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MANA TOHU MĀTAURANGA O AOTEAROA

For Supervisor's use only

Level 2 Mathematics, 2009

90292 Solve straightforward trigonometric equations

Credits: Two
9.30 am Monday 16 November 2009

Check that the National Student Number (NSN) on your admission slip is the same as the number at the top of this page.

Make sure you have the Formulae Sheet L2-MATHF.

Answer ALL the questions in this booklet.

The questions in this paper are NOT in order of difficulty. Attempt all questions or you may not provide enough evidence to achieve the required standard.

If you need more space for any answer, use the page(s) provided at the back of this booklet and clearly number the question.

Check that this booklet has pages 2–6 in the correct order and that none of these pages is blank.

YOU MUST HAND THIS BOOKLET TO THE SUPERVISOR AT THE END OF THE EXAMINATION.

For Assessor's use only	**Achievement Criteria**	
Achievement	**Achievement with Merit**	**Achievement with Excellence**
Solve straightforward trigonometric equations. ☐	Solve trigonometric equations. ☐	Solve multi-step trigonometric problems. ☐
Overall Level of Performance ☐		

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You are advised to spend 30 minutes answering the questions in this booklet.

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QUESTION ONE

(a) Solve the equation $2\sin x = 0.8,\ 0 \le x \le 360°$.

(b) Solve the equation $2 - \tan x = 3.4,\ 0 \le x \le 360°$.

(c) The level of the water below the surface of a jetty changes with the tide.

On 1 November there are two high tides. The distance d metres of the water below the surface of the jetty can be modelled by

$$d = \cos\frac{\pi t}{6} - 2.6$$

where t is the time in hours **since midnight**.

P is a point 1.8 metres below the surface of the jetty. The water level must be above P for it to be safe to dive.

Use the equation $\cos\frac{\pi t}{6} = 0.8$ to find how long it is safe to dive from the jetty between 8 am and 8 pm on 1 November.

(d) Solve the equation $\tan^2 x + \tan x - 6 = 0,\ 0 \le x \le 2\pi$.

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QUESTION TWO

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(a) Solve the equations:

(i) $\sin x + 2.3 = 3.0,\ 0 \le x \le 2\pi$

(ii) $\cos\frac{x}{2} = 0.75,\ 0 \le x \le 2\pi$

(b) A wheel on a machine in a factory is mounted vertically.
The wheel rotates at a constant speed.

P is a point on the circumference of the wheel.

The height d metres of P above the factory floor is given by the function

$$d = \sin\frac{\pi t}{10} + 1.6$$

where t is the time in seconds since the wheel began turning.

(i) For how long in any one complete rotation of the wheel will the point P be more than 2.1 metres above the factory floor?

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(ii) A second wheel is also mounted vertically and rotates at a constant speed.

The wheel completes three revolutions in one minute.

Q is a point on the circumference of this wheel.

The maximum height of Q above the factory floor is 2.5 m and the minimum is 1.1 m.

The height h metres of Q at any time t seconds after it is at its highest point is given by a trigonometric function of the form

$$h = A\cos Bt + C$$

where A, B and C are constants.

Find:

- the equation for h
- the height of Q 10 seconds after it is at the highest point.

Extra paper for continuation of answers if required.
Clearly number the question.

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Question number