

Grade 9 Pre-AP Math
Unit 0 – Introduction to Mathematical Thinking – Practice Test

Victim: Mr. SolutionsWell done Mr. S.!

KU	APP	TIPS	COM
10/10	20/20	10/10	10/10

Modified True or False (5 KU)

Indicate whether each statement is **true** or **false**. If false, **change** the underlined part to make the statement true.

- F ✓ Math is like a dating service because it's all about relativity. Change: relationships ✓
- F ✓ If the radius of a circle is doubled, its area is doubled. ✓ = $\frac{1}{2}$ mark Change: quadrupled ✓
- F ✓ A triangular pyramid has four **lateral** faces. Change: three ✓
- F ✓ The basic elements of math are objects, operatives and relationships. Change: operations ✓
- F ✓ $(A_{\text{base}})(\text{height})$ is the surface area of any solid with a uniform cross-section. Change: volume ✓

Multiple Choice (5 KU)

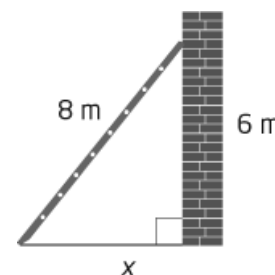
For questions 6 to 10, select the best answer. Write the letter of your choice in the provided blank space.

6. b ✓ A cone has a volume of 314.16 cm^3 and a radius of 5 cm. To one decimal place, what is its height?

(a) 10.1 cm (b) 12.0 cm (c) 11.3 cm (d) 12.8 cm

7. c ✓ A window cleaner has placed an 8-m ladder against a wall. The top of the ladder is 6 m above the ground. What is the distance, to the nearest tenth of a metre, of the ladder from the wall?

(a) 5.1 m (b) 5.2 m (c) 5.3 m (d) 5.4 m



8. d ✓ A circular swimming pool has a diameter of 8.6 m. It is filled to height of 1.6 m. To the nearest 100 L, how much water is in the pool?

(a) 93 800 L (b) 98 500 L (c) 99 900 L (d) 92 900 L



9. d ✓ Which statement is **not** true?

(a) The length of any side of a right triangle can be calculated if the lengths of the other two sides are known.
 (b) The hypotenuse is the longest side in a right triangle.
 (c) The hypotenuse is always opposite the 90° angle in a right triangle.
 (d) The Pythagorean Theorem applies to **all** triangles.

10. b ✓ The measure of any exterior angle of a triangle is equal to

(a) The measure of the opposite interior angle.
 (b) The sum of the measures of the two opposite interior angles.
 (c) 180°
 (d) 360°

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Full Solutions/Explanations

11. Vyshna and Uday have a kite-making business that they call VUiTon Fashionable Kites. Their company makes large kites in the shape shown at the right. Each of these kites has fancy gold trim around the **perimeter**. How much gold trim is used for each kite? (4 APP)

Let P represent the perimeter of the kite.

Then,

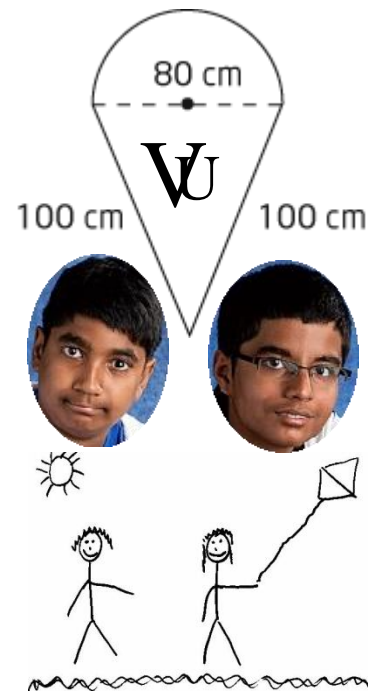
$$P = 100 + 100 + \frac{2\pi r}{2} \quad \checkmark$$

$$= 200 + \pi r \quad \checkmark$$

$$= 200 + 3.14(40) \quad \checkmark$$

$$= 325.6 \quad \checkmark$$

About 325.6 cm of gold trim is needed for each kite.



12. A picture measures 60 cm by 30 cm. The mat around the picture is 6 cm wide. Find the area of the mat. (4 APP)

$A_m \rightarrow$ area of mat, $A_L \rightarrow$ area of large rectangle
 $A_s =$ area of small rectangle

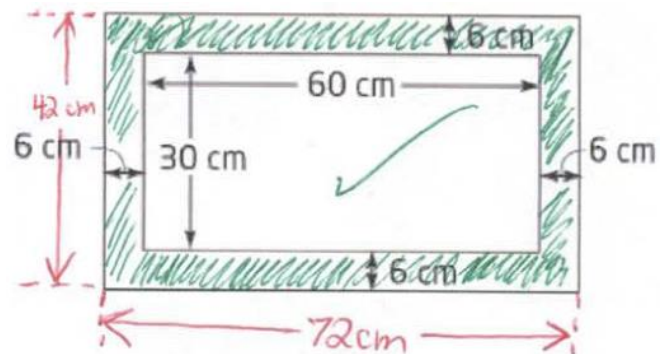
$$\therefore A_m = A_L - A_s \quad \checkmark$$

$$= 72(42) - 60(30) \quad \checkmark$$

$$= 3024 - 1800 \quad \checkmark$$

$$= 1224 \quad \checkmark$$

The area of the mat is 1224 cm^2 .



13. A **cone** with a volume of 120 cm^3 just fits inside a **cylindrical** container having the same radius and height. What is the volume of the cylindrical container? (2 APP)

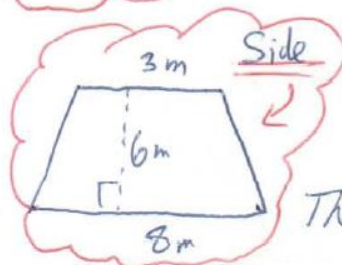
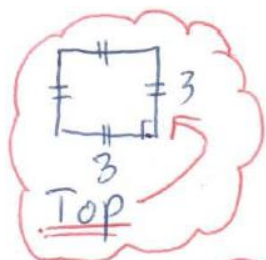
$$V_{\text{cone}} = \frac{1}{3} A_{\text{base}} (\text{height}) = 120 \text{ cm}^3 \quad \checkmark$$

$$\text{But } V_{\text{cylinder}} = A_{\text{base}} (\text{height}) = 3 V_{\text{cone}} \quad \checkmark$$

$$\therefore V_{\text{cylinder}} = 3(120) = 360 \text{ cm}^3 \quad \checkmark$$

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14. The base for a large statue is in the form of a frustum of a pyramid with dimensions as shown. The **top** and **sides** are covered with paint. What area is painted? (4 APP)



Total painted area

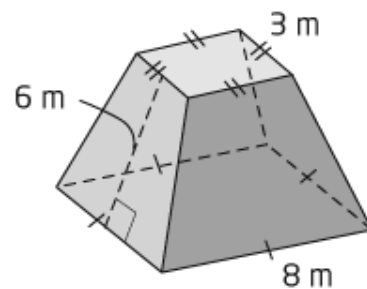
$$= A_{\text{Top}} + 4A_{\text{side}}$$

$$= 3(3) + 4\left(\frac{6(8+3)}{2}\right)$$

$$= 9 + 12(11)$$

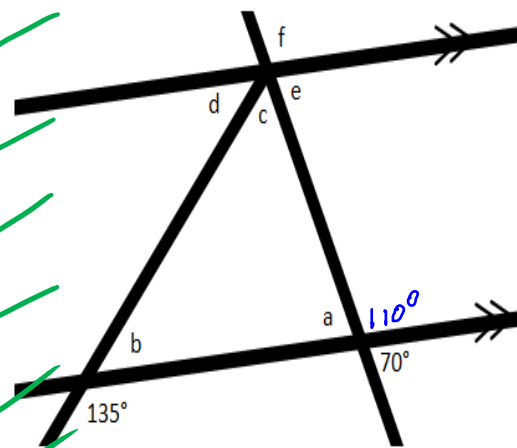
$$= 141$$

The total painted area is 141 m^2



15. Find the measures of each angle labelled with a letter. In each case, state your **reasoning**. (6 APP)

Measure of Angle	Reasoning (State Why)
$a = 70^\circ$	X opposite angles are equal
$b = 45^\circ$	$180^\circ - 135^\circ$ (supplementary angles)
$c = 65^\circ$	$d + c + e = 180^\circ \rightarrow 45^\circ + c + 70^\circ = 180^\circ$
$d = 45^\circ$	alternate angles are equal
$e = 70^\circ$	alternate angles are equal
$f = 110^\circ$	corresponding angles are equal



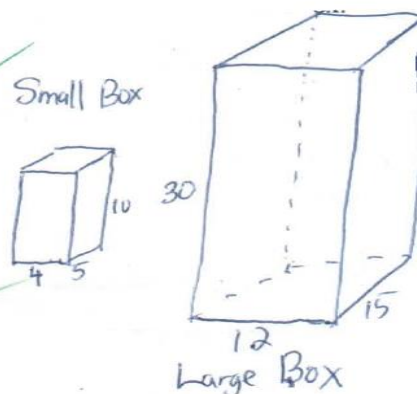
16. Big Bran breakfast cereal is sold in a single serving size. This rectangular prism shaped box has dimensions 4 cm by 5 cm by 10 cm. The manufacturer also sells the cereal in a box that has dimensions three times those of the small box. Compare the volume of the two boxes and explain your answer. (4 TIPS)

$$V_{\text{small box}} = (4\text{ cm})(5\text{ cm})(10\text{ cm}) = 200 \text{ cm}^3$$

$$V_{\text{large box}} = (12\text{ cm})(15\text{ cm})(30\text{ cm}) = 5400 \text{ cm}^3$$

$$\frac{V_{\text{large box}}}{V_{\text{small box}}} = \frac{5400 \text{ cm}^3}{200 \text{ cm}^3} = 27$$

The volume of the large box is 27 times greater than that of the small box.



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17. The volume of the planet Mercury is about $61,000,000,000 \text{ km}^3$ (61 billion cubic kilometres). The Earth's radius is about 2.6 times that of Mercury. What is the Earth's volume? (6 TIPS)

$$V_M = 61,000,000,000 = \frac{4\pi r_M^3}{3} \quad \checkmark$$

$$V_E = \frac{4\pi r_E^3}{3}$$

$$= \frac{4\pi (2.6 r_M)^3}{3} \quad \checkmark \quad \left(\begin{array}{l} \text{Since} \\ r_E = 2.6 r_M \end{array} \right)$$

$$= \frac{(2.6)^3 (4\pi r_M^3)}{3}$$

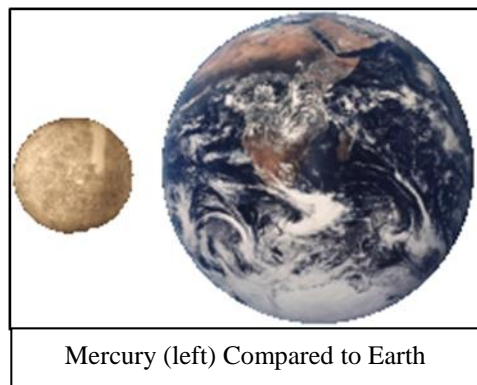
$$= 17.576 \left(\frac{4\pi r_M^3}{3} \right) \quad \checkmark$$

$$= 17.576 V_M \quad \checkmark$$

$$\therefore V_E = 17.576 V_M = 17.576 (61,000,000,000) \quad \checkmark$$

$$= 1,072,136,000,000 \quad \checkmark$$

The Earth's volume is about 1 trillion km^3 !!



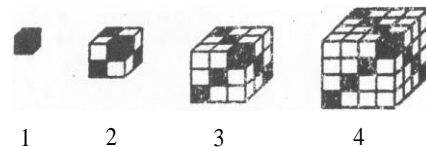
Mercury (left) Compared to Earth

$V_M \rightarrow$ Mercury's volume (km^3)
 $V_E \rightarrow$ Earth's volume (km^3)
 $r_M \rightarrow$ Mercury's radius (km)
 $r_E \rightarrow$ Earth's radius (km)

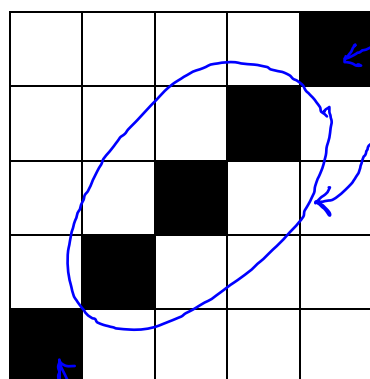
18. Shown at the right is one of the patterns that you investigated in the introductory activity for unit 0. In this activity, we discovered that

$$c = 6(d-2) + 4, d \neq 1,$$

where d represents the diagram number and c represents the number of coloured cubes.



- (a) Without using a table of values, explain why this equation makes sense. (4 COM)



corner cube (belongs to 3 faces) \checkmark

These cubes appear on only one face. There are 3 of them, which is $d-2$. \checkmark

corner cube (belongs to 3 faces)

Consider the case $d=5$. Each face will look like the diagram at the left. Three of the 5 cubes appear only on a single face. \checkmark
 Since there are 6 faces, there are $6(3) = 18$ of these cubes altogether.

In general, $d-2$ cubes appear only on one face. Therefore, there are $6(d-2)$ of these cubes altogether. When the 4 corner cubes are added, the total number is $6(d-2) + 4$. \checkmark

- (b) Explain why, in the equation given above, the value of d is not allowed to equal 1. (1 COM) $6(d-2) + 4$.

When $d=1$,

$$6(d-2) + 4$$

$$= 6(1-2) + 4$$

$$= 6(-1) + 4$$

$$= -6 + 4$$

$$= -2$$

Since the number of cubes cannot be negative, the equation does not hold for the case $d=1$. \checkmark

This isn't surprising because the argument in (a) doesn't apply to the case $d=1$.

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