## 4.1 Homework: Area of rectangles, triangles, parallelograms – review
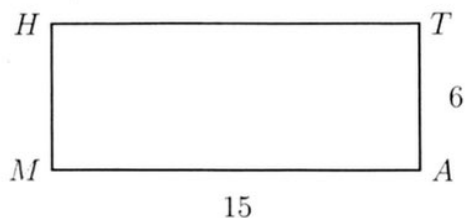
1. Given rectangle $MATH$ shown below with dimensions $MA = 15$ and $AT = 6$.
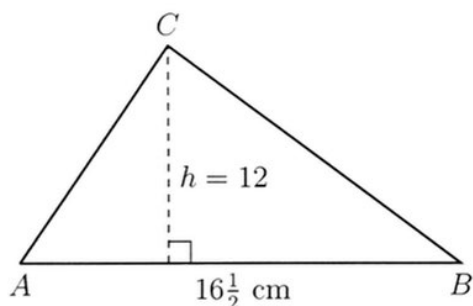


(a) Find the area of the rectangle.

$$A = 6 \cdot 15 = 90$$
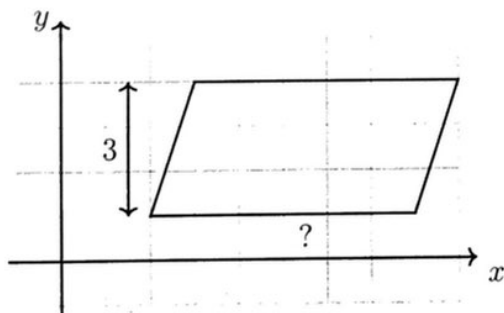
(b) Find its perimeter.

$$P = 2(6) + 2(15) = 42$$

2. Find the area of $\triangle ABC$. The altitude $h$ of the triangle is 12 centimeters and the base $AB = 16\frac{1}{2}$ cm.



$$A = \frac{1}{2}(12)\left(16\frac{1}{2}\right)$$

$$= 99 \text{ cm}^2$$

3. A given parallelogram has a height $h = 3$ and area 18. Find the length of its base.
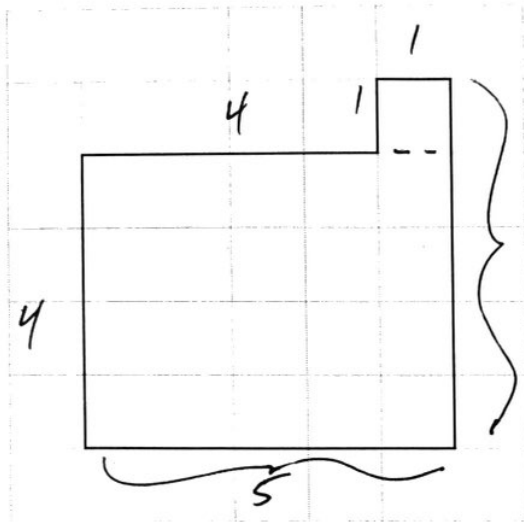


$$A = \ell \cdot h = 18$$
$$\ell = 6$$

4. The area of a square is 36 square meters. Find the length of the side of the square.
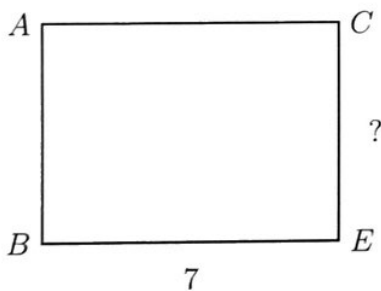
$$A = s^2 = 36$$
$$s = 6 \text{ m}$$

5. A compound shape is drawn below, combining a rectangle and a square. The grid is in centimeters. Find its perimeter and its area. (label the sides with their lengths first)



$$P = 4 + 5 + 5 + 1 + 1 + 4 = 20 \text{ cm}$$

$$A = 4.5 + 1.1$$
$$= 21 \quad cm^2$$

6. The rectangle $BECA$ has an area of 35, with length $BE = 7$. Find the width of the rectangle $EC$.



$$A = 7 \cdot w = 35$$
$$w = 5$$

7. The compound shape shown below is composed of a rectangle 4 inches tall by 6 inches long, and a triangle with base 3 inches. Find the total area of the combined shape.
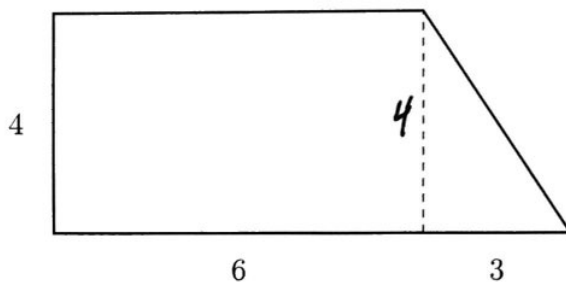


$$A = 6 \cdot 4 + \frac{1}{2}(4)(3)$$
$$= 24 + 6$$
$$= 30 \quad in^2$$
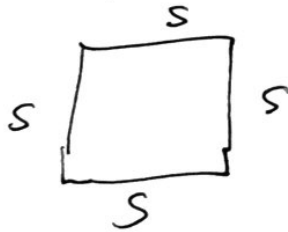
**4.2 Classwork: Volume of a prism (box)**

1. Find the volume of a rectangular prism with length 5 cm, width 4 cm, and height 3 cm.

$$V = 5 \times 4 \times 3 = 60 \text{ cm cubed}$$

2. A triangle has an area of 68 square centimeters. Its height is 16 centimeters. Find the length of its base.

$$A = \frac{1}{2}(16x) = 68$$
$$= \quad 8x = 68$$
$$x = 8\frac{1}{2} \text{ cm}$$

3. The perimeter of a square is 10 inches. Find its area.
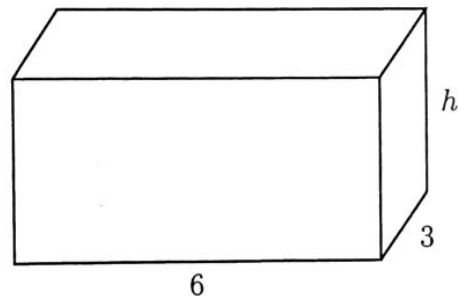


$$P = 4s = 10$$
$$s = \frac{10}{4} = 2.5$$
$$A = (2.5)^2 = 6.25 \text{ inches}^2$$

4. The volume of a rectangular prism (box) is $V = 72$ cubic feet. Its length is $l = 6$ feet and depth of $w = 3$ feet. Find its height. Start with the equation

$$V = l \times w \times h = 72$$

$$6 \cdot 3 \cdot h = 72$$
$$18 h = 72$$
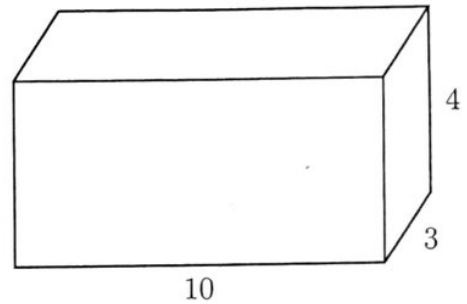$$h = \frac{72}{18} = 4 \text{ ft.}$$

5. Find the volume of a rectangular prism (box). Its length is $l = 10$ feet, its height $h = 4$, and depth is $w = 3$ feet. Start with the equation

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

$$= 10 \times 3 \times 4$$

$$= 120 \ ft^3$$

4

3

10

6. The volume of a rectangular prism (box) is $V = 110$ cubic feet. Its height is $h = 5$ feet and depth of $w = 4$ feet. Find its length. Start with the equation

$$V = l \times w \times h = 110$$

$$l \times 4 \times 5 = 110$$

$$l = \frac{110}{20} = 5.5 \ ft.$$

5

4

?
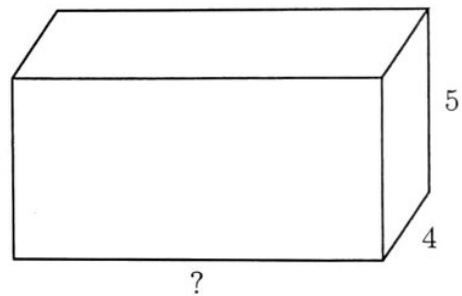
7. A rectangular prism (shown below) has a volume $V = 925$ cubic feet. Calculate the area of its base and then solve for its height.

(a) The base measures 12.5 by 4 in feet.
    Find its area.

$$A = 12.5 \times 4 = 50 \ ft^2$$

(b) Find the prism's height, $x$.

$$V = 50 \, x = 925$$

$$x = \frac{925}{50} = 18\frac{1}{2} \ ft.$$

x

4

12.5

## 4.3 Homework: Angle review

1. Given $\overline{JKL}$, $JK = 5.4$, and $KL = 1.1$. Find $JL$.

   Show your work by marking the diagram and writing an equation.

$$JL = 5.4 + 1.1 = 6.5$$

   5.4        1.1

   $J$       $K$    $L$
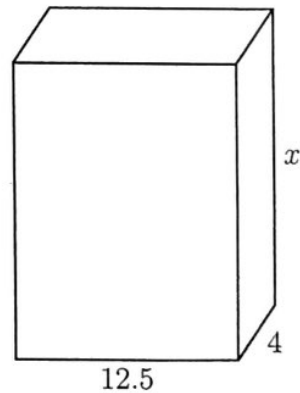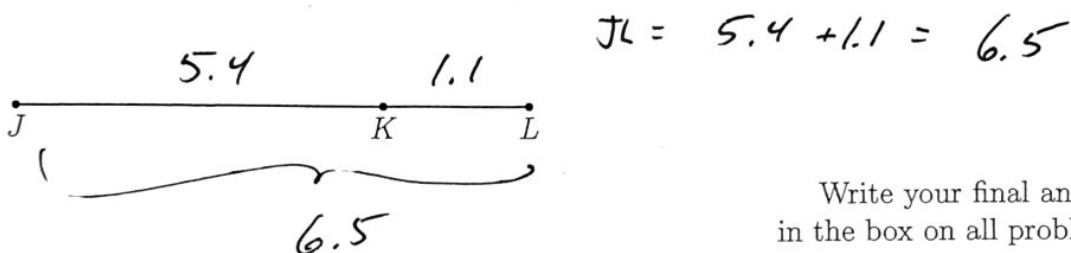
   6.5

   Write your final answer
   in the box on all problems.

2. A parallelogram is shown on the $x$-$y$ plane having a base $b = 2.5$ and height $h = 4.0$.

   Find its area, showing the calculation.

$$A = 2.5 \times 4.0$$
$$= 10$$

   4.0

   2.5
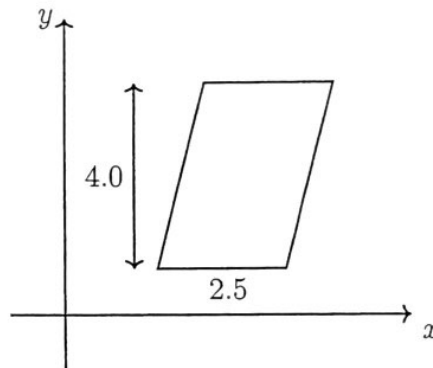
3. Subtract to find the length between $P(-3)$ and $Q(2)$. Take the absolute value if necessary since lengths are positive numbers.

$$\ell = 2 - (-3) = 5$$

   $P$        $Q$

   $-4 \quad -3 \quad -2 \quad -1 \quad 0 \quad 1 \quad 2 \quad 3 \quad 4$
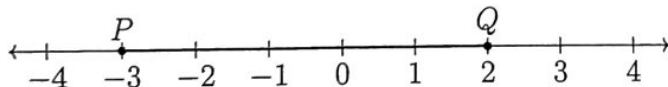
4. As shown below, two lines intersect making four angles: $\angle 1$, $\angle 2$, $\angle 3$, and $\angle 4$.

   Given $m\angle 2 = 105°$.

   (a) Find $m\angle 3$

   $$105 + x = 180$$
   $$x = 85°$$

   $85$   1

   2   $105$

   3   $85$

   4

   $105$

   (b) Find $m\angle 4$

   $$105°$$

5. Given $\overline{ABC}$, $AB = 2x + 2$, $BC = 6$, $AC = 14$. Find $x$.

$$\begin{array}{ccc} \overset{2x+2}{\underset{A}{\bullet\!\!-\!\!-\!\!-\!\!-\!\!-\!\!-\!\!-\!\!-}} & \overset{6}{\underset{B}{\bullet\!\!-\!\!-\!\!-\!\!-\!\!-\!\!-}} & \underset{C}{\bullet} \end{array}$$

$$\xleftarrow{\hspace{3cm}} \underset{14}{} \xrightarrow{\hspace{3cm}}$$

$(2x+2) + 6 = 14$

$2x = 6$
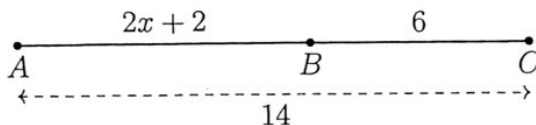
$2(3) + 2 = 8 \qquad 8 + 6 = 14 \checkmark \qquad x = 3$

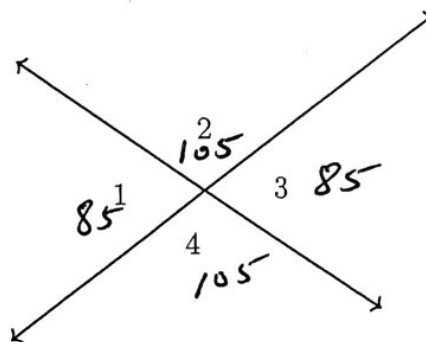6. Find the volume of a rectangular prism (box). Its length is $l = 19$ inches, its height $h = 11$ inches, and depth is $w = 7$ inches. Start with the equation

$V = l \times w \times h$

$V = 19 \cdot 7 \cdot 11$

$= 1463 \text{ in}^3$

11

7

19
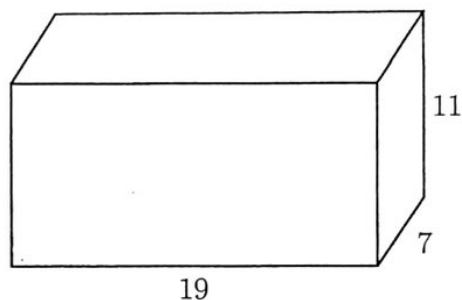
Do not write units in the box, just the value.

7. Apply the Angle Addition postulate. Write and equation to support your work.

Given $m\angle CBD = 28°$, $m\angle ABC = 90°$.

Find $m\angle ABD$.

A

D

? $x$

28°

B          C

$28 + x = 90$

$x = 62°$

**4.5 Classwork: Volume of cylinders, cones, pyramids, spheres**

1. Find the volume of a rectangular prism with length 2 cm, width 5 cm, and height 3 cm.

$$V = 2 \cdot 5 \cdot 3 = 30 \quad cm^3$$

2. Find the volume of a pyramid ($V = \frac{1}{3}Bh$) having a height of 11.3 inches and with a square base having side lengths of 7 inches. Express your result to the *nearest cubic inch*.

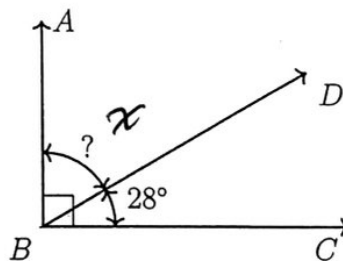$$V = \frac{1}{3}(7^2)(11.3) = 184.56\overline{6}$$
$$\approx 185 \quad in.^3$$

3. Find the volume of a sphere with a radius of 30 inches, to the *nearest whole cubic inch*. (The formula for the volume of a *sphere* is $V = \frac{4}{3}\pi r^3$)

$$V = \frac{4}{3}\pi(30^3) = 113097.31..$$
$$\approx 113,097 \quad in^3$$

4. A waffle cone has a radius of 2 inches and height of 4 inches.

    (a) Write down the general formula for the volume of a cone.

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

    (b) Find the volume of the waffle cone.

$$= \frac{1}{3}\pi(2^2)4 = 16.7551...$$
$$\approx 16.8 \quad in^3$$

5. A given sphere has a radius of 6 inches.

    (a) Write down the general formula for the volume of a sphere, using $r$ to represent the radius.

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

    (b) Find the volume of the sphere, to the *nearest whole cubic inch*.

$$= \frac{4}{3}\pi 6^3 = 904.7786...$$
$$\approx 905 \quad in^3$$

6. A pyramid with a square base has a volume of 576 cubic inches. Its height is the same as the lengths of the sides of the base. Find the area of its base.

$$V = \frac{1}{3}x^3 = 576$$
$$x = 12$$
$$A = 144$$

7. Spicy Do Now: The volume of a sphere is $(121\frac{1}{2})\pi$. Find its radius.

$$V = \frac{4}{3}\pi r^3 = 121\frac{1}{2}\pi$$
$$r^3 = 91.125$$
$$r = 4.5$$

8. A pyramid with a square base has a volume of 576 cubic inches. Its height is the same as the lengths of the sides of the base. Find the area of its base.

Given the volume formula $V = \frac{1}{3}(s^2)h$ for a pyramid with a square base $(B = s^2)$.

(a) Write down the variable representing the height

$$h = s = x$$

(b) Write down the variable representing the length of the base's side

$$s = x$$

(c) Write an equation relating the two variables in (a) and (b)

$$h = s = x$$

(d) Substitute and solve

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

9. A waffle cone has a radius of 2 inches and height of 4 inches.

(a) Write down the general formula for the volume of a cone.

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

(b) Find the volume of the waffle cone.

$$= 16.8$$

10. A given sphere has a radius of 6 inches.

(a) Write down the general formula for the volume of a sphere, using $r$ to represent the radius.

See page 1

(b) Find the volume of the sphere, to the *nearest whole cubic inch*.

**4.6 Classwork Modeling: Applying unit conversions to real world situations**

The following questions concern Kevin's college dorm room, which he shares with a roommate.

1. Kevin's room is 12 feet wide by 8 feet long.

   (a) If he wants to install carpet tiles that are 1 foot by 1 foot, how many tiles will he need?

   $$12 \text{ tiles by } 8 \text{ tiles}$$
   $$12 \times 8 = 96 \text{ tiles}$$

   (b) Carpet tiles are sold in boxes of 20 tiles. How many boxes should Kevin buy?

   $$96 \text{ tiles} \times \frac{1 \text{ box}}{20 \text{ tiles}} = 4.8 \text{ boxes}$$
   $$5 \text{ boxes}$$

   (c) It takes about 15 minutes to put down one box of tiles, plus 10 minutes to clean up. About how long will it take Kevin to complete the job?

   $$5 \text{ boxes} \times \frac{15 \text{ minutes}}{1 \text{ box}} = 75 \text{ minutes}$$
   $$75 + 10 = 85 \text{ minutes} = 1.25$$

   (d) If Kevin's roommate helps him with the job, how long will it take them? (What did you assume to get to this answer?)
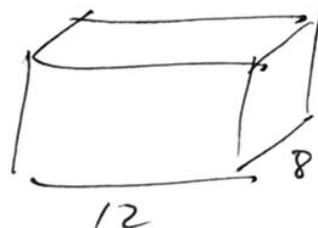
   $$85/2 = \text{about } 40\text{-}45 \text{ minutes}$$
   $$\text{assume they work efficiently together}$$

2

2. Kevin wants to paint the walls (and ceiling). His walls are $7\frac{1}{2}$ feet high.

(a) A 1 gallon can of paint covers 100 square feet of wall. How many cans of paint will he need?

$$S.A = \overset{ceiling}{1(8 \cdot 12)} + 2(12 \times 7.5) + 2(8 \cdot 7.5)$$
$$= 96 + 180 + \cancel{60} \, 120$$
$$= 396 \text{ sq. ft.}$$
$$\approx 4 \text{ cans of paint}$$

(b) If each can of paint costs $10, how much will it cost him to paint his room?

$$4 \text{ cans} \times \$10/\text{can} = \$40$$

(c) If it takes Kevin 45 minutes to apply each can of paint, how long will it take him to paint his room?

$$4 \text{ cans} \times 45 \text{ minutes/can} = 3 \text{ hours}$$

(d) If Kevin invites 2 friends to help him with the job, how long will it take them?

$$3 \text{ hours} / 3 = 1 \text{ hour together}$$

(e) Kevin's air conditioner can reduce the temperature of 2500 cubic feet of air by one degree every 20 minutes. How long will it take to reduce the temperature of his room from 77 degrees to 70 degrees?

$$V = 7.5 \times 12 \times 8 = 720 \text{ cubic ft.}$$
$$77 - 70 = 7 \text{ degrees}$$
$$720 \text{ ft}^3 \times 7 \text{ degrees} \times \frac{20 \text{ minutes} \cdot \text{degree}}{2500 \text{ ft}^3} = 40.32 \text{ minutes}$$
$$\approx 40 \text{ minutes}$$

3. Marcela owns a factory that makes cement blocks. Each block is an exact cube, with each side 2 feet across, and weighs 18 lbs. After the blocks are produced, she needs to store them in a warehouse until they are delivered to her clients.
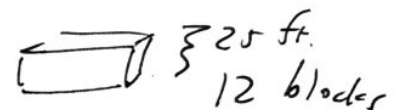
(a) She stores them in a warehouse that is 50 feet across and 120 feet long. How many blocks will cover the floor?

$25 \times 60 = 1500$ blocks

50 ft $\{$ 25 blocks

120 ft
60 blocks
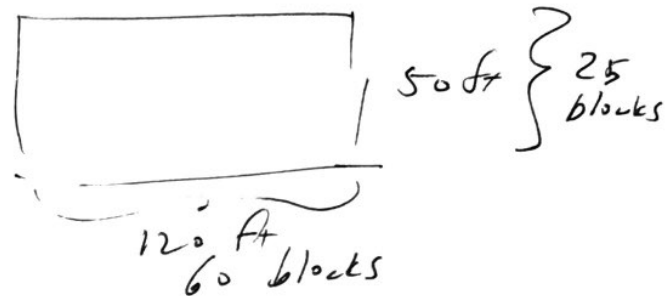
(b) If the warehouse is 25 feet high, how many blocks can it hold?

$12 \times 1500 = 18,000$ blocks

25 ft.
12 blocks

(c) Her old warehouse was 20% smaller in all dimensions: What were its dimensions?

$(1 - 0.20) \; \cancel{0.80} \times \{50 \times 120 \times 25]$

$= 40 ft \times 96 ft \times 20 ft.$

How many blocks could she store there?

$20 \times 48 \times 10 = 9600$ blocks

4

4. Kevin's room at home is 25% longer and 25% wider than his college dorm room.

(a) How many carpet tiles would cover his bedroom floor at home?

$$(8 \times 12) \times 1.25 = 10 \times 15 \text{ ft.}$$

$$150 \text{ sq. ft (tiles)}$$

Are 25% more tiles required? Why or why not.

No

$$96 \times 1.25 = 120 \neq 150$$

(b) How many gallons of paint would he need to paint that room?

$$S.A. = 10 \times 15 + 2(10 \times 7.5) + 2(15 \times 7.5)$$

$$= 150 + 150 + 225$$

$$= 525 \text{ sq.ft.}$$

$$525 \text{ sqft} \times \frac{1 \text{ can}}{100 \text{ sq ft.}} = 5.25 \text{ cans} \rightarrow 6 \text{ gallon cans}$$

(c) With the same air conditioner, how long would it take to reduce the temperature of the room at home by 7 degrees?

$$V = 7.5 \times 15 \times 10 = 1125 \text{ ft}^3$$

$$1125 \text{ ft}^3 \times 7 \text{ degrees} \times \frac{20 \text{ min. degrees}}{2500 \text{ ft}^3} = 63 \text{ minutes}$$

$$\sim 1 \text{ hour}$$

## 4.7 Classwork: Density of 3-dimensional objects, weight and cost

1. Find the weight of a metal block with a volume of 20 cubic inches and a density of 0.75 pounds per cubic inch.

$$W = 20 \text{ in}^3 \times 0.75 \frac{lbs}{in^3} = 15 \text{ lbs}$$

2. A large block of ice has a volume of 45 liters. The density of ice (water) is one kilogram per liter. Find the weight of the ice.

$$45 \ell \times \frac{1 kg}{1 \ell} = 45 \text{ kg}$$

3. A tank of gasoline holds 20 gallons. Find the cost to completely fill the tank if gasoline costs $2.35 per gallon.

$$20 \text{ gallons} \times \frac{\$2.35}{1 \text{ gallon}} = \$47.00$$

4. A bar of solid gold is in the shape of a rectangular prism having a length of 10 cm, width of 4 cm, and thickness of 1.5 cm. The density of gold is 19.3 grams per cubic cm, and its approximate market value is $50 per gram.

   (a) Find the weight of the bar of gold.

   $$V = 10 \times 4 \times 1.5 = 60 \text{ cm}^3$$

   $$W = 60 \text{ cm}^3 \times 19.3 \frac{g}{cm^3} = 1158 \text{ grams}$$

   (b) Find its value in dollars.

   $$1158 g \times \frac{\$50}{g} = \$57,900$$