

## Released Items Answer and Alignment Document

**Mathematics – Geometry****2019**

Item Number	Entity ID	Answer Key	Evidence Statement Key
1.	VH244455	B, C	G-SRT.6
2.	VH024886	Part A: B Part B: B Part C: B Part D: C	G-CO.C
3.	M41207	See Rubric	HS-D.3-4a
4.	VH176142	B, D, E	G-SRT.2
5.	M44766	$\sin T = \frac{9}{15}$ or $\sin T = \frac{3}{5}$	G-SRT.7-2
6.	VF657676	See Rubric	HS-C.13.3
7.	VF646567	3	G-GPE.1-1
8.	VH222235	A	G-SRT.2
9.	M40525	C	G-CO.3
10.	M41165	See Rubric	HS-C.14.1
11.	M40033	C	G-GPE.6
12.	2875-M42383	Part A: See Rubric Part B: See Rubric	HS-D.1-2

### #3 M41207 Rubric

Score	Description
<b>3</b>	<p>Student response includes each of the following 3 elements.</p> <ul style="list-style-type: none"> <li>• Correct value for <math>\theta</math> (<math>24.44^\circ</math> to <math>30.96^\circ</math>).</li> <li>• Shows valid calculations and reasoning to find <math>24.44^\circ</math> as the smallest value of <math>\theta</math></li> <li>• Shows valid calculations and reasoning to find <math>30.96^\circ</math> as the largest value of <math>\theta</math></li> </ul> <p>Alternately a student response may earn 1 point for each of the following:</p> <ul style="list-style-type: none"> <li>• Shows valid reasoning to find <math>24.44^\circ</math> as the smallest value of <math>\theta</math> and <math>30.96^\circ</math> as the largest value of <math>\theta</math>.</li> <li>• Shows valid calculations to find <math>24.44^\circ</math> as the smallest value of <math>\theta</math> and <math>30.96^\circ</math> as the largest value of <math>\theta</math>.</li> </ul> <p>Valid and complete calculations can also demonstrate reasoning with no further explanation needed.</p> <p>Sample Student Response:</p> <p>To determine <math>\theta</math>, use the tangent and the quotient <math>\frac{b}{a}</math>.</p> <p>The smallest estimate of <math>\theta</math> comes from the smallest value of <math>b</math> and the greatest value of <math>a</math>.</p> $\theta \approx \tan^{-1}\left(\frac{5}{11}\right)$ $\approx 24.44^\circ$ <p>The greatest estimate of <math>\theta</math> comes from the greatest value of <math>b</math> and the smallest value of <math>a</math>.</p> $\theta \approx \tan^{-1}\left(\frac{6}{10}\right)$ $\approx 30.96^\circ$ <p>Therefore, <math>\theta</math> can vary from <b><math>24.44^\circ</math></b> to <b><math>30.96^\circ</math></b>.</p> <p><b>Note:</b> It is acceptable to round a degree measure to the nearest ones place, since the side lengths of the triangle are only given to the nearest ones place.</p>
<b>2</b>	Student response includes 2 of the 3 above elements.
<b>1</b>	Student response includes 1 of the 3 above elements.
<b>0</b>	The response is incorrect or irrelevant.

### #6 VF657676 Rubric

Score	Description
<b>3</b>	<p>Student response includes each of the following 3 elements:</p> <ul style="list-style-type: none"><li>• <b>Computation component</b> = 1 point<ul style="list-style-type: none"><li>○ Correct equation of the line</li></ul></li></ul> <p>Sample Student Response: <math>y = \frac{2}{3}x - 1</math> or any equivalent equation of the line is acceptable, for example:</p> $(y - 1) = \frac{2}{3}(x - 3).$ <ul style="list-style-type: none"><li>• <b>Computation component</b> = 1 point<ul style="list-style-type: none"><li>○ Valid description about the shorter base of the trapezoid</li></ul></li></ul> <p>Sample Student Response:</p> <p>The student explains that the shorter base of a trapezoid is parallel to the longer base of the trapezoid, and therefore must have the same slope as the longer base. This implies that the student calculates the slope of the longer base.</p> <ul style="list-style-type: none"><li>• <b>Computation component</b> = 1 point<ul style="list-style-type: none"><li>○ Valid description of how the student created his or her equation</li></ul></li></ul> <p>Notes:</p> <ul style="list-style-type: none"><li>• Student must mention at least one of the formulas to receive credit.</li><li>• Parts should be scored independently. An error in one part but used correctly in another part should earn full credit on the second part.</li></ul>
<b>2</b>	Student response includes 2 of the 3 elements.
<b>1</b>	Student response includes 1 of the 3 elements.
<b>0</b>	The response is incorrect or irrelevant.

## #10 M41165 Rubric

Score	Description
<b>3</b>	<p>Student response includes each of the following 3 elements.</p> <ul style="list-style-type: none"> <li>• <b>Reasoning component</b> = 1 point</li> <li>• <b>Reasoning component</b> = 1 point <ul style="list-style-type: none"> <li>○ Correct reasoning that accurately uses geometric relationships and properties of lines, segments, angles, and triangles to prove that <math>\overline{XY}</math> and <math>\overline{AC}</math> are parallel (2 points)</li> </ul> </li> <li>• <b>Modeling component</b> = 1 point <ul style="list-style-type: none"> <li>○ Correct use of notation and vocabulary to support reasoning</li> </ul> </li> </ul> <p>Sample Student Response:</p> <p><math>\triangle XBY</math> and <math>\triangle ABC</math> are similar triangles. This follows from the SAS Triangle Similarity criterion.</p> $\angle B \cong \angle B \qquad \frac{BX}{BA} = \frac{1}{3} \qquad \frac{BY}{BC} = \frac{1}{3}$ <p>Therefore, <math>\angle BXY \cong \angle BAC</math>.</p> <p>If corresponding angles resulting from two lines cut by a transversal are congruent, then the lines are parallel. Therefore, <math>\overline{XY}</math> and <math>\overline{AC}</math> are parallel.</p> <p>Note: When a student references Angle Y, scorers are to assume Angle BYX, and when a student references Angle X, scorers are to assume Angle BXY.</p>
<b>2</b>	Student attempts to write a logical proof and works with similar triangles but makes mistakes in notation, logic, and steps in justification.
<b>1</b>	Student attempts to write a proof but does not show much ability to write a logical argument with reasons or justification.
<b>0</b>	The response is incorrect or irrelevant.

**#12 2875-M42383 Rubric Part A**

<b>Score</b>	<b>Description</b>
<b>4</b>	<p>Student response includes each of the following 4 elements:</p> <ul style="list-style-type: none"><li>• Correct determination of the desired volume for the fish tank, which is approximately 13.369 cubic feet.</li><li>• Correct recognition that units must be converted in order to make them consistent throughout calculations, and correct conversions to achieve that goal.</li><li>• Correct application of the volume formula for a rectangular prism.</li><li>• Correct calculations that lead to the correct height for the fish tank, which is 23.772 inches.</li></ul> <p>Sample Student Response:</p> <p>Since the desired capacity of the fish tank is 100 gallons, and 7.48 gallons of water are equivalent to 1 cubic foot, the desired volume of the fish tank is <math>(100 \div 7.48)</math> cubic feet, or approximately 13.369 cubic feet.</p> <p>The desired volume is stated as a number of cubic feet so the known dimensions of the fish tank must be converted from inches to feet.</p> $\begin{aligned} \text{length} &= 54 \text{ inches} = 4.5 \text{ feet} \\ \text{width} &= 18 \text{ inches} = 1.5 \text{ feet} \end{aligned}$ <p>The formula for the volume <math>V</math> of a rectangular prism with length <math>\ell</math>, width <math>w</math>, and height <math>h</math> is <math>V = \ell wh</math>. Substitute the known dimensions into the formula and solve for <math>h</math>.</p> $\begin{aligned} V &= \ell wh \\ 13.369 &\approx 4.5 \times 1.5 \times h \\ 13.369 &\approx 6.75h \\ h &\approx 1.981 \end{aligned}$ <p>So the height of the fish tank should be approximately 1.981 feet. This is equivalent to 23.772 inches.</p> <p>Note: Correct variations of the answers may result due to rounding during calculations. In Part A, Element 1 has an acceptable range of 13.36 – 13.4 and Element 4 has an acceptable range of 23.767 – 23.822.</p>
<b>3</b>	Student response includes 3 of the 4 elements.

<b>2</b>	Student response includes 2 of the 4 elements.
<b>1</b>	Student response includes 1 of the 4 elements.
<b>0</b>	The response is incorrect or irrelevant.

**#12 2875-M42383 Rubric Part B**

<b>Score</b>	<b>Description</b>
<b>2</b>	<p>Student response includes each of the following 2 elements: Correct weight of the fish tank when empty, which is 265.774 pounds. Correct cost to ship the fish tank, which is \$66.44.</p> <p>Sample Student Response:</p> <p>Find the volume of the completed fish tank using <math>V = \ell wh</math>, which is the formula for the volume <math>V</math> of a rectangular prism with length <math>\ell</math>, width <math>w</math>, and height <math>h</math>. Substitute the known dimensions of the fish tank into the formula and solve for <math>V</math>.</p> $V = \ell wh$ $V = 4.5 \times 1.5 \times 1.981$ $V = 13.369$ <p>So the volume of the fish tank is 13.369 cubic feet, and this will be the volume of the water when the fish tank is filled to capacity. Use the fact that one cubic foot of water weighs 62.4 pounds to find the weight of the water.</p> $\text{Weight of water} = 13.369 \text{ cubic feet} \times 62.4 \text{ pounds} / 1 \text{ cubic foot} = 834.226 \text{ pounds}$ <p>Subtract the weight of the water alone from the combined weight of the water and fish tank to find the weight of the fish tank alone.</p> $1,100 \text{ pounds} - 834.226 \text{ pounds} = 265.774 \text{ pounds}$ <p>Multiply the weight of the fish tank alone by the per-pound shipping cost to find the total cost of shipping.</p> $265.774 \text{ pounds} \times \$0.25 / 1 \text{ pound} = \$66.44$ <p>Therefore, the total cost to ship the fish tank when it is empty will be \$66.44.</p> <p>Note: Correct variations of the answers may result due to rounding during calculations. In Part B, Element 1 has an acceptable range of 263.84 – 265.78 and Element 2 has an acceptable range of \$65.96 - \$66.45.</p>

<b>1</b>	Student response includes 1 of the 2 elements.
<b>0</b>	The response is incorrect or irrelevant.