**Stage 1 Mathematical Methods**

**Trigonometry Test**

**Topic 3: Subtopics 3.1, 3.2, 3.3**

**Total Marks – 44**

**(Calculator and one A4 page of handwritten notes permitted.)**

1. (4 marks)
2. Find the value of $θ$ in the diagram (not drawn to scale).

8 cm

7 cm

6 cm

*θ*°

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(2 marks)

1. Find the value of $x$ in the diagram (not drawn to scale).

11 cm

*x* cm

8 cm

57°

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(2 marks)

1. (4 marks)

Find **ALL** possible values of $θ$ in the diagram (not drawn to scale).

8 m

*θ*°

50°

10 m

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(4 marks)

1. (6 marks)

Consider the following diagram (not drawn to scale):

15 cm

A

B

C

D

20 cm

7 cm

*x* cm

35°

1. Find the area of triangle ABD.

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(4 marks)

1. Find the value of $x$ given that the area of triangle BCD is 75 cm².

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(2 marks)

1. (6 marks)

A tower 40 metres high, stands on top of a hill. From a point some distance from the base of the hill, the angle of elevation to the top of the tower is 13°. From the same point the angle of elevation to the bottom of the tower is 8°. Find the height of the hill.

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(4 marks)

1. (2 marks)
2. State the period of $y=4\sin(\left(\frac{x}{5}\right))$.

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(1 mark)

1. State the period of $y=\tan(\left(3x\right)-1)$.

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(1 mark)

1. (2 marks)
2. Find $b$ given that the function $y=\sin(\left(bx\right))$ has period $\frac{π}{4}$.

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(1 mark)

1. Find $b$ given that the function $y=\cos(\left(bx\right))$ has period $4$.

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(1 mark)

1. (4 marks)

Find the cosine functions represented in each of the following graphs:

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| --- | --- |
| 1. Chart, line chart  Description automatically generated
 | 1.
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|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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| (2 marks) | (2 marks) |

1. (4 marks)

Sketch at least one complete cycle of the following graphs:

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| --- | --- |
| 1. $y=\cos(\left(x\right)-3)$
 | 1. $y=\cos(\left(x-\frac{π}{4}\right))$
 |
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| (2 marks) | (2 marks) |

1. (6 marks)

Solve the following algebraically for $0\leq x\leq 2π$.

1. $2\sin(\left(x\right))=-1$

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(2 marks)

1. $2\cos(\left(x\right))-\sqrt{2}=0$

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(2 marks)

1. $\cos(\left(2x\right))=\sqrt{3}\sin(\left(2x\right))$

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(2 marks)

1. (6 marks)

An ecologist studying a species of water beetle estimates the population of a colony over an eight week period. If $t$ is the number of weeks after the initial estimate is made, then the population in thousands can be modelled by $P\left(t\right)=5+2\sin(\left(\frac{πt}{3}\right))$ where $0\leq t\leq 8$.

1. What was the initial population?

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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(1 mark)

1. What was the population after 8 weeks?

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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(1 mark)

1. What was the smallest population and when did it occur?

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(2 marks)

1. During what time interval(s) did the population exceed 6000?

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(2 marks)