Name: _____ Date: _____

Baldivis Secondary College

Year 11 Applications

Test 4, 2020

Topics – Pythagoras, Measurement, Similarity and Matrices

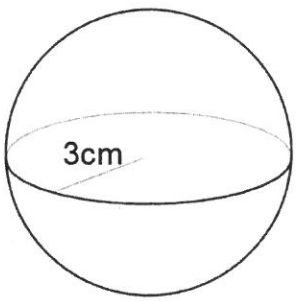
	43
	=____ %

Total Time:	*44 minutes*
Total Reading:	*3 minutes*
Total Working:	*43 minutes*
Equipment:	*SCSA Formula Sheet; 1 page notes (A4 two sides, **Unfolded**), CASIO ClassPad; Scientific Calculator*

Resource Free Section – 13 min 1 min reading time **[13 marks]**

1. [3 marks]

Show how the volume of this sphere can be expressed as $36\pi cm^3$



$\frac{4}{3}\pi r^3$ ✓

$= \frac{4}{3} \times \pi \times 3^3$ ✓

$= 4 \times \pi \times 3^2$

$= 36\pi$ ✓

(3)

2. [1, 1, 3, 1, 1, 1, 2 = 10 marks]

Consider the matrices $A=\begin{bmatrix}2 & 0\\ 1 & 3\end{bmatrix}$ $B=\begin{bmatrix}-2 & 5\end{bmatrix}$ $C=\begin{bmatrix}3\\ -1\end{bmatrix}$ $D=\begin{bmatrix}1 & -2\\ 2 & 0\end{bmatrix}$

(a) State

(i) the size of the row matrix

$B = 1\times 2$ ✓

(ii) d_{12}

$= -2$ ✓

(b) Find x and y if $2C-\begin{bmatrix}x\\ -1\end{bmatrix}=\begin{bmatrix}2\\ y\end{bmatrix}$

✓

$\begin{bmatrix}6\\ -2\end{bmatrix}-\begin{bmatrix}x\\ -1\end{bmatrix}=\begin{bmatrix}2\\ y\end{bmatrix}$ $x = 4$ ✓

$y = -1$ ✓

(c) If possible, calculate the following. If not possible, explain why.

(i) A + D

$=\begin{bmatrix}3 & -2\\ 3 & 3\end{bmatrix}$ ✓

(ii) 2A

$\begin{bmatrix}4 & 0\\ 2 & 6\end{bmatrix}$ ✓

(iii) B – C

Can't do as different sizes ✓

(iv) 3D - A

✓

$\begin{bmatrix}3x & -6\\ 6 & 0\end{bmatrix}-\begin{bmatrix}2 & 0\\ 1 & 3\end{bmatrix}$

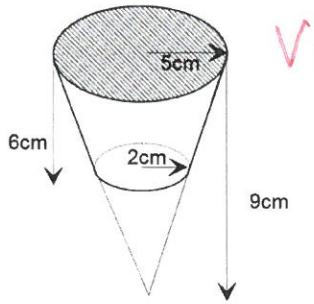
$=\begin{bmatrix}1 & -6\\ 5 & -3\end{bmatrix}$ ✓

10

Resource Section – 30 min plus 2 min reading time **NAME:** **[30 marks]**

3. [3 marks]

Find the capacity of the drinking glass pictured below to the nearest ml.



$V = \frac{1}{3}\pi 5^2 \times 9 - \frac{1}{3}\pi 2^2 \times 3$ ✓

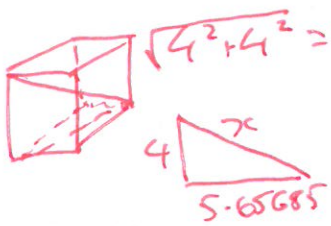
$= 223.05\ cm^3$ ✓

✓

$= 223mL$

4. [3 marks]

What is the longest pencil that can fit into a 4cm cube?



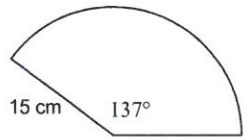
$\sqrt{4^2+4^2} = \sqrt{32} = 5.65685$ ✓

$x = \sqrt{4^2 + 5.6585^2}$ ✓

$= 6.93cm$ ✓ (2dp)

5. [2 marks]

Determine the perimeter of the sector shown below.



$P = 15 + 15 + \frac{137}{360} \times 2\pi(15)$ ✓

$= 65.87cm$ ✓

(8)

6. [1, 2, 2 = 5 Marks]

Swimming's Cool is a company which produces swimming pools. They have three different models of pool which they sell and each one requires a different amount of each of the following materials as shown in matrix **A** below.

$$\mathbf{A} = \begin{array}{c} \\ \text{Model A} \\ \text{Model B} \\ \text{Model C} \end{array} \begin{array}{c} \begin{array}{cccc} \text{Fiberglass (Sheets)} & \text{Concrete (kg)} & \text{Tiles (number)} & \text{Gravel (bags)} \end{array} \\ \begin{bmatrix} 1 & 100 & 30 & 20 \\ 3 & 120 & 90 & 90 \\ 2 & 150 & 50 & 70 \end{bmatrix} \end{array}$$

a) Swimming's Cool receives the following orders: 4 of Model A, 2 of Model B and 1 of Model C. Create matrix **B** to represent this information.

$B = [4 \quad 2 \quad 1]$ ✓

b) Use matrix methods to calculate the total amount of each material needed to fill the order.

$BA = [12 \quad 790 \quad 350 \quad 330]$ ✓

12 sheets fiberglass
790 kg concrete
350 tiles
330 bags of gravel ✓

c) The costs for each of the materials are as follows:

Fiberglass ($300/Sheet)	Concrete ($50/kg)	Tiles ($5 each)	Gravel ($70/bag)

Calculate, **using matrix methods and showing full working**, the total cost of the order.

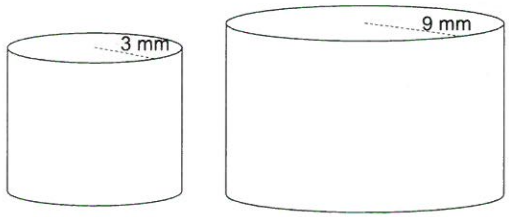
$BA \times \begin{bmatrix} 300 \\ 50 \\ 5 \\ 70 \end{bmatrix} = \$67950$ ✓

✓

(5)

7. [3, 4 = 7 Marks]

a) The figures below are similar.



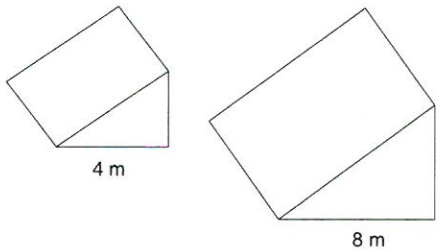
The surface area of the smaller cylinder is 25 mm^2. What is the surface area of the larger cylinder?

$SA = 25 \times 3^2$ ✓✓

$= 25 \times 9$

$= 225 mm^2$ ✓

b) The prisms below are similar.



$V = 800 \times (\frac{1}{2})^3$ ✓✓

$= 800 \times \frac{1}{8}$ ✓

$= 100 m^3$

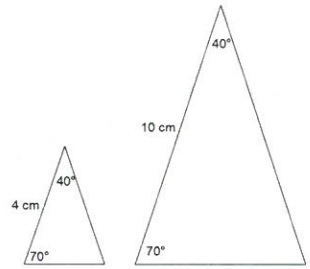
The volume of the larger prism is 800 m^3. What is the volume of the smaller prism?

7

8. [2, 2, 2 = 6 Marks]

For the following sets of triangles, determine whether they are similar or not, and state the rule used to justify your answer.

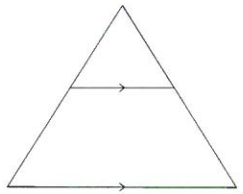
a)



✓ ✓

Yes by AAA

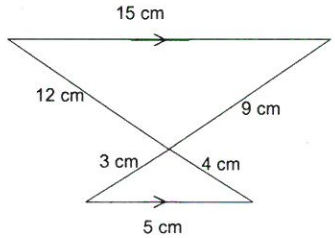
b)



✓ ✓

Yes by AAA

c)



✓ ✓

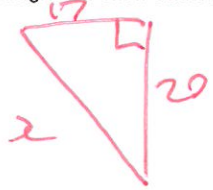
Yes by SSS

6

9. [1, 3 = 4 Marks]

Cadel is going for a casual Sunday cycle. He cycles 20 km due north and stops to have a coffee at a café. Then he cycles 17 km due west to practice his sprints. He then returns directly back home.

a) Draw a diagram to show Cadel's cycle path.



✓

b) Calculate his total distance traveled.

$x^2 = 17^2 + 20^2$ ✓

$x = \sqrt{17^2 + 20^2}$

$= 26.25$ km ✓

$P = 17 + 20 + 26.25$

$= 263.25$ km ✓

(4)

- End of Test -