<table>
<tr><td rowspan="2">Program Information</td><td colspan="3">[Lesson Title]

Volume for Cylinders, Pyramids, Cones, and Spheres</td><td colspan="2">TEACHER NAME

Andrea Karpiak</td><td colspan="2">PROGRAM NAME

Mansfield City Schools – Adult & Community Ed</td></tr>
<tr><td colspan="3">[Unit Title]

Geometry: Volume</td><td colspan="2">NRS EFL(s)

2 – 6</td><td colspan="2">TIME FRAME
Steps 1-6 Videos & Worksheet:
60-90 minutes
Step 7 Jeopardy Game:
60 minutes</td></tr>
<tr><td rowspan="7">Instruction</td><td colspan="7">ABE/ASE Standards – Mathematics</td></tr>
<tr><td colspan="2">Numbers (N)</td><td colspan="2">Algebra (A)</td><td colspan="2">Geometry (G)</td><td>Data (D)</td></tr>
<tr><td>Numbers and Operation</td><td>N.3.22
N.3.26
N.3.28
N.4.6
N.6.1</td><td>Operations and Algebraic Thinking</td><td>A.2.2
A.2.10
A.3.9
A.4.4
A.4.6</td><td>Geometric Shapes and Figures</td><td></td><td>Measurement and Data</td><td></td></tr>
<tr><td>The Number System</td><td></td><td>Expressions and Equations</td><td></td><td>Congruence</td><td></td><td>Statistics and Probability</td><td></td></tr>
<tr><td>Ratios and Proportional Relationships</td><td></td><td>Functions</td><td></td><td>Similarity, Right Triangles. And Trigonometry</td><td></td><td colspan="2" rowspan="2">Benchmarks identified in RED are priority benchmarks. To view a complete list of priority benchmarks and related Ohio ABLE lesson plans, please see the Curriculum Alignments located on the Teacher Resource Center.</td></tr>
<tr><td>Number and Quantity</td><td></td><td colspan="2"></td><td>Geometric Measurement and Dimensions</td><td>G.5.2</td></tr>
</table>

		Modeling with Geometry		

Mathematical Practices (MP)			
☒	Make sense of problems and persevere in solving them. (MP.1)	☒	Use appropriate tools strategically. (MP.5)
☒	Reason abstractly and quantitatively. (MP.2)	☒	Attend to precision. (MP.6)
☒	Construct viable arguments and critique the reasoning of others. (MP.3)	☒	Look for and make use of structure. (MP.7)
☐	Model with mathematics. (MP.4)	☒	Look for and express regularity in repeated reasoning. (MP.8)

LEARNER OUTCOME(S)

- Students will be able to use volume formulas for cylinders, pyramids, cones, and spheres to solve problems.

ASSESSMENT TOOLS/METHODS

- Students will be completing a worksheet either individually or by working together.
- Students will be working together on a Jeopardy Game.

LEARNER PRIOR KNOWLEDGE

- Students should have already completed the lesson for G.3.5 *Finding Perimeter and Area of Polygons* and be able to apply formulas for area of triangles, special quadrilaterals, and polygons.
- Students should be able to read the centimeter side of a ruler and round to the nearest half of a centimeter.
- This is an extension of lesson G.4.4. *Real World Application to Area, Volume, and Surface Area of Two and Three Dimensional Shapes*. Completing that lesson first or along with this lesson will be helpful for calculating volume.

	INSTRUCTIONAL ACTIVITIES	RESOURCES
	1. Pass out *Mathematics Formula Sheet & Explanation* from the GED testing service website. Encourage your students to keep this reference and write down their own notes on it how they will find volume that is more user friendly for them. 2. Watch Volume – Rectangular Prisms and complete questions 3 and 8 on *Solid Figures* worksheet together. 3. Watch Where Does the Volume of a Cylinder Formula Come From? Then complete questions 1 and 2 on *Solid Figures* worksheet together. 4. Watch Volume of a Pyramid and complete question 12 on *Solid Figures* worksheet together. 5. Watch How to Find the Volume of a Cone: THE EASY WAY! and complete questions 16 and 17 on *Solid Figures* worksheet together. 6. Watch Volume of a Sphere, How to Get the Formula Animation and complete questions 5 and 6 on *Solid Figures* worksheet together. 7. Complete more of *Solid Figures* worksheet using your formula sheet on calculating volume of prisms, cylinders, pyramids, cones, and spheres until you feel comfortable that your students can apply the formulas. Your students may draw their own three dimensional figures. Students may work together or alone on this.	Computer with Internet access Speakers Projector/ability to project Calculators for student use Student copies of *Mathematics Formula Sheet & Explanation* Mathematics Formula Sheet & Explanation [PDF file]. (n.d.). Retrieved from http://www.gedtestingservice.com/uploads/files/0756c16704434ff71e43c8117a5fa738.pdf M. (2011, October 17). Volume - Rectangular Prisms. Retrieved from https://www.youtube.com/watch?v=E8tuMaDxgJM Student copies of *Solid Figures* worksheet (attached) K. (2014, September 04). Where Does The Volume of a Cylinder Formula Come From? Retrieved from https://www.youtube.com/watch?v=s0IOtwKMaEQ V. (2012, April 29). Volume of a Pyramid. Retrieved from https://www.youtube.com/watch?v=e7-am8JtREI M. (2013, October 01). How To Find The Volume Of A Cone: THE EASY WAY! Retrieved from

	8. Once this unit is complete you can play the *Jeopardy Unit 8 Review* of Volume with Real-World Application. a. Divide your students into equal small groups of 2-4 students when playing. b. They can solve the problems on individual white boards if you have them and award a prize to the winning team (optional).	https://www.youtube.com/watch?v=rP7ZjyYwqHo M. (2011, June 09). Volume of a Sphere, How to get the formula animation. Retrieved from https://www.youtube.com/watch?v=xuPl_8o_j7k *Jeopardy Unit 8 Review* Unit 8 Review [PPT]. (n.d.). Retrieved from mccleskeyms.typepad.com/files/unit-8---review.ppt **Optional resources:** Individual dry erase boards Prizes for winning Jeopardy team
	DIFFERENTIATION • The tutorial videos are giving your students the visualization they will need in order to calculate volume of prisms, cylinders, pyramids, cones, and spheres. • The worksheet is allowing your students to solve these problems using the formulas from the videos that correlate with their formula sheets from the GED testing service website. • The calculator will allow your students to do basic mathematical computations. • You may allow your students to work together to solve the problems. • The Jeopardy game is a fun way to teach and work together on Real-World application.	

Reflection	**TEACHER REFLECTION/LESSON EVALUATION**
	ADDITIONAL INFORMATION

Solid figures - complete

Find the volume of each of the figures, using the information from the description.

1) A cylinder with a radius of 10 ft and a height of 8 ft.

2) A cylinder with a diameter of 6 m and a height of 5 m.

3) A square prism measuring 6 m along each edge of the base and 5 m tall.

4) A cylinder with a radius of 2 ft and a height of 9 ft.

5) A sphere with a diameter of 8 cm.

6) A sphere with a diameter of 16 ft.

7) A cylinder with a radius of 6 cm and a height of 8 cm.

8) A rectangular prism measuring 8 in and 5 in along the base and 7 in tall.

9) A square prism measuring 3 in along each edge of the base and 6 in tall.

10) A rectangular prism measuring 3 mi and 10 mi along the base and 6 mi tall.

11) A sphere with a radius of 6 km.

12) A square pyramid measuring 2 yd along each edge of the base with a height of 2 yd.

13) A square prism measuring 7 km along each edge of the base and 5 km tall.

14) A sphere with a diameter of 6 yd.

15) A square prism measuring 2 ft along each edge of the base and 5 ft tall.

16) A cone with radius 9 m and a height of 18 m.

17) A cone with diameter 12 cm and a height of 12 cm.

18) A square prism measuring 6 ft along each edge of the base and 4 ft tall.

19) A cylinder with a diameter of 14 ft and a height of 9 ft.

20) A cone with radius 2 in and a height of 6 in.

21) A cone with radius 10 mi and a height of 20 mi.

22) A sphere with a radius of 9.4 mi.

23) A square prism measuring 5 in along each edge of the base and 10 in tall.

24) A rectangular prism measuring 3 cm and 6 cm along the base and 6 cm tall.

25) A rectangular prism measuring 6 km and 3 km along the base and 4 km tall.

26) A square prism measuring 4 yd along each edge of the base and 10 yd tall.

27) A sphere with a radius of 4.1 yd.

28) A rectangular prism measuring 8 km and 5 km along the base and 4 km tall.

29) A cylinder with a diameter of 12 m and a height of 6 m.

30) A square pyramid measuring 6 cm along each edge of the base with a height of 7 cm.

Answers to Solid figures - complete

1) 2513.3 ft^3
2) 141.4 m^3
3) 180 m^3
4) 113.1 ft^3
5) 268.1 cm^3
6) 2144.7 ft^3
7) 904.8 cm^3
8) 280 in^3
9) 54 in^3
10) 180 mi^3
11) 904.8 km^3
12) 2.7 yd^3
13) 245 km^3
14) 113.1 yd^3
15) 20 ft^3
16) 1526.8 m^3
17) 452.4 cm^3
18) 144 ft^3
19) 1385.4 ft^3
20) 25.1 in^3
21) 2094.4 mi^3
22) 3479.1 mi^3
23) 250 in^3
24) 108 cm^3
25) 72 km^3
26) 160 yd^3
27) 288.7 yd^3
28) 160 km^3
29) 678.6 m^3
30) 84 cm^3