BECA / Dr. Huson / Geometry
Unit 4: Volume and polyhedra
22 November 2022

Name: Solutions

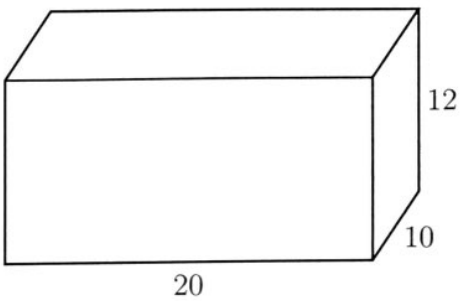
4.10 Test: Solids, volume, and density **HSA.CED.A1**

1. Find the volume of a rectangular prism volume of water. Its length is $l = 20$ feet, its height $h = 12$ feet, and depth is $w = 10$ feet. Start with the equation

   $V = l \times w \times h$

   $V = 20 \times 10 \times 12$

   $= 2400 \text{ ft}^3$

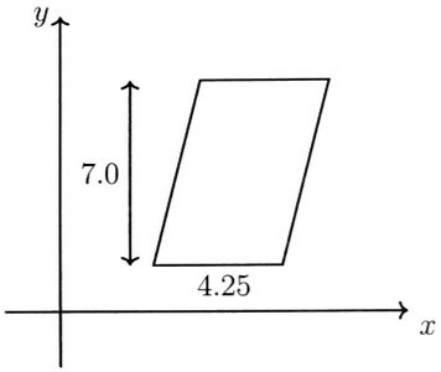


2. A parallelogram is shown on the x-y plane having a base $b = 4.25$ and height $h = 7.0$.

   Find its area, showing the calculation.

   $A = 7.0 \times 4.25$

   $= 29.75$



3. Given the circle centered at O with radius $r = 3$. Leave answers in terms of π.

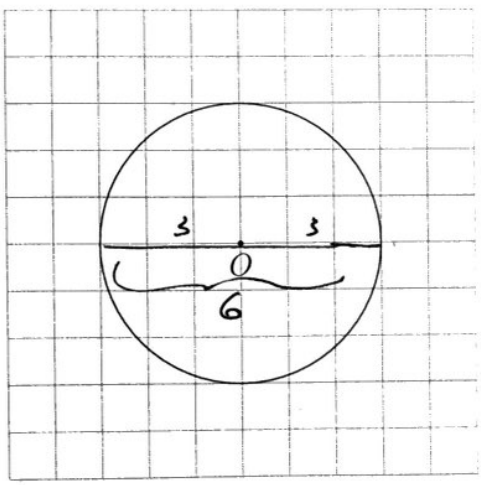
   (a) Write down the length of the circle's diameter. 6

   (b) Find the circumference of a circle.

   $C = 6\pi$

   (c) Find the area of the circle.

   $A = 9\pi$

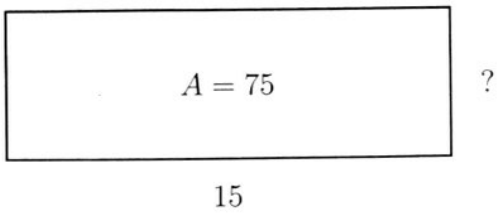


4. Find the width of the base of a rectangle with area $A = 75$ and height $h = 15$. Start with the form (use b or x):

   $A = b \times h = 75$

   $A = 15x = 75$

   $x = 5$



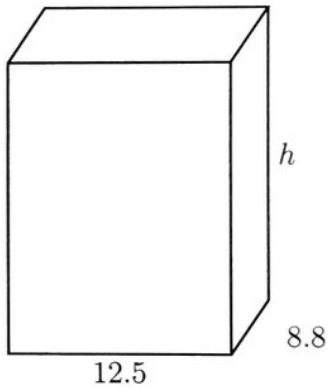
5. The rectangular prism shown has a volume of $V = 1815$ cubic centimeters. Its base measures $l = 12.5$ cm by $w = 8.8$ cm.

   Find its height in centimeters. Begin by writing the following formula with values substituted:

   $V = l \times w \times h = 1815$

   $V = 12.5 \times 8.8 \times h = 1815$

   $h = 16.5$ cm

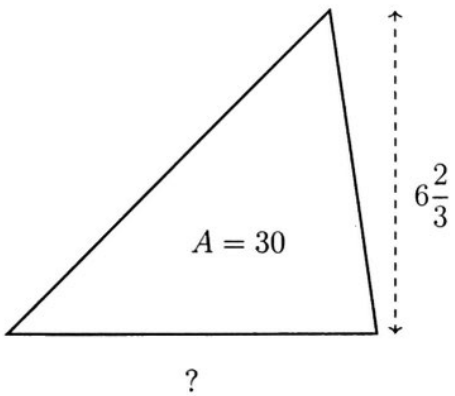


6. Find the length of the base of a triangle with area $A = 30$ and height $h = 6\frac{2}{3}$. Start with the form (use b or x):

   $A = \frac{1}{2} \times b \times h = 30$

   $A = \frac{1}{2}(x)(6\frac{2}{3}) = 30$

   $x = 9$



Model the situation with an equation starting with a labeling variable. Do NOT solve! **HSG.GMD.A3**

7. *Worked example:* Find the radius of a circle with an area of 100.

$$A = \pi r^2 = 100$$

8. A sphere has a radius of 5 centimeters. Find the volume of the sphere.

$V = \frac{4}{3} \pi 5^3$

9. A large concrete post in the shape of a cylinder has a volume of 250 cubic feet. Its height is 12 feet. Find the radius of the base of the post.

$V = \pi r^2 (12) = 250$

10. A prism has a base area of 40 square centimeters. Its volume is 300 cubic centimeters. Find the prism's height, h.

$V = (40)h = 300$

11. The volume of a waffle cone having a **diameter** of 3 inches is 50 cubic inches. Find the cone's height.

$V = \frac{1}{3}\pi\left(\frac{3}{2}\right)^2 h = 50$

12. The volume of the Great Pyramid of Giza, the tomb of Pharoah Khufu, is approximately 2,500,000 cubic meters. It is 140 meters tall. Find the area of its base.

$V = \frac{1}{3}B \times 140 = 2,500,000$

13. The smaller pyramid for his wife, Queen Meretites, has a square base with an area of 2500 square meters. Find the length of the side of its base, s.

$s^2 = 2500$

Apply the concept of density. Solve and state units. **HSG.MG.A2**

14. A large bill board might be 20 feet high by 60 feet wide. If billboard paper costs approximately 25 cents per square foot, how much would the paper cost to cover such a billboard?

$$C = 20\,\text{ft} \times 60\,\text{ft} \times \frac{\$0.25}{1\,\text{ft}^2} = \$300$$

15. Find the population density of Staten Island, New York (Richmond County) in people per square mile.

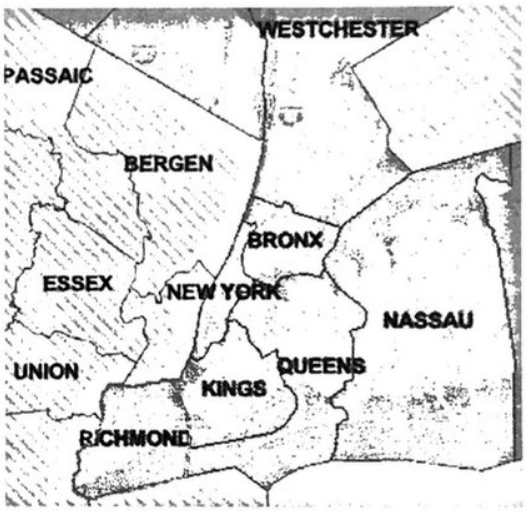
Population estimate July 1, 2019: 476,143

Land area in square miles: 58.37

$$D = \frac{476,143}{58.37}$$

$$= 8157.323\ldots$$

$$\approx 8160 \text{ people/sq mi}$$



Source: US Census (census.gov)

16. The American Eagle *silver* coin is minted by the US Treasury. The one ounce coin has a radius of about $r = 20$ millimeters and thickness $h = 3$ mm. Given that the density of silver is $D = 0.0105$ grams per cubic millimeter, find the coin's volume and weight.

$V = \pi r^2 h$ and $W = VD$

$$V = \pi (20)^2 (3) = 3769.91\ldots \text{ mm}^3$$

$$W = 3769.91\ldots \times 0.0105$$

$$= 39.5840\ldots$$

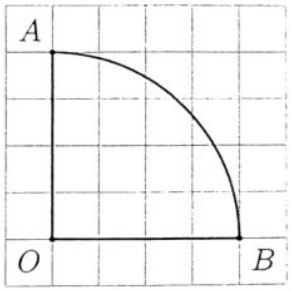
$$\approx 39.6 \text{ g}$$

Name: SOLUTIONS

4.10 Test: Extension topics

Diagrams are not necessarily drawn to scale unless otherwise stated.

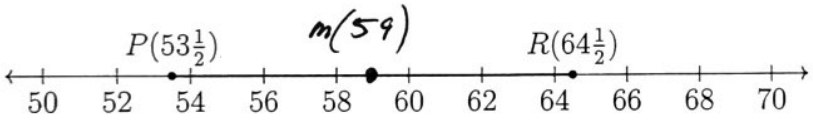
1. Find the perimeter of the quarter-circle shown with radius $OB = OA = 4$. Leave the result in terms of π.



$P = 4 + 4 + \frac{1}{4}(2)(4)\pi$

$= 8 + 2\pi$

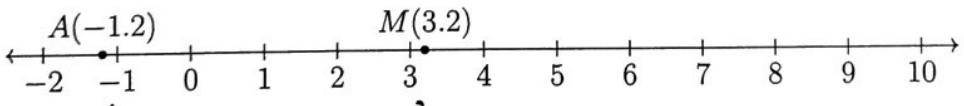
2. Mark and label the midpoint Q of $\overline{PQR}$ on the number line, including its value.



$m = \frac{53\frac{1}{2} + 64\frac{1}{2}}{2} = 59$ or $m = 53\frac{1}{2} + \frac{(64\frac{1}{2} - 53\frac{1}{2})}{2}$

$= 59$

3. The point $M(3.2)$ is the midpoint of points $A(-1.2)$ and $B(x)$. Find the value of $B(x)$ and mark and label it on the number line.



$AM = 3.2 - (-1.2)$

$= 4.4$

$M + AM = 3.2 + 4.4$

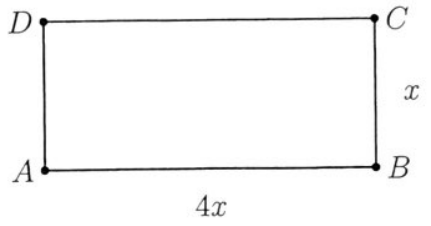
$= 7.6$

or

$\frac{-1.2 + x}{2} = 3.2$

$x = 7.6$

4. Rectangle $ABCD$ has area $A = 289$. Its length $AB = 4x$ is four times its width $BC = x$. Find its dimensions.



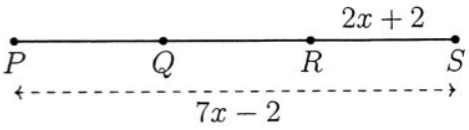
$A = (4x)x = 289$

$x^2 = 72.25$

$x = \sqrt{72.25} = 8.5$

5. Points Q and R trisect $\overline{PQRS}$, and $RS = 2x + 2$, $PS = 7x - 2$.

Write down an equation to represent the situation. Find x.



$3(2x+2) = 7x-2$

$6x+6 = 7x-2$

$8 = x$

Check

$RS = 2(8)+2$

$= 18$

$PS = 7(8)-2$

$= 54$

$18 \times 3 = 54$ ✓

Use the formula for percent error in the following problem

$$\epsilon = \left| \frac{v_A - v_E}{v_E} \right| \times 100\%$$

6. The actual length of earth's year is about 365.25 days. Find the percent error of using an approximation of 360 days. Round to three significant figures.

$\mathcal{E} = \left(\frac{365.25 - 360}{365.25} \right) = 1.43737\ldots\%$

$\approx 1.44\%$