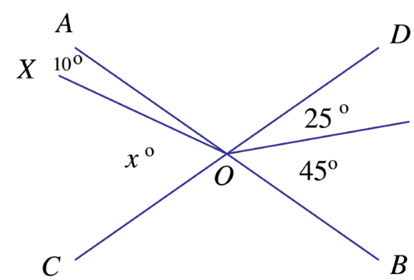
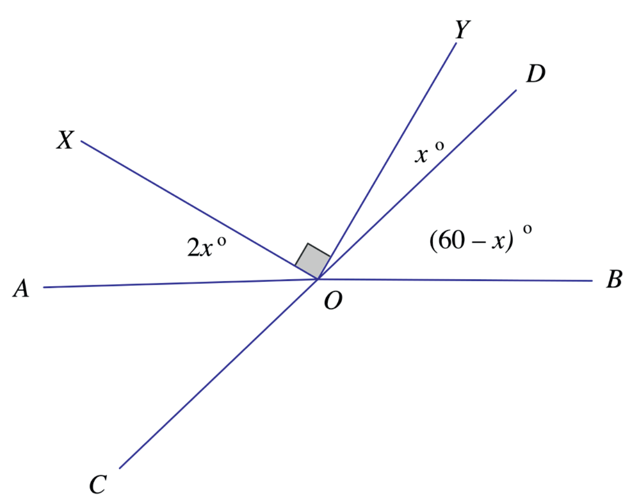
Name ______________________________ Date ____________

1. In the following two questions, lines AB and CD intersect at point O. When necessary, assume that seemingly straight lines are indeed straight lines. Determine the measures of the indicated angles.

   a. Find the measure of $\angle XOC$.



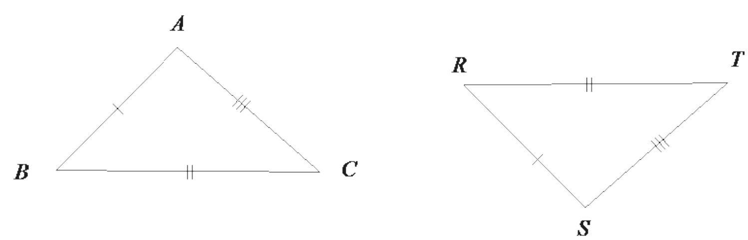
   b. Find the measures of $\angle AOX$, $\angle YOD$, and $\angle DOB$.



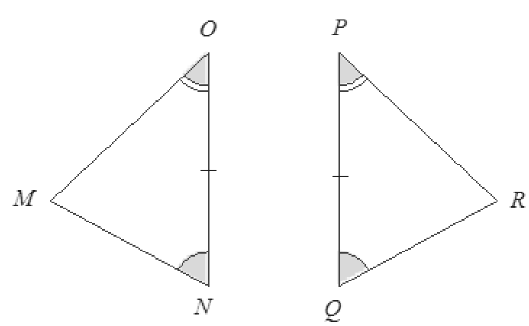
2. Is it possible to draw two different triangles that both have angle measurements of $40°$ and $50°$ and a side length of 5 cm? If it is possible, draw examples of these conditions, and label all vertices and angle and side measurements. If it is not possible, explain why.

3. In each of the following problems, two triangles are given. For each: (1) State if there are sufficient or insufficient conditions to show the triangles are identical, and (2) explain your reasoning.

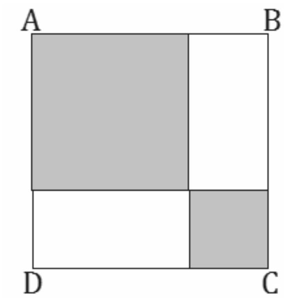
a.



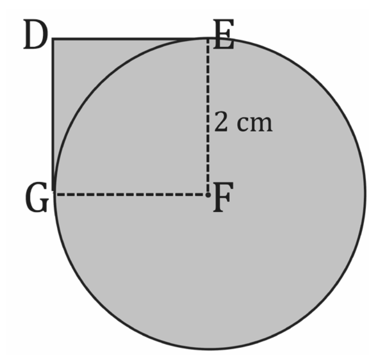
b.



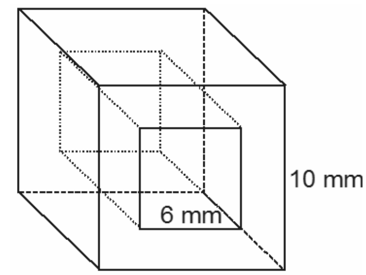
4. In the following diagram, the length of one side of the smaller shaded square is $\frac{1}{3}$ the length of square $ABCD$. What percent of square $ABCD$ is shaded? Provide all evidence of your calculations.



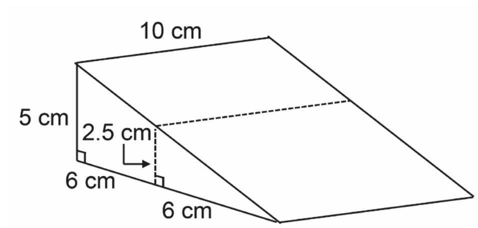
5. Side $\overline{EF}$ of square $DEFG$ has a length of 2 cm and is also the radius of circle F. What is the area of the entire shaded region? Provide all evidence of your calculations.



6. For his latest design, a jeweler hollows out crystal cube beads (like the one in the diagram) through which the chain of a necklace is threaded. If the edge of the crystal cube is 10 mm, and the edge of the square cut is 6 mm, what is the volume of one bead? Provide all evidence of your calculations.

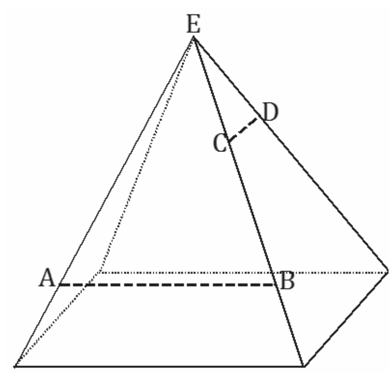


7. John and Joyce are sharing a piece of cake with the dimensions shown in the diagram. John is about to cut the cake at the mark indicated by the dotted lines. Joyce says this cut will make one of the pieces three times as big as the other. Is she right? Justify your response.



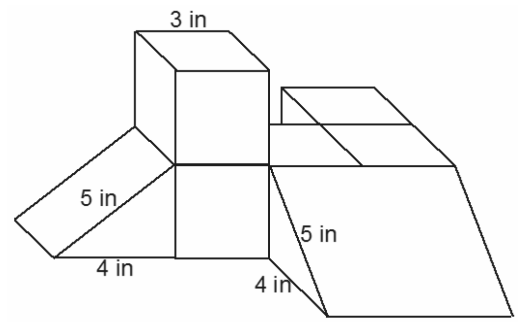
8. A tank measures 4 ft. in length, 3 ft. in width, and 2 ft. in height. It is filled with water to a height of 1.5 ft. A typical brick measures a length of 9 in., a width of 4.5 in., and a height of 3 in. How many whole bricks can be added before the tank overflows? Provide all evidence of your calculations.

9. Three vertical slices perpendicular to the base of the right rectangular pyramid are to be made at the marked locations: (1) through $\overline{AB}$, (2) through $\overline{CD}$, and (3) through vertex E. Based on the relative locations of the slices on the pyramid, make a reasonable sketch of each slice. Include the appropriate notation to indicate measures of equal length.



(1) Slice through $\overline{AB}$	(2) Slice through $\overline{CD}$	(3) Slice through vertex E

10. Five three-inch cubes and two triangular prisms have been glued together to form the composite three-dimensional figure shown in the diagram. Find the surface area of the figure, including the base. Provide all evidence of your calculations.



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** **7.G.B.5**	Student correctly sets up the equation to solve the problem, but no further supporting work is shown.	Student finds an incorrect value due to conceptual error (e.g., an equation that does not reflect the angle relationship), but complete supporting work is shown.	Student finds an incorrect value due to a calculation error, but complete supporting work is shown.	Student finds $\angle XOC = 60°$, and complete supporting work is shown.
	b **7.G.B.5**	Student correctly sets up the equations to solve for the angles, but no further supporting work is shown.	Student finds the correct value for one angle and shows complete supporting work, but a calculation error leads to one incorrect answer.	Student finds the correct values for two angles and shows complete supporting work, but a calculation error leads to one incorrect answer.	Student finds $\angle AOX = 30°$, $\angle YOD = 15°$, and $\angle DOB = 45°$, and complete supporting work is shown.
2	**7.G.A.2**	Student states that it is not possible to construct two different triangles under the given conditions, or two identical triangles are constructed.	Student correctly constructs two different triangles according to the given conditions, but they are missing measurement and/or vertex labels.	Student constructs two different triangles that are appropriately labeled, but the corresponding angle measurements are not exactly equal and off within 3° of the given conditions.	Student correctly constructs two different triangles according to the given conditions, and they are appropriately labeled.

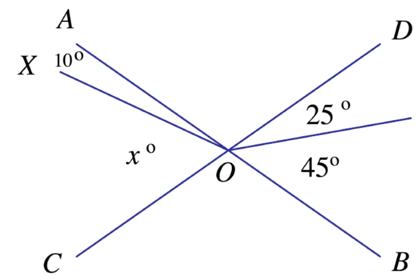
3	a 7.G.A.2	Student does not provide a response. OR Student fails to provide evidence of comprehension.	Student correctly identifies triangles as identical or not identical, but no further evidence is provided.	Student correctly identifies triangles as identical or not identical but with the incorrect supporting evidence, such as giving the incorrect condition by which they are identical.	Student correctly identifies triangles as identical or not identical and supports this answer, such as giving the condition by which they are identical or the information that prevents them from being identical.
	b 7.G.A.2	Student does not provide a response. OR Student fails to provide evidence of comprehension.	Student correctly identifies triangles as identical or not identical, but no further evidence is provided.	Student correctly identifies triangles as identical or not identical but with the incorrect supporting evidence, such as giving the incorrect condition by which they are identical.	Student correctly identifies triangles as identical or not identical and supports this answer, such as giving the condition by which they are identical or the information that prevents them from being identical.
4	7.G.B.6	Student incorrectly calculates the percentage of the shaded area due to a combination of at least one conceptual and one calculation error or due to more than one conceptual or calculation error.	Student incorrectly calculates the percentage of the shaded area due to one conceptual error (e.g., taking the incorrect values by which to calculate percentage), but all other supporting work is correct.	Student incorrectly calculates the percentage of the shaded area due to one calculation error (e.g., not summing both shaded areas), but all other supporting work is correct.	Student correctly finds $55\frac{5}{9}\%$ as the percentage of the shaded area, and complete evidence of calculations is shown.
5	7.G.B.6	Student incorrectly calculates the shaded area due to a combination of at least one conceptual and one calculation error OR due to more than one conceptual or calculation error.	Student incorrectly calculates the shaded area due to one conceptual error (e.g., taking the incorrect fraction of the area of the circle to add to the area of the square), but all other supporting work is correct.	Student incorrectly calculates the shaded area due to one calculation error (e.g., making an error in taking a fraction of 4π), but all other supporting work is correct.	Student correctly finds the shaded area to be either $4\text{ cm}^2 + 3\pi\text{ cm}^2$, or approximately 13.4 cm^2, and complete evidence of calculations is shown.
6	7.G.B.6	Student incorrectly finds the volume due to one or more calculation errors or a combination of calculation and conceptual errors.	Student incorrectly finds the volume due to one conceptual error (e.g., calculating the volume of the hollow as a cube rather than as a rectangular prism), but all other supporting work is correct.	Student incorrectly finds the volume due to one calculation error (e.g., an arithmetic error), but all other supporting work is correct.	Student correctly finds the volume of the bead to be 640 mm^3, and complete evidence of calculations is shown.

7	7.G.B.6	Student incorrectly finds the volume due to one or more calculation errors or a combination of calculation and conceptual errors.	Student incorrectly finds the volume due to one conceptual error (e.g., using the wrong formula for the volume of a trapezoidal prism), but all other supporting work is correct.	Student incorrectly finds the volume due to one calculation error (e.g., an arithmetic error), but all other supporting work is correct.	Student correctly finds the volume of the trapezoidal prism to be 225 cm^3 and the volume of the triangular prism to be 75 cm^3, and the larger piece is shown to be 3 times as great as the smaller piece.
8	7.G.B.3 7.G.B.6	Student incorrectly finds the number of bricks due to one or more calculation errors or a combination of calculation and conceptual errors.	Student incorrectly finds the number of bricks due to a calculation error (e.g., using the volume of water rather than the volume of the unfilled tank), but all other supporting work is correct.	Student incorrectly finds the number of bricks due to one calculation error (e.g., a rounding error), but all other supporting work is correct.	Student correctly finds that 85 bricks can be put in the tank without the tank overflowing and offers complete evidence of calculations.
9	7.G.B.6	Student does not appropriately sketch two relative trapezoids according to their relative positions on the pyramid, and an isosceles triangle is not made for the slice through the vertex.	Student sketches two relative trapezoids appropriately but does not sketch an isosceles triangle as a slice through the vertex.	Student makes three sketches but does not indicate lengths of equal measure.	Student makes three sketches that indicate appropriate slices at the given locations on the pyramid and indicates the lengths of equal measure.
10	7.G.B.6	Student incorrectly finds the surface area due to more than one calculation error or a combination of calculation and conceptual errors.	Student incorrectly finds the surface area due to a conceptual error (e.g., mistaking which measure to use in computation).	Student incorrectly finds the surface area due to a calculation error, such as an arithmetic error.	Student correctly calculates the surface area to be 276 in^2, and complete evidence of calculations is shown.

Name ______________________________ Date ______________

1. In the following two questions, lines AB and CD intersect at point O. When necessary, assume that seemingly straight lines are indeed straight lines. Determine the measures of the indicated unknown angles.

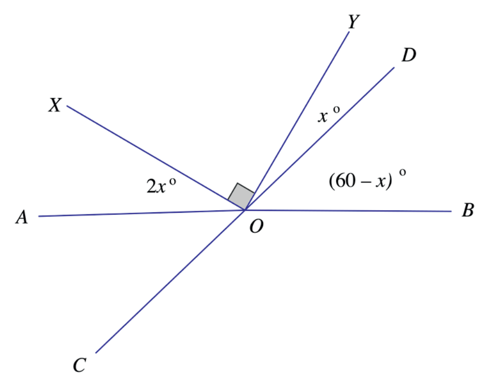
   a. Find the measure of $\angle XOC$.



$$x + 10 = 25 + 45$$
$$x + 10 - 10 = 70 - 10$$
$$x = 60$$

$\angle XOC = 60°$

   b. Find the measures of $\angle AOX$, $\angle YOD$, and $\angle DOB$.

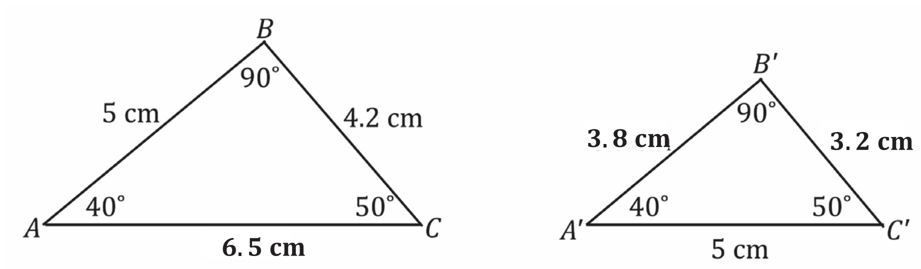


$$2x + 90 + x + (60 - x) = 180$$
$$2x + 150 - 150 = 180 - 150$$
$$2x = 30$$
$$\frac{1}{2}(2x) = \frac{1}{2}(30)$$
$$x = 15$$

$\angle AOX = 2(15)° = 30°$
$\angle YOD = 15°$
$\angle DOB = (60 - 15)° = 45°$

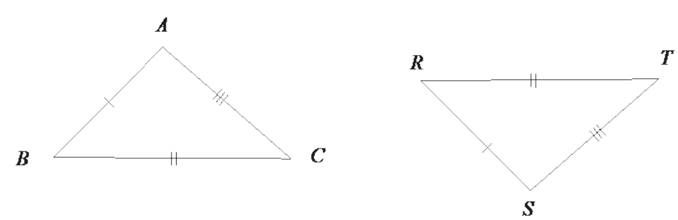
2. Is it possible to draw two different triangles that both have angle measurements of $40°$ and $50°$ and a side length of 5 cm? If it is possible, draw examples of these conditions, and label all vertices and angle and side measurements. If it is not possible, explain why.

One possible solution:

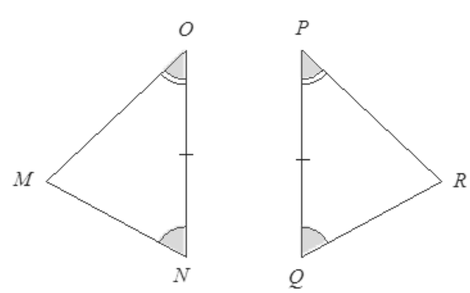


3. In each of the following problems, two triangles are given. For each: (1) State if there are sufficient or insufficient conditions to show the triangles are identical, and (2) explain your reasoning.

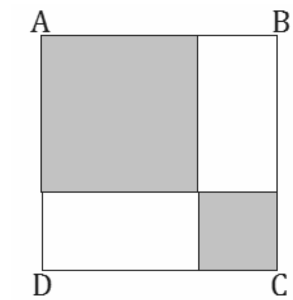
a. *The triangles are identical by the three sides condition.* $\triangle ABC \leftrightarrow \triangle SRT$



b. *The triangles are identical by the two angles and included side condition. The marked side is between the given angles.* $\triangle MNO \leftrightarrow \triangle RQP$



4. In the following diagram, the length of one side of the smaller shaded square is $\frac{1}{3}$ the length of square $ABCD$. What percent of square $ABCD$ is shaded? Provide all evidence of your calculations.



Let x be the length of the side of the smaller shaded square. Then AD = 3x; the length of the side of the larger shaded square is $3x - x = 2x$.

$\text{Area}_{ABCD} = (3x)^2 = 9x^2$

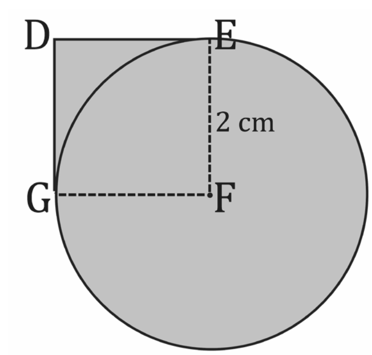
$\text{Area}_{\text{Large Shaded}} = (2x)^2 = 4x^2$

$\text{Area}_{\text{Small Shaded}} = (x)^2 = x^2$

$\text{Area}_{\text{Shaded}} = 4x^2 + x^2 = 5x^2$

$\text{Percent Area}_{\text{Shaded}} = \frac{5x^2}{9x^2}(100\%) = 55\frac{5}{9}\%$

5. Side $\overline{EF}$ of square $DEFG$ has a length of 2 cm and is also the radius of circle F. What is the area of the entire shaded region? Provide all evidence of your calculations.



$\text{Area}_{\text{Circle } F} = (\pi)(2\text{ cm})^2 = 4\pi\text{ cm}^2$

$\text{Area}_{\frac{3}{4}\text{Circle } F} = \frac{3}{4}(4\pi\text{ cm}^2) = 3\pi\text{ cm}^2$

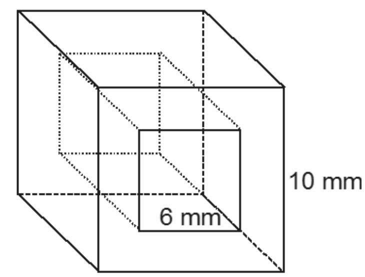
$\text{Area}_{DEFG} = (2\text{ cm})(2\text{ cm}) = 4\text{ cm}^2$

$\text{Area}_{\text{Shaded Region}} = 4\text{ cm}^2 + 3\pi\text{ cm}^2$

$\text{Area}_{\text{Shaded Region}} \approx 13.4\text{ cm}^2$

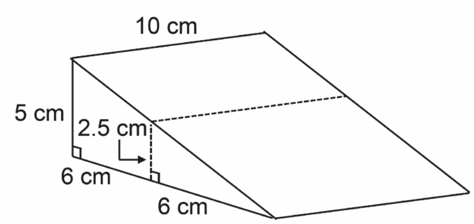
6. For his latest design, a jeweler hollows out crystal cube beads (like the one in the diagram) through which the chain of a necklace is threaded. If the edge of the crystal cube is 10 mm, and the edge of the square cut is 6 mm, what is the volume of one bead? Provide all evidence of your calculations.

$\text{Volume}_{\text{Large Cube}} = (10 \text{ mm})^3 = 1{,}000 \text{ mm}^3$
$\text{Volume}_{\text{Hollow}} = (10 \text{ mm})(6 \text{ mm})(6 \text{ mm}) = 360 \text{ mm}^3$
$\text{Volume}_{\text{Bead}} = 1{,}000 \text{ mm}^3 - 360 \text{ mm}^3 = 640 \text{ mm}^3$



7. John and Joyce are sharing a piece of cake with the dimensions shown in the diagram. John is about to cut the cake at the mark indicated by the dotted lines. Joyce says this cut will make one of the pieces three times as big as the other. Is she right? Justify your response.

$\text{Volume}_{\text{Trapezoidal Prism}} = \frac{1}{2}(5 \text{ cm} + 2.5 \text{ cm})(6 \text{ cm})(10 \text{ cm}) = 225 \text{ cm}^3$
$\text{Volume}_{\text{Triangular Prism}} = \frac{1}{2}(2.5 \text{ cm})(6 \text{ cm})(10 \text{ cm}) = 75 \text{ cm}^3$



Joyce is right; the current cut would give 225 cm^3 of cake for the trapezoidal prism piece and 75 cm^3 of cake for the triangular prism piece, making the larger piece 3 times the size of the smaller piece ($\frac{225}{75} = 3$).

8. A tank measures 4 ft. in length, 3 ft. in width, and 2 ft. in height. It is filled with water to a height of 1.5 ft. A typical brick measures a length of 9 in., a width of 4.5 in., and a height of 3 in. How many whole bricks can be added before the tank overflows? Provide all evidence of your calculations.

Volume in tank not occupied by water:

$V = (4 \text{ ft.})(3 \text{ ft.})(0.5 \text{ ft.}) = 6 \text{ ft}^3$

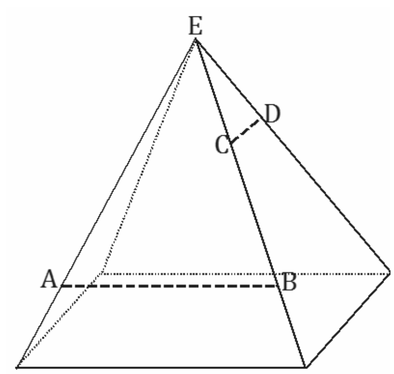
$\text{Volume}_{\text{Brick}} = (9 \text{ in.})(4.5 \text{ in.})(3 \text{ in.}) = 121.5 \text{ in}^3$

Conversion (in³ to ft³): $(121.5 \text{ in}^3)\left(\frac{1 \text{ ft}^3}{12^3 \text{ in}^3}\right) = 0.0703125 \text{ ft}^3$

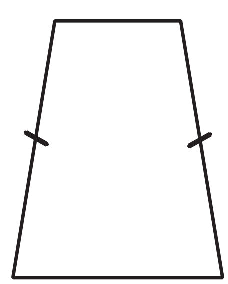
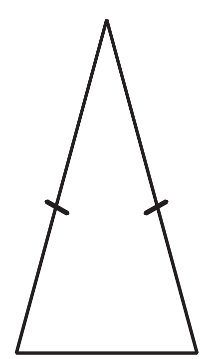
Number of bricks that fit in the volume not occupied by water: $\left(\frac{6 \text{ ft}^3}{0.0703125 \text{ ft}^3}\right) = 85\frac{1}{3}$

Number of whole bricks that fit without causing overflow: 85

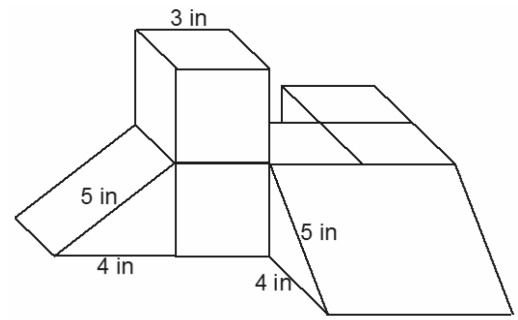
9. Three vertical slices perpendicular to the base of the right rectangular pyramid are to be made at the marked locations: (1) through $\overline{AB}$, (2) through $\overline{CD}$, and (3) through vertex E. Based on the relative locations of the slices on the pyramid, make a reasonable sketch of each slice. Include the appropriate notation to indicate measures of equal length.



Sample response:

(1) Slice through $\overline{AB}$	(2) Slice through $\overline{CD}$	(3) Slice through vertex E
		

10. Five three-inch cubes and two triangular prisms have been glued together to form the composite three-dimensional figure. Find the surface area of the figure, including the base. Provide all evidence of your calculations.



19 square surfaces: $19(3 \text{ in.})^2 = 171 \text{ in}^2$

4 triangular surfaces: $(4)\left(\frac{1}{2}\right)(3 \text{ in.})(4 \text{ in.}) = 24 \text{ in}^2$

3×5 rectangular surface: $(3 \text{ in.})(5 \text{ in.}) = 15 \text{ in}^2$

3×4 rectangular surface: $(3 \text{ in.})(4 \text{ in.}) = 12 \text{ in}^2$

6×5 rectangular surface: $(6 \text{ in.})(5 \text{ in.}) = 30 \text{ in}^2$

6×4 rectangular surface: $(6 \text{ in.})(4 \text{ in.}) = 24 \text{ in}^2$

Total surface area: $171 \text{ in}^2 + 24 \text{ in}^2 + 15 \text{ in}^2 + 12 \text{ in}^2 + 30 \text{ in}^2 + 24 \text{ in}^2 = 276 \text{ in}^2$