



2017 Yr 11 Specialist Mathematics
Matrices & Transformations Technology Access Test
 (1 double sided A4 Summary Sheet & 45 min writing time)

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Name:

Total Marks: / 45

Section A. Multiple Choice Questions. Clearly circle your answer (10 x 2 marks = 20 marks total)

1. Matrix A is: $\begin{bmatrix} 3 & 0 & -1 \\ 2 & -4 & 1 \end{bmatrix}$. The Matrix AB exists if B is: A $\begin{bmatrix} 2 & 1 & 3 \end{bmatrix}$ B $\begin{bmatrix} 3 & 5 & 1 \\ 2 & 4 & 0 \end{bmatrix}$ C $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ D $\begin{bmatrix} 4 \\ 7 \end{bmatrix}$ E $\begin{bmatrix} 1 & 2 \\ 3 & 4 \\ 5 & 6 \end{bmatrix}$	Working Space
2. Given that $A = \begin{bmatrix} 4 & -1 \\ 3 & 2 \end{bmatrix}$ and $B = \begin{bmatrix} 5 & 2 \\ 0 & -4 \end{bmatrix}$, $3A - 2B$ is: A $\begin{bmatrix} 22 & 1 \\ 9 & -2 \end{bmatrix}$ B $\begin{bmatrix} 2 & -7 \\ 9 & 14 \end{bmatrix}$ C $\begin{bmatrix} -7 & -8 \\ 6 & 16 \end{bmatrix}$ D $\begin{bmatrix} -1 & -3 \\ 3 & 6 \end{bmatrix}$ E $\begin{bmatrix} 9 & 1 \\ 3 & -2 \end{bmatrix}$	
3. Matrix $E = \begin{bmatrix} 2 & 1 & 5 \\ 7 & -3 & 6 \\ 9 & -5 & -1 \end{bmatrix}$, e_{13} is: A 5 B 9 C 13 D -1 E 2	

4. Matrix $M = \begin{bmatrix} 2 & 1 \\ -1 & -2 \end{bmatrix}$ and $N = \begin{bmatrix} 4 & -2 \\ 2 & 6 \end{bmatrix}$ $MN - N^2M$ is: A $\begin{bmatrix} -34 & 10 \\ 44 & 34 \end{bmatrix}$ B $\begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$ C $\begin{bmatrix} -34 & -50 \\ -16 & 34 \end{bmatrix}$ D $\begin{bmatrix} 0 & -6 \\ -6 & 0 \end{bmatrix}$ E $\begin{bmatrix} -24 & -44 \\ -10 & 34 \end{bmatrix}$	
5. Matrix $A = \begin{bmatrix} n & 4 \\ 1 & n+3 \end{bmatrix}$ is singular if $n =$ A 1 B 4 C -3 or 1 D -1 or 4 E -4 or 1	
6. The image of the point (4,-3) under the transformation $(x,y) \rightarrow (2x-4y, -3x+y)$ is: A (20,-15) B (-4,9) C (-4,-9) D (20,9) E (4,-15)	
7. The Matrix $\begin{bmatrix} -1 & 2 \\ 0 & 1 \end{bmatrix}$ represents: A A reflection in the x-axis followed by a shear of factor 2 parallel to the x-axis. B A reflection in the y-axis followed by a shear of factor 2 parallel to the x-axis. C A shear of factor 2 parallel to the x-axis followed by a reflection in the x-axis. D A shear of factor 2 parallel to the x-axis followed by a reflection in the y-axis. E A shear of factor 2 parallel to the y-axis followed by a reflection in the x-axis.	
8. The matrix $\begin{bmatrix} \frac{1}{2} & \frac{\sqrt{3}}{2} \\ -\frac{\sqrt{3}}{2} & \frac{1}{2} \end{bmatrix}$ represents: A A 30° rotation anticlockwise. B A 60° rotation anticlockwise. C A 30° rotation clockwise. D A 60° rotation clockwise. E A 90° rotation clockwise.	

9. The image of the graph $y = 2x^2 - 1$ under the transformation: $\begin{bmatrix} 4 & 0 \\ 2 & 1 \end{bmatrix}$ is: A $y = 32x^2 - 2x - 1$ B $y = 32x^2 + 2x - 1$ C $y = 32x^2 - 2x + 1$ D $y = 32x^2 + 2x + 1$ E $y = \frac{1}{8}x^2 + \frac{1}{2}x - 1$	
10. A triangle with vertices (0,0) (1,0) and (0,1) is transformed by the rule $(x,y) \rightarrow (-3x + y, 2x + 4y)$. The area of the image is: A -14 B -7 C 14 D 7 E 3.5	

Section B. Short Answer Questions (total 25 marks)

1. For the following pair of simultaneous equations:

$$3x + 2y = 3$$

$$4x - y = 37$$

a) Express as a matrix equation in the form: $AX = B$

b) State the determinant of A

c) Hence find the inverse of A, (A^{-1})

d) Solve the equation to find matrix X

(1 + 1 + 1 + 1 = 4 marks)

2. If $A = \begin{bmatrix} 3 & 2 \\ -3 & 5 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & -2 \\ -2 & 1 \end{bmatrix}$ find:

a) AB

b) B^{-1}

c) $A^{-1}B$

d) $(AB^2)^{-1}$

(1 + 1 + 2 + 2 = 6 Marks)

3. The line $3x + 2y = 6$ undergoes a dilation of factor 2 from the x-axis followed by a 90° rotation anticlockwise.

a) Express these two transformations as a single matrix.

b) Use the inverse of this matrix to find x and y in terms of x' and y'

c) Hence find the equation of the image of the line

(2 + 2 + 2 = 6 marks)

4. The unit square is mapped to a parallelogram of area 6 using the matrix $\begin{bmatrix} m & m \\ 5 & m \end{bmatrix}$.
Find all possible values of m .

(3 marks)

5. The line $y = \sqrt{3}x$ is rotated by 30° anticlockwise about the point $(1, 2)$

a) Find the image of the point on the line $(0, 0)$

b) Find the image of the point on the line $(1, \sqrt{3})$

c) Hence, or otherwise find the equation of the image of the line.

(2 + 2 + 2 = 6 marks)