**

**Mathematics Specialist Unit 2**

# Test 4

**Trigonometric Identities and Matrices**

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| **Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Total Marks:\_\_\_\_\_\_\_\_\_\_** |
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|  |

**Task type: Response**

**Time allowed for this task:** 60 minutes, in-class, under test conditions

Section One: Calculator-free 30 minutes ( 24 marks)

Section Two: Calculator-assumed 30minutes ( 29 marks)

**Materials required:** Calculator with CAS capability (to be provided by the student)

**Standard items:** Pens (blue/black preferred), pencils (including coloured), sharpener, correction fluid/tape, eraser, ruler, highlighters

**Special items:**  Drawing instruments, templates, notes on one unfolded sheet of   
A4 paper, and up to three calculators approved for use in the WACE examinations

Formula sheet

**Marks available: 53 marks**

**Task weighting: 7%**

**Section One : Calculator Free 24 Marks**

**Time Allowed 30 minutes**

**Question 1**

**[8 marks]**

(a) If , determine the exact value of . (2 marks)

(b) Prove the identity . (3 marks)

(c) Prove that for all values of . (3 marks)

**Question 2**

**[9 marks]**

Let and .

(a) Determine

(i) . (2 marks)

(ii) . (2 marks)

(iii) . (2 marks)

(b) Use a matrix method to solve the system of equations and .

(3 marks)

**Question 3**

**[7 marks]**

For the following matrices

A =  B =  C =  D = 

1. Determine the following, if not possible explain why. (5 marks)
2. CB
3. BC
4. A2 (iv) BC
5. Find the value(s) of *r* for which matrix D is singular. (2 marks)

**Section Two : Calculator Assumed 29 Marks**

**Time Allowed 30 minutes Name:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Question 4**

**[9 marks]**

Let  and .

(a) Given that , determine the value of k. (2 marks)

(b) The equations  and  can be expressed as a matrix equation in the form .

(i) State the matrices X and C. (2 marks)

(ii) Write down a matrix equation to determine X in terms of B and C. (2 marks)

(c) Determine the matrix D, if . (3 marks)

**Question 5**

**[6 marks]**

1. Express in the form where and . Hence find the exact value of and to two decimal places.

[3 marks]

1. The double angle formula for sine is .

By expressing *3A* as *2A + A*, show the Triple Angle formula for sine is

(3 marks)

**Question 6**

**[7 marks]**

The Perth Pergola Company manufactures pergolas, sheds and garages. Each item requires a number of nuts, bolts and washers:

Pergolas need 65 nuts, 40 bolts and 15 washers.

Sheds need 70 nuts, 20 bolts and 20 washers.

Garages need 34 nuts, 34 bolts and 102 washers

a) Represent this information in matrix form (2 marks)

The Perth Pergola Company has a manufacturing goal of 40 pergolas, 64 sheds and 35 garages.

b) Use matrix methods to show how many nuts, bolts and washers are needed. (3 marks)

The cost of each nut, bolt and washer is 15c, 25c and 5c , respectively.

c) Use matrix methods to find the how much the of nuts, bolts and washers would cost for the company to reach their goal. (2 marks)

**Question 7**

**[7 marks]**

Prove the following identities

[3 marks]

[4 marks]