PERTH MODERN SCHOOL
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Independent Public School

Mathematics Specialist Year 11

Student name: _____ Teacher name: _____

Date: Friday 24 September 2021

Task type:	**Response**
Time allowed:	**40 mins**
Number of questions:	**7**
Materials required:	Notes on two unfolded sheets of paper (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 and up to three calculators approved for use in the WACE examinations
Marks available:	**40 marks**
Task weighting:	**10%**
Formula sheet provided:	**Yes**
Scientific Calculator and CAS:	**Not Permitted**

Note: All part questions worth more than 2 marks require working to obtain full marks.

Question 1 (2.2.1, 2.2.2) (6 marks)

Given that A, B and C are 2×2 matrices, $X = \begin{bmatrix} 2 \\ 1 \end{bmatrix}$, $Y = \begin{bmatrix} 3 & 4 \end{bmatrix}$, $Z = \begin{bmatrix} 3 & -1 \\ 0 & 2 \end{bmatrix}$ and I is the 2×2 identity matrix, find the following where possible

(a) XY (1 mark)

(b) YX (1 mark)

(c) Matrix W given that $3Z - W = I$ (2 marks)

(d) An expression for matrix V in terms of other matrices given that $V - ABV = C$ (2 marks)

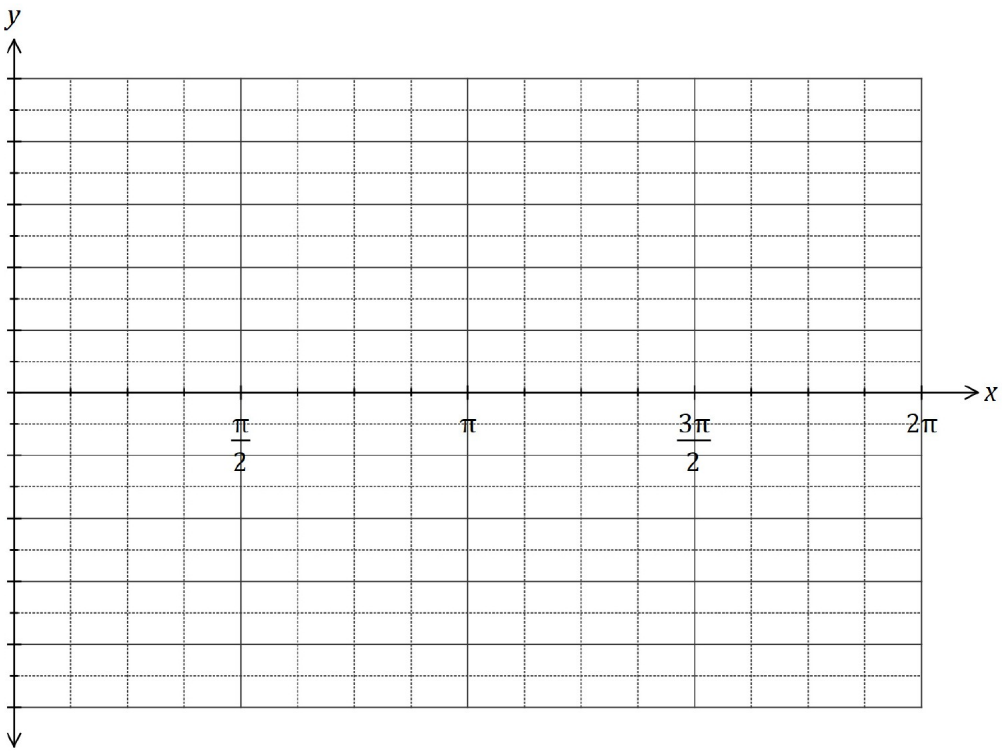
Question 2 (2.2.3, 2.2.11) (5 marks)

(a) For what values of a is the matrix $\begin{bmatrix} a & 5 \\ 3 & a \end{bmatrix}$ singular? (2 marks)

(b) Use matrices to find the point of intersection of the lines given by the equations $3x + y = 2$ and $5x + 2y = 1$. (3 marks)

Question 3 (2.1.4) (5 marks)

Using the same scale, sketch the graphs of $y=\sin(2x)$ and $y=cosec(2x+\pi)$ on the grid below for $0\le x\le 2\pi$



Question 4 (2.1.5, 2.1.6, 2.1.8) (5 marks)

Prove the identity below

$$\frac{1-\sin(2\theta)}{\sin\theta-\cos\theta}=\sin\theta-cos\theta$$

Question 5 (2.2.5, 2.2.7, 2.2.10) (5 marks)

(a) Find the matrices that produce each of the transformations described below

i. A reflection in the line $y=x$ (1 mark)

ii. A rotation clockwise about the origin by $90°$ (2 mark)

(b) Find and describe a single transformation matrix T that is a result of a reflection in the line $y=x$ followed by a $90°$ clockwise rotation about the origin. (2 marks)

Question 6 (2.2.6, 2.2.9) (9 marks)

(a) Find the matrix of the linear transformation such that $(1,2) \to (12,7)$ and $(-3,1) \to (-1,0)$ (4 marks)

(b) The matrix $\begin{bmatrix} t & t \\ 1 & t \end{bmatrix}$ maps the unit square into a parallelogram of area 2 square units. Find the possible value(s) of t (5 marks)

Question 7 (2.1.7) (5 marks)

Find the general solution of $3\cos(x)-\sqrt{3}\sin(x)=3$

Additional working space Question _____

Additional working space Question _____

Additional working space Question _____