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#### 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.

$$W = V \times D$$

$$W = 100 \times 62.4$$

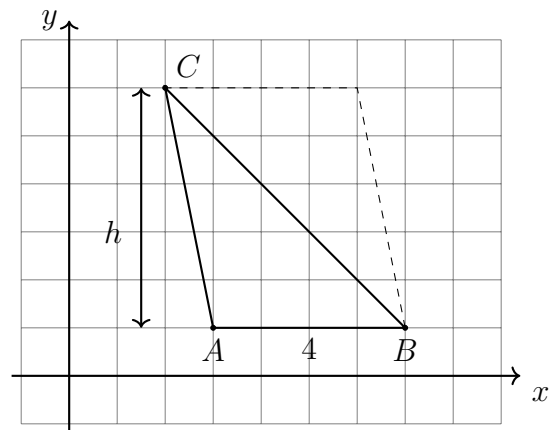
$$W = 6,240 \text{ pounds}$$

Find the weight of 125 cubic feet of water.

3. 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  $h$ .

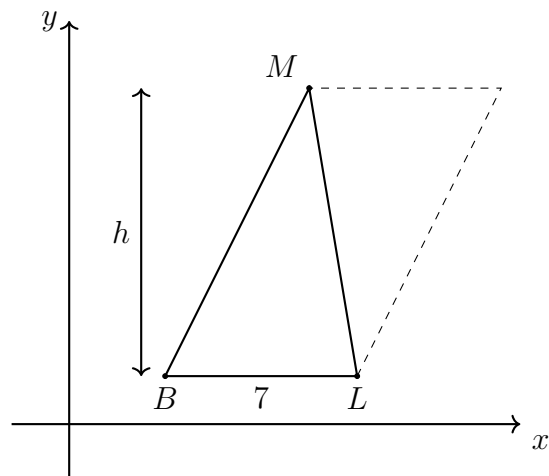
(b) Find the triangle's area, showing the calculation.



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

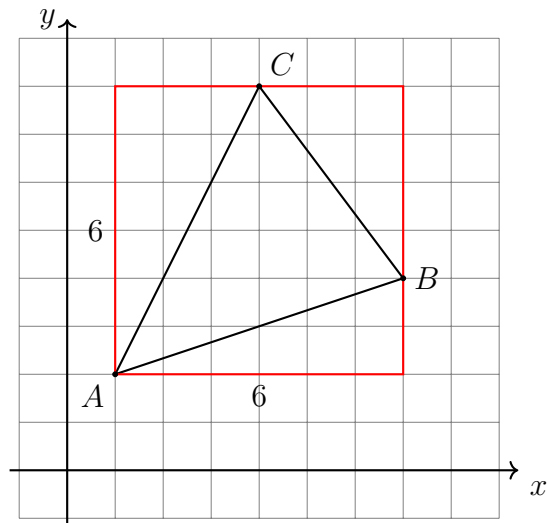
Start by substituting values in the area formula:

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



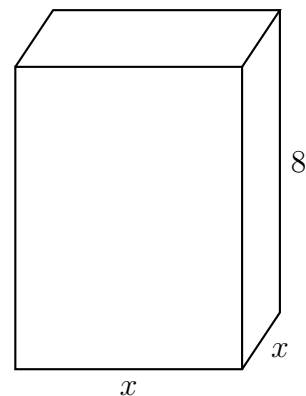
5. Find the area of the  $\triangle ABC$ , shown below, with  $A(1, 2)$ ,  $B(7, 4)$ , and  $C(4, 8)$ .

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



6. 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.



7. 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)

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$$\begin{aligned}
 b &= 12.5 & A &= \frac{1}{2}(12.5)(8.4) \\
 h &= 8.4 & A &= 52.5 \quad \text{Show substitution step in copy of formula.} \\
 A &= \frac{1}{2}bh
 \end{aligned}$$

8. 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.

$$\begin{aligned}
 A_{\text{semi-circle}} &= \frac{1}{2}\pi r^2 \\
 r &= 7.5 \\
 \pi &= 3.14 & A_{\text{semi-circle}} &= \frac{1}{2}(3.14)(7.5)^2 \\
 & & A_{\text{semi-circle}} &= 88.313
 \end{aligned}$$

9.

10. 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)

$$\begin{aligned}
 A &= 108.1 & P &= 2358582 \\
 D &= \frac{P}{A} & D &= \frac{(2358582)}{(108.1)} \\
 & & D &= 21818.52
 \end{aligned}$$

11. 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:

$$A = l \times w$$



12. 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.

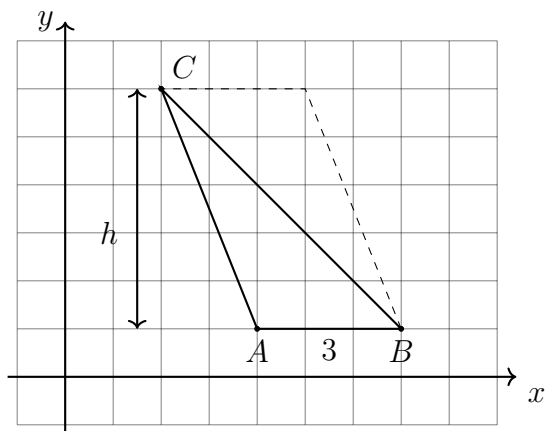
$$W = V \times D$$

13. 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.

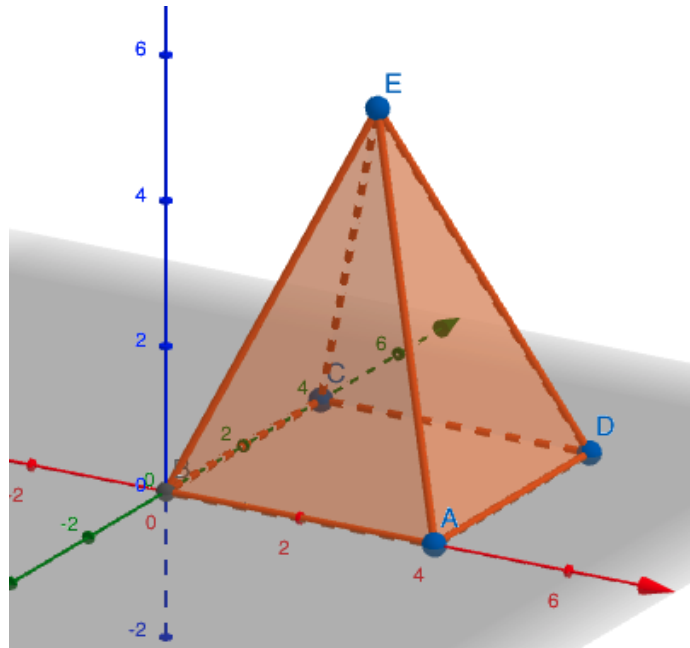
$$A = \frac{1}{2}bh$$



14. 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.

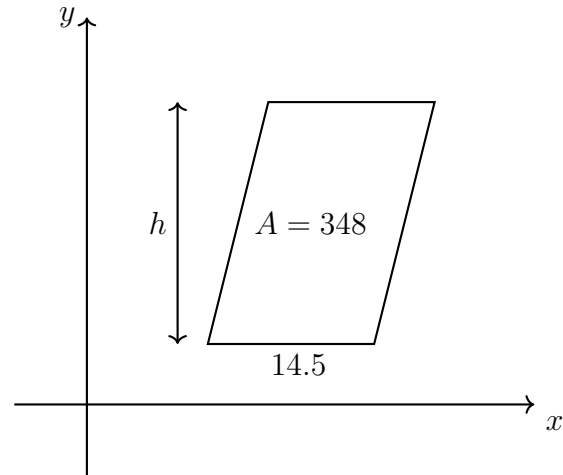
$$V = \frac{1}{3}s^2h$$

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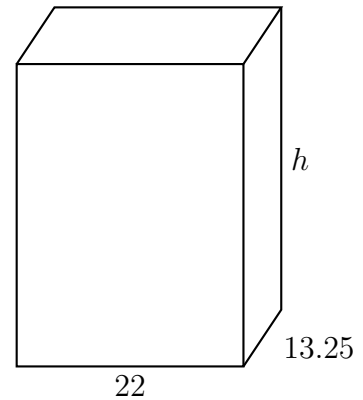
15. A parallelogram is shown on the  $x$ - $y$  plane having a base  $b = 14.5$ , unknown height  $h$ , and area  $A = 348$ . Find the height.

Show the area formula with substituted values for full credit.



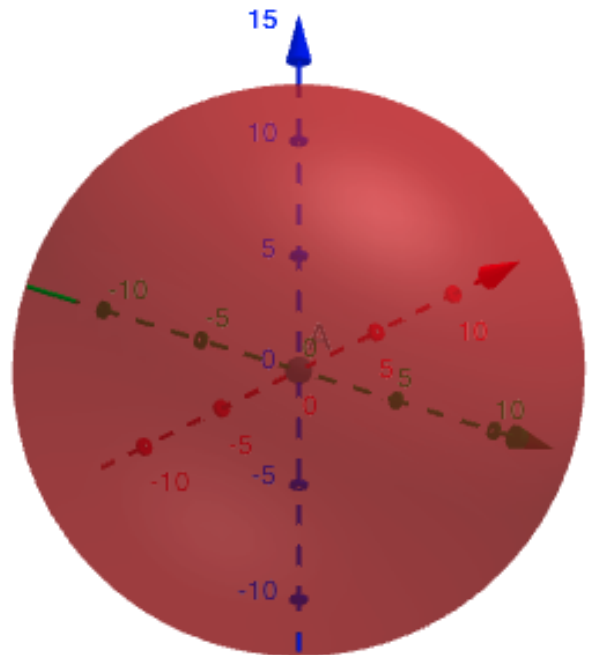
16. The rectangular prism shown has a volume of  $V = 9911$  cubic centimeters. Its base measures  $l = 22$  centimeters by  $w = 13.25$  cm.

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



17. 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.

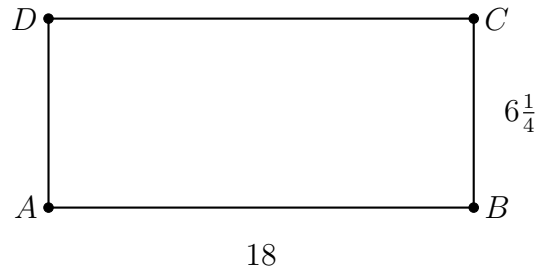
$$V = \frac{4}{3}\pi r^3$$



18. 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:

$$A = l \times w$$

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19. 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.

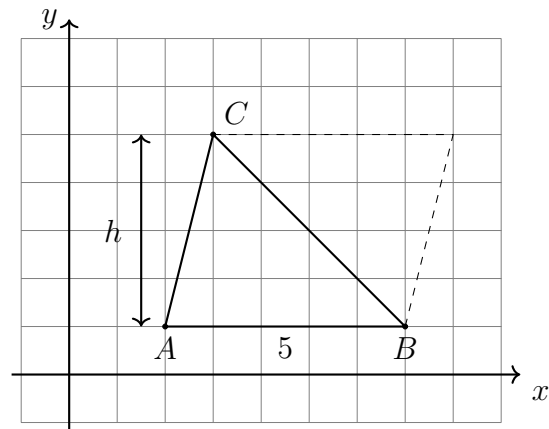
$$W = V \times D$$

20. 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  $h$ .

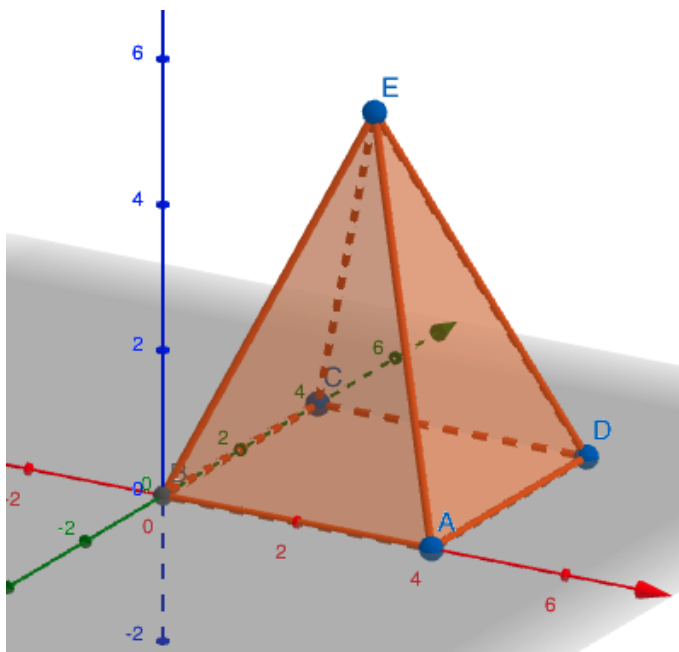
- (b) Find the triangle's area, showing the substitution into the area formula.

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



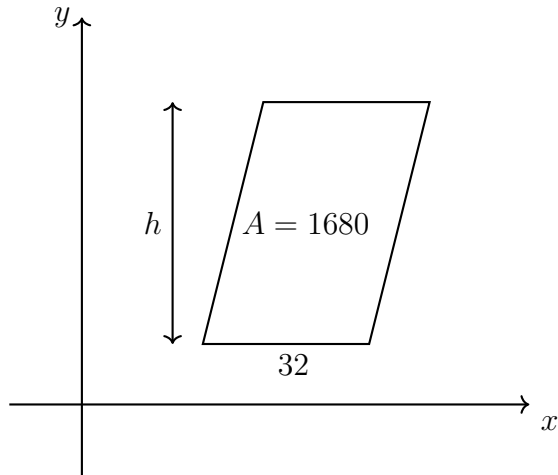
21. Find the volume of a pyramid having a square base 4 units on each side,  $s = 4$ , and a height of  $h = 5$ . Show the substitution in the volume formula for full credit.

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



22. 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.

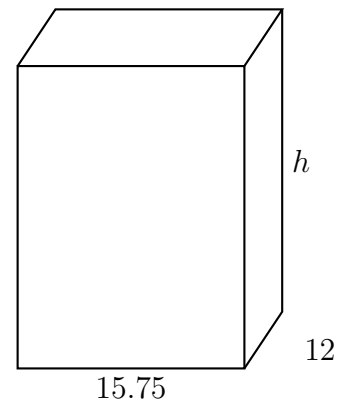


23. The rectangular prism shown has a volume of  $V = 5103$  cubic centimeters. Its base measures  $l = 15.75$  centimeters by  $w = 12$  cm.

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

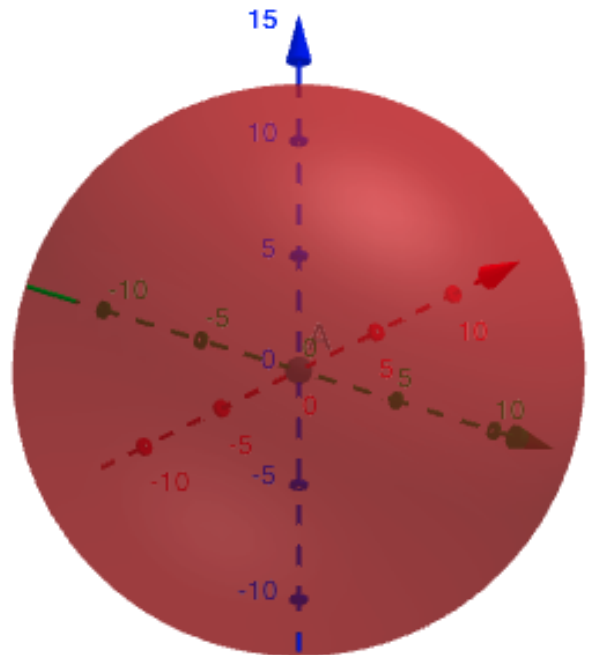


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24. Find the radius of a sphere having a volume of 7791 cubic inches. Round to *the nearest tenth of an inch*. Show the substitution in the volume formula for full credit.

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



25. 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?
26. 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)
27. 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)

28. 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?