Name: _____

Year 9 Stage 5.3 Mathematics
Assignment Term 3 2023

Equations, Indices & Trigonometry		
Task number: 3	**Weighting: 15%**	**Due Date: 30/8/2023**

Outcomes assessed:

MA5.3-2WM generalises mathematical ideas and techniques to analyse and solve problems efficiently.

MA5.3-7NA solves complex linear, quadratic, simple cubic and simultaneous equations, and rearranges literal equations.

MA5.3-6NA performs operations with surds and indices.

MA5.3-15MG applies Pythagoras' theorem, trigonometric relationships, the sine rule, the cosine rule and the area rule to solve problems.

Nature and description of the task:
As a result of completing this Assignment, students should be familiar with the topics:

- Simultaneous Equations - Substitution method, Elimination method, and worded problems.
- Indices and Surds - index laws for multiplying, dividing, power of a power, zero power, negative indices, scientific notation, significant figures, fractional indices and simple operations with surds.
- Trigonometry - Pythagoras' Theorem to find hypotenuse and short sides, 2D and 3D Pythagoras problems, trigonometric ratios, finding unknown sides, solving for the denominator, and finding unknown angles.
- Problem Solving

On the 30th of August 2023 you will be required to hand in this assignment to your classroom teacher and you will then receive a similar selection of questions to complete in 20 minutes in an in-class Validation Task. The final mark for this assessment (15% of your final grade) will be split between the take home assignment and the final in class validation.

Take home preparation section = 70%

In-class Validation = 30%

NOTE: You will NOT have access to the Preparation Activity during the Validation Task. You will NOT be given any answers to the Preparation Activity.

Non-Completion of Task:

If you know you are going to be away on the day the Assessment Task is due and are unable to hand in the Assignment on the due day, then you must have supportive documentation.

OUTCOME	MARKS
Equations and Inequalities – MA5.3-7NA solves complex linear, quadratic, simple cubic and simultaneous equations, and rearranges literal equations.	**/8**
Indices and Surds – MA5.3-6NA performs operations with surds and indices.	**/16**
Trigonometry – MA5.3-15MG applies Pythagoras' theorem, trigonometric relationships, the sine rule, the cosine rule and the area rule to solve problems.	**/18**
Problem Solving – MA5.3-2WM generalises mathematical ideas and techniques to analyse and solve problems efficiently.	**/9**
TOTAL	**/51**

Section I: Equations and Inequalities

SHORT ANSWER.

Answer in the space provided. Show all necessary working out.

1. Solve the following simultaneous equation using either substitution or elimination. **3**

$$2x - y = -3 \; and \; 3x - y = 6$$

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2. At a circus, there were twice as many children as there were adults in attendance. Altogether 1020 attended the circus. How many were children?

a. Write two equations to represent the situation above. **2**

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b. Solve the equations simultaneously to find the number of children. **3**

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Equations and Inequalities Total /8

End of Section I.

Section II begins on next page.

Section II: Indices & Surds

MULTIPLE CHOICE

Circle the correct answer below.

3. $x^2 \times (x^4)^3$ simplifies to: **1**

A x^9 **B** x^{24} **C** x^{14} **D** x^{-10}

4. $\frac{x^2y^6}{4x^2y}$ simplifies to: **1**

A $-4x^4y$ **B** $\frac{x^3y^2}{4}$ **C** $\frac{x^4y}{4}$ **D** $\frac{y^5}{4}$

5. $6(8y^2)^0$ simplifies to: **1**

A 6 **B** 48 **C** $48y^2$ **D** $6y$

6. The simplified form of $7\sqrt{5} - 2\sqrt{5} + 10\sqrt{2} + 4\sqrt{5}$ is: **1**

A $10\sqrt{7}$ **B** $9\sqrt{5} + 10\sqrt{2}$ **C** $5\sqrt{5} + 14\sqrt{7}$ **D** $19\sqrt{7}$

7. $64^{\frac{1}{2}}$ is equal to: **1**

A 4096 **B** 8 **C** 32 **D** 16

End of Multiple Choice

Short answer questions begin on next page.

SHORT ANSWER.

Answer in the space provided. Show all necessary working out.

8. Write the following numbers using scientific notation and correct to three significant figures.

a. 0.0014753 **1**

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b. 9128000 **1**

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9. Simplify fully **2**

$$\frac{2(ab)^2 \times (2a^2b)^3}{4ab^2 \times 4a^7b^3}$$

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10. Write in index form. **1**

$$\sqrt[7]{c}$$

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11. Expand and simplify. **2**

$$4\sqrt{5}(2\sqrt{3}+1)$$

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Section II continues on next page.

12. Simplify fully. **2**

$4\sqrt{45} - 3\sqrt{63} + 5\sqrt{80}$

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13. Express the following with positive indices.

a. $6m^{-3}$ **1**

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b. $\frac{4x^3y^{-5}}{5c^{-2}b^8}$ **1**

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Indices & Surds Total /16

End of Section II.

Section III begins on next page.

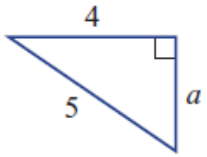
Section III: Trigonometry

MULTIPLE CHOICE

Circle the correct answer below.

14. Which of the following is true for this triangle?

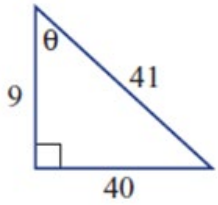
1



A $a = 5 - 4$ **B** $a^2 = 5^2 - 4^2$ **C** $5^2 = 4^2 - a^2$ **D** $a = \sqrt{10}$

15. A trigonometric expression for this triangle could be:

1



A $cos\theta = \frac{40}{41}$ **B** $cos\theta = \frac{9}{40}$ **C** $sin\theta = \frac{40}{41}$ **D** $tan\theta = \frac{9}{40}$

End of Multiple Choice

Short answer questions begin on next page.

SHORT ANSWER.

Answer in the space provided. Show all necessary working out.

16. A bird 18 m up a tree spots a worm on the ground 12m from the base of the tree.

a) Draw a diagram to represent this information. **1**

b) Find distance from the bird to the worm, to the nearest whole metre. **2**

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17. What are the dimensions of the largest square peg which can be inserted in a hole, 8cm in diameter? **2**

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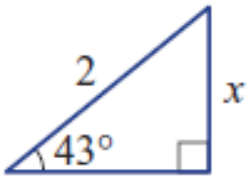
Short answer questions continue on next page.

18. Find the value of the pronumerals below correct to 2 decimal places.

a. **2**



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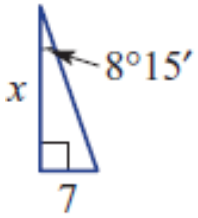
b. 2



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19. A roof is pitched so that the angle at its peak is $90°$.
If each roof truss spans 10.5 m and distance y is 7.2 m, find the pitch angles A and B, to the nearest whole degree.

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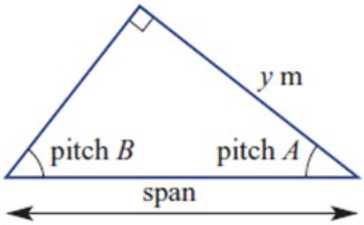

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Section III continues on next page.

20. From a pedestrian overpass, Edward spots a landmark at an angle of 32°. How far away, to the nearest metre, is Edward from the base of the 24-metre-high landmark? Show full working.

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21. A 20cm drinking straw sits diagonally in a glass of radius 3cm and height 10cm. What length of straw protrudes from the glass? Round your answer to 1 decimal place.

2

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Trigonometry Total /18

End of Section III.

Section IV begins on next page.

Section IV: Problem Solving

22. An area in regional Australia was experiencing drought-breaking weather. It rained continuously for 2 weeks. The first rainy day produced 5 mm of rain. Everyday thereafter, there was 50% more rain than on

the previous day. The township had to be evacuated after a total of 250mm of rain fell. On what day did evacuation occur? **(1 mark)**

23. Six people are travelling on a train. They are seated opposite one another on two bench seats.
Each is an expert in his or her own interest and has written a book on it. Each is reading a book written by one of the other five.
The people are experts in art appreciation, geophysics, medicine, poetry, mathematics, and athletics coaching.

From the facts below, determine each person's profession and seating arrangement.

1. Gerald is reading a book on art appreciation.
2. Hillary is reading a book written by the person opposite her.
3. Illya is sitting between the art critic and the doctor.
4. Jillian is sitting next to the mathematician.
5. The art critic is sitting opposite the geophysicist.
6. Kelvin is reading a mathematics book.
7. Gerald is sitting in the corner and has no interest in geophysics.
8. Kelvin is sitting opposite the poet.
9. Jillian is reading a medical book.
10. Lydia has never read a book on athletics coaching. Obviously, she is not the coach!

Person: **Profession:**	**Person:** **Profession:**	**Person:** **Profession:**
Person: **Profession:**	**Person:** **Profession:**	**Person:** **Profession:**

(6 marks)

24. A certain 5-digit number has an amazing property.
If you put the digit 1 after the number, it is three times as large as the number with the digit 1 before it.
What is the number? Show all of your working. **(2 marks)**

Problem Solving Total /9

End of Preparation