**2004**

### Internal Assessment Resource

Subject Reference: **Calculus 3.3**

## Internal assessment resource reference number:

**Calc/3/3\_B version 2**

#### “Sunshine”

# Supports internal assessment for:

# Achievement Standard: 90637

Title: Solve problems and equations involving trigonometric functions

Credits: 4

#### Date version published: December 2003

**Ministry of Education** For use in internal assessment

**quality assurance status** from 2004

**Teacher Guidelines:**

The following guidelines are supplied to enable teachers to carry out valid and consistent assessment using this internal assessment resource.

**Context/setting:**

The assessment contains skills questions and problems relating to sunshine hours and temperatures.

Conditions:

This assessment is a class closed book test, needing about 45 minutes.

Students will require access to the Level 3 Calculus formula sheet.

**Resource requirements:**

Access to a computer or graphics calculators is acceptable.

**2004**

**Internal Assessment Resource**

Subject Reference: **Calculus 3.3**

## Internal assessment resource reference number:

**Calc/3/3\_B version 2**

#### “Sunshine”

# Supports internal assessment for:

# Achievement Standard: 90037 version 1

Title: Solve problems and equations involving trigonometric functions

Credits: 4

**Student Instructions Sheet**

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1. Find a solution (in radians) to the equations

a) 

 b) 

 c) 

2) The times of sunrise in Auckland can be modelled by the curve


 where ***t*** is the time in minutes after midnight

 and ***d*** is the number of days after 1 January 2003

 and the angle is measured in degrees.

**Use the model to answer these questions:**

* 1. What is number of minutes between the earliest sunrise and the latest sunrise.
	2. How many days are there between the date of the earliest sunrise and the date of the latest sunrise?
	3. What is the time of sunrise 25 days after the 1st January?
	4. What is the first day in the year that has a sunrise at 7:05 am?
1. On a nice February day you would like to form an equation that models the

temperature from midnight one day through to midnight the next day (ie 24 hours).

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The angle is given in degrees.

a) If the lowest temperature is 7o C at 3am and the highest temperature is 29o C at 3 pm, find the the exact equation for this model.

1. Use your model to find the temperature at midnight
2. Use your model to find the temperature at mid day.
3. Give one time when the temperature is 200
	* 1. Prove that



5) Give the general solution to 

1. Find the general solution for



# Assessment schedule: Calc/3/3 \_B v2: “Sunshine”

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Achievement criteria | Task | Evidence | Judgement | Sufficiency |
| **Achievement** | Solve straightforward problems with models involving trigonometric functions.Solve straightforward trigonometric equations. | 2a2b2c1a 1b 1c | 150 mins180 days6:17am Any value of + (-1)n x 0.243 ± 0.698 + 1.37 | Units not required in this taskAny rounding allowable anywhere in this taskNo alternativeAllow 181, 182,183Allow values close to this. | Any 2 correct from 2a 2b, and 2c.Replacement Evidence 3c, 3d.ANDAny 2 correct from 1a, 1b and 1c Replacement Evidence 2d, 3e or 5  |
| Achievement with Merit | Solve problems with models that involve trigonometric functions Use trigonometric manipulation.. | 3a bcd2d4 5  | 10.2025.8o9.7 or 20.3 hours after midnight or 9:42 am or 8:18pm66 days after 1 January   | Allow equivalent functions including sine.No alternativeNo alternativesAny oneMust have the 66 daysAlternative proofs are acceptableOr equivalent solutionAccept answer + | Achievement plus3a correctAND2 of 3c, 3d, 3eAND2 of 2d, 4 and 5Replacement evidence for manipulation 6  |
| Achievement with Excellence | Apply knowledge of trigonometric relationships to solve complex problem(s). | 6 |   |  | Both 3b and at least one solution in 6 |