Honors Key

NCM3 Unit D: Modeling with Geometry Review Honors Version Name: Key # D12

p. 1

Part One: Equations of a Circle

1. I can find the center and radius of a circle given its equation. D1

a. $(x+2)^2+(y+3)^2=25$

C (-2, -3) r = 5

b. $(x-1)^2+y^2=40$

C (1, 0) r = $\sqrt{40}$

2. I can write an equation for a circle given key characteristics. D3-D4

a. Center: (-2, 5); Area: 7π

$A = \pi r^2$

$7\pi = \pi r^2$

$7 = r^2$

$(x+2)^2+(y-5)^2=7$

b. Center: (7, 0); Circumference: 24π

$24\pi = 2\pi r$

$12 = r$

$(x-7)^2+y^2=144$

c. Center: (-2,7); Point on Circle: (6,-5)

$(x+2)^2+(y-7)^2=208$

d. Ends of a diameter: (2, -2) and (4,-6)

$(x-3)^2+(y+4)^2=5$

Work shown on CP key

3. I can complete the square to write an equation for a circle in standard form and use it to find its center and radius. D2-D3

a. $\frac{0.5y^2}{0.5}+\frac{0.5x^2}{0.5}+\frac{6x}{0.5}-\frac{1.5y}{0.5}=\frac{13.5}{0.5}$

$y^2+x^2+12x-3y=27$

$(x^2+12x+36)+(y^2-3y+2.25)=27+36+2.25$

$(x+6)^2+(y-1.5)^2=65.25$

Center (-6, 1.5) r = $\sqrt{65.25}$

b. $14x+6y+22=-x^2-y^2$

$(x+7)^2+(y+3)^2=36$

Center (-7, -3)

r = 6

c. $5x^2+5y^2=30x-55y-16.25$

$(x-3)^2+(y+5.5)^2=36$

Center (3, -5.5) r = 6

Work shown on CP key

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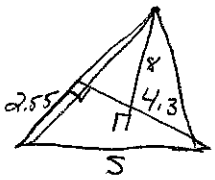
Part Two: Three Dimensional Solids p. 2

4. I can use multiple volume formulas together to find the volume of composite shapes. D5-D7

a. Find the volume of a triangular pyramid with a base that is a right triangle with lengths 2.55 inches, 4.3 inches, and 5 inches and pyramid height of 8 inches. Show your work. Round your answer to the nearest hundredth.



$V = \text{Area of Base} \cdot \text{Height}$

$V = \frac{1}{3}\left(\frac{1}{2} b \cdot h \cdot H\right)$

$V = \frac{1}{6}(2.55)(4.3)(8)$

$V = 14.62 \text{ in}^3$

b. Suppose a cone was constructed around a square pyramid in such a way that the base of the pyramid was inscribed in the base of the cone and the cone and the pyramid had a height of 4.5 mi. Find the length of the radius of the cone if the volume of the pyramid is 96 mi^3. Show your work. Round your answer to the nearest hundredth.

The hypotenuse is the diameter

Volume of Pyramid $= \frac{1}{3}$ area of base $\cdot$ Height

$96 \text{mi}^3 = \frac{1}{3}(\text{side})^2 \cdot 4.5 \text{ mi}$

$3(21.33) = (\text{side})^2$

$64 = (\text{side})^2$

$a^2 + b^2 = c^2$

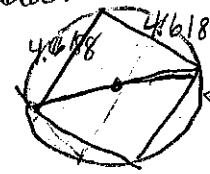
$64 + 64 = c^2$

$128 = c^2$

$11.32 = c$

$5.66 = r$

The radius is approx 5.66 mi



← Base picture

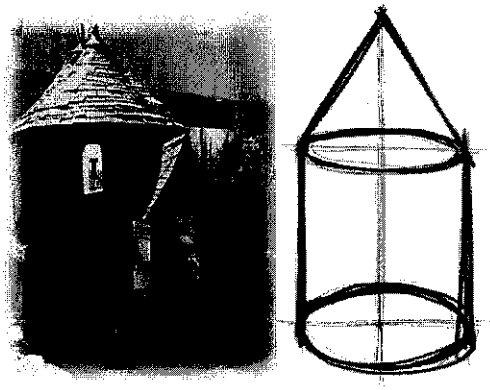
c. Ms. Pace had a special dog house built for her dog, Franklin. Find the volume (living area) of this house if the diameter of the base is 6 feet and the total height is 8 feet. The distance from the floor to the lowest part of the roof is 5.75 feet.

$V = \frac{1}{3}\pi r^2 h + \pi r^2 h$

$V = 6.75\pi + 51.75\pi$

$V = 58.5\pi \text{ ft}^3$

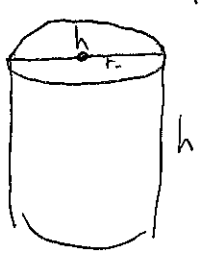
$V \approx 183.78 \text{ ft}^3$



5. I can compare volumes of the same shape with different dimensions to determine which dimension has a greater effect. D6

A cylinder has a diameter equal to the height. Which would have a greater effect on the volume, doubling the diameter or doubling the height? Explain your reasoning.

* Doubling diameter b/c the radius is squared.



$r = \frac{h}{2}$

$V = \pi r^2 h$

Original Volume $= \pi\left(\frac{h}{2}\right)^2 h = \frac{\pi h^3}{4}$

Double diameter Volume $= \pi(h)^2 h = \pi h^3$

Double height Volume $= \pi\left(\frac{h}{2}\right)^2 \cdot 2h = \pi\left(\frac{h^2}{4}\right)2h = \frac{\pi h^3}{2}$

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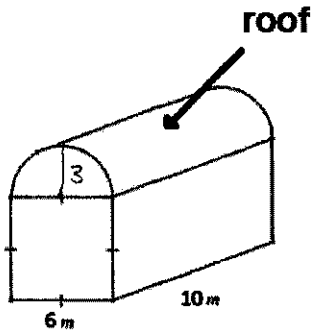
6. I can use volume and surface area to solve contextual problems. D8

a. Find the total volume of the storage barn on the right. Round your answer to the nearest tenth. Show your work.



$V = \frac{1}{2}$ cylinder + rectangular prism

$V = \frac{\pi r^2 h}{2} + l \cdot w \cdot h$

$V \approx 501.37\ m^3$

b. Suppose the owner wanted to paint the roof red and the rest of the building black. Find the cost of the minimimum amount of paint needed to put two coats on the roof and a single coat of paint on the building. One gallon of exterior paint covers about 30 square meters. Each gallon cost $16.03 with taxes included. Show your work.

(Hint: Surface Area of a Cylinder = $2\pi rh + 2\pi r^2$)

RED

2 coats of red paint = 1 cylinder

$2\pi rh + 2\pi r^2$

$60\pi + 18\pi$

$78\pi \approx 245.04\ m^2$

$245.04\ m^2 \div 30 = 8.16$

Need 9 gallons

16 gallons x $16.03 = $256.48

BLACK

1 coat of black paint = 2 long sides + 2 short sides

$2lw + 2w \cdot h$

$2(10)(6) + 2(6)(6)$

$120\ m^2 + 72\ m^2$

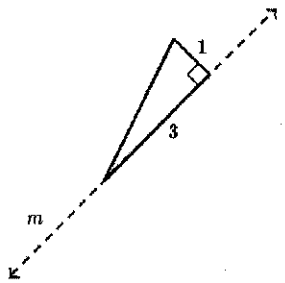
$192\ m^2$

$192 \div 3 = 6.4$

Need 7 gallons

7. I can find 3D solids from rotating 2D figures. D9

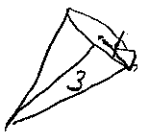
a. What 3D object is formed by rotating this triangle around line m? Describe any known characteristics of the 3D shape.



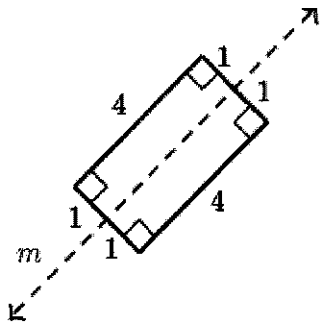
Cone

$r = 1$

$h = 3$



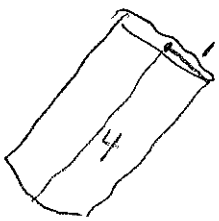
b. What 3D object is formed by rotating a rectangle with dimensions around line m? Describe any known characteristics of the 3D shape.



Cylinder

$r = 1$

$h = 4$



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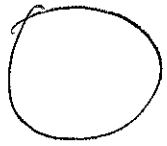
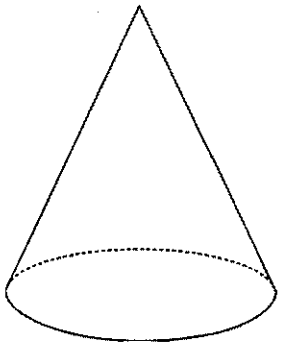
8. I can determine cross sections of 3D solids. D11

a. What 2D figure can we create by taking a horizontal cross-section of a cone? Name and sketch.

Circle 

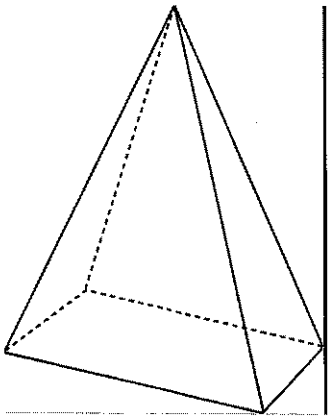


b. What 2D figure can we create by taking a vertical cross-section through the apex of a cone? Name and sketch.

Triangle 

c. What 2D figure can we create by taking a horizontal cross-section of this rectangular pyramid? Name and sketch.

Rectangle 



d. What 2D figure can we create by taking a vertical cross-section of this rectangular pyramid? Name and sketch.

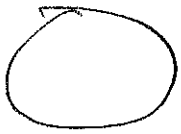
Through Apex:  Triangle

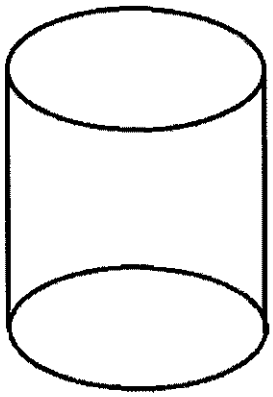
Through Side:  Trapezoid

e. What is the greatest possible number of edges of a cross section created from a rectangular pyramid?

5 edges b/c there are 5 faces.

f. What 2D figure can we create by taking a horizontal cross-section of a cylinder? Name and sketch.

Circle 



g. What 2D figure can we create by taking a vertical cross-section of a cylinder? Name and sketch.

Rectangle