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90292

NEW ZEALAND QUALIFICATIONS AUTHORITY
MANA TOHU MĀTAURANGA O AOTEAROA

National Certificate of Educational Achievement
TAUMATA MĀTAURANGA Ā-MOTU KUA TAEA

Level 2 Mathematics, 2003

90292 Solve straightforward trigonometric equations

Credits: Two
9.30 am Wednesday 19 November 2003

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

You should answer ALL the questions in this booklet.

Show ALL working.

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

Check that this booklet has pages 2–7 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.

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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 ☐		

You are advised to spend 25 minutes answering the questions in this booklet.

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TRIGONOMETRIC EQUATIONS

Show **ALL** working.

QUESTION ONE

Solve the following trigonometric equations:

(a) $\sin \boldsymbol{x} = 0.3,\ 0° \leq \boldsymbol{x} \leq 360°$

(b) $\cos \boldsymbol{x} + 2 = 2.9,\ 0° \leq \boldsymbol{x} \leq 360°$

(c) $2\tan \boldsymbol{x} = 3.6,\ 0 \leq \boldsymbol{x} \leq 2\pi$

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QUESTION TWO

Solve $\cos 2\boldsymbol{x} = 0.8,\ 0° \leq \boldsymbol{x} \leq 360°$

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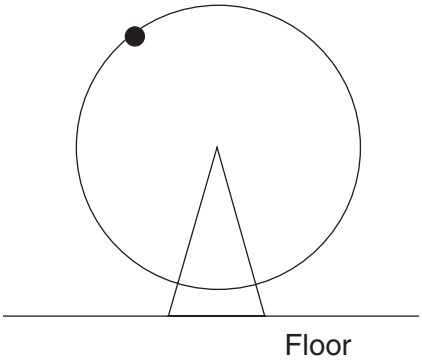
QUESTION THREE



John has bought an exercise wheel for his pet mouse.

The exercise wheel has a radius of 10 cm.
There is a piece of coloured plastic on the edge of the wheel.
The height of the plastic above the floor of the cage can be modelled by the equation:

$$\mathbf{H} = 12 + 10\sin \boldsymbol{t}$$

where $\mathbf{H}$ = the height above the floor of the cage in centimetres
and $\boldsymbol{t}$ = time after the wheel starts turning in seconds.

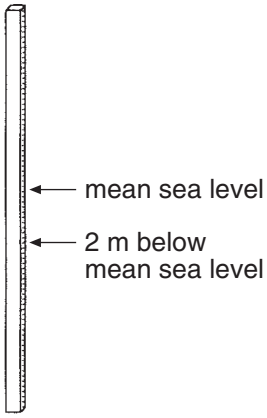
After how many seconds will the piece of plastic first be 20 cm above the floor of the cage?

QUESTION FOUR

The height of a tide above mean sea level, on 7 March, can be modelled by the equation:

$$\boldsymbol{y} = 3\cos \frac{\boldsymbol{t}}{2}$$

where $\boldsymbol{y}$ = the height of the tide in metres
and $\boldsymbol{t}$ = time in hours since high tide.



A ship cannot enter port when the water level is below the mean sea level mark by more than 2 metres.

For how long after high tide will the ship still be able to enter the port?

QUESTION FIVE

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The loudness of car alarms can be modelled by the equation:

$$y = 110 - 15\cos(0.4\pi t)$$

where y = the loudness of the alarm in decibels
and t = time in seconds after the alarm sounds.

The alarm often goes off by accident.

The owner knows that his ears will hurt when the noise level is over 120 decibels.

It takes 15 seconds to turn off the alarm.

However, if, during that 15 seconds, there is a total of at least 6 seconds of loudness being over 120 decibels, then the owner cannot complete the task.

Will he be able to turn the alarm off in the 15 seconds needed?

Justify your answer.

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

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Question Number

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

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