4.8 Homework: Density of 3-dimensional objects, weight and cost

1. Do Now: Complete the four problems in the Graspable Math activity linked above. Paste a cropped screenshot of the fourth problem here. It should look like the modelled solution below.

2. *Density* is a ratio that maps proportional variables having different units. For example, weight per volume or population per area.

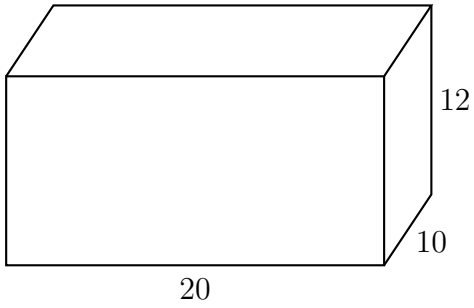
   Find the weight of a volume of water of 100 cubic feet if the density of water is 62.4 pounds per cubic feet.

   $W = V \times D$
   $W = 100 \times 62.4$
   $W = 6,240$ pounds

   Find the weight of 125 cubic feet of water.

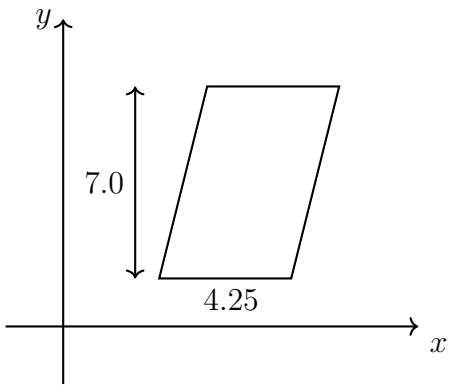
3. Find the volume of a rectangular prism volume of water. Its length is $l = 20$ feet, its height $h = 12$ feet, and depth is $w = 10$ feet. Start with the equation

   $V = l \times w \times h$



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

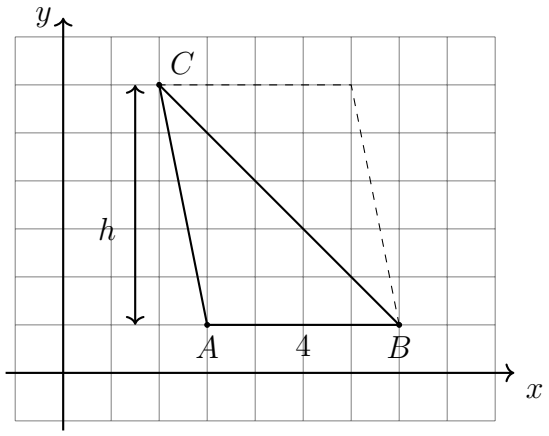
   Find its area, showing the calculation.



5. The $\triangle ABC$ is shown below with $A(3, 1)$, $B(7, 1)$, and $C(2, 6)$. The length of the base of the triangle is $AB = 4$.

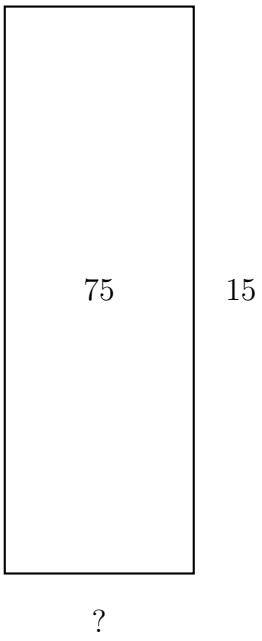
(a) Find the height h.

(b) Find the triangle's area, showing the calculation.



6. 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):

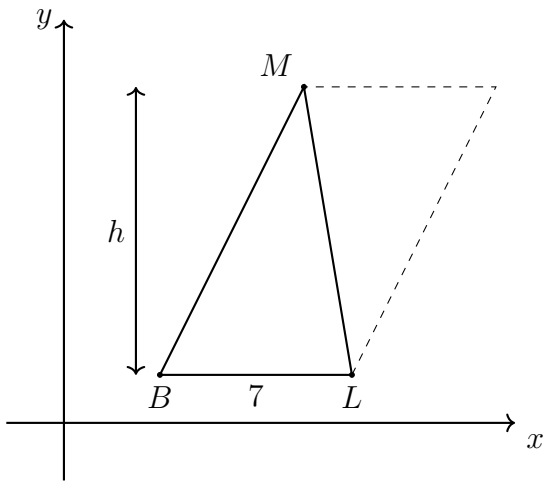
   $A = b \times h = 75$



7. Find the height of the $\triangle BLM$, having an area of $A = 42$ and base $BL = 7$.

   Start by substituting values in the area formula:

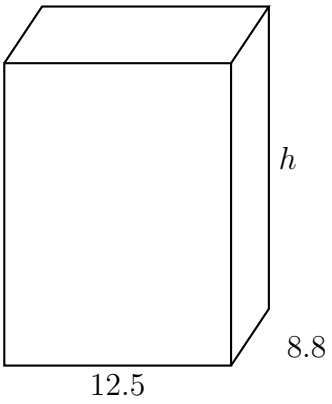
   $A = \frac{1}{2}bh = 42$



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

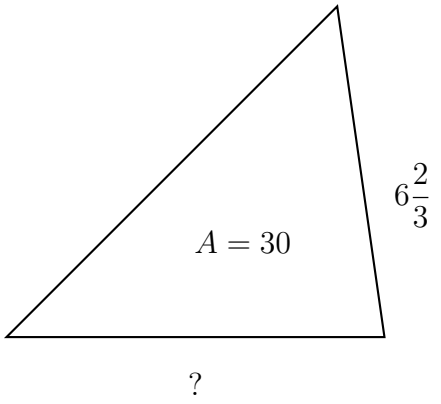
   Find its height in centimeters. Begin by writing the following formula with values substituted:

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



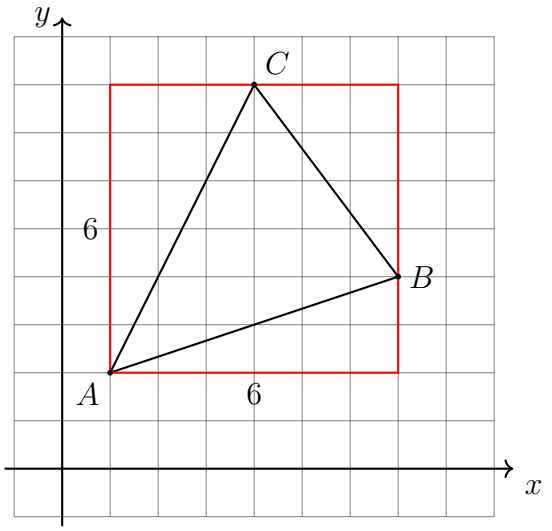
9. Find the length of the base of a triangle with area $A = 30$ and height $h = 6\frac{2}{3}$. Start with the form (use b or x):

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



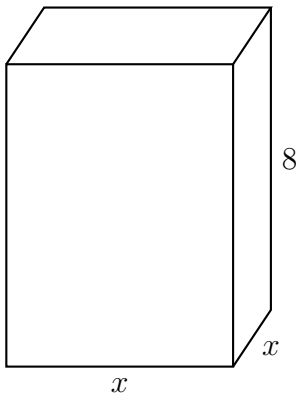
10. Find the area of the $\triangle ABC$, shown below, with $A(1, 2)$, $B(7, 4)$, and $C(4, 8)$.

    Hint: Subtract the areas of the three right triangles from the area of the red square.



11. A rectangular prism has a square base. Its volume is $V = 162$ cubic centimeters and its height is $h = 8$ cm.

    Calculate the dimensions of its base.



12. Find the area of a triangle with base $b = 12.5$ and height $h = 8.4$. Use the Graspable Math activity linked above. Paste a cropped screenshot of the first problem here. It

should look like the modelled solution below.

- ☐ Copy expressions (drag the handle on the left of the formula)
- ☐ Substitute values (drag the variable onto the formula)
- ☐ Show/hide steps (show the substitution, final line, and key steps)
- ☐ Copy/paste screenshot: command-control-shift-4 (Mac)

$b = 12.5$
$h = 8.4$
$A = \frac{1}{2}bh$

$A = \frac{1}{2}(12.5)(8.4)$
$A = 52.5$

Show substitution step in copy of formula.

13. Find the area of a semi-circle with radius $r = 7.5$. Paste a cropped screenshot of the Graspable Math. Compare your format to the model solution.

$A_{semi-circle} = \frac{1}{2}\pi r^2$
$r = 7.5$
$\pi = 3.14$

$A_{semi-circle} = \frac{1}{2}(3.14)(7.5)^2$
$A_{semi-circle} = 88.313$

14.

15. Find the population density of Queens, New York. Paste a cropped screenshot of the Graspable Math. Make a copy of the formula and show the substitution step.

Find the density of Queens given its area and population.
(Drag values to substitute)

$A = 108.1$ $P = 2358582$

$D = \frac{P}{A}$ $D = \frac{(2358582)}{(108.1)}$

$D = 21818.52$

16. Find the area of rectangle $ABCD$ having length $l = 11$ and width $w = 3\frac{3}{5}$. Start with a formula of this form, substituting the given values:

    $A = l \times w$

17. Find the weight of a volume of water of 18 cubic feet given that the density of water is 62.4 pounds per cubic foot.

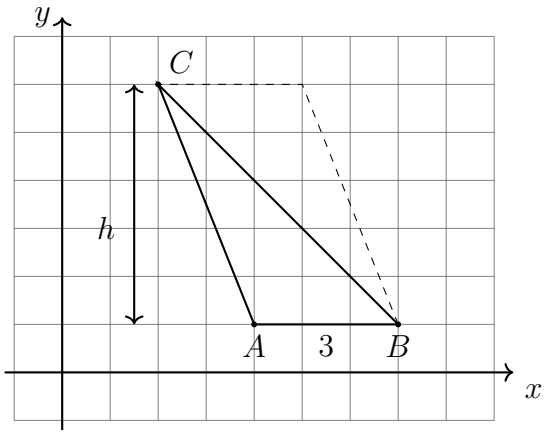
    $W = V \times D$

18. The $\triangle ABC$ is shown below with $A(4, 1)$, $B(7, 1)$, and $C(2, 6)$. The length of the base of the triangle is $AB = 3$.

    (a) Write down the height h.

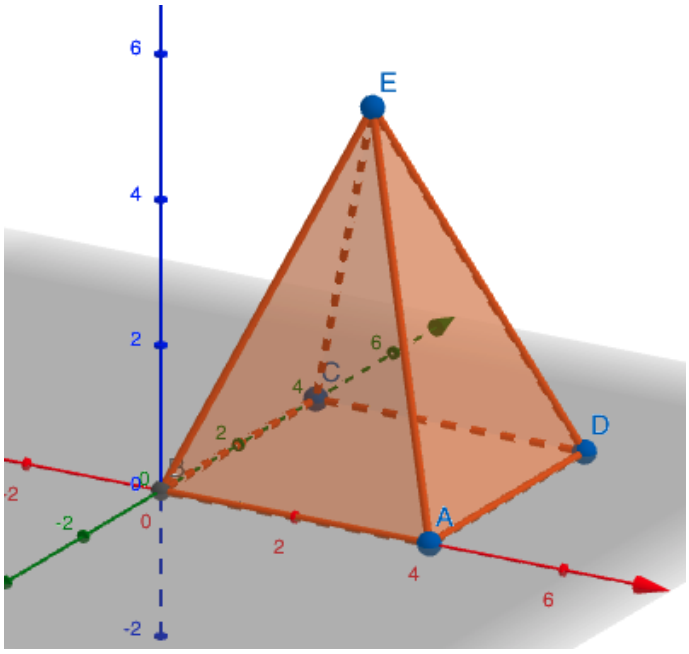
    (b) Find the triangle's area, showing the substitution into the area formula.

    $A = \frac{1}{2}bh$



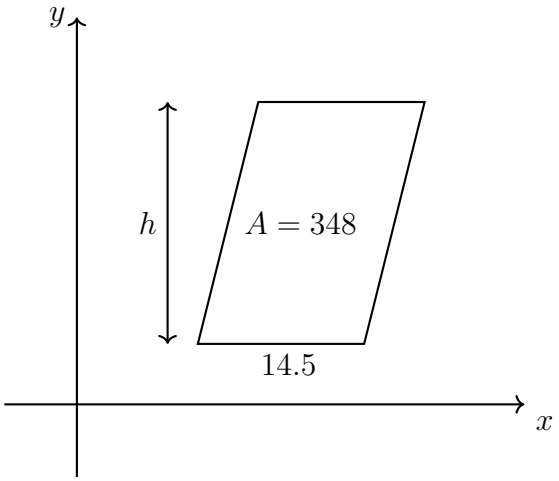
19. Find the volume of a pyramid having a square base 3 units on each side, $s = 3$, and a height of $h = 4$. Show the substitution in the volume formula for full credit.

$$V = \frac{1}{3}s^2h$$



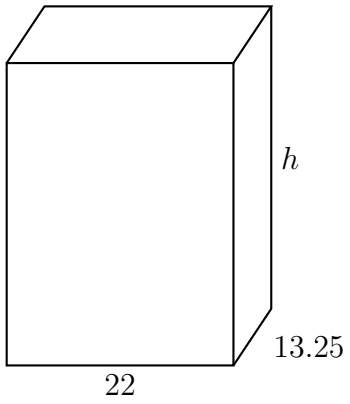
20. A parallelogram is shown on the x-y plane having a base $b = 14.5$, unknown height h, and area $A = 348$. Find the height.

    Show the area formula with substituted values for full credit.



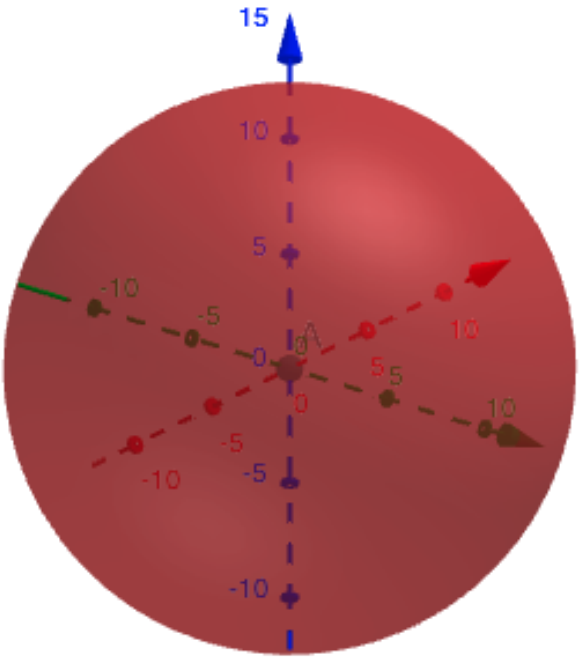
21. The rectangular prism shown has a volume of $V = 9911$ cubic centimeters. Its base measures $l = 22$ centimeters by $w = 13.25$ cm.

    Find its height in centimeters. For credit, begin by writing the volume formula with values substituted.



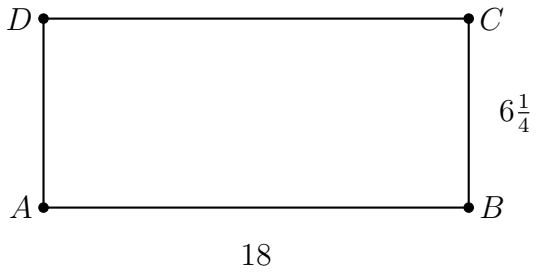
22. Find the radius of a sphere having a volume of 6367.4 cubic inches. Round to *the nearest tenth of an inch*. Show the substitution in the volume formula for full credit.

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



23. Find the area of rectangle $ABCD$ having length $l = 18$ and width $w = 6\frac{1}{4}$. Start with a formula of this form, substituting the given values:

$$A = l \times w$$



24. Find the weight of a volume of water of 23 cubic feet given that the density of water is 62.4 pounds per cubic foot.

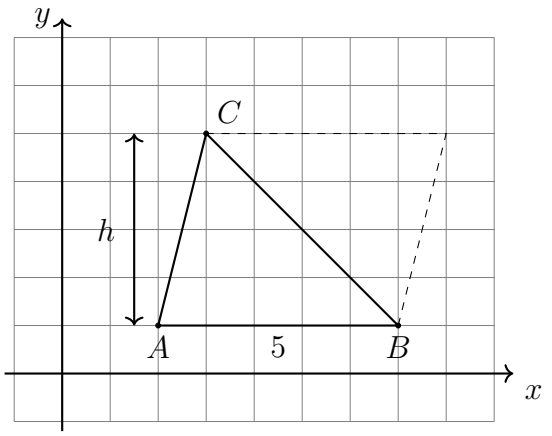
    $W = V \times D$

25. The $\triangle ABC$ is shown below with $A(2, 1)$, $B(7, 1)$, and $C(3, 5)$. The length of the base of the triangle is $AB = 5$.

    (a) Write down the height h.

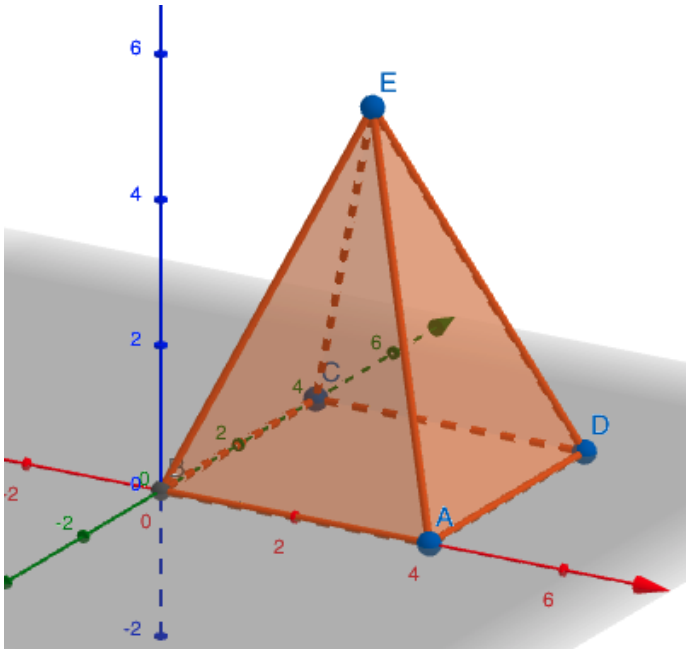
    (b) Find the triangle's area, showing the substitution into the area formula.

    $A = \frac{1}{2}bh$



26. Find the volume of a pyramid having a square base 4 units on each side, $s = 4$, and a height of $h = 5$. Show the substitution in the volume formula for full credit.

    $V = \frac{1}{3}s^2h$



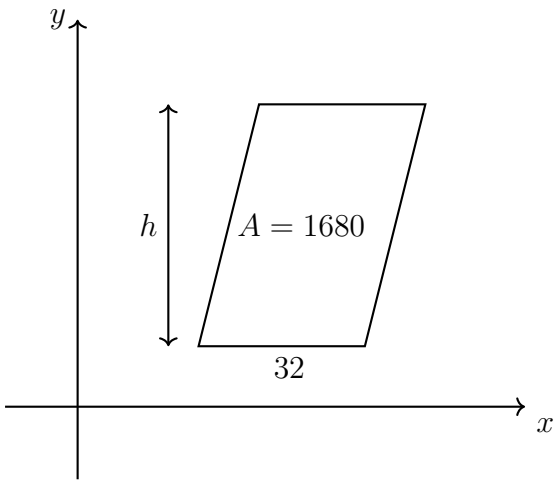
27. The American Eagle *silver* coin is minted by the US Treasury. The one ounce coin has a radius of about $r = 20$ millimeters and thickness $h = 3$ mm. Given that the density of silver is $D = 0.0105$ grams per cubic millimeter, find the coin's volume and weight.

    Show the substitution into both formulas for full credit.

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

28. A parallelogram is shown on the x-y plane having a base $b = 32$, unknown height h, and area $A = 1680$. Find the height.

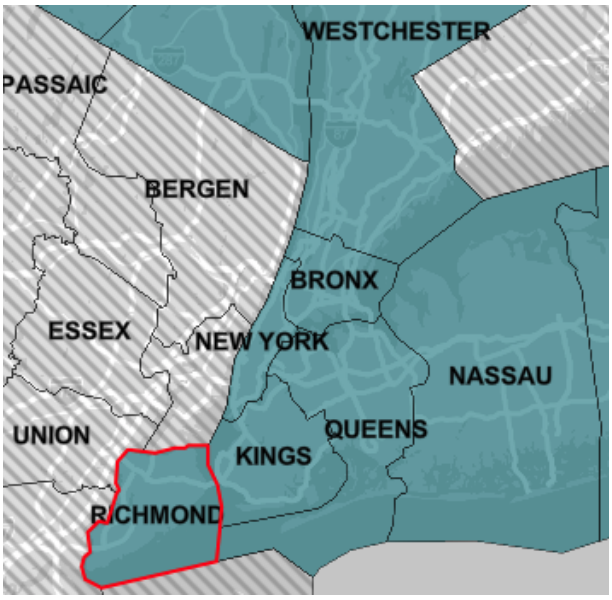
    Show the area formula with substituted values for full credit.



29. 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

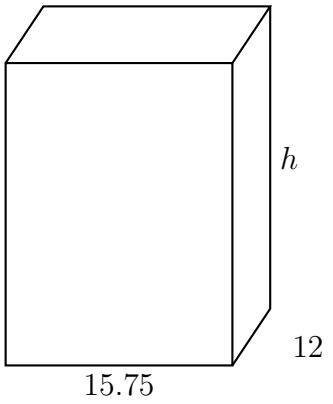


Source: US Census (census.gov)

30. The rectangular prism shown has a volume of $V = 5103$ cubic centimeters. Its base measures $l = 15.75$ centimeters by $w = 12$ cm.

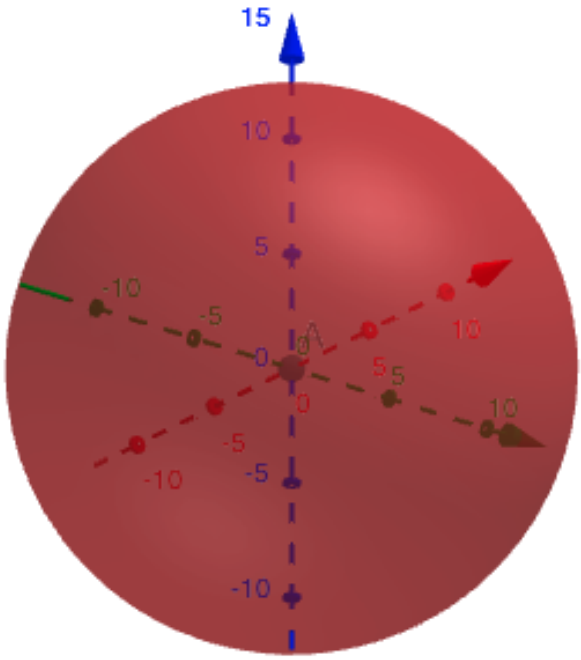
    Find its height in centimeters. For credit, begin by writing the volume formula with values substituted.

12



31. Find the radius of a sphere having a volume of 7791 cubic inches. Round to *the nearest tenth of an inch*. Show the substitution in the volume formula for full credit.

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



32. A building wall must be painted. Each gallon of paint covers 250 square feet and costs \$25. If the wall measures 100 feet wide by 50 feet tall, how much will the paint cost?

33. A building wall must be painted. Each gallon of paint covers 250 square feet and costs \$24.50. If the wall measures 130 feet wide by 35 feet tall, how much will the paint cost? (assume that paint must be purchased in gallon cans)

34. A building wall must be painted. Each gallon of paint covers 400 square feet and costs \$34.50. If the wall measures 120 feet wide by 45 feet tall, how much will the paint cost? (assume that paint must be purchased in gallon cans)

35. A building wall must be painted. Each gallon of paint covers 250 square feet and costs \$25. If the wall measures 100 feet wide by 50 feet tall, how much will the paint cost?