COMMUNITY LEARNING CENTER LESSON PLAN

Level *(preGED or GED):* GED

Content Area *(RLA, Math, Science, Social Studies):* Math

General Topic: Geometry

Specific Lesson Title: Surface Area and Volume of pyramids, cones, spheres, and composite solids (Lesson 15)

Estimated Time: 180 minutes

Anchor(s) & Level(s)	CCR Standards CCRS Level D: Geometry • Solve real-world and mathematical problems involving area, volume and surface area of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms. GED Assessment Anchors Q.5.d When given geometric formulas, compute volume and surface area of right pyramids and cones. Solve for side lengths, height, radius, or diameter when given volume or surface area. Q.5.e When given geometric formulas, compute volume and surface area of spheres. Solve for radius or diameter when given the surface area. Q.5.f Compute surface area and volume of composite 3-D geometric figures, given geometric formulas as needed.	*Practice(s)*	MP 3

SWBAT:

- Define and identify right pyramids, cones, and spheres.
- Find surface area and volume of right pyramids, cones, and spheres.
- Given volume or surface area, solve for side length, height, radius, or diameter.
- Find surface area and volume of composite solid geometric figures

Kaplan New GED Test Strategies, Practice, and Review

Steck-Vaughn GED: Test Preparation Student Workbook Mathematical Reasoning

TI-30xs MultiView calculators

GED Mathematics formula sheet: http://www.gedtestingservice.com/uploads/files/0756c16704434ff71e43c8117a5fa738.pdf

Surface area of mixed solids worksheet:
http://cdn.kutasoftware.com/Worksheets/PreAlg/Surface%20Area%20of%20Solids.pdf

Volume of mixed solids worksheet: http://cdn.kutasoftware.com/Worksheets/PreAlg/Volumes%20of%20Solids.pdf

Printable surface area worksheets for various shapes included in the lesson, including composite solids:
http://www.mathworksheets4kids.com/surface-area.php

Printable volume worksheets for various shapes included in the lesson, including composite solids:
http://www.mathworksheets4kids.com/volume.php

Teacher/Developer: [Type text] Date: [Type text]

What will the learners do?)

Pre-lesson activities (30 minutes)

1) Review homework and answer questions. Discuss problems from exit ticket that students had trouble with.

Lesson (2 hours plus 10 minute break)

2) Surface area and volume of pyramids, cones, and spheres

   Direct students to appropriate formulas and discuss. Demonstrate calculation of volume and surface area with each of the three shapes.

   Demonstrate solving for height, radius, or side length when volume or surface area are given (ex. Steck-Vaungh p. 154 #1-2, 6-7)

   Provide time for guided practice. Ask students to discuss and explain thought process in solving the problem. Suggested resources:

   Kaplan p. 391

   Steck-Vaughn p. 154-157

   Surface area of mixed solids worksheet:
   http://cdn.kutasoftware.com/Worksheets/PreAlg/Surface%20Area%20of%20Solids.pdf

   Printable surface area worksheets for various shapes included in the lesson
   http://www.mathworksheets4kids.com/surface-area.php

   Printable volume worksheets for various shapes included in the lesson
   http://www.mathworksheets4kids.com/volume.php

3) Surface area and volume of composite solids

   Discuss composite solids – provide visual model if possible. Discuss strategy of dividing composite solid into known geometric figures to find volume, and strategy of subtracting overlapping areas to find surface area.

   Kaplan p. 397

   Steck-Vaughn p. 158-161

   Printable surface area worksheets (scroll down for composite solids)
   http://www.mathworksheets4kids.com/surface-area.php

   Printable volume worksheets (scroll down for composite solids)
   http://www.mathworksheets4kids.com/volume.php

4) Geometry review

   Have students complete the geometry review in Kaplan p. 400-402, or provide another mixed review of geometry concepts learned. You can choose to approach this as an opportunity for further guided practice or as an assessment where students work independently.

Closure (20 minutes)

- Ask students to recap vocabulary and concepts learned today.
- Assign homework
- Collect work completed on geometry review

ASSESSMENT ACTIVITIES ***(How will you know that the learners have met the objectives for this lesson?)***

Q.1.b. Perform addition, subtraction, multiplication, and division on rational numbers.

- check geometry review.

HOMEWORK

Finish any guided practice not completed during class.

Teacher/Developer: [Type text] Date: [Type text]

Mathematics Formula Sheet & Explanation

The 2014 GED® Mathematical Reasoning test contains a formula sheet, which displays formulas relating to geometric measurement and certain algebra concepts. Formulas are provided to test-takers so that they may focus on *application*, rather than the *memorization*, of formulas.

Area of a:

square	$A = s^2$
rectangle	$A = lw$
parallelogram	$A = bh$
triangle	$A = \frac{1}{2}bh$
trapezoid	$A = \frac{1}{2}h(b_1 + b_2)$
circle	$A = \pi r^2$

Perimeter of a:

square	$P = 4s$
rectangle	$P = 2l + 2w$
triangle	$P = s_1 + s_2 + s_3$
Circumference of a circle	$C = 2\pi r$ OR $C = \pi d$; $\pi \approx 3.14$

Surface area and volume of a:

rectangular prism	$SA = 2lw + 2lh + 2wh$	$V = lwh$
right prism	$SA = ph + 2B$	$V = Bh$
cylinder	$SA = 2\pi rh + 2\pi r^2$	$V = \pi r^2 h$
pyramid	$SA = \frac{1}{2}ps + B$	$V = \frac{1}{3}Bh$
cone	$SA = \pi rs + \pi r^2$	$V = \frac{1}{3}\pi r^2 h$
sphere	$SA = 4\pi r^2$	$V = \frac{4}{3}\pi r^3$

(p = perimeter of base with area B; $\pi \approx 3.14$)

Data

mean	mean is equal to the total of the values of a data set, divided by the number of elements in the data set
median	median is the middle value in an odd number of ordered values of a data set, or the mean of the two middle values in an even number of ordered values in a data set

Algebra

slope of a line	$m = \frac{y_2 - y_1}{x_2 - x_1}$
slope-intercept form of the equation of a line	$y = mx + b$
point-slope form of the equation of a line	$y - y_1 = m(x - x_1)$
standard form of a quadratic equation	$y = ax^2 + bx + c$
quadratic formula	$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
Pythagorean theorem	$a^2 + b^2 = c^2$
simple interest	$I = Prt$ (I = interest, P = principal, r = rate, t = time)
distance formula	$d = rt$
total cost	total cost = (number of units) × (price per unit)

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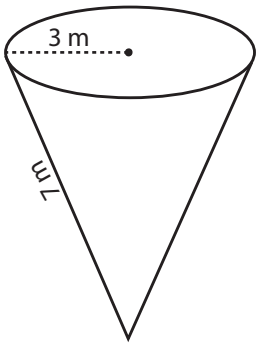
Name : _____ Score : _____

ES1

Surface Area - Cone

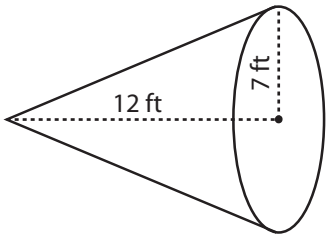
Find the surface area of each cone. Round the answer to nearest tenth. (use π = 3.14)

1)



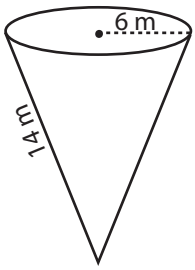
Surface Area = _____

2)



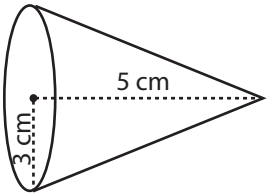
Surface Area = _____

3)



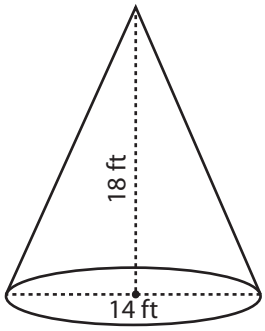
Surface Area = _____

4)



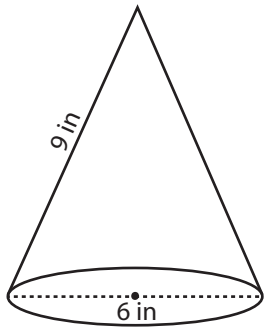
Surface Area = _____

5)



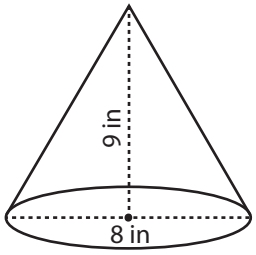
Surface Area = _____

6)



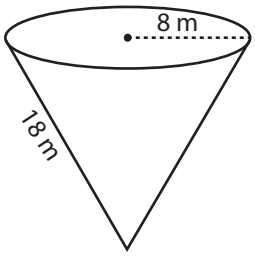
Surface Area = _____

7)



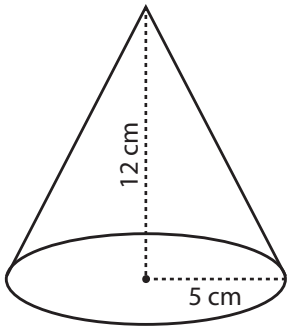
Surface Area = _____

8)



Surface Area = _____

9)



Surface Area = _____

Name : _____ Score : _____

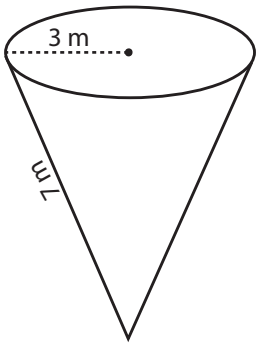
Answer key

Surface Area - Cone

ES1

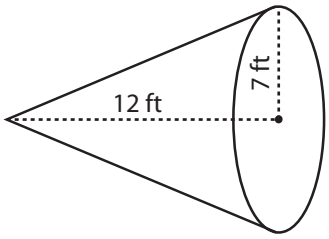
Find the surface area of each cone. Round the answer to nearest tenth. (use π = 3.14)

1)



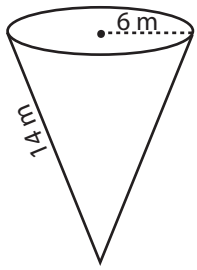
Surface Area = **94.2 m²**

2)



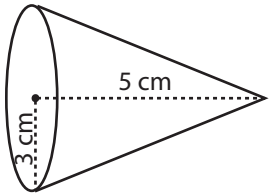
Surface Area = **459.2 ft²**

3)



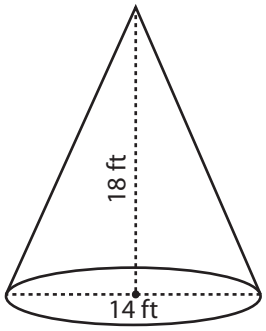
Surface Area = **376.8 m²**

4)



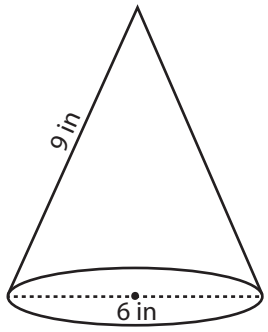
Surface Area = **83.2 cm²**

5)



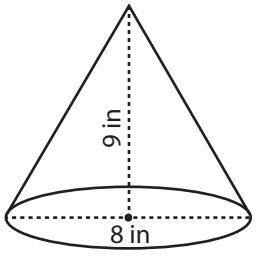
Surface Area = **578.4 ft²**

6)



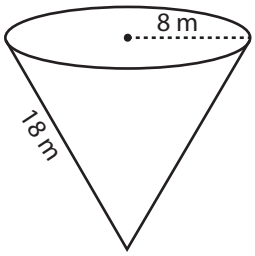
Surface Area = **113 in²**

7)



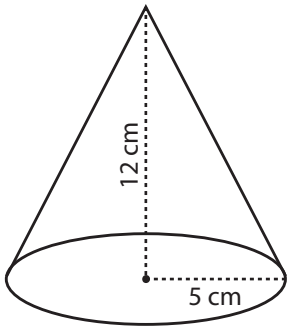
Surface Area = **173.9 in²**

8)



Surface Area = **653.1 m²**

9)



Surface Area = **282.6 cm²**

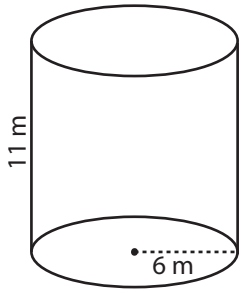
Name : _____ Score : _____

ES1

Volume - Cylinder

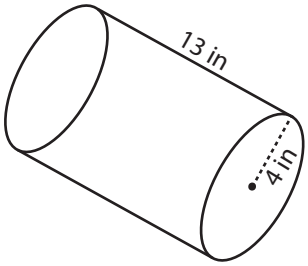
Find the exact volume of each cylinder.

1)



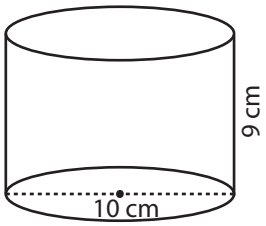
Volume = _____

2)



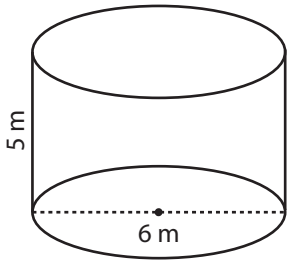
Volume = _____

3)



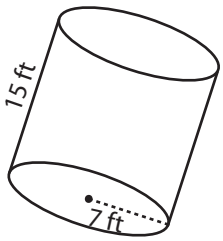
Volume = _____

4)



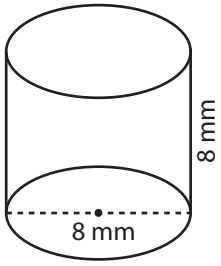
Volume = _____

5)



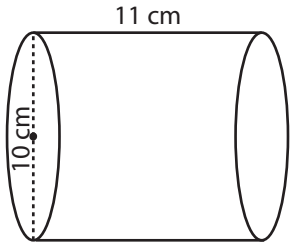
Volume = _____

6)



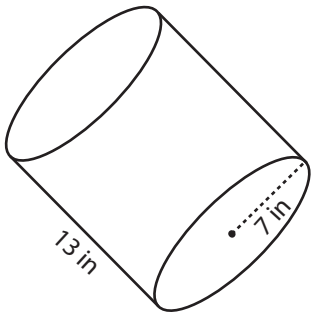
Volume = _____

7)



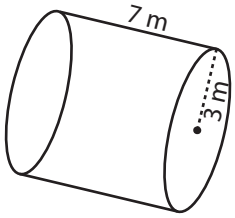
Volume = _____

8)



Volume = _____

9)



Volume = _____

10) The cross-section of a pipe has a width of 6 centimeter and height of 15 centimeter. Calculate the volume of the pipe.

Volume = _____

Name : _____ Score : _____

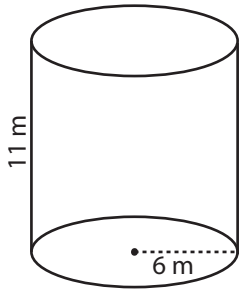
Answer Key

ES1

Volume - Cylinder

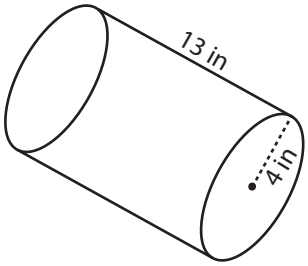
Find the exact volume of each cylinder.

1)



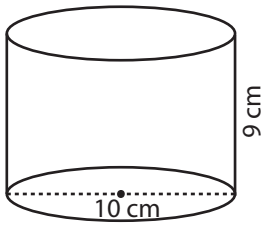
Volume = **396π m³**

2)



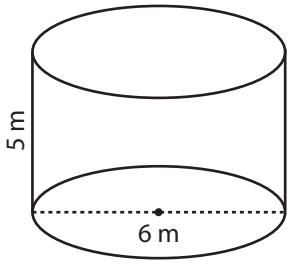
Volume = **208π in³**

3)



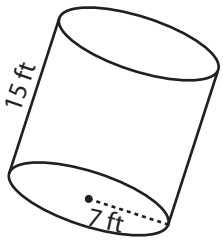
Volume = **225π cm³**

4)



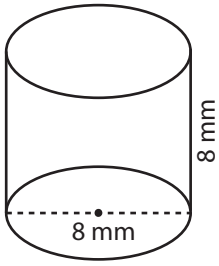
Volume = **45π m³**

5)



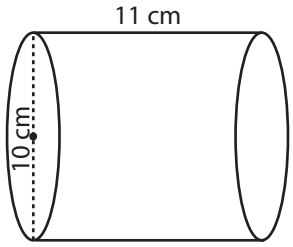
Volume = **735π ft³**

6)



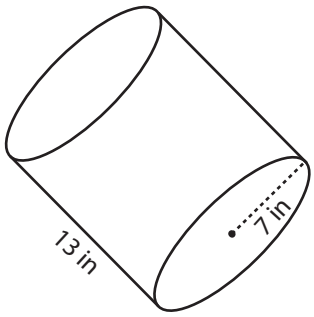
Volume = **128π mm³**

7)



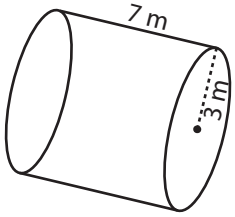
Volume = **275π cm³**

8)



Volume = **637π in³**

9)



Volume = **63π m³**

10) The cross-section of a pipe has a width of 6 centimeter and height of 15 centimeter. Calculate the volume of the pipe.

Volume = **135π cm³**

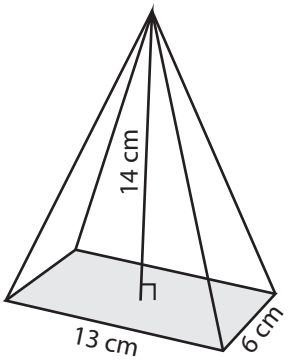
Name : _____ Score : _____

Sheet 1

Volume of Rectangular Pyramid

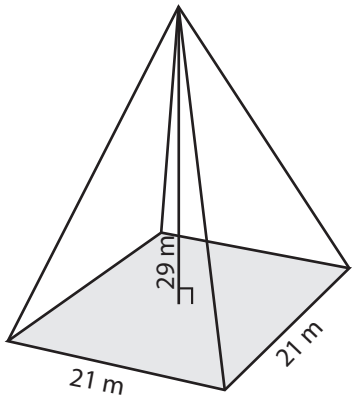
Find the volume of each rectangular pyramid. Round the answer to two decimal places.

1)



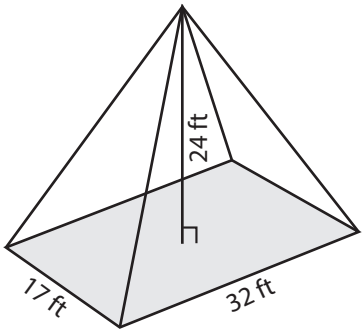
Volume = _____

2)



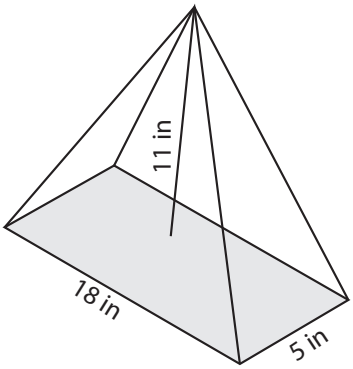
Volume = _____

3)



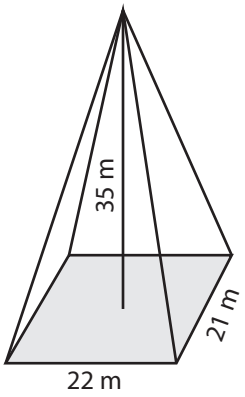
Volume = _____

4)



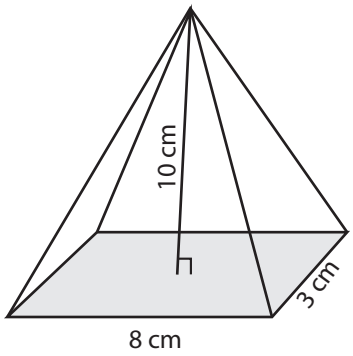
Volume = _____

5)



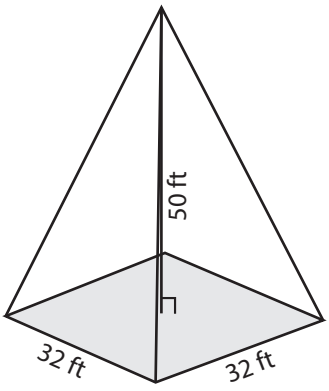
Volume = _____

6)



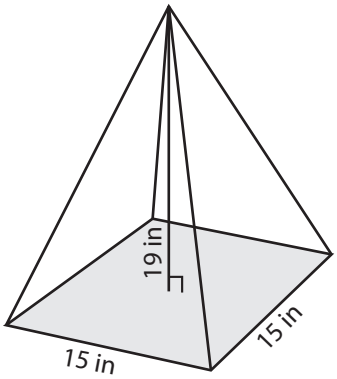
Volume = _____

7)



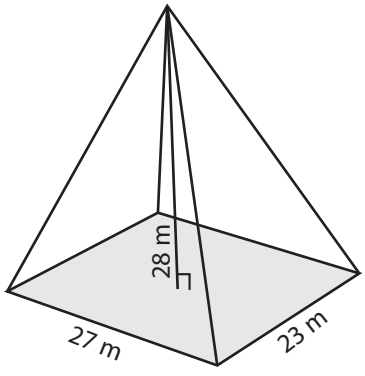
Volume = _____

8)



Volume = _____

9)



Volume = _____

Name : _____ Score : _____

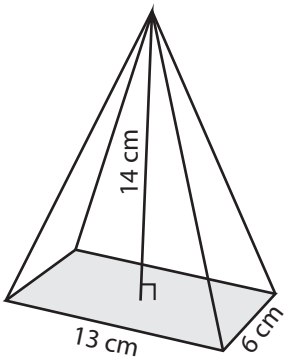
Answer Key

Sheet 1

Volume of Rectangular Pyramid

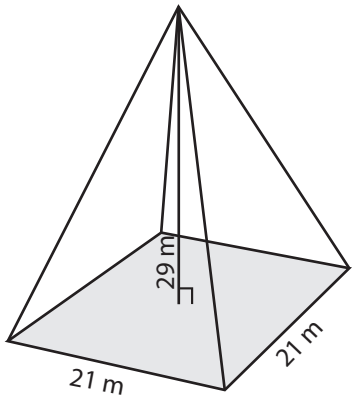
Find the volume of each rectangular pyramid. Round the answer to two decimal places.

1)



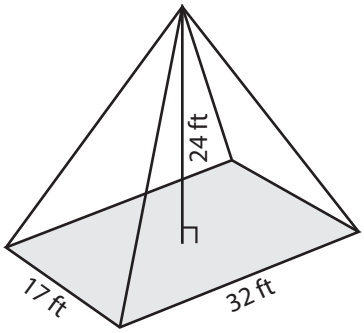
Volume = **364 cm³**

2)



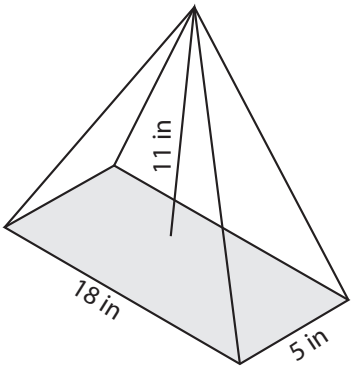
Volume = **4263 m³**

3)



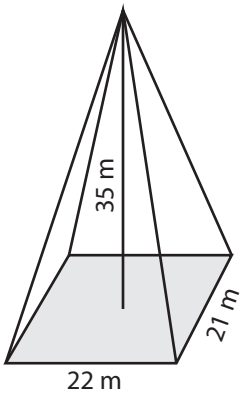
Volume = **4352 ft³**

4)



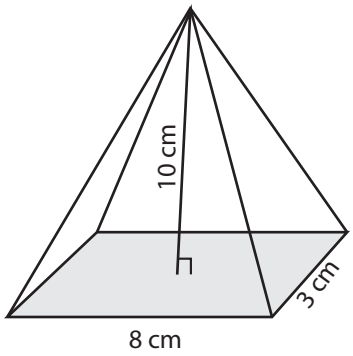
Volume = **330 in³**

5)



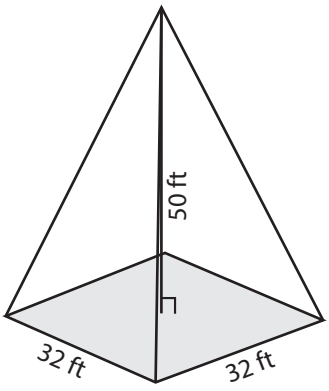
Volume = **5390 m³**

6)



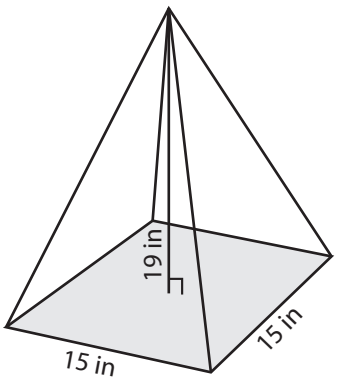
Volume = **80 cm³**

7)



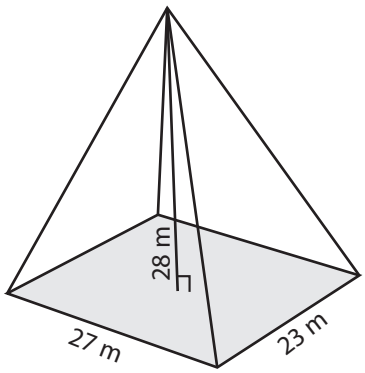
Volume = **17066.67 ft³**

8)



Volume = **1425 in³**

9)



Volume = **5796 m³**

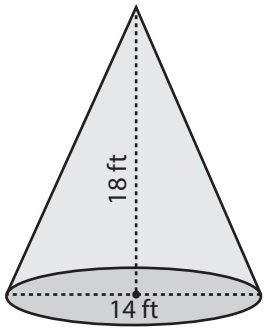
Name : _____ Score : _____

ES1

Volume - Mixed Shapes

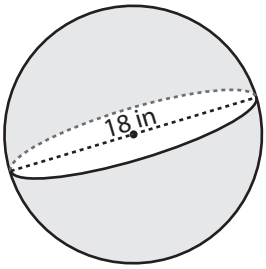
Find the exact volume of each shape.

1)



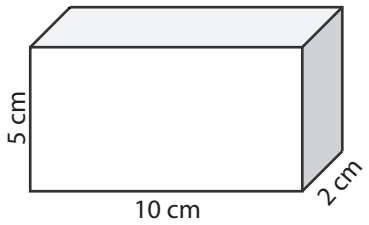
Volume = _____

2)



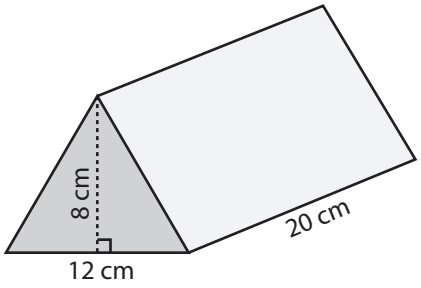
Volume = _____

3)



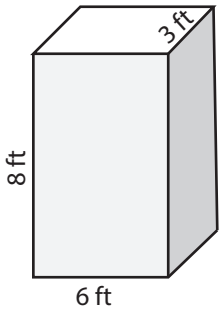
Volume = _____

4)



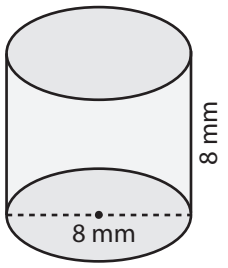
Volume = _____

5)



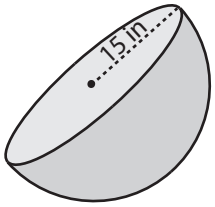
Volume = _____

6)



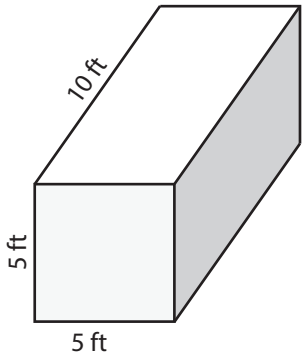
Volume = _____

7)



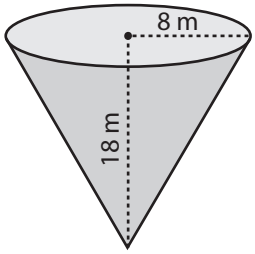
Volume = _____

8)



Volume = _____

9)



Volume = _____

Name : _____ Score : _____

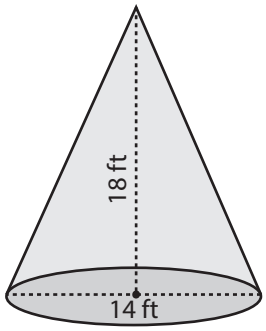
Answer Key

Volume - Mixed Shapes

ES1

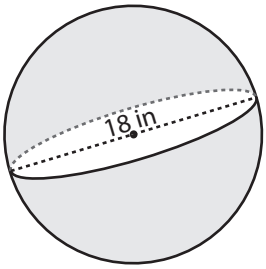
Find the exact volume of each shape.

1)



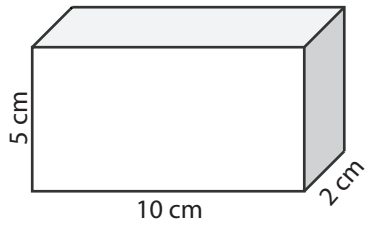
Volume = **294π ft³**

2)



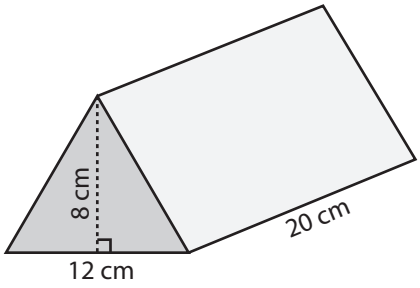
Volume = **972π in³**

3)



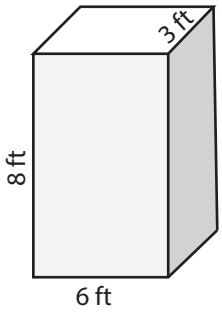
Volume = **100 cm³**

4)



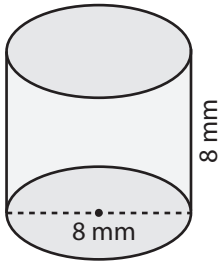
Volume = **960 cm³**

5)



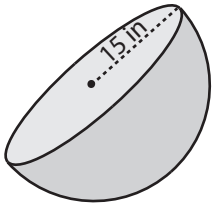
Volume = **144 ft³**

6)



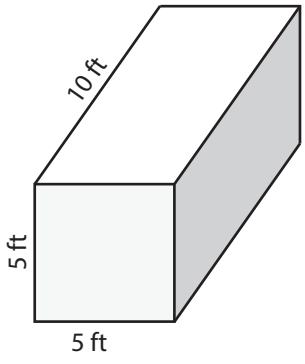
Volume = **128π mm³**

7)



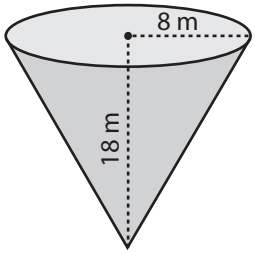
Volume = **2250π in³**

8)



Volume = **250 ft³**

9)



Volume = **384π m³**

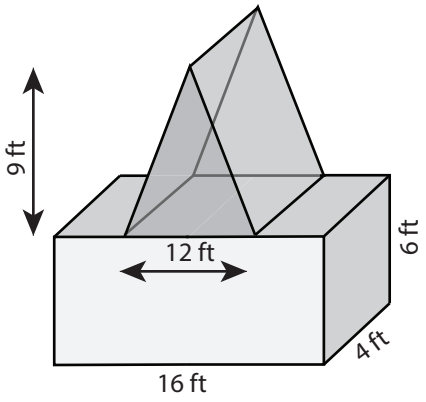
Name : _____ Score : _____

Sheet 1

Volume - Compound Shapes

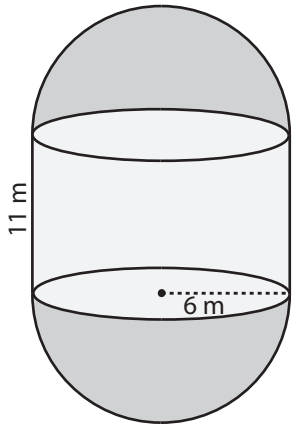
Find the volume of each figure. Round the answer to two decimal places. (use π = 3.14)

1)



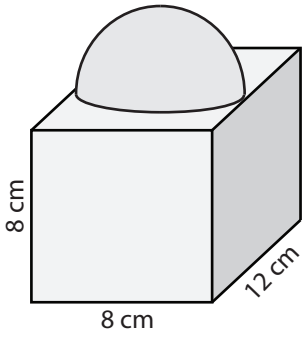
Volume = _____

2)



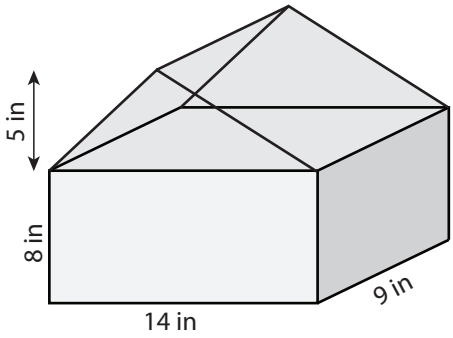
Volume = _____

3)



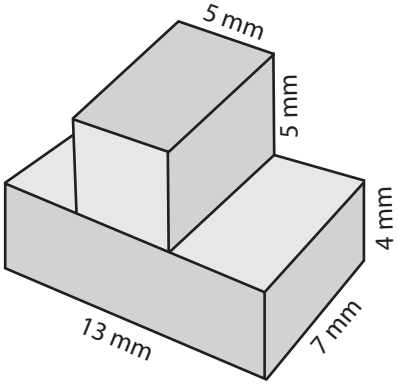
Volume = _____

4)



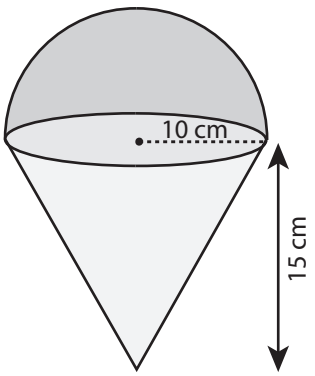
Volume = _____

5)



Volume = _____

6)



Volume = _____

Name : _____ Score : _____

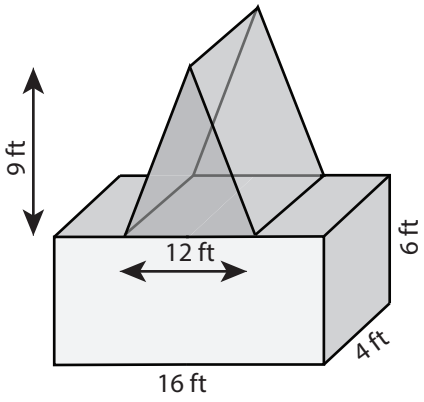
Answer Key

Sheet 1

Volume - Compound Shapes

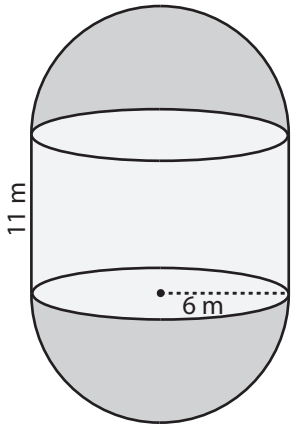
Find the volume of each figure. Round the answer to two decimal places. (use π = 3.14)

1)



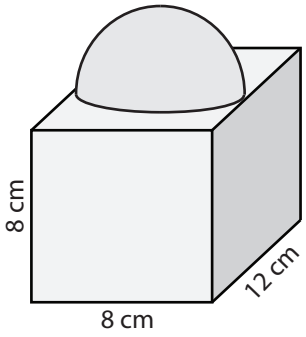
Volume = **600 ft³**

2)



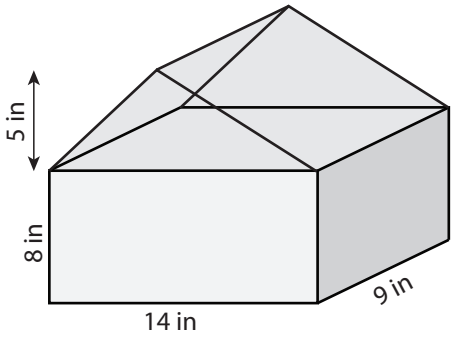
Volume = **2147.76 m³**

3)



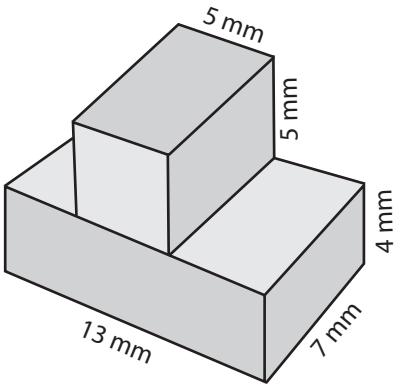
Volume = **901.97 cm³**

4)



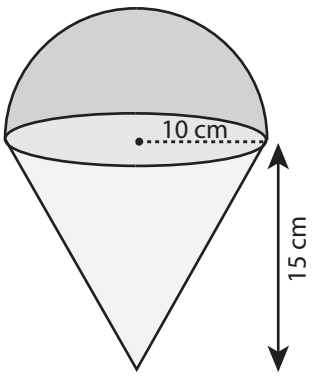
Volume = **1323 in³**

5)



Volume = **539 mm³**

6)



Volume = **3663.33 cm³**