UNIT TEST #013 | Australian Curriculum Mathematics | UTM8T3U5

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Volume, Surface Area, and Transformations

8 Unit Test

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Instructions: Read all questions carefully to ensure you understand what is being asked. When completing your official tests / exams, your grade will be based upon your: **understanding, fluency, reasoning, and problem solving,** so ensure you show all lines of working and draw accurate, labelled diagrams where necessary. (ACiQ|9.0 Mathematics standard elaborations found on final page (general assessment marking standards)). [Practise tests are marked out of a score of 10]. For multiple choice questions, tick or fill in the circle next to the corresponding letter under the question.

Check your work if you have time. *Remember:* you don't have to start at question one, it's always best to firstly look through the test, highlight the easy looking questions and complete them first, then secondly, go back through and work on the harder questions. Good luck! And remember to breathe!

$$\sum = \frac{\quad}{10} = \quad \%$$

Part 1: Multiple Choice (2 marks)

Question 1:

a) What is the volume of a cube with an edge length of $4\,cm$?

A. $16\,cm^3$ **B.** $32\,cm^3$ **C.** $64\,cm^3$ **D.** $128\,cm^3$

◯ A ◯ B ◯ C ◯ D

Space for Q1a...

b) The formula for the volume of a cylinder is:

A. $V = \pi r^2$ **B.** $V = 2\pi rh$ **C.** $V = \pi r^2 h$ **D.** $V = 4\pi r^2$

◯ **A** ◯ **B** ◯ **C** ◯ **D**

Space for Q1b...

Question 2:

a) Which set of coordinates represents a reflection over the line $y = x$?

A. $(x, y) \rightarrow (-y, x)$ **B.** $(x, y) \rightarrow (x, y)$ **C.** $(x, y) \rightarrow (x, x)$ **D.** $(x, y) \rightarrow (y, x)$

◯ **A** ◯ **B** ◯ **C** ◯ **D**

Space for Q2a...

b) Which formula is used to calculate the slop of a line ?

A. $\frac{y_2 - y_1}{x_2 - x_1}$ **B.** $\frac{y_1 - y_1}{x_1 - x_1}$ **C.** $\frac{run}{rise}$ **D.** $\frac{x_2 - x_1}{y_2 - y_1}$

◯ **A** ◯ **B** ◯ **C** ◯ **D**

Space for Q2b...

Part 2: Short Answer (4 marks)

Question 3:

a) Calculate the area of a rectangle with length $8\,cm$ and width $5\,cm$.

b) Find the volume of a prism with a triangular base where the base of the triangle is $6\,cm$, the height of the triangle is $4\,cm$, and the height of the prism is $10\,cm$.

Question 4:

a) The letter 'E' is drawn on a graph so that the top left corner of the letter is positioned at the point $P(-3,\ 4)$. The letter is reflected over the $x-axis$, to produce and upside down 'E'. P' is the reflected coordinate of P. What is the coordinate of P'?

b) A circle is centred at the point $M(2, 4)$, and is rotated $90°$ clockwise about the origin to form point M'. Find the coordinates of M'.

Part 3: Problem Solving (4 marks)

Question 5:

a) A cylindrical can has a radius of $3\,cm$ and a height of $10\,cm$. Calculate its volume. (use $\pi = 3.14$)

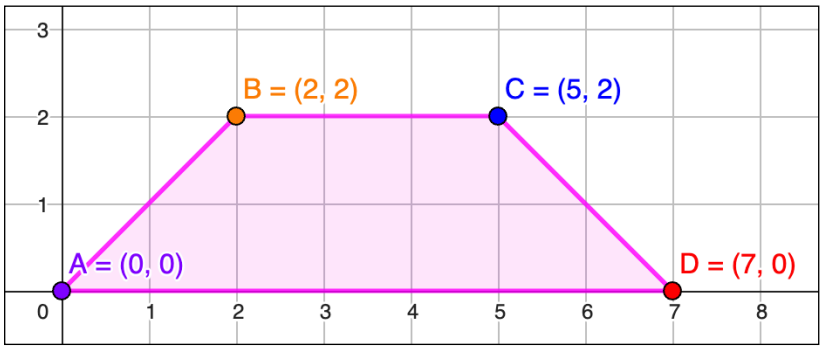
b) A rectangular prism has dimensions of $5\,cm$ by $6\,cm$ by $7\,cm$. Calculate its volume. If this prism is filled with water and then poured into a cylindrical container with a radius of $3\,cm$, how high will the water level be in the cylinder? (Use $\pi = 3.14$)

Question 6:

a) A triangle with vertices $A(1, 2)$, $B(3, 2)$, and $C(2, 4)$ is first translated 4 units to the right and 2 units down, then reflected over the $y-axis$. Determine the coordinates of the vertices of the final image triangle $A''B''C''$.

b) A quadrilateral $ABCD$ with vertices $A(0,\ 0)$, $B(2,\ 2)$, $C(5,\ 2)$, and $D(7,\ 0)$ is reflected over the line $y = x$ to form quadrilateral $A'B'C'D'$.

I) Find the coordinates of $A'B'C'D'$.
II) Check $AD \parallel BC$,



Solutions

1. (0.5 marks)

C. $64\,cm^3$.

- Volume of a cube $=$ side^3

$= 4^3$

$= 64\,cm^3$.

b. (0.5 marks)

C. $V = \pi r^2 h$

- This is the formula where r is the radius of the base and h is the height of the cylinder.

2a. (0.5 marks)

D. $(x, y) \rightarrow (y, x)$

b. (0.5 marks)

A. $\dfrac{y_2 - y_1}{x_2 - x_1} = \dfrac{rise}{run}$

3a. (0.5 marks)

Area $=$ Length $\times$ Width

$= 8\,cm \times 5\,cm$

$= 40\,cm^2$.

b. (1.5 marks)

Area of the triangular base $= \dfrac{1}{2} \times 6\,cm \times 4\,cm$

$= 12cm^2$

Volume of the prism $=$ Base Area $\times$ Height

$= 12cm^2 \times 10cm$

$= 120cm^3$.

4a. (1 mark)

To reflect a point over the $x-axis$, the $x-coordinate$ remains unchanged, and the $y-coordinate$ is multiplied by -1, $(x,\ y) \rightarrow (x,\ -y)$

For $P(-3,\ 4)$, the $x-coordinate$ is -3, and the $y-coordinate$ is 4.

After reflection :

$x' = -3,\ y' = -4$.

Thus, the coordinates of P' are $(-3, -4)$.

b. (1 mark)

Coordinates of M' :

A 90° clockwise rotation about the origin maps $(x, y) \rightarrow (y, -x)$.

$M(2, 4) \rightarrow M'(4, -2)$.

Rotaion Coordinate Rules (around the origin)

90° counterclockwise or 270° clockwise

$(x, y) \rightarrow (-y, x)$

180° clockwise or 180° counterclockwise

$(x, y) \rightarrow (-x, -y)$

90° clockwise or 270° counterclockwise

$(x, y) \rightarrow (y, -x)$

5a. (1 mark)

Volume of cylinder $= \pi r^2 h$

$$V = 3.14 \times (3)^2 \times 10$$
$$V = 3.14 \times 9 \times 10$$
$$= 282.6\, cm^3$$

b. (1 mark)

Volume of the prism: $V = 5\, cm \times 6\, cm \times 7\, cm$

$$= 210\, cm^3 .$$

Height of water in the cylinder: $V_{cylinder} = 210\, cm^3$

$$210 = \pi r^2 h$$
$$210 = 3.14 \times (3)^2 \times h$$
$$210 = 3.14 \times 9 \times h$$
$$210 = 28.26 \times h$$
$$\frac{210}{28.26} = \frac{\cancel{28.26} \times h}{\cancel{28.26}}$$
$$7.43 \approx h$$
$$h \approx 7.43\, cm .$$

6a. (0.5 marks)

Step 1: Perform the translation.

A translation of 4 units right and 2 units down is represented by $(x, y) \rightarrow (x + 4, y - 2)$.

For $A(1, 2)$: $(1 + 4, 2 - 2) = (5, 0)$, so $A' = (5, 0)$.
For $B(3, 2)$: $(3 + 4, 2 - 2) = (7, 0)$, so $B' = (7, 0)$.
For $C(2, 4)$: $(2 + 4, 4 - 2) = (6, 2)$, so $C' = (6, 2)$.
The intermediate triangle has vertices $A'(5, 0)$, $B'(7, 0)$, $C'(6, 2)$.

Step 2: Reflect over the $y - axis$.

A reflection over the $y - axis$ is represented by $(x, y) \rightarrow (-x, y)$.
For $A'(5, 0)$: $(-5, 0)$, so $A'' = (-5, 0)$.
For $B'(7, 0)$: $(-7, 0)$, so $B'' = (-7, 0)$.
For $C'(6, 2)$: $(-6, 2)$, so $C'' = (-6, 2)$.

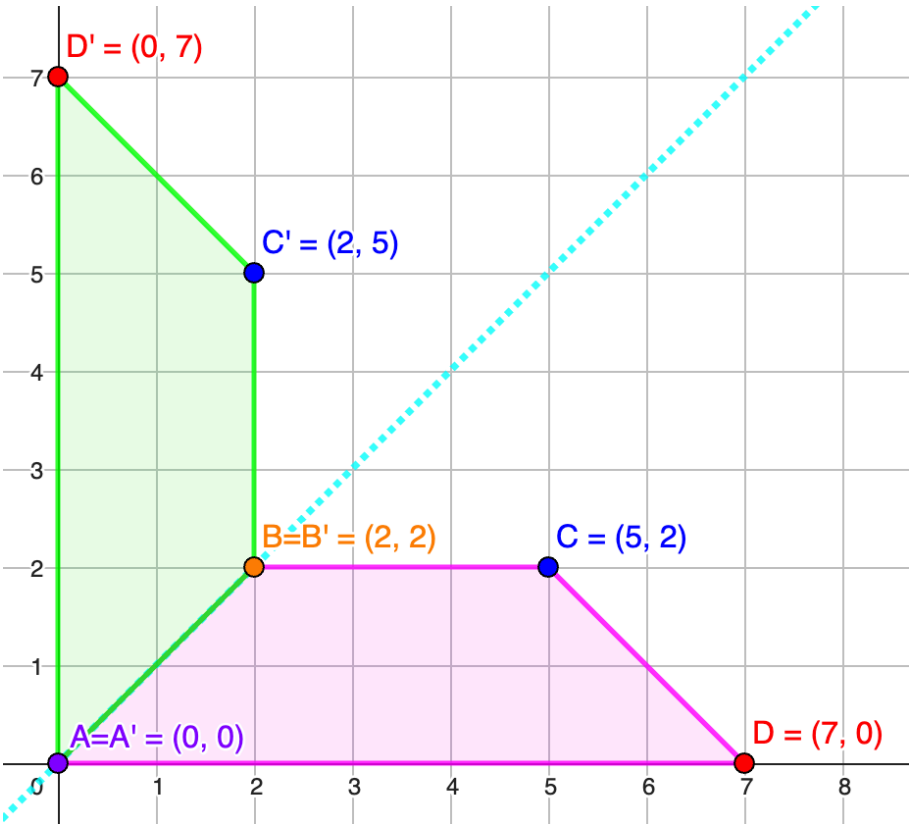
Answer: The coordinates of the final image triangle are $A''(-5, 0)$, $B''(-7, 0)$, $C''(-6, 2)$.

b. (1.5 marks)

I)

Coordinates of $A'B'C'D'$:
Reflection over $y = x$ swaps the $x-$ and $y - coordinates$: $(x, y) \rightarrow (y, x)$.
For $A(0, 0)$ $A'(0, 0)$.
For $B(2, 2)$ $B'(2, 2)$.
For $C(5, 2)$ $C'(2, 5)$.
For $D(7, 0)$ $D'(0, 7)$.

The vertices are $A'(0, 0)$, $B'(2, 2)$, $C'(2, 5)$, and $D'(0, 7)$.



II)
Check if $AD \parallel BC$:

Slope of AD :

From $A(0, 0) = (x_1, y_1)$ to

$D(7, 0) = (x_2, y_2)$

$$\text{Slope} = \frac{rise}{run}$$
$$= \frac{y_2 - y_1}{x_2 - x_1}$$
$$= \frac{0 - 0}{7 - 0}$$
$$= 0 \text{ (horizontal line).}$$

Slope of BC :

From $B(2, 2) = (x_1, y_1)$ to

$C(5, 2) = (x_2, y_2)$

$$\text{Slope} = \frac{rise}{run}$$
$$= \frac{y_2 - y_1}{x_2 - x_1}$$
$$= \frac{2 - 2}{5 - 2}$$
$$= 0 \text{ (horizontal line).}$$

Since slopes are equal, $AD \parallel BC$.

$$\sum = \frac{}{10} = \quad \%$$

General Assessment Marking Standards

Remember: When your official tests are marked, they won't be a score out of 10, they will be a grade (A,B,C,D,E) based on the following standards:

ACiQ | v9.0

Year 8 Mathematics standard elaborations

		A	B	C	D	E
		The folio of student work contains evidence of the following:				
Mathematical proficiencies	Understanding	accurate and consistent identification, representation, description and connection of mathematical concepts and relationships in complex unfamiliar, complex familiar, and simple familiar situations	accurate identification, representation, description and connection of mathematical concepts and relationships in complex familiar and simple familiar situations	identification, representation, description and connection of mathematical concepts and relationships in simple familiar situations	partial identification, representation and description of mathematical concepts and relationships in some simple familiar situations	fragmented identification, representation and description of mathematical concepts and relationships in isolated and obvious situations
	Fluency	choice, use and application of comprehensive facts, definitions, and procedures to find solutions in complex unfamiliar, complex familiar, and simple familiar situations	choice, use and application of effective facts, definitions, and procedures to find solutions in complex familiar and simple familiar situations	choice, use and application of facts, definitions, and procedures to find solutions in simple familiar situations	choice and use of partial facts, definitions, and procedures to find solutions in some simple familiar situations	choice and use of fragmented facts, definitions and procedures to find solutions in isolated and obvious situations
	Reasoning	comprehensive explanation of mathematical thinking, strategies used, and conclusions reached in complex unfamiliar, complex familiar, and simple familiar situations	detailed explanation of mathematical thinking, strategies used, and conclusions reached in complex familiar and simple familiar situations	explanation of mathematical thinking, strategies used, and conclusions reached in simple familiar situations	partial explanation of mathematical thinking, strategies used, and conclusions reached in some simple familiar situations	fragmented explanation of mathematical thinking, strategies used, and conclusions reached in isolated and obvious situations
	Problem-solving	purposeful use of problem-solving approaches to find solutions to problems.	effective use of problem-solving approaches to find solutions to problems.	use of problem-solving approaches to find solutions to problems.	partial use of problem-solving approaches to make progress towards finding solutions to problems.	fragmented use of problem-solving approaches to make progress towards finding solutions to problems.

Key shading emphasises the qualities that discriminate between the A–E descriptors

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