A Progression Toward Mastery					
Assessment Task Item		STEP 1 Missing or incorrect answer and little evidence of reasoning or application of mathematics to solve the problem.	STEP 2 Missing or incorrect answer but evidence of some reasoning or application of mathematics to solve the problem.	STEP 3 A correct answer with some evidence of reasoning or application of mathematics to solve the problem, OR an incorrect answer with substantial evidence of solid reasoning or application of mathematics to solve the problem.	STEP 4 A correct answer supported by substantial evidence of solid reasoning or application of mathematics to solve the problem.
1	a–b 8.G.B.7	Student does not attempt problem or leaves item blank.	Student correctly responds yes or no to one of parts (a) or (b). Student may or may not provide an explanation. Explanation may show some evidence of mathematical reasoning and references the Pythagorean Theorem.	Student correctly responds yes or no to one of parts (a) or (b). Student may make a mathematical error leading to an incorrect response. Student provides an explanation that references the converse of the Pythagorean Theorem.	Student correctly responds yes or no to both parts (a) and (b); (a) yes, (b) no. Student may make a mathematical error leading to an incorrect response. Student provides an explanation that references the converse of the Pythagorean Theorem.
	c 8.G.B.7	Student does not attempt problem or leaves item blank.	Student may use the numbers 5 and 30 to determine the length of the hypotenuse. OR Student may calculate the height of the right triangle and names it as the length of the hypotenuse.	Student uses the information in the problem to determine the height of the triangle and the length of the hypotenuse. Student may make a mathematical error leading to an incorrect height and/or an incorrect hypotenuse length.	Student correctly uses the information provided to determine the height of the triangle, 12 ft., and the length of the hypotenuse, 13 ft.
	d 8.G.B.7	Student does not attempt problem or leaves item blank.	Student may or may not answer correctly. Student is able to calculate one of the paths correctly. OR Student is able to calculate both paths but	Student uses the information to calculate the distance of both paths. Student may not approximate $\sqrt{130}$ correctly leading to an incorrect answer. Student may make	Student correctly uses the information provided to calculate that the shortest path is $\sqrt{130} \approx 11.4$ miles. Student's explanation includes the length of the other path as 16

© 2014 Common Core, Inc. Some rights reserved. commoncore.org
This work is licensed under a Creative Commons Attribution-NonCommercial-ShareAlike 3.0 Unported License.

			is unable to approximate the $\sqrt{130}$. Student may or may not provide an explanation. Explanation does not make reference to the Pythagorean Theorem.	calculation errors that lead to an incorrect answer. Student's explanation includes the use of the Pythagorean Theorem.	miles. Student's explanation includes the use of the Pythagorean Theorem. Student may or may not include an explanation of the approximation of $\sqrt{130}$.
	e **8.G.B.8**	Student does not attempt the problem or leaves item blank.	Student does not use the Pythagorean Theorem to determine the distance between points A and B. Student may say the distance is 2 units right and 5 units up or another incorrect response.	Student uses the Pythagorean Theorem to determine the distance between points A and B, but may make a mathematical error leading to an incorrect answer.	Student correctly identifies the length between points A and B as $\sqrt{29}$ units by using the Pythagorean Theorem.
	f **8.G.B.8**	Student does not attempt the problem or leaves item blank. Student may or may not graph the coordinates. Student finds one of the segment lengths. Student does not make use of the Pythagorean Theorem.	Student may or may not answer correctly. Student may make calculation errors in using the Pythagorean Theorem. Student finds one or two of the segment lengths, but does not compute the third segment length. Student may make calculation errors in using the Pythagorean Theorem.	Student answers correctly that the coordinates do not form a right triangle. Student makes use of the Pythagorean Theorem to determine all the segment lengths of each segment. Student may make calculation errors in using the Pythagorean Theorem.	Student answers correctly that the coordinates do not form a right triangle. Student makes use of the Pythagorean Theorem to determine the segment lengths of each segment. Student shows the length of each segment as follows: from $(-1,6)$ to $(7,6)$ is 8 units, from $(-1,6)$ to $(4,2)$ is $\sqrt{41}$ units and from $(4,2)$ to $(7,6)$ is 5 units.
	g–i **8.G.B.6**	Student does not attempt the problem or leaves item blank. Student may use the same example to explain the Pythagorean Theorem and its converse. Student's explanation does not demonstrate evidence of mathematical understanding of the Pythagorean Theorem or its converse.	Student may or may not use different examples to explain the Pythagorean Theorem and its converse. Student may or may not explain a proof of the Pythagorean Theorem or its converse. Student's explanation lacks precision and misses many key points in the logic of the proofs. Student's explanation demonstrates some evidence of mathematical understanding of the Pythagorean Theorem or its converse.	Student uses different examples to explain the Pythagorean Theorem and its converse. Student explains a proof of the Pythagorean Theorem and its converse. Student's explanation, though correct, may lack precision or miss a few key points in the logic of the proofs. There is substantial evidence that the student understands the proof of the Pythagorean Theorem and its converse.	Student uses different examples to explain the Pythagorean Theorem and its converse. Student thoroughly explains a proof of the Pythagorean Theorem and its converse. Student uses appropriate mathematical vocabulary and demonstrates with strong evidence understanding of the proofs. Student uses one of the proofs of the Pythagorean Theorem found in M2–L15, M3–L13, or M7–L17 and the proof of the converse found in M3–L14 or M7–L18.

© 2014 Common Core, Inc. Some rights reserved. commoncore.org
This work is licensed under a Creative Commons Attribution-NonCommercial-ShareAlike 3.0 Unported License.

2	**8.G.C.9**	Student does not attempt problem or leaves item blank.	Student incorrectly applies the volume formulas leading to incorrect answers. Student may or may not identify the cylinder with the half-sphere on top as the container with the greatest volume. Student may or may not write a note with a recommendation for Dorothy.	Student correctly applies volume formulas, but may make a mathematical error leading to an incorrect answer. Student may or may not identify the cylinder with the half-sphere on top as the container with the greatest volume. Student may or may not write a note with a recommendation for Dorothy.	Student correctly calculates the volume of both containers, 684π and 516π. Student correctly identifies the cylinder with the half-sphere on top as the container with the greatest volume. Student writes a note with a recommendation for Dorothy.
3	**a** **8.G.B.7** **8.G.C.9**	Student does not attempt the problem or leaves item blank.	Student may or may not determine the height of the cone using the Pythagorean Theorem. Student may or may not apply the volume formula for a cone to determine the volume. There is some evidence that the student knows what to do but is unable to apply the correct mathematical concepts to determine the volume.	Student correctly applies the Pythagorean Theorem to determine the height of the cone or correctly applies the volume formula for a cone but made a mathematical error leading to an incorrect answer.	Student correctly calculates the volume of the cone in terms of pi as 270.6896542π mm^3 and the approximate volume of the cone as 850.4 mm^3.
	b **8.G.B.7** **8.G.C.9**	Student does not attempt the problem or leaves item blank.	Student may or may not determine the radius of the sphere using the Pythagorean Theorem. Student may or may not apply the volume formula for a sphere to determine the volume. There is some evidence that the student knows what to do but is unable to apply the correct mathematical concepts to determine the volume.	Student correctly applies the Pythagorean Theorem to determine the radius of the sphere or correctly applies the volume formula for a sphere but makes a mathematical error leading to an incorrect answer.	Student correctly calculates the volume of the sphere in terms of pi as 471.4045208π in^3 and the approximate volume of the sphere as approximately 1481 in^3.

© 2014 Common Core, Inc. Some rights reserved. commoncore.org
This work is licensed under a Creative Commons Attribution-NonCommercial-ShareAlike 3.0 Unported License.

	c **8.G.C.9**	Student does not attempt the problem or leaves item blank.	Student uses the formula for the volume of a sphere to write an equation but is unable to solve the equation to determine r. OR Student may use the wrong volume formula leading to an incorrect answer.	Student uses the formula for the volume of a sphere to write an equation. Student may make a mathematical error leading to an incorrect answer. OR Student may leave the answer in the form of $\sqrt[3]{343}$.	Student correctly identifies the radius of the sphere as 7 in.

© 2014 Common Core, Inc. Some rights reserved. commoncore.org
This work is licensed under a Creative Commons Attribution-NonCommercial-ShareAlike 3.0 Unported License.

Name ______________________________ Date ______________

1.

a. Is a triangle with side lengths of 7 cm, 24 cm, and 25 cm a right triangle? Explain.

$7^2 + 24^2 = 25^2$
$49 + 576 = 625$
$625 = 625$

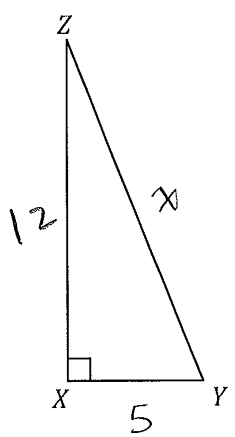
YES. THE LENGTHS 7, 24, 25 SATISFY THE PYTHAGOREAN THEOREM THEREFORE IT IS A RIGHT TRIANGLE.

b. Is a triangle with side lengths of 4 mm, 11 mm, and 15 mm a right triangle? Explain.

$4^2 + 11^2 = 15^2$
$16 + 121 = 225$
$137 \neq 225$

NO. THE LENGTHS 4, 11, 15 DO NOT SATISFY THE PYTHAGOREAN THEOREM THEREFORE IT IS NOT A RIGHT TRIANGLE.

c. The area of the right triangle shown below is 30 ft^2. The segment $\overline{XY}$ has a length of 5 ft. Find the length of the hypotenuse.



$30 = \frac{h(5)}{2}$

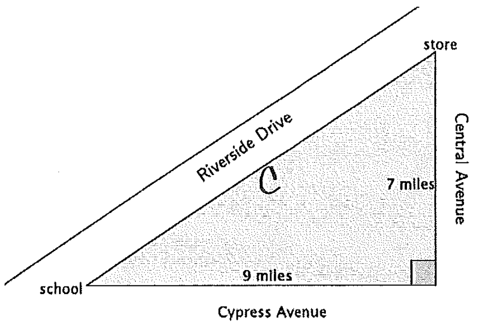
$60 = 5h$
$12 = h$

$5^2 + 12^2 = x^2$
$25 + 144 = x^2$
$169 = x^2$
$\sqrt{169} = x$
$13 = x$

THE LENGTH OF THE HYPOTENUSE IS 13 ft.

© 2014 Common Core, Inc. Some rights reserved. commoncore.org
This work is licensed under a Creative Commons Attribution-NonCommercial-ShareAlike 3.0 Unported License.

d. Two paths from school to the store are shown below, one that uses Riverside Drive and another which uses Cypress and Central Avenues. Which path is shorter? By about how much? Explain how you know.



LET C BE THE HYPOTENUSE.

$7^2+9^2=c^2$

$49+81=c^2$

$130=c^2$

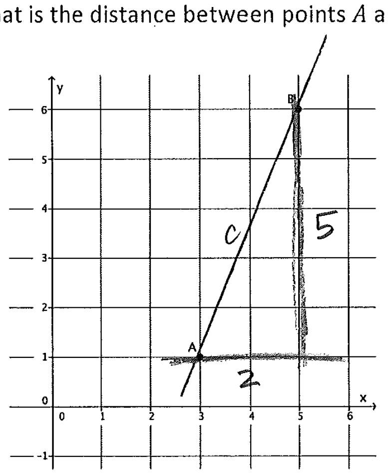
$\sqrt{130}=\sqrt{c^2}$

$\sqrt{130}=c$

$11.4\approx c$

THE PATH ALONG RIVERSIDE DRIVE IS SHORTER, ABOUT 11.4 MILES COMPARED TO THE PATH ALONG CYPRESS & CENTRAL AVENUES WHICH IS 16 MILES. THE DIFFERENCE IS ABOUT 4.6 MILES. THE PYTHAGOREAN THEOREM ALLOWED ME TO CALCULATE THE DISTANCE ALONG RIVERSIDE DRIVE BECAUSE THE 3 ROADS FORM A RIGHT TRIANGLE.

e. What is the distance between points A and B?



LET C BE THE DISTANCE BETWEEN POINTS A & B.

$2^2+5^2=c^2$

$4+25=c^2$

$29=c^2$

$\sqrt{29}=\sqrt{c^2}$

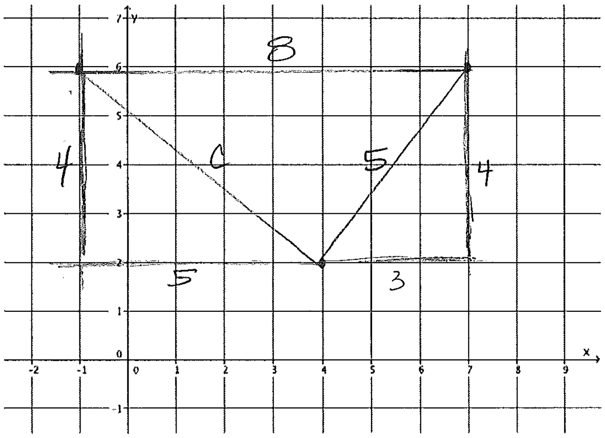
$\sqrt{29}=c$

$5.4\approx c$

THE DISTANCE BETWEEN POINTS A & B IS ABOUT 5.4 UNITS.

© 2014 Common Core, Inc. Some rights reserved. commoncore.org
This work is licensed under a Creative Commons Attribution-NonCommercial-ShareAlike 3.0 Unported License.

f. Do the segments connecting the coordinates $(-1,6)$, $(4,2)$, and $(7,6)$ form a right triangle? Show work that leads to your answer.



$3^2 + 4^2 = 5^2$
$9 + 16 = 25$
$25 = 25$

$4^2 + 5^2 = c^2$
$16 + 25 = c^2$
$41 = c^2$
$\sqrt{41} = \sqrt{c^2}$
$\sqrt{41} = c$

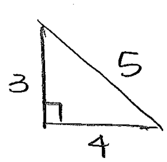
$6 < \sqrt{41} < 7$ SO SIDE 8 UNITS IS LONGEST.

$5^2 + (\sqrt{41})^2 = 8^2$
$25 + 41 = 64$
$66 \neq 64$

NO, THE SEGMENTS CONNECTING $(-1,6)$, $(4,2)$ & $(7,6)$ DO NOT FORM A RIGHT TRIANGLE BECAUSE THEIR LENGTHS DO NOT SATISFY THE PYTHAGOREAN THEOREM.

g. Using an example, illustrate, and explain the Pythagorean Theorem.

GIVEN A RIGHT TRIANGLE $\triangle ABC$, THE SIDES a, b, c (c IS LONGEST) SATISFY $a^2 + b^2 = c^2$.

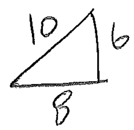


$a = 3, b = 4, c = 5$
$3^2 + 4^2 = 5^2$
$9 + 16 = 25$
$25 = 25$

© 2014 Common Core, Inc. Some rights reserved. commoncore.org
This work is licensed under a Creative Commons Attribution-NonCommercial-ShareAlike 3.0 Unported License.

h. Using a different example than part (g), illustrate and explain the converse of the Pythagorean Theorem.

GIVEN A TRIANGLE $\triangle ABC$ WITH SIDES LENGTHS a, b, c (c IS LONGEST) THAT SATISFIES $a^2 + b^2 = c^2$, THEN TRIANGLE $\triangle ABC$ IS A RIGHT TRIANGLE.



$6^2 + 8^2 = 10^2$

$36 + 64 = 100$

$100 = 100$

THEREFORE $\triangle ABC$ IS A RIGHT TRIANGLE.

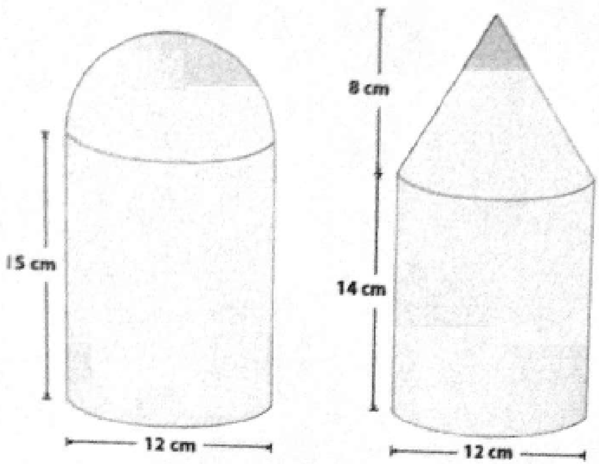
i. Explain a proof of the Pythagorean Theorem and its converse.

* SEE RUBRIC TO LOCATE PROOFS OF THE THEOREM & ITS CONVERSE WITHIN THE MODULES.

© 2014 Common Core, Inc. Some rights reserved. commoncore.org
This work is licensed under a Creative Commons Attribution-NonCommercial-ShareAlike 3.0 Unported License.

2. Dorothy wants to purchase a container that will hold the most sugar. Assuming each of the containers below can be completely filled with sugar, write a note recommending a container, including justification for your choice.

Note: Figures not drawn to scale.



CYLINDER

$V = 6^2\pi(15)$

$= 540\pi$

$\frac{1}{2}$ SPHERE

$V = \frac{1}{2}\left(\frac{4}{3}\right)\pi 6^3$

$= \frac{2}{3}(216)\pi$

$= 144\pi$

TOTAL VOLUME:

$540\pi + 144\pi = 684\pi\ cm^3$

CYLINDER

$V = 6^2\pi(14)$

$= 504\pi$

CONE

$V = \frac{1}{3}\pi(6^2)$

$= 12\pi$

TOTAL VOLUME:

$504\pi + 12\pi = 516\pi\ cm^3$

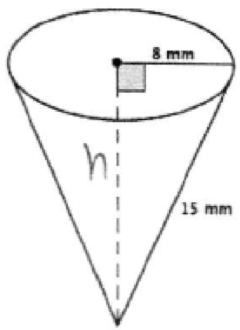
DOROTHY,

YOU SHOULD CHOOSE THE CONTAINER WITH THE HALF SPHERE ON TOP BECAUSE IT HAS A GREATER VOLUME THAN THE CONTAINER WITH THE CONE ON TOP. THE CONTAINERS HAVE VOLUMES OF $684\pi\ cm^3$ AND $516\pi\ cm^3$. SINCE 684π IS GREATER THAN 516π, THEN THE CONTAINER WITH THE HALF SPHERE WILL HOLD MORE SUGAR COMPARED TO THE CONTAINER WITH THE CONE ON TOP.

© 2014 Common Core, Inc. Some rights reserved. commoncore.org
This work is licensed under a Creative Commons Attribution-NonCommercial-ShareAlike 3.0 Unported License.

3.

a. Determine the volume of the cone shown below. Give an exact answer, in terms of π, and an approximate answer rounded to the tenths place.

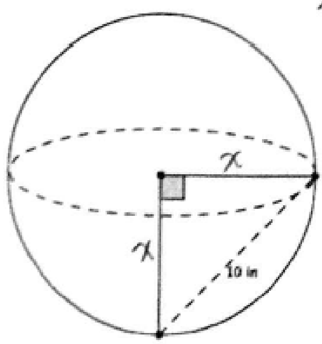


$8^2 + h^2 = 15^2$
$64 + h^2 = 225$
$h^2 = 161$
$\sqrt{h^2} = \sqrt{161}$
$h = \sqrt{161}$

$V = \frac{1}{3}\pi(64)(\sqrt{161})$
$= \frac{812.0689626}{3}\pi$
$= 270.6896542\pi \text{ mm}^3$
$\approx 850.4 \text{ mm}^3$

THE VOLUME OF THE CONE IS EXACTLY 270.68965426π mm^3 AND APPROXIMATELY 850.4 mm^3.

b. The distance between the two points on the surface of the sphere shown below is 10 units. Determine the volume of the sphere. Give an exact answer, in terms of π, and an approximate answer rounded to a whole number.



$x^2 + x^2 = 10^2$
$2x^2 = 100$
$x^2 = 50$
$\sqrt{x^2} = \sqrt{50}$
$x = \sqrt{50}$

$V = \frac{4}{3}\pi(\sqrt{50})^3$
$= \frac{1414.213562}{3}\pi$
$= 471.4045208\pi \text{ in}^3$
$\approx 1481 \text{ in}^3$

THE VOLUME OF THE SPHERE IS EXACTLY 471.4045208π in^3 AND APPROXIMATELY 1481 in^3.

c. A sphere has a volume of $457\frac{1}{3}\pi$ in^3. What is the radius of the sphere?

$V = 457\frac{1}{3}\pi$
$\frac{\frac{4}{3}\pi r^3}{\pi} = \frac{457\frac{1}{3}\pi}{\pi}$
$\frac{4}{3}r^3 = 457\frac{1}{3}$
$r^3 = 457\frac{1}{3} \times \frac{3}{4}$

$r^3 = \frac{1372}{3} \times \frac{3}{4}$
$r^3 = \frac{1372}{4}$
$r^3 = 343$
$\sqrt[3]{r^3} = \sqrt[3]{343}$
$r = 7$

THE RADIUS OF THE SPHERE IS 7 in.

© 2014 Common Core, Inc. Some rights reserved. commoncore.org
This work is licensed under a Creative Commons Attribution-NonCommercial-ShareAlike 3.0 Unported License.