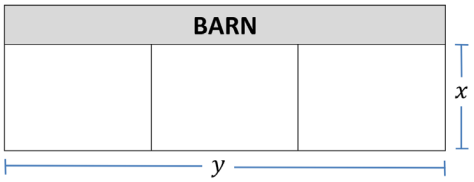
Question 3 (3 marks)

A farmer bought 240m of fencing to construct three equal rectangular fields. No fencing is required along the side of the barn.



(a) Show that $y = 240 - 4x$ **1**

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(b) Hence, or otherwise, find the maximum area of the enclosed area. **2**

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Question 4 (5 marks)

A ball is thrown into the air from a balcony that is 30 metres above the ground. The function that models the height, $h(t)$ in metres above the ground, of the ball over time, t in seconds, is $h(t) = 30 + 12t - 5t^2$.

(a) What is the height of the ball above the ground after 2 seconds? **1**

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(b) When does the ball hit the ground? Answer correct to the nearest second. **2**

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(c) What is the maximum height above the ground reached by the ball? Answer correct to one decimal place. **2**

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Question 5 (2 marks)

Prove the quadratic expression $7x^2 + 4x + 1$ is positive definite for all values of x.

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Question 6 (3 marks)

For what values of m does the equation $x^2 - 2mx + 8m - 15 = 0$ have two roots?

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Question 7 (2 marks)

Prove the line $y = 6x + 1$ is a tangent to the curve with equation $y = x^2 + 4x + 2$.

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Question 8 (4 marks)

Find the exact value of:

(a) $\tan 30°$ **1**

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(b) $\sin 300°$ **1**

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(c) $\cot(-30°)$ **1**

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(d) $\operatorname{cosec} 150°$ **1**

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Question 9 (2 marks)

Given $\sin\theta = \frac{3}{7}$ and $\cos\theta < 0$, find the exact value of $\tan\theta$.

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Question 10 (2 marks)

Show that $\tan(90° + \theta) = -\cot\theta$

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Question 11 (2 marks)

Find all values of $x, 0° \leq x \leq 360°$ for which $2\cos^2 x - 1 = 0$.

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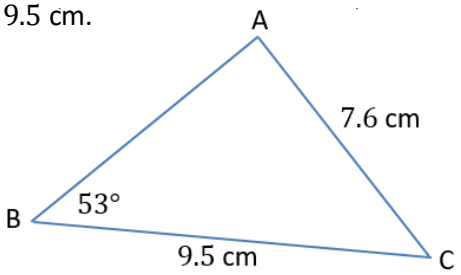
Question 12 (2 marks)

In triangle $ABC, \angle B = 53°, AC = 7.6$ cm and $BC = 9.5$ cm.
Find $\angle A$ to the nearest degree.



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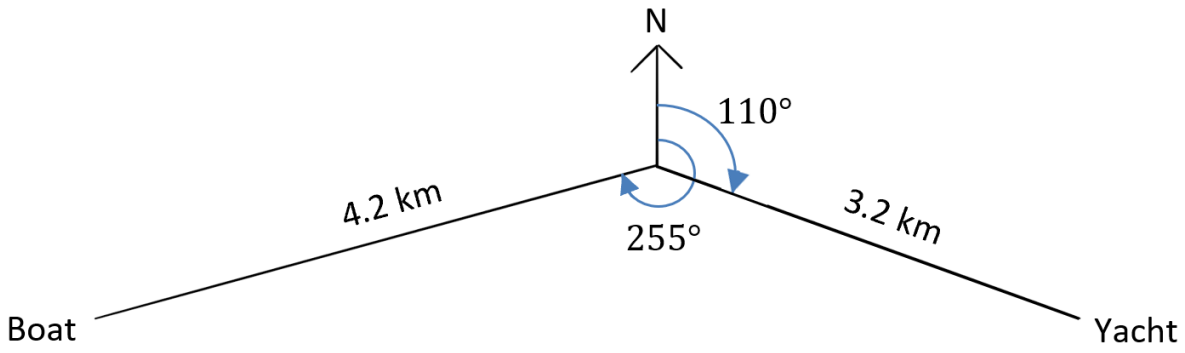
Question 13 (4 marks)

The bearings of a yacht and a boat from a lighthouse are $110°$ and $255°$ respectively. The yacht is 3.2km and the boat 4.2 km from the lighthouse.



(a) Find the distance between the yacht and the boat. Answer correct to one decimal place. **2**

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(b) Find the true bearing of the yacht from the boat. Answer correct to the nearest degree. **2**

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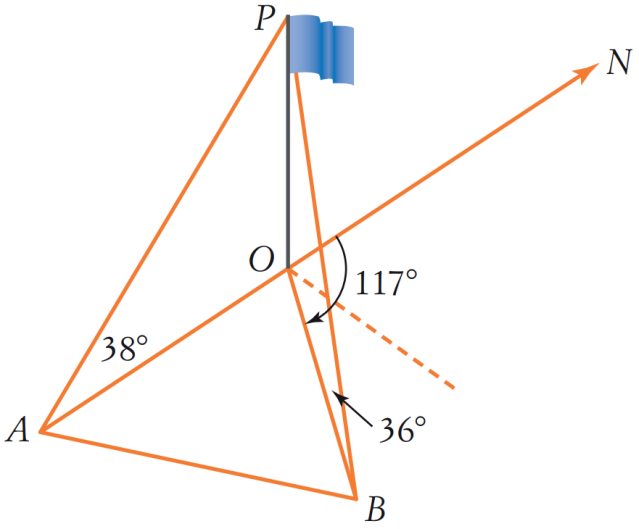
Question 14 (4 marks)

From a point A due south of a flagpole, the angle of elevation of the top of the pole P, is $38°$. From another point B, on a bearing of $117°$ from the pole, the angle of elevation of P is $36°$. The distance AB is 110 metres. Let h be the height of the flagpole in metres.



(a) $OA = \dfrac{h}{\tan 38°}$. Show that $OB = \dfrac{h}{\tan 36°}$. **1**

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(b) Hence find, correct to one decimal place, the height of the flagpole. **3**

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END OF EXAM

Extra writing space

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