

# ***LHF STUDY GUIDE***

**PASS THE HiSET® MATH TEST!**

## **GEOMETRY Part One**

### **Area & Perimeter of Squares & Rectangles**

#### **Basic Area & Perimeter of Squares & Rectangles**

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dgruve642@gmail.com

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# BASIC AREA & PERIMETER OF SQUARES & RECTANGLES

A **rectangle** is a 4-sided figure with four right angles ( $90^\circ$  angles). Opposite sides have the same length.

A **square** is a special kind of rectangle where all four sides have the same length.

## 1. Perimeter

The perimeter of a rectangle is the distance around the outside edge of the rectangle. This is calculated as the sum of the lengths of the four sides. (Sum means to add.)

Perimeter is measured in linear units such as feet, inches, miles.

The formula is  $P = L + L + W + W$ .

Perimeter is equal to Length + Length + Width + Width.

You will often see the formula written as  $P = 2L + 2W$ .

Perimeter is equal to 2 times Length + 2 times Width.

You may also see it written as  $P = 2(L + W)$  or  $P = 2 \times (L + W)$ .

Perimeter is equal to 2 times the sum of Length + Width.

The good news is you don't really need a formula at all. If you understand what perimeter is, you will know that you have to add up the lengths of the four sides.

Remember that in a square all four sides have equal lengths. If you are given the length of 1 side, add it up 4 times, or multiply the length  $\times 4$  to calculate perimeter.

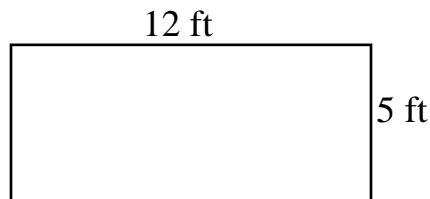
**Example 1.** What is the perimeter of a rectangular figure with sides of 5 feet and 12 feet?

A. 17 ft                  B. 60 ft                  C. 29 ft                  D. 34 ft                  E. 48 ft

Opposite sides are equal. Add up all four sides.  $5 + 5 + 12 + 12 = 34$

**Answer: D. 34 ft**

Sometimes the question will include a diagram and sometimes it will not. It may help you to draw one if it is not provided.



**Example 2.** Which expression shows how many feet of framing are needed to make a frame for a picture that measures 8 feet by 3 feet?

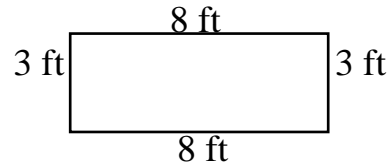
- A.  $8 + 3$     B.  $(2 \times 8) + (2 \times 3)$     C.  $8 \times 3$     D.  $4 \times (8 + 3)$     E.  $11 \times 11$

This question asks for an expression, not a numerical answer.

Add up the four sides:  $3 + 3 + 8 + 8$

This is not one of the answer choices, but B.  $(2 \times 8) + (2 \times 3)$  has the same value.

**Answer: B.  $(2 \times 8) + (2 \times 3)$**



**Tip** – If you know that the perimeter is  $3 + 3 + 8 + 8 = 22$  feet, but aren't sure which of the multiple choice answers is correct, calculate the value of each answer choice until you find one that is equal to 22.

**Note** – Dimensions are sometimes given without the words length and width, like in example 2, where it says 8 feet by 3 feet. Also, it doesn't matter which side you call length and which side you call width.

**Example 3.** What is the perimeter of a square field that has a length of 100 yards?

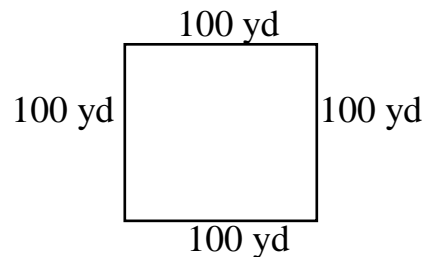
- A. 100 yd    B. 200 yd    C. 300 yd    D. 400 yd    E. 500 yd

All four sides of a square have the same length.

$100 + 100 + 100 + 100 = 400$  yd

**OR**  $4 \times 100 = 400$  yd

**Answer: D. 400 yd**



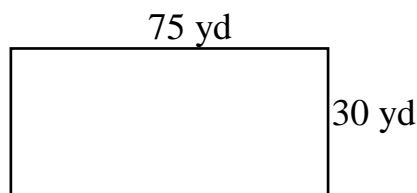
**Example 4.** A rectangular field measures 30 yards wide and 75 yards long. How many yards will Lina run if she runs around the field 6 times?

- A. 210    B. 1,260    C. 13,500    D. 105    E. 630

**First**, get the perimeter:  $30 + 30 + 75 + 75 = 210$  yd. This is the number of yards she runs when she goes around the field one time.

**Next**, multiply  $210 \times 6 = 1,260$  yd, because she runs around the field 6 times.

**Answer: B. 1,260 yd**



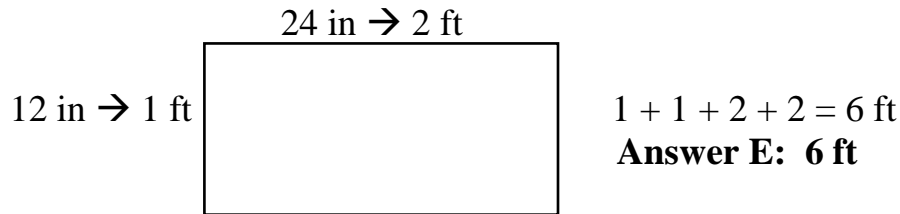
**Example 5.** John needs to put framing around his window. If the window is 12 inches wide and 24 inches long, how many feet of framing should he buy?

- A. 72 ft      B. 36 ft      C. 288 ft      D. 48 ft      E. 6 ft

Notice that the problem gives the dimensions in inches, and asks for an answer in feet, so convert the inches to feet and add up the sides. There are 12 inches in a foot, so divide by 12 to get feet.

$$24 \text{ in} \div 12 = 2 \text{ ft}$$

$$12 \text{ in} \div 12 = 1 \text{ ft}$$



**OR** Add up the sides in inches and then convert to feet.

$$12 + 12 + 24 + 24 = 72 \text{ in}$$

$$72 \div 12 = 6 \text{ ft} \quad \textbf{Answer E: 6 ft}$$

**Note** – If you have trouble knowing whether to divide or multiply when converting distance measurements, check out the Appendix on p. 60 for some tips.

### **Basic Distance Conversions To Memorize:**

**1 foot = 12 inches**

**1 yard = 3 feet**

**1 yard = 36 inches**

**Note** – The first two conversions will be provided on the formula sheet that is available when taking the HiSET. The third conversion will not be provided.

### **Practice One – Perimeter** (Draw a diagram if it helps.) *Answers – p. 31*

**1.** Tom wants to fence in his backyard. If the backyard is 30 feet wide and 15 feet long, how many feet of fence will he need to buy?

- A. 45 ft      B. 90 ft      C. 450 ft      D. 75 ft      E. 540 ft

**2.** What is the perimeter, in yards, of a room that is 10 yards wide and 18 yards long?

- A. 180      B. 28      C. 65      D. 112      E. 56

**3.** Which expression shows how many inches of framing will be needed to frame a picture that is 8 inches wide and 20 inches long?

- A.  $2 \times (8 + 20)$       B.  $8 + 20$       C.  $8 \times 20$       D.  $2 \times (8 \times 20)$       E.  $2 \times 8 + 20$

4. A square tablecloth is to be trimmed with a lace border. If the tablecloth is 3 feet wide, and lace trim costs \$2.99 per foot, how much will the lace trim cost?  
A. \$12.00      B. \$23.92      C. \$8.97      D. \$35.88      E. \$12.99

5. The edge of a bulletin board will be trimmed with ribbon. How many inches of ribbon will be needed if the bulletin board is 5 feet wide and 2 feet long?  
A. 14 in      B. 186 in      C. 40 in      D. 336 in      E. 168 in

## **2. Area**

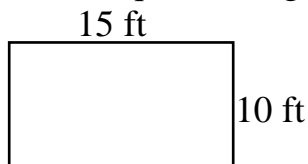
The area of a rectangle is the amount of space of the flat surface inside the perimeter. It is calculated by multiplying length x width, and is measured in square units such as square inches, square feet, square yards.

$$A = L \times W$$

Area is equal to Length times Width.

- Example 1.** Tiffany wants to put new tile down in her kitchen, which is 15 feet long and 10 feet wide. How many square feet of tile should she buy?  
A. 150      B. 25      C. 50      D. 60      E. 145

Area is equal to length times width, so multiply  $15 \times 10 = 150$  sq ft



**Answer: A. 150 sq ft**

Don't confuse area and perimeter.

**Perimeter** is the distance around the outside edge of the rectangle, and is calculated by **adding up the lengths of all four sides**.

**Area** is the amount of space inside the rectangle, and is calculated by **multiplying two numbers, the length times the width**.

- Example 2.** What is the area of a square room that has a length of 12 feet?  
A. 48 sq ft      B. 24 sq ft      C. 50 sq ft      D. 144 sq ft      E. 441 sq ft

All 4 sides of a square are equal, so length and width are both 12.

Area is equal to length times width, so multiply  $12 \times 12 = 144$  sq ft

**Answer: D. 144 sq ft**

**Example 3.** Which expression shows how many square inches of glass will be needed to replace a broken window that is 60 inches by 20 inches?

- A.  $60 + 20$                       B.  $60 + 60 + 20 + 20$                       C.  $60 \times 20$   
D.  $4 \times (60 + 20)$                       E.  $\frac{60 \times 20}{4}$

Multiply length of 60 x width of 20 to get square inches.    **Answer: C. 60 x 20**

**Example 4.** Goodtimes Daycare is building a new play area, which needs to be 300 square feet. If the width has to be 20 feet, what will the length be?

- A. 30 ft                      B. 40 ft                      C. 15 ft                      D. 600 ft                      E. 6,000 ft

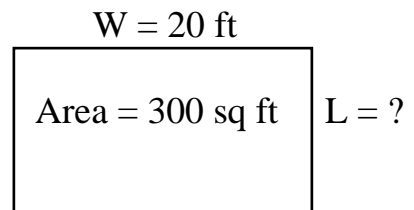
The formula for area is:  $\text{Area} = L \times W$ .

The problem tells you that  $\text{area} = 300$  and  $\text{width} = 20$ .

Plug those numbers into the formula:  $300 = L \times 20$ .

Divide to get the length.  $300 \div 20 = 15$  ft

**Answer: C. 15 ft**



**OR** You can use trial and error to see which of the 5 possible answers will give you 300 square feet when multiplied x the 20 foot width.

Try A.  $30 \times 20$  does not = 300, so 30 is not the correct length.

Try B.  $40 \times 20$  does not = 300, so 40 is not the correct length.

Try C.  $15 \times 20$  does = 300, so **C. 15 ft is the correct length.**

**Careful** – Most area problems provide length and width and ask you to calculate area. Example 4 provides area and width, and asks you to calculate length. Read carefully to make sure you are calculating what the question asks for. A very common mistake in this type of problem is to think that 20 and 300 are length and width, and then multiply.

**Example 5.** It costs \$10 per square yard to have carpeting installed. If an apartment complex is installing new carpet in 12 living rooms that each measure 5 yards by 10 yards, how much will it cost?

- A. \$500                      B. \$5,000                      C. \$600                      D. \$1,200                      E. \$6,000

Step 1 – Calculate the area of 1 living room.     $5 \times 10 = 50$  sq yd

Step 2 – Calculate the cost of 1 living room.     $50$  sq yd x \$10 per sq yd = \$500

Step 3 – Calculate the cost of 12 living rooms.     $12 \times \$500 = \$6,000$

**Answer: E. \$6,000**

**OR**

Step 1 – Calculate the area of 1 living room.     $5 \times 10 = 50$  sq yd

Step 2 – Calculate the area of 12 living rooms.     $12 \times 50$  sq yd = 600 sq yd

Step 3 – Calculate the cost of 600 sq yd.     $600$  sq yd x \$10 per yd = \$6,000

**Answer: E. \$6,000**

**Example 6.** Ebony wants to make a cardboard sign to fit inside a frame that is 36 inches wide and 48 inches tall. How many square feet of cardboard should she buy?  
 A. 84 sq ft      B. 12 sq ft      C. 1,728 sq ft      D. 168 sq ft      E. 14 sq ft

Notice that the dimensions are given in inches and the answer needs to be in square feet. So, convert the inches to feet, and then get area.

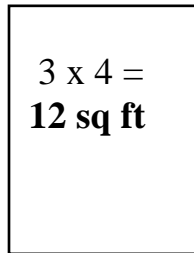
There are 12 inches in 1 foot, so divide by 12 to convert inches to feet.

$$36 \text{ in} \div 12 = 3 \text{ ft}$$

$$48 \text{ in} \div 12 = 4 \text{ ft}$$

$$\text{Area} = L \times W = 3 \times 4 = \mathbf{12 \text{ sq ft}}$$

$$36 \text{ in} = 3 \text{ ft}$$



$$48 \text{ in} = 4 \text{ ft}$$

**Answer: B. 12 sq ft**

For area problems, it is usually easier to convert first, then multiply, as just shown, but you could also get the area in square inches first and then convert to square feet.

$$36 \times 48 = 1,728 \text{ square inches.}$$

Divide by 144 to get square feet.

$$1,728 \div 144 = 12 \text{ sq ft}$$

**Answer: B. 12 sq ft**

**Note** – When you convert an area from square inches to square feet, you divide by 144, because there are 144 square inches in 1 square foot.

A square foot is 12 inches on each side, so the area of 1 square foot is the same as 12 in x 12 in = 144 sq in.

A common mistake is to divide by 12 because we are used to thinking that there are 12 inches in 1 foot. And there are, however, only when referring to linear feet.

The conversion for linear feet, used to measure distance, is 1 ft = 12 in.

The conversion for square feet, used to measure area, is 1 sq ft = 144 sq in.

So, dividing by 12 is not correct because there are 144 square inches in 1 square foot, not 12 square inches. The mistake comes from confusing linear inches with square inches.

**Note** – Example 6 gives the dimensions in width and height instead of width and length.

When calculating perimeter and area of a rectangle, the rectangle has a long side and a short side, and it doesn't matter if the sides are called length, width, or height.

For area, multiply the long side times the short side.

For perimeter, add up 2 short sides plus 2 long sides.

**Practice Two – Area** (Draw a diagram if it helps.) *Answers – p. 32*

1. What is the area of a rectangular table that is 14 feet long and 2 ½ feet wide?  
A. 33 sq ft      B. 49 ½ sq ft      C. 35 sq ft      D. 70 sq ft      E. 16 ½ sq ft
  
2. Which expression shows how many square inches of tile are needed to cover a kitchen backsplash that is 50 inches long and 12 inches wide?  
A.  $50 + 12$       B.  $2 \times (50 + 12)$       C.  $\frac{50 \times 12}{4}$       D.  $50 \times 12$       E.  $\frac{2(50+12)}{4}$
  
3. If the area of a floor is 660 square feet, and the length is 30 feet, what is the width of the floor?  
A. 600 ft      B. 20 ft      C. 22 ft      D. 165 ft      E. 25 ft
  
4. How many square yards of material are in a blanket that measures 12 ft by 6 ft?  
A. 72 sq yd      B. 36 sq yd      C. 18 sq yd      D. 6 sq yd      E. 8 sq yd
  
5. How much will it cost to carpet a room that measures 28 feet by 20 feet if carpeting costs \$2.75 per square foot?  
A. \$560      B. \$1,540      C. \$1,450      D. \$264      E. \$528

**3. Area vs. Perimeter**

**REMEMBER:** Perimeter is the distance around the edge, and Area is the amount of flat space inside the edge.

**Perimeter:** add up the lengths of 2 long sides plus 2 short sides. **Add up 4 numbers.**

**Area:** multiply the long side times the short side. **Multiply 2 numbers.**

Before you do a problem, decide if you are calculating area or perimeter. It may help to draw a picture.

\*\*If you want length or distance around something, it is a perimeter problem.

\*\*If you want how much of something is needed to cover something else, it is an area problem.

\*\*Look at what the problem is asking for. If a problem asks how many square inches, square feet, or square anything, then you know it is an area problem.



**Practice Three – Area vs. Perimeter**    *Answers – p. 34*

Label each as area (A) or perimeter (P).

- a) Baseboard around the room\_\_\_\_
- b) Amount of sod needed to cover a field\_\_\_\_
- c) Crown molding around the ceiling\_\_\_\_
- d) Amount of tile to cover a kitchen floor\_\_\_\_
- e) Size of glass in a picture frame\_\_\_\_
- f) Pathway around a garden\_\_\_\_
- g) Distance around the edge of a picture frame\_\_\_\_
- h) Wallpaper to cover a whole wall\_\_\_\_
- i) Size of carpet to cover the floor of a room\_\_\_\_
- j) Lace to trim the edge of a tablecloth\_\_\_\_
- k) Length of a fence to go around a garden\_\_\_\_
- l) Square feet of paneling to cover a wall\_\_\_\_
- m) Distance run around a field\_\_\_\_
- n) Walkway around a swimming pool\_\_\_\_

**4. Mixed Basic Area & Perimeter Word Problems**

**Practice 4 – Mixed Word Problems**    *Answers – p. 34*

**1.** Leo is installing molding around the ceiling of his living room, which is 20 feet long and 15 feet wide. How many feet of molding should he buy?

- A. 300 ft            B. 35 ft            C. 70 ft            D. 55 ft            E. 50 ft

**2.** If Leo also wants to put new tile on the ceiling, how much tile should he buy?  
Use information from question #1.

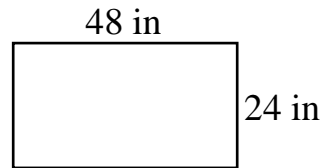
- A. 350 sq ft        B. 300 sq ft        C. 70 sq ft        D. 400 sq ft        E. 225 sq ft

**3.** Damon is installing a fence around a square playground that is 20 yards wide. How much fencing will he need?

- A. 80 yd            B. 400 yd            C. 40 yd            D. 60 yd            E. 75 yd

4. Lara has a fancy frame that she wants to put a mirror in and then hang over her couch. If the frame is 48 inches long and 24 inches wide, how many square feet of mirror should she buy?

- A. 1,152 sq ft      B. 144 sq ft      C. 96 sq ft      D. 12 sq ft      E. 8 sq ft



5. A walking path has been built around the outside edge of an athletic field that measures 75 yards by 35 yards. Which expression shows how many yards would be traveled by walking around the pathway one time?

- A.  $75 \times 35$       B.  $75 + 35$       C.  $2 \times (75 + 35)$       D.  $2 \times 75 + 35$       E.  $110 \times 4$

6. A large living room with a hardwood floor measures 40 feet long and 26 feet wide. How much will it cost to refinish the floor if the charge is \$3 per square foot?

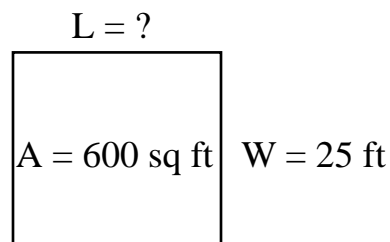
- A. \$1,040      B. \$3,210      C. \$396      D. \$3,120      E. \$198

7. The fabric required for one drapery panel measures 5 yards by 14 yards. Which expression shows how much it will cost to buy fabric for 8 panels if the fabric costs \$4.50 per square yard?

- A.  $5 \times 14 \div 8 \times \$4.50$       B.  $5 \times 14 \times 8 \times \$4.50$       C.  $8 \times (5 + 14) \times \$4.50$   
D.  $(19 \times 2) \times 8 \times \$4.50$       E.  $5 \times 14 \times 8 \div \$4.50$

8. Jerome wants his new patio to be 600 square feet. If the width has to be 25 feet, what will the length be?

- A. 625 ft      B. 575 ft      C. 24 ft      D. 50 ft      E. 75 ft



9. Which expression shows the cost to tile a bathroom floor that measures 10 feet by 7 feet if the tile costs \$6.25 per square foot?

- A.  $\frac{10 + 7}{\$6.25}$                       B.  $(10 + 10 + 7 + 7) \times \$6.25$                       C.  $10 \times 7 \times \$6.25$   
D.  $\frac{2 \times (10 + 7)}{\$6.25}$                       E.  $10 \times 7 \div \$6.25$

10. Leroy wants to make a vegetable garden in his side yard. It has to be 4 feet wide, and he wants it to cover an area of 60 square feet. How long should the garden be?

- A. 15 ft                      B. 240 ft                      C. 64 ft                      D. 128 ft                      E. 12 ft

11 Emmanuel is putting anti-slip tape around the edge of his swimming pool. If the pool is 30 yards wide and 75 yards long, how many feet of tape will he need?

- A. 210 ft                      B. 2,250 ft                      C. 420 ft                      D. 630 ft                      E. 70 ft

12. The Hillside Playground has a path around the outside that people use for jogging. The dimensions of the playground are 100 yards wide and 80 yards long. How many yards does Jerome run if he runs around the playground 5 times?

- A. 360 yd                      B. 1,800 yd                      C. 180 yd                      D. 900 yd                      E. 8,000 yd

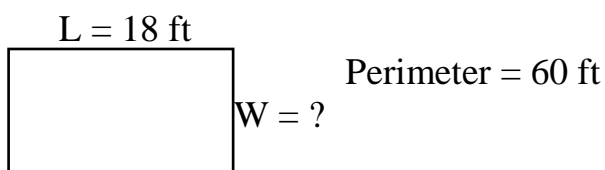
13. Sandria is making a bulletin board with a decorative ribbon border. The board is 20 inches long and 30 inches wide, and she needs to run the ribbon around the edge 3 times to make it look nice. How much ribbon will she need?

- A. 600 in                      B. 50 in                      C. 100 in                      D. 200 in                      E. 300 in

**\*\*\* → Multi-Step Challenger ← \*\*\*** *Answer – p. 21*

A room has a perimeter of 60 feet and a length of 18 feet. If carpeting costs \$29 per square yard, how much will it cost to carpet the room?

- A. \$31,320                      B. \$2,262                      C. \$696                      D. \$1,944                      E. \$12,528



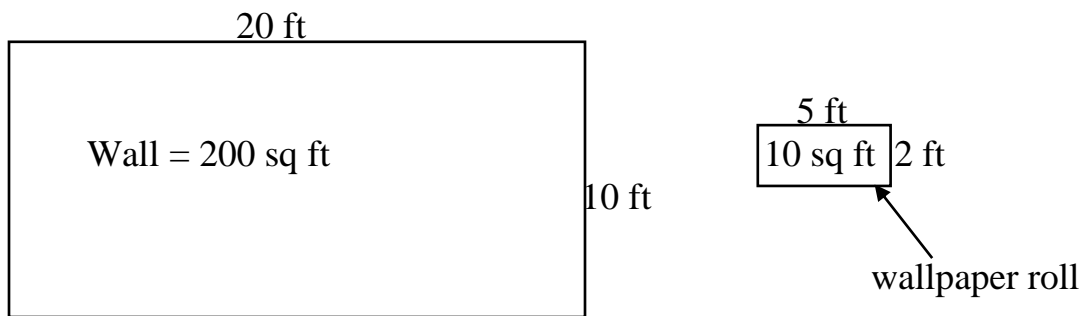
# MORE TYPES OF AREA & PERIMETER OF SQUARES and RECTANGLES WORD PROBLEMS

## 5. “Covering an Area” Word Problems

This type of word problem requires you to figure out how much of some material is needed to cover an area. Answers may be asked for as numbers or expressions.

**Example 1.** The Logans want to wallpaper one wall in their entryway. The wallpaper comes in rolls that are 2 feet by 5 feet and the wall is 10 feet long and 20 feet wide. How many rolls of wallpaper will be needed to cover the wall?

- A. 200            B. 210            C. 30            D. 20            E. 25



**Step 1:** Calculate the area of the wall:  $10 \times 20 = 200$  sq ft

**Step 2:** Calculate the area that each roll of wallpaper will cover:  $2 \times 5 = 10$  sq ft

**Step 3:** Divide to see how many rolls are needed:  $200 \div 10 = 20$  rolls of wallpaper

**Answer: D. 20**

**OR**

Once you figure out how many square feet need to be covered, and how many square feet are in 1 roll of wallpaper, if you don't know what to do next, you could use trial and error to see how many 10 sq ft rolls are needed to cover the 200 sq ft wall.

Try A. 200 rolls            Does 200 rolls  $\times$  10 sq ft per roll = 200 sq ft?  
**No**, it is 2,000 sq ft so 200 rolls of wallpaper is not correct.

Try B. 210 rolls            Does 210 rolls  $\times$  10 sq ft per roll = 200 sq ft?  
**No**, it is 2,100 sq ft so 210 rolls of wallpaper is not correct.

Try C. 30 rolls            Does 30 rolls  $\times$  10 sq ft per roll = 200 sq ft?  
**No**, it is 300 sq ft so 30 rolls of wallpaper is not correct.

Try D. 20 rolls            Does 20 rolls  $\times$  10 sq ft per roll = 200 sq ft?  
**Yes, it is 200 sq ft so 20 rolls of wallpaper is the answer.**

**Example 2.** The Smiths are putting new tile on the floor in their den. Each tile is 1 square foot and is purchased in boxes that contain 16 tiles. How many boxes of tiles will be needed if the den is 13 feet wide and 25 feet long?

- A. 20                      B. 31                      C. 21                      D. 8                      E. 22

Calculate the number of square feet to be covered:  $13 \times 25 = 325$  sq ft

Square feet of tile per box:  $16 \text{ tiles} \times 1 \text{ sq ft each} = 16 \text{ sq ft}$

Divide to see how many boxes are needed:  $325 \div 16 = 20.3125$  boxes

Normally, 20.3125 would round down to 20.

In this problem you have to go up to 21 boxes because 20 boxes of tile would not be enough to do the job.

**Answer: C. 21**

**Example 3.** A porch floor is being covered with outdoor carpet tiles that are each 3 feet long and 1 foot wide, and the porch is 15 feet by 20 feet. Which expression shows how many carpet tiles are needed?

- A.  $(20 \times 15) \div 3$                       B.  $(20 + 15) \div 3$                       C.  $20 \times 15 \times 3$   
D.  $20 + 15 \div 3$                       E.  $(20 + 15) \times 3$

Notice that you need an expression answer, not a numerical solution.

You need to divide total square feet to be covered by the number of square feet in each outdoor carpet tile.

Total square feet to be covered, or area:  $20 \times 15$

The number of square feet in each tile:  $3 \times 1 = 3$

**Answer: A.  $(20 \times 15) \div 3$**

**Note -** This could also have been written as  $(15 \times 20) \div 3$ , and, if you think of the fraction bar as a division sign, the answer could also be written as

$$\frac{20 \times 15}{3} \quad \text{or} \quad \frac{15 \times 20}{3} .$$

**Example 4.** Alana is adding decorative mirror tile to accent her bathroom wall. If the tiles are 3-inch-square, and she is covering an area that is 6 inches by 75 inches, how many mirror tiles will she need?

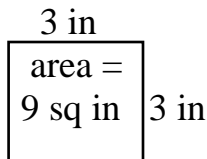
- A. 150                  B. 75                  C. 100                  D. 38                  E. 50

Note that the tiles are described as 3-inch-square. This means they are square tiles that are 3 inches on each side. Each tile has an area of  $3 \times 3 = 9$  sq in.

“3-inch-square” is not the same as “3 square inches.”

“3-inch-square” gives the length of the sides of a square.

“3 square inches” is the area of a figure.



3-inch-square means a square that is 3 inches on all sides, so  $\text{area} = 3 \times 3 = 9$  square inches.

3-inch-square **does not** mean 3 square inches.

You need to divide total square inches to be covered by the number of square inches in each tile.

Total square inches to be covered, or area:  $6 \times 75 = 450$  sq in

The number of square inches in each tile:  $3 \times 3 = 9$  sq in

$450 \div 9 = 50$  tiles

**Answer: E. 50**

**Practice Five – “Covering an Area” Word Problems** *Answers – p. 39*

**1.** A hotel is putting new wooden flooring down in one of their function rooms. If the room is 60 feet long and 100 feet wide, and the wooden flooring comes in pieces that are 2 feet wide and 10 feet long, how many pieces of wooden flooring will be needed?

- A. 300                  B. 500                  C. 350                  D. 12                  E. 8

**2.** Deandra is covering one wall of her craft room with cork tiles. If the wall is 10 feet by 20 feet, and the tiles are 2 feet long and 1 foot wide, which expression represents the number of cork tiles needed?

- A.  $10 \times 20 \times 2$                   B.  $(10 + 20) \times 2$                   C.  $(10 + 20) \div 2$   
 D.  $10 + 20 \div 2$                   E.  $(10 \times 20) \div 2$

**3.** A kitchen is getting a new tile floor. The kitchen is 10 feet wide and 24 feet long, and the tiles are 2 feet by 3 feet. Which expression shows how many tiles are needed to cover the kitchen floor?

A.  $\frac{6}{10 \times 24}$

B.  $(10 \times 24) + (2 \times 3)$

C.  $\frac{10 \times 24}{6}$

D.  $10 \times 24 \times 6$

E.  $10 + 24 + 2 + 3$

**4.** How many 4-inch-square tiles are needed to cover a kitchen backsplash area that is 4 feet by 5 feet?

A. 5

B. 720

C. 360

D. 180

E. 810

**5.** Suzanne is putting new wallpaper on both walls of her entryway. Each wall is 10 feet tall and 30 feet wide, and the wallpaper comes in rolls that are 3 feet wide and 10 feet tall. How many rolls of wallpaper will she need to cover both walls?

A. 10

B. 20

C. 30

D. 40

E. 50

**6.** Decorative mosaic tile wall covering comes in rolls that can cover 4 square feet. Which expression shows how many rolls will be needed to cover a 10 x 8 foot section of wall?

A.  $\frac{10 \times 8}{4}$

B.  $\frac{4}{10 \times 8}$

C.  $4 \times 8 \times 10$

D.  $\frac{4 \times 10}{8}$

E.  $10 \times 8 + 4$

**7.** Pegboard is sold in 2-foot-square pieces that cost \$4.49 each. How much will it cost to cover a section of workshop wall that is 4 feet tall and 8 feet wide?

A. \$71.84

B. \$143.68

C. \$53.92

D. \$35.92

E. \$8

**8.** A contractor needs to order enough drywall to cover 520 square feet of wall. How many 4 x 8 foot sheets of drywall should be ordered?

A. 16

B. 17

C. 43

D. 44

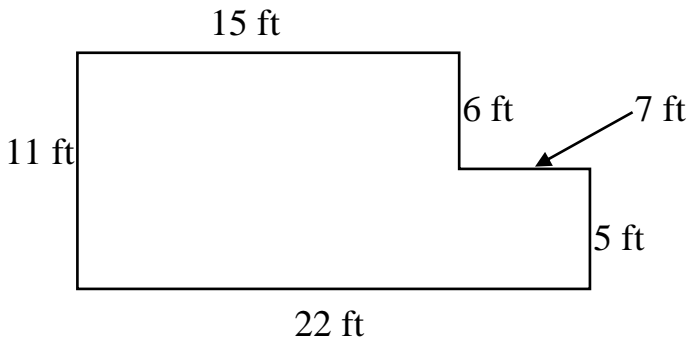
E. 71

## 6. Area of L-Shaped Figures

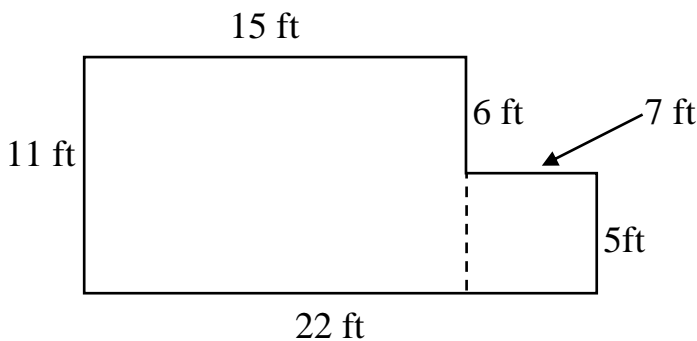
In this type of problem, you must divide an L-shaped figure into two rectangles, get the area of each, and then add together to get the total area of the L-shaped figure.

**Example 1.** What is the area of the figure shown?

- A. 165 sq ft    B. 242 sq ft    C. 200 sq ft    D. 250 sq ft    E. 66 sq ft



Divide the figure into two rectangles, get the area of each rectangle, and add together.



Area of small rectangle:

$$5 \times 7 = 35 \text{ sq ft}$$

Area of big rectangle:

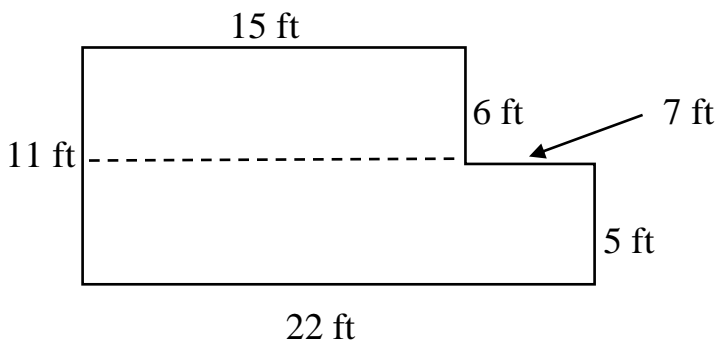
$$15 \times 11 = 165 \text{ sq ft}$$

$$\text{Total area: } 35 + 165 = 200 \text{ sq ft}$$

**Answer: C. 200 sq ft**

Notice that to get the area of the large rectangle on the left side, you multiply  $11 \times 15$ , **NOT  $11 \times 22$** . The 22 ft number is the distance all the way across the base of both rectangles. This is longer than the base of the one rectangle that you are measuring.

You could also divide into two rectangles the other way, and get the same answer.



Area of top rectangle:

$$15 \times 6 = 90 \text{ sq ft}$$

Area of bottom rectangle:

$$5 \times 22 = 110 \text{ sq ft}$$

$$\text{Total area: } 90 + 110 = 200 \text{ sq ft}$$

**Answer: C. 200 sq ft**



**Example 2.** What is the area of the bedroom bathroom suite shown in the diagram?

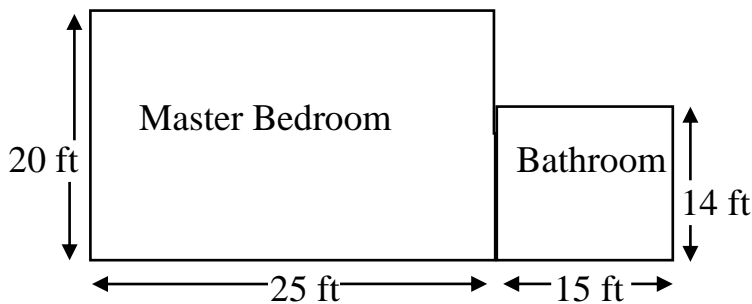
A. 500 sq ft

B. 280 sq ft

C. 710 sq ft

D. 210 sq ft

E. 114 sq ft



Get the area of the bedroom and the area of the bathroom and add together. Notice that in this diagram, the lengths of the sides are shown by arrows pointing to the beginning and end of the side, with the number of feet in the middle of the arrows.

Bedroom area:  $20 \times 25 = 500$  sq ft

Bathroom area:  $15 \times 14 = 210$  sq ft

Add together:  $500 + 210 = 710$  sq ft

**Answer: C. 710 sq ft.**

**Practice Six – Area of L-Shaped Figures** *Answers – p. 43*

**1.** What is the area of the diagram below?

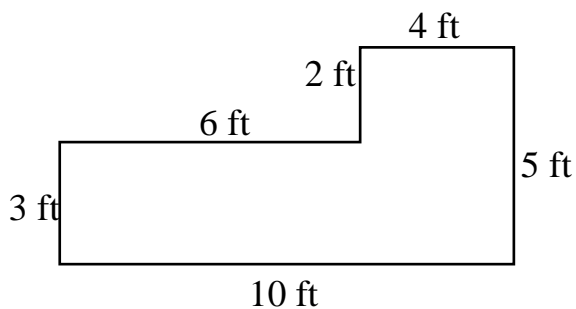
A. 38 sq ft

B. 58 sq ft

C. 50 sq ft

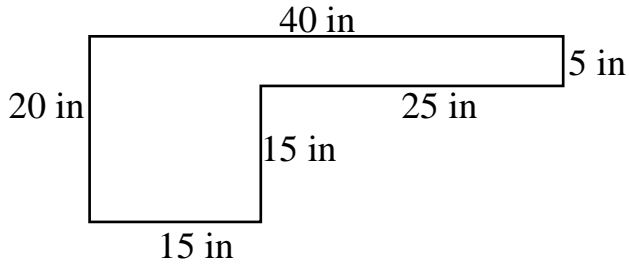
D. 68 sq ft

E. 24 sq ft



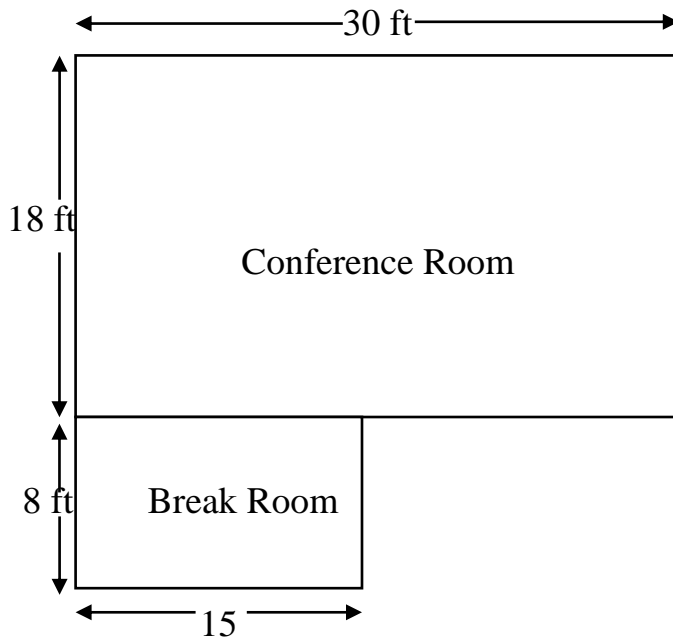
2. What is the area of the figure below?

- A. 500 sq in    B. 800 sq in    C. 425 sq in    D. 300 sq in    E. 95 sq in



3. What is the area of the corner of an office suite that holds the conference room and break room as shown in the diagram?

- A. 780 sq ft    B. 540 sq ft    C. 1,125 sq ft    D. 660 sq ft    E. 390 sq ft

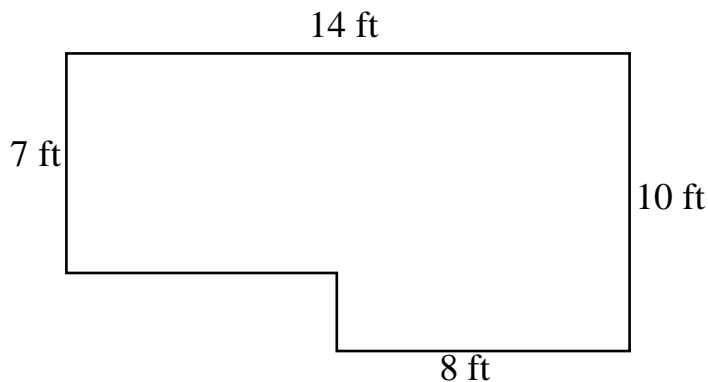


## 7. Missing Information in L-Shaped Figures

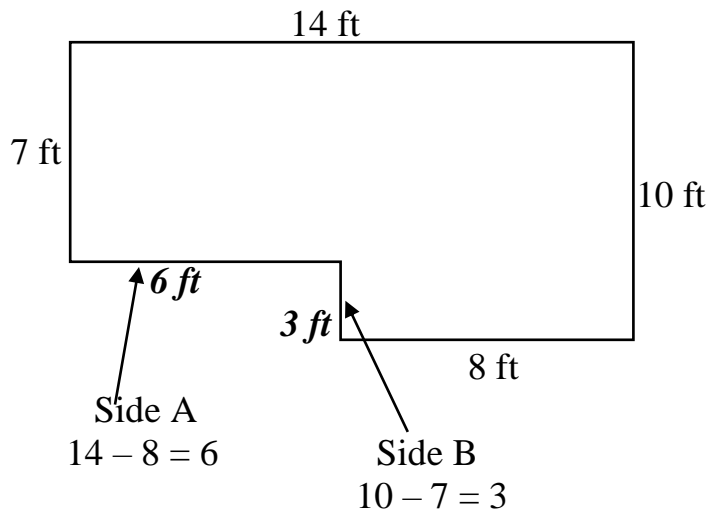
In this type of problem, the lengths of some sides are not provided. Use the lengths that are provided to calculate the missing lengths, then calculate what is asked for in the problem.

**Example 1.** How many feet of wire fence will be needed to go around the backyard shown in the diagram?

- A. 39 ft      B. 48 ft      C. 42 ft      D. 45 ft      E. 47 ft



Notice that two of the sides have not been labeled with the length. Before you can get perimeter, you have to calculate these two lengths.



When you are calculating the missing length of a side, look at the sides that go in the same direction as the side with the missing length. Then, add or subtract the numbers.

**Side A** is horizontal, (goes across), so look at the lengths of the other horizontal sides, which are 14 and 8.  $14 - 8 = 6$  ft

**Side B** is vertical, (goes up and down) so look at the lengths of the other vertical sides, which are 10 and 7.  $10 - 7 = 3$  ft

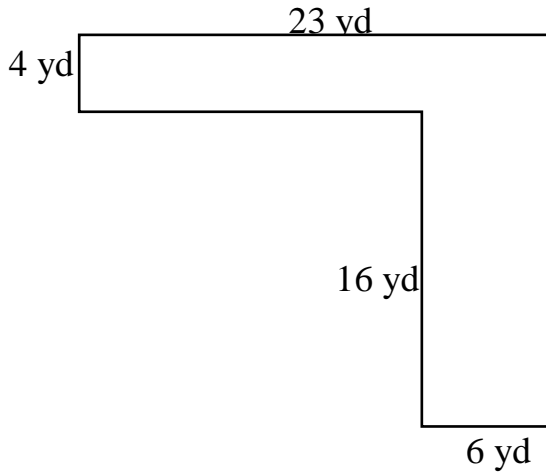
Add up the sides to get perimeter:  $7 + 14 + 10 + 8 + 3 + 6 = 48$

**Answer: B. 48 ft**

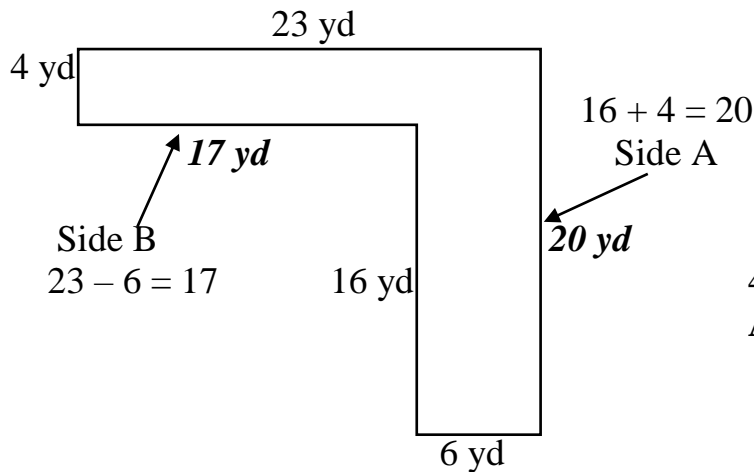
**Tip** – Be careful that you add up all 6 sides. Don't leave one out by mistake.

**Example 2.** How long will a pathway be if it goes all the way around the edge of the outdoor exhibit shown in the diagram?

- A. 49 yd      B. 69 yd      C. 66 yd      D. 86 yd      E. 96 yd



Calculate the two missing lengths, then add up the sides.



Perimeter:  
 $4 + 23 + 20 + 6 + 16 + 17 = 86$  yd  
**Answer: D. 86 yd**

**For Side A,** look at the lengths of the other two sides that go in the same direction. These are the sides that measure 16 yd and 4 yd.

Side A is longer than either of those sides, so add to get the length.  $16 + 4 = 20$  yd

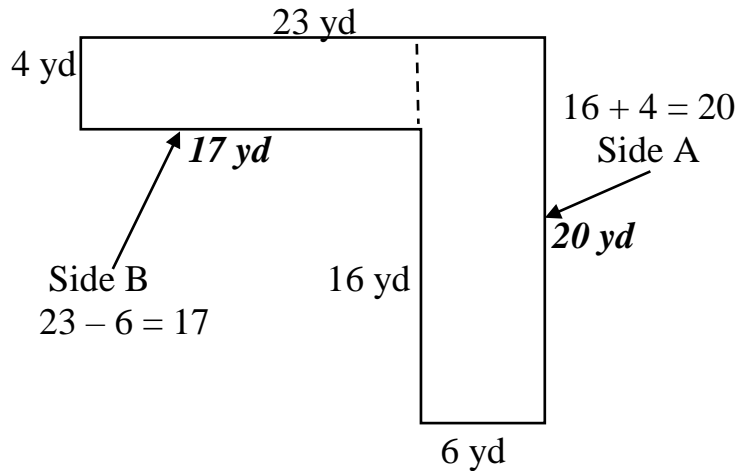
**For Side B,** look at the lengths of the other two sides that go in the same direction. These are the sides that measure 23 yd and 6 yd.

Side B is shorter than the 23 yd side, so subtract to get the length.  $23 - 6 = 17$  yd

**Example 3.** How much will it cost to carpet the exhibit floor in Example 2 if carpet costs \$9 per sq yd?

- A. \$188      B. \$1,926      C. \$1,080      D. \$774      E. \$1,692

You have already calculated the missing sides, so calculate area, then multiply to get cost.



Area of top rectangle:  $4 \times 17 = 68$  sq yd

Area of rectangle on the right:  $6 \times 20 = 120$  sq yd

Total area:  $68 + 120 = 188$  sq yd

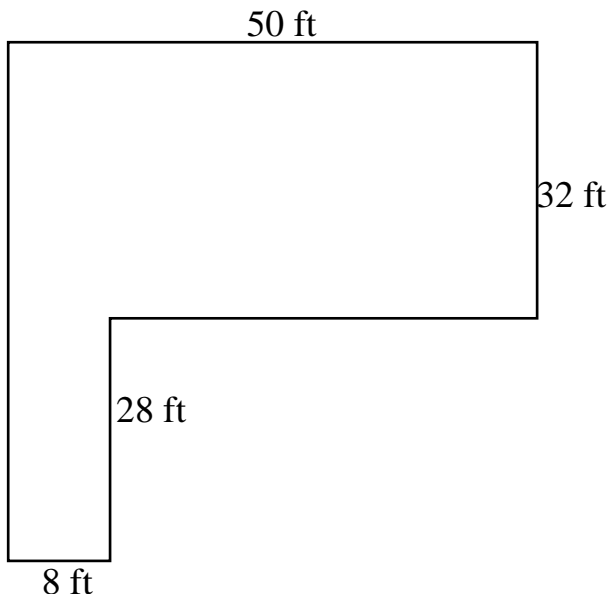
Cost:  $188 \times \$9 = \$1,692$       **Answer: E. \$1,692**

**Practice Seven – Missing Information In L-Shaped Figures**

*Answers – p. 45*

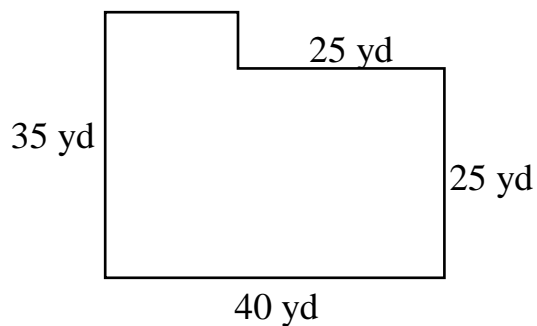
**1.** What is the perimeter of the figure shown below?

- A. 118 ft      B. 220 ft      C. 212 ft      D. 110 ft      E. 400 ft



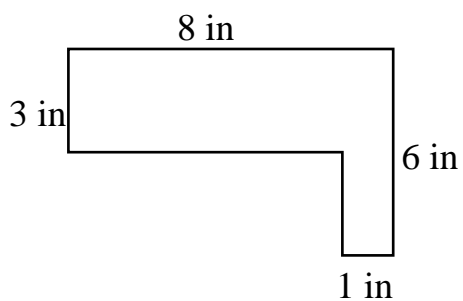
2. How long will a fence need to be to surround the playground shown below?

- A. 125 yd      B. 140 yd      C. 115 yd      D. 150 yd      E. 110 yd



3. Lina needs 12 pieces of fabric shaped like the diagram below for the quilt she is making. How many square inches will these pieces cover?

- A. 27 sq in      B. 216 sq in      C. 28 sq in      D. 336 sq in      E. 324 sq in

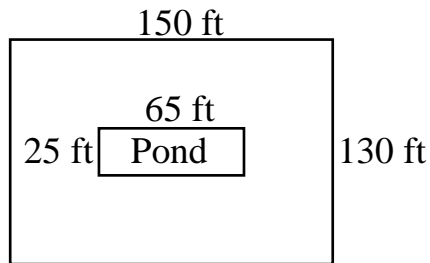


## 8. Area of Figures with Cutouts

In this type of problem, calculate the area of a portion of a rectangle by subtracting out the parts you don't want.

**Example 1.** A park with a rectangular pond in the center is to be planted with new grass. What is the area that will be planted?

- A. 19,500 sq ft                      B. 190 sq ft                      C. 21,125 sq ft  
D. 17,875 sq ft                      E. 19,410 sq ft



The area to be planted is the space all around the pond, but not including the pond.

Area of the park including the pond:  $130 \times 150 = 19,500$  sq ft

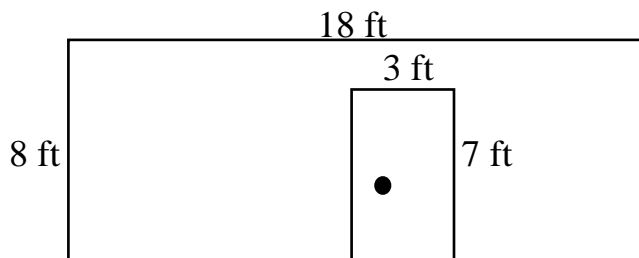
Area of the pond:  $25 \times 65 = 1,625$  sq ft

Subtract to get area around the pond:  $19,500 - 1,625 = 17,875$  sq ft

**Answer: D. 17,875 sq ft**

**Example 2.** Which expression shows how many square feet of wallpaper will be needed to cover the wall shown in the diagram?

- A.  $8 \times 18$                       B.  $(8 \times 18) + (3 \times 7)$                       C.  $(8 \times 18) \div (3 \times 7)$   
D.  $(18 \times 7) - (3 \times 8)$                       E.  $(8 \times 18) - (3 \times 7)$



Notice that you need an expression answer, not a number.

Also, understand that the door in the diagram will not be covered with the wallpaper. Sometimes the problem will spell this out and sometimes it won't.

Total area of the wall with door included:  $8 \times 18$

Area of the door by itself:  $3 \times 7$

Subtract door from total area:  $(8 \times 18) - (3 \times 7)$       **Answer: E.  $(8 \times 18) - (3 \times 7)$**

**Example 3.** If wallpaper costs \$1.79 per square foot, how much will it cost to buy the wallpaper needed for the wall in Example #2?

- A. \$257.76      B. \$440.34      C. \$220.17      D. \$202.71      E. \$93.08

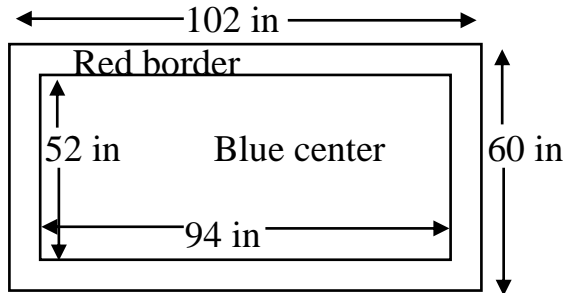
Total sq ft:  $(8 \times 18) - (3 \times 7) = 123$  sq ft

Cost:  $123 \times \$1.79 = \$220.17$

**Answer: C. \$220.17**

**Example 4.** A blue tablecloth has a red border around the edge. Based on the diagram below, what expression would you use to calculate the area of the red border?

- A.  $60 \times 102$       B.  $(60 \times 102) - (52 \times 94)$       C.  $(52 \times 102) - (60 \times 94)$   
D.  $(60 \times 102) \times (52 \times 94)$       E.  $(52 \times 102) + (60 \times 94)$



To get the area of the border, you have to get the area of the whole tablecloth (red border plus blue center), and then subtract out the area of the center.

Be careful when reading the numbers on diagrams like this. The many lines and arrows can be confusing. The outside dimensions, for the whole tablecloth, are 60 in and 102 in. The inside dimensions, for the center of the tablecloth, are 52 in and 94 in.

Area of the whole tablecloth:  $60 \times 102$

Area of the center of the tablecloth:  $52 \times 94$

Subtract to get the area of the border:  $(60 \times 102) - (52 \times 94)$

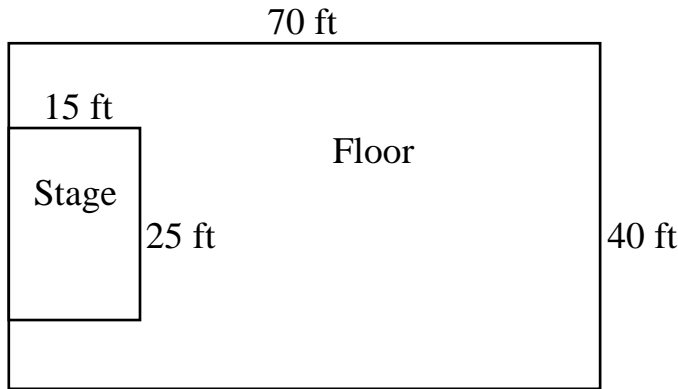
**Answer: B.  $(60 \times 102) - (52 \times 94)$**



**Practice Eight – Area of Figures with Cutouts** *Answers – p. 48*

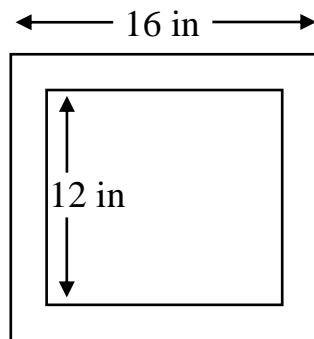
1. The auditorium below is getting a new wooden floor, except for the stage area which will have a painted floor. What is the area that will be covered with wooden flooring?

- A. 2,425 sq ft    B. 2,800 sq ft    C. 300 sq ft    D. 180 sq ft    E. 3,175 sq ft



2. A plain square wooden frame surrounding a square wall mirror is being decorated with mosaic tile. Based on the diagram below, what expression could you use to calculate the area of the frame?

- A.  $(16 \times 16) + (12 \times 12)$     B.  $(16 \times 16) - (12 \times 12)$     C.  $2(16 \times 12)$   
D.  $(12 \times 12) - (16 \times 16)$     E.  $(16 - 12) \times (16 - 12)$



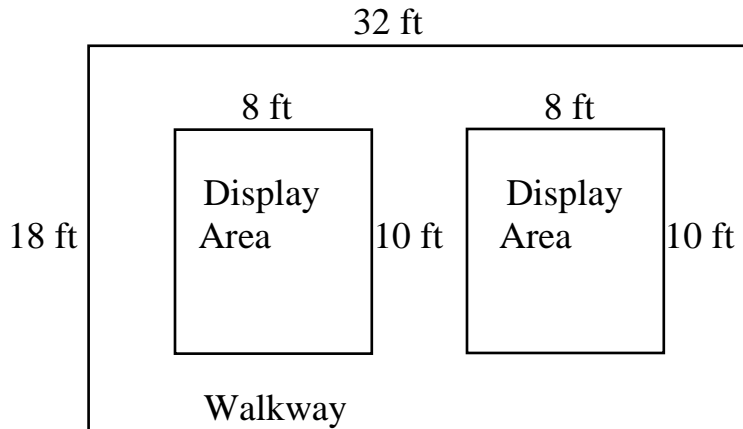
3. A wall with two windows is getting painted with an accent color. The wall measures 10 x 18 feet, and each window is 3 x 4 feet. Which expression would you use to calculate the area of the wall that will be painted?

- A.  $(10 \times 18) - (3 \times 4)$     B.  $(10 \times 18) + (3 \times 4)$     C.  $(10 \times 18) - 2(3 \times 4)$   
D.  $(10 \times 18) \times 2(3 \times 4)$     E.  $2(10 + 18) - 4(3 + 4)$

A diagram is not provided, but it may be helpful to draw one.

4. A sculpture display area at a museum has a walkway built around and through it, as shown below. To complete the project, the walkway will be tiled with tiles that cost \$4 per square foot, and a guardrail that costs \$12 per foot will be built around each 8 ft x 10 ft display area. How much will it cost to complete the project?

- A. \$1,664      B. \$3,584      C. \$2,624      D. \$2,096      E. \$2,528

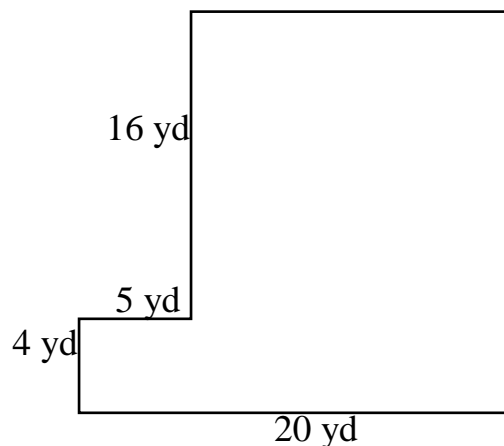


**Practice Nine – More Word Problem Practice** *Answers – p. 51*

Questions 1 and 2 refer to the diagram below.

1. The area in the diagram will be paved with outdoor tile, and a border of stepping stones will be placed around the outside edge. How many square yards of outdoor tile will be needed?

- A. 400 sq yd      B. 80 sq yd      C. 300 sq yd      D. 325 sq yd      E. 320 sq yd



2. How long will the stepping stone border be?

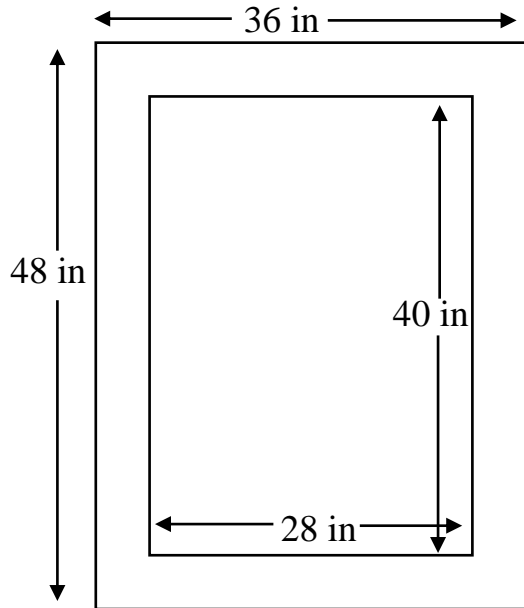
- A. 80 yd      B. 60 yd      C. 85 yd      D. 45 yd      E. 65 yd

3. A micro-tile backsplash material is sold in 4 x 1 foot sections, and Adel wants to use it on her backsplash area that measures 3 x 8 feet. Which expression shows how many micro-tile sections are needed?

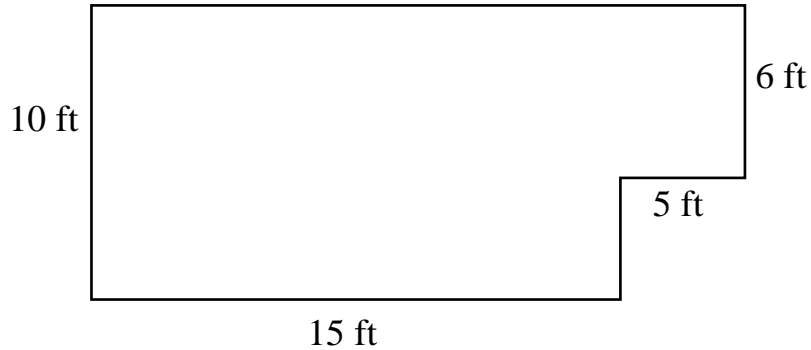
- A.  $\frac{4}{3 \times 8}$       B.  $(3 \times 8) \times 4$       C.  $\frac{3 \times 8}{4}$       D.  $2(3 + 8) + 2(4 + 1)$       E.  $3 \times 4 \div 8$

4. Lenore is making posters to advertise a New Year's Eve party, as shown in the diagram below. Each poster will have a border made from fancy metallic fireworks pattern paper. Which expression could you use to calculate the number of square inches of fireworks pattern paper that Lenore will need?

- A.  $(48 \times 36) + (28 \times 40)$       B.  $(48 \times 36) - (28 \times 40)$       C.  $(48 \times 28) - (40 \times 36)$   
D.  $(48 \times 28) \times (40 \times 36)$       E.  $2(48 + 36) + 2(28 \times 40)$



Questions 5 and 6 refer to the room in the diagram below.

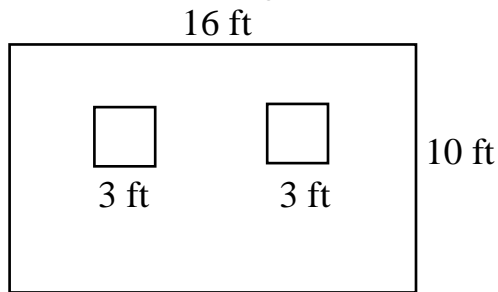


**5.** How much will it cost to carpet the room if carpeting costs \$3.99 per square foot?  
A. \$180      B. \$143.64      C. \$430.92      D. \$718.20      E. \$798

**6.** How much will it cost to put crown molding around the edge of the ceiling, if the molding costs \$4.99 per foot?  
A. \$60      B. \$294.90      C. \$299.40      D. \$359.28      E. \$748.50

**7.** How many 2-foot-square ceiling tiles will be needed to cover the ceiling in a room that is 16 feet long and 20 feet wide?  
A. 160      B. 144      C. 36      D. 320      E. 80

Questions 8 – 10 refer to the diagram below of a wall with 2 square windows.



**8.** The wall in the diagram will be painted, not including the 2 windows. Which expression shows how many square feet of wall will be painted?

- A.  $(16 \times 10) - (3 \times 3)$       B.  $(16 \times 10) - 2(3 \times 3)$       C.  $2(16 \times 10) - (3 + 3)$   
D.  $2(16 \times 10) - 2(3 \times 3)$       E.  $(16 \times 10) \div 2(3 \times 3)$

**9.** In the Gateway Apartment Complex, there are 26 walls exactly like the wall in the diagram that need to be painted. If one gallon of paint covers 400 square feet of wall, how many gallons of paint will need to be purchased to cover the 26 walls?

- A. 9                      B. 10                      C. 15                      D. 8                      E. 12

**10.** They are also putting new glass in all the windows in the 26 walls. If glass costs \$5 per square foot, what will it cost to buy the glass for all the windows?

- A. \$468                  B. \$1,170                  C. \$1,560                  D. \$2,340                  E. \$4,160

**11.** Decorative tiles for a kitchen backsplash measure 2 inches wide and 2 inches long. How many of these tiles will be needed to cover a backsplash area that is  $2\frac{1}{2}$  feet by 8 feet?

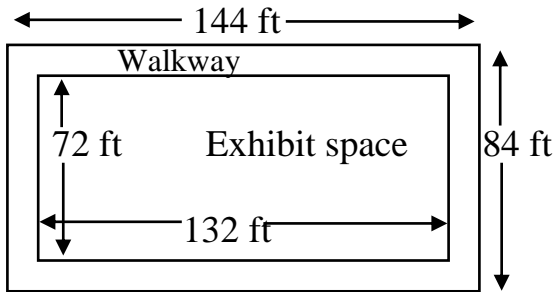
- A. 10                      B. 720                      C. 5                      D. 1,440                      E. 270

**12.** A 12 by 24 inch decorative wall quilt is being put together with pre-cut quilt pieces that are each 4 inches long and 1 inch wide. Which expression shows how many quilt pieces will be needed?

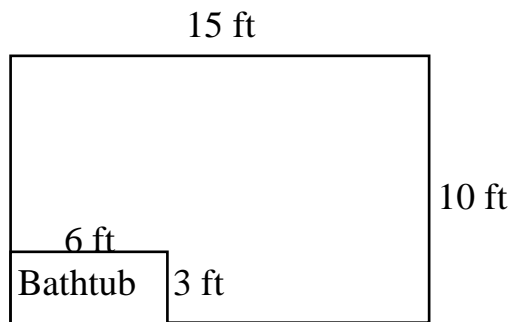
- A.  $(12 \times 24) \times 4$                       B.  $2(12 + 24) \div 4$                       C.  $(12 \times 24) \div 4$   
D.  $2(12 + 24) \times 4$                       E.  $(12 \times 24) + 4$

- 13.** For the quilt being made in problem #12, the quilt pieces come in packs of 10 that cost \$2.75 per pack. How much will it cost to buy enough quilt pieces?  
 A. \$72                      B. \$19.25                      C. \$27.50                      D. \$198                      E. \$22

- 14.** At the zoo, there is a rectangular wild bird exhibit space with a walkway going around all four sides, as shown in the diagram below. What expression would you use to calculate the area of the walkway?  
 A.  $84 \times 144$                       B.  $(84 \times 144) - (72 \times 132)$                       C.  $72 \times 132$   
 D.  $(84 \times 144) + (72 \times 132)$                       E.  $(72 \times 144) - (84 \times 132)$

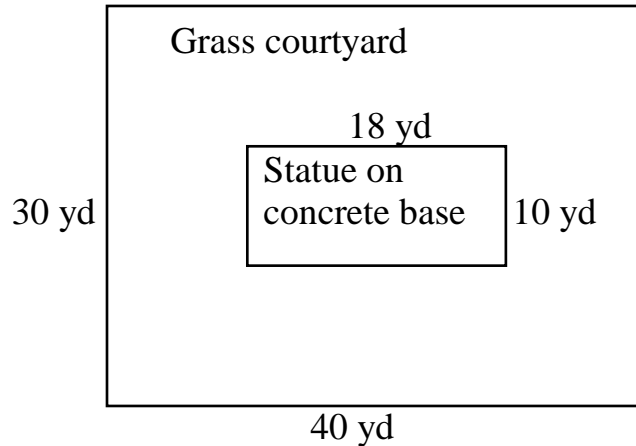


- 15.** The bathroom shown is getting a new tile floor. Which expression could be used to show how many square feet of tile are needed, assuming that the bathtub area will not be tiled?  
 A.  $(15 \times 10) - (3 \times 6)$                       B.  $(15 \times 10) + (3 \times 6)$                       C.  $(15 \times 10) \times (3 \times 6)$   
 D.  $(15 \times 10) \div (3 \times 6)$                       E.  $(15 \times 6) - (3 \times 10)$



- 16.** Acoustical ceiling tile is being installed in a workroom that is 72 feet long and 44 feet wide. If each tile covers 8 square feet, which of the following expressions would you use to calculate the number of tiles needed?  
 A.  $72 \times 44 \times 8$                       B.  $2(72 + 44) \div 8$                       C.  $72 \div 8 + 44 \div 8$   
 D.  $2(72 + 44) \times 8$                       E.  $(72 \times 44) \div 8$

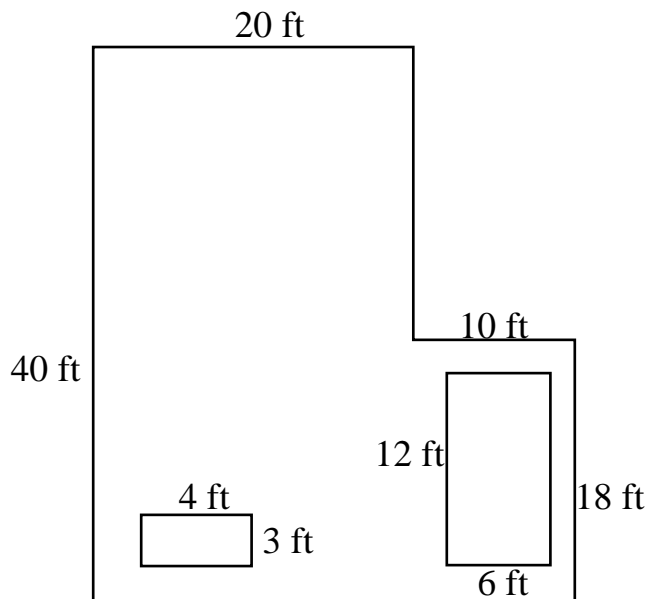
17. The grass courtyard at Boone Town Hall has a statue on a concrete rectangular base as shown in the diagram. If the grass part of the courtyard is being reseeded at a cost of \$1.75 per square yard, how much will the reseeding job cost?
- A. \$1,785      B. \$1,200      C. \$1,020      D. \$686      E. \$1,875



**\*\*\* → Multi-Step Challenger ← \*\*\***

The layout of Primo Coffee Corner is shown below. There is a 12 by 6 foot counter/coffee station and a 3 by 4 foot condiment station. New wood flooring is being installed everywhere except under these two stations. How much will it cost to install the flooring if the charge is \$8 per square foot?

- A. \$5,728      B. \$8,928      C. \$7,618      D. \$7,168      E. \$1,120



# ANSWER KEY

## Practice One – Perimeter (page 3)

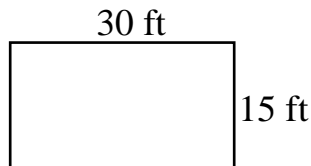
1. Tom wants to fence in his backyard. If the backyard is 30 feet wide and 15 feet long, how many feet of fence will he need to buy?

- A. 45 ft      **B. 90 ft**      C. 450 ft      D. 75 ft      E. 540 ft

The fence goes around the outside edge of the backyard, so it is the same as perimeter.

Opposite sides are equal. Add up all four sides.  $15 + 15 + 30 + 30 = 90$  ft

**Answer: B. 90 ft**



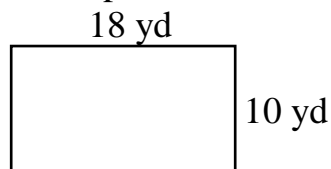
2. What is the perimeter, in yards, of a room that is 10 yards wide and 18 yards long?

- A. 180      B. 28      C. 65      D. 112      **E. 56**

The question asks for perimeter, so make sure you know the meaning of the word perimeter. Perimeter means to calculate the distance around the outside edge.

Opposite sides are equal. Add up all four sides.  $10 + 10 + 18 + 18 = 56$  yd

**Answer: E. 56 yd**



3. Which expression shows how many inches of framing will be needed to frame a picture that is 8 inches wide and 20 inches long?

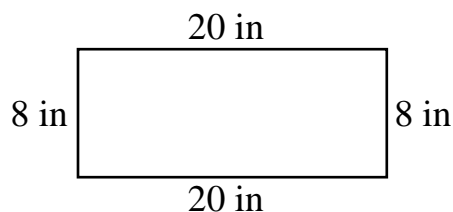
- A.  **$2 \times (8 + 20)$**       B.  $8 + 20$       C.  $8 \times 20$       D.  $2 \times (8 \times 20)$       E.  $2 \times 8 + 20$

Framing goes around the edge of a picture, so find an expression for perimeter.

Opposite sides are equal. Add up the four sides.  $8 + 8 + 20 + 20$

Remember, this can also be expressed as  $(2 \times 8) + (2 \times 20)$  or  $2 \times (8 + 20)$ .

**Answer: A.  $2 \times (8 + 20)$**





4. A square tablecloth is to be trimmed with a lace border. If the tablecloth is 3 feet wide, and lace trim costs \$2.99 per foot, how much will the lace trim cost?  
 A. \$12.00      B. \$23.92      C. \$8.97      **D. \$35.88**      E. \$12.99

Trimming goes around the edge, so calculate perimeter.

In a square, all four sides are equal, so perimeter is  $4 \times 3 \text{ ft} = 12 \text{ ft}$ .

Multiply x cost per foot.  $12 \times \$2.99 = \$35.88$

**Answer: D. \$35.88**

5. The edge of a bulletin board will be trimmed with ribbon. How many inches of ribbon will be needed if the bulletin board is 5 feet wide and 2 feet long?  
 A. 14 in      B. 186 in      C. 40 in      D. 336 in      **E. 168 in**

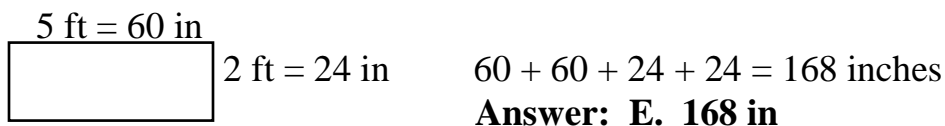
The ribbon is going around the edge, so calculate perimeter.

Notice that the dimensions of the bulletin board are given in feet, and the question asks for the amount of ribbon in inches.

Convert the feet to inches, then add up the four sides.

$$5 \text{ ft} \times 12 = 60 \text{ in}$$

$$2 \text{ ft} \times 12 = 24 \text{ in}$$



**OR** Add up the four sides in feet, and then convert to inches.

$$5 + 5 + 2 + 2 = 14 \text{ ft}$$

$$14 \text{ ft} \times 12 = 168 \text{ inches}$$

**Answer: E. 168 in**

### Practice Two – Area (page 7)

1. What is the area of a rectangular table that is 14 feet long and  $2 \frac{1}{2}$  feet wide?  
 A. 33 sq ft      B.  $49 \frac{1}{2}$  sq ft      **C. 35 sq ft**      D. 70 sq ft      E.  $16 \frac{1}{2}$  sq ft

Area is asked for. Be sure you know that area of a rectangle means length x width.

$$14 \times 2 \frac{1}{2} = 35 \text{ sq ft}$$

**Answer: C. 35 sq ft**

2. Which expression shows how many square inches of tile are needed to cover a kitchen backsplash that is 50 inches long and 12 inches wide?

- A.  $50 + 12$     B.  $2 \times (50 + 12)$     C.  $\frac{50 \times 12}{4}$     **D.  $50 \times 12$**     E.  $\frac{2(50+12)}{4}$

Tile to cover a surface means area.

Also note that the question asks for the answer in square inches, not in inches. When an answer is asked for in square anything, it means to calculate area.

Area = L x W    A = 50 x 12    **Answer: D. 50 x 12**

3. If the area of a floor is 660 square feet, and the length is 30 feet, what is the width of the floor?

- A. 600 ft    B. 20 ft    **C. 22 ft**    D. 165 ft    E. 25 ft

Notice that you are not asked to calculate area. You are given area and length, and asked to calculate width.

The formula for area is Area = L x W.

You are given area = 660 and length = 30.

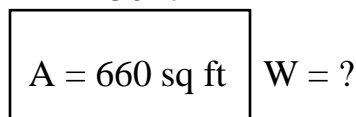
Plug those numbers into the formula

and you get  $660 = 30 \times W$ .

Divide to get the width.  $660 \div 30 = 22$  ft

**Answer: C. 22 ft**

L = 30 ft



**OR** Use trial and error to see which of the 5 possible answers will give you 660 sq ft when multiplied x the 30 ft length.

Try A.  $30 \times 600$  does not = 660, so 600 ft is not the correct width.

Try B.  $30 \times 20$  does not = 660, so 20 ft is not the correct width.

Try C.  $30 \times 22$  does = 660, so **C. 22 ft is the correct width.**

4. How many square yards of material are in a blanket that measures 12 feet by 6 feet?

- A. 72 sq yd    B. 36 sq yd    C. 18 sq yd    D. 6 sq yd    **E. 8 sq yd**

The amount of material in a blanket covers a surface, so calculate area.

Note that the blanket dimensions are given in feet, and the answer is asked for in square yards.

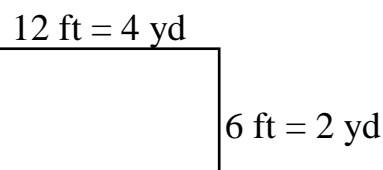
Convert the feet to yards, then multiply length x width to get area.

$12 \text{ ft} \div 3 = 4 \text{ yd}$

$6 \text{ ft} \div 3 = 2 \text{ yd}$

$4 \times 2 = 8 \text{ sq yd}$

**Answer: E. 8 sq yd**



5. How much will it cost to carpet a room that measures 28 feet by 20 feet if carpeting costs \$2.75 per square foot?

- A. \$560      **B. \$1,540**      C. \$1,450      D. \$264      E. \$528

Carpet covers a floor surface, so calculate area.

$$\text{Area} = L \times W \quad A = 28 \times 20 = 560 \text{ sq ft}$$

$$\text{Multiply sq ft} \times \text{cost per sq ft. } 560 \times \$2.75 = \$1,540 \quad \text{Answer: B. } \$1,540$$

### **Practice Three – Area vs Perimeter** (page 8)

Label each as area (A) or perimeter (P).

- a) Baseboard around the room P
- b) Amount of sod needed to cover a field A
- c) Crown molding around the ceiling P
- d) Amount of tile to cover a kitchen floor A
- e) Size of glass in a picture frame A
- f) Pathway around a garden P
- g) Distance around the edge of a picture frame P
- h) Wallpaper to cover a whole wall A
- i) Size of carpet to cover the floor of a room A
- j) Lace to trim the edge of a tablecloth P
- k) Length of a fence to go around a garden P
- l) Square feet of paneling to cover a wall A
- m) Distance run around a field P
- n) Walkway around a swimming pool P

### **Practice Four – Mixed Area and Perimeter Word Problems** (page 8)

1. Leo is installing molding around the ceiling of his living room, which is 20 feet long and 15 feet wide. How many feet of molding should he buy?

- A. 300 ft      B. 35 ft      **C. 70 ft**      D. 55 ft      E. 50 ft

Molding goes around the edge of the ceiling, so calculate perimeter.

Add up the lengths of the four sides.

$$20 + 20 + 15 + 15 = 70 \quad \text{Answer: C. } 70 \text{ ft}$$

2. If Leo also wants to put new tile on the ceiling, how much tile should he buy?

Use information from question #1.

- A. 350 sq ft      **B. 300 sq ft**      C. 70 sq ft      D. 400 sq ft      E. 225 sq ft

Tile covers the space inside the edges of the ceiling, so calculate area.

Also note that the answers are in sq ft, which tells you this is an area problem.

$$\text{Area} = L \times W \quad A = 20 \times 15 = 300 \text{ sq ft} \quad \text{Answer: B. } 300 \text{ sq ft}$$

**3.** Damon is installing a fence around a square playground that is 20 yards wide. How much fencing will he need?

- A. **80 yd**      B. 400 yd      C. 40 yd      D. 60 yd      E. 75 yd

The fence goes around the edge of the playground, so calculate perimeter.

A square is the same length on all four sides. Add up the four sides.

$20 + 20 + 20 + 20 = 80$     **OR**     $4 \times 20 = 80$     **Answer: A. 80 yards**

**4.** Lara has a fancy frame that she wants to put a mirror in and then hang over her couch. If the frame is 48 inches long and 24 inches wide, how many square feet of mirror should she buy?

- A. 1,152 sq ft      B. 144 sq ft      C. 96 sq ft      D. 12 sq ft      E. **8 sq ft**

The mirror covers the space inside the frame, so calculate area.

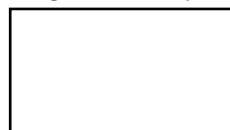
Note that the dimensions are given in inches, and the answer is asked for in square feet. Convert inches to feet, then multiply to get area in square feet.

$48 \text{ in} \div 12 = 4 \text{ ft}$

$24 \text{ in} \div 12 = 2 \text{ ft}$

Area = L x W     $A = 4 \times 2 = 8 \text{ sq ft}$

$48 \text{ in} = 4 \text{ ft}$



$24 \text{ in} = 2 \text{ ft}$

**Answer: E. 8 sq ft**

**5.** A walking path has been built around the outside edge of an athletic field that measures 75 yards by 35 yards. Which expression shows how many yards would be traveled by walking around the pathway one time?

- A.  $75 \times 35$       B.  $75 + 35$       C.  **$2 \times (75 + 35)$**       D.  $2 \times 75 + 35$       E.  $110 \times 4$

The pathway is around the edge of the field, so calculate perimeter.

Add up the four sides:  $75 + 75 + 35 + 35$

This can also be written as:  $2 \times (75 + 35)$     or     $(2 \times 75) + (2 \times 35)$

**Answer: C.  $2 \times (75 + 35)$**

**Tip** – What if you know that the perimeter is  $75 + 75 + 35 + 35$ , but aren't sure which of the answer choices is the same as that? Calculate the value of your answer, then calculate the value of each answer choice until you get one that matches.

Calculate the value of your answer:  $75 + 75 + 35 + 35 = 220$

Try Answer A.  $75 \times 35 = 2,625$       No Match.

Try Answer B.  $75 + 35 = 110$       No Match.

Try Answer C.  $2 \times (75 + 35) = 220$     Matches 220, the value of your answer.

**Answer: C.  $2 \times (75 + 35)$**

**Note** – Answer D is not correct because Order of Operations rules tell you to multiply  $2 \times 75$  first, and then add 35, to get 185.

Answer C is correct because Order of Operations rules tell you to first do what is inside the parentheses, and then multiply  $\times 2$ , to get 220.

6. A large living room with a hardwood floor measures 40 feet long and 26 feet wide. How much will it cost to refinish the floor if the charge is \$3 per square foot?  
 A. \$1,040      B. \$3,210      C. \$396      **D. \$3,120**      E. \$198

The surface of a floor is area.

First calculate the number of square feet, then multiply x the cost per square foot.

$$\text{Area} = L \times W \quad 40 \times 26 = 1,040 \text{ sq ft}$$

$$1,040 \text{ sq ft} \times \$3 = \$3,120$$

**Answer: D. \$3,120**

7. The fabric required for one drapery panel measures 5 yards by 14 yards. Which expression shows how much it will cost to buy fabric for 8 panels if the fabric costs \$4.50 per square yard?

- A.  $5 \times 14 \div 8 \times \$4.50$       **B.  $5 \times 14 \times 8 \times \$4.50$**       C.  $8 \times (5 + 14) \times \$4.50$   
 D.  $(19 \times 2) \times 8 \times \$4.50$       E.  $5 \times 14 \times 8 \div \$4.50$

An amount of fabric is area.

Determine area in sq yd of one panel:  $5 \times 14$

Multiply x 8 panels to get total sq yd needed:  $5 \times 14 \times 8$

Multiply x \$4.50 per sq yd to get total cost:  $5 \times 14 \times 8 \times \$4.50$

**Answer: B.  $5 \times 14 \times 8 \times \$4.50$**

8. Jerome wants his new patio to be 600 square feet. If the width has to be 25 feet, what will the length be?

- A. 625 ft      B. 575 ft      **C. 24 ft**      D. 50 ft      E. 75 ft

This is an area problem where you are given the area and the width, and asked to calculate the length.

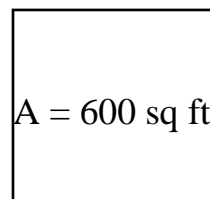
$$\text{Area} = L \times W$$

$$600 = L \times 25$$

$$\text{Divide to get L. } 600 \div 25 = 24$$

**Answer: C. 24 ft**

$$L = ?$$



$$W = 25 \text{ ft}$$

**OR** You can use trial and error to see which of the 5 possible answers will give you 600 sq ft when multiplied x the 25 ft width.

Try A.  $625 \times 25$  does not = 600, so 625 ft is not the correct length.

Try B.  $575 \times 25$  does not = 600, so 575 ft is not the correct length.

Try C.  $24 \times 25$  does = 600, so **C. 24 ft is the correct length.**

9. Which expression shows the cost to tile a bathroom floor that measures 10 feet by 7 feet if the tile costs \$6.25 per square foot?

- A.  $\frac{10 + 7}{\$6.25}$                       B.  $(10 + 10 + 7 + 7) \times \$6.25$                       C.  **$10 \times 7 \times \$6.25$**   
D.  $\frac{2 \times (10 + 7)}{\$6.25}$                       E.  $10 \times 7 \div \$6.25$

The amount of tile to cover a floor is area.

Calculate the number of square feet, which is L x W:      $10 \times 7$

Multiply x \$6.25 per square foot to get cost:              $10 \times 7 \times \$6.25$

**Answer: C.  $10 \times 7 \times \$6.25$**

10. Leroy wants to make a vegetable garden in his side yard. It has to be 4 feet wide, and he wants it to cover an area of 60 square feet. How long should the garden be?

- A. **15 ft**                      B. 240 ft                      C. 64 ft                      D. 128 ft                      E. 12 ft

This is an area problem where you are given the area and the width, and asked to calculate the length.

Area = L x W      $60 = L \times 4$

Divide to get L.  $60 \div 4 = 15$                       **Answer: A. 15 ft**

**OR** Use trial and error as shown in problem #8 above.

11. Emmanuel is putting anti-slip tape around the edge of his swimming pool. If the pool is 30 yards wide and 75 yards long, how many feet of tape will he need?

- A. 210 ft                      B. 2,250 ft                      C. 420 ft                      D. **630 ft**                      E. 70 ft

Tape goes around the edge, so calculate perimeter.

Notice that the dimensions are given in yards, and the answer is asked for in feet.

Convert yards to feet, then calculate perimeter.

There are 3 feet in each yard so multiply yards x 3 to get feet.

$30 \text{ yards} \times 3 = 90 \text{ ft}$

$75 \text{ yards} \times 3 = 225 \text{ ft}$

Perimeter is  $90 + 90 + 225 + 225 = 630 \text{ ft}$      **Answer: D. 630 ft**

**OR** Calculate perimeter in yards, then convert answer to feet:

Perimeter is  $30 + 30 + 75 + 75 = 210 \text{ yards}$

There are 3 feet in each yard so multiply yards x 3 to get feet.  $210 \times 3 = 630 \text{ ft}$

**Answer: D. 630 ft**

- 12.** The Hillside Playground has a path around the outside that people use for jogging. The dimensions of the playground are 100 yards wide and 80 yards long. How many yards does Jerome run if he runs around the playground 5 times?  
 A. 360 yd      **B. 1,800 yd**      C. 180 yd      D. 900 yd      E. 8,000 yd

This is the distance around something, so calculate perimeter.

$$100 + 100 + 80 + 80 = 360$$

360 yards is once around the playground.

Multiply x 5 because he runs around 5 times.  $5 \times 360 = 1,800$

**Answer: B. 1,800 yd**

- 13.** Sandria is making a bulletin board with a decorative ribbon border. The board is 20 inches long and 30 inches wide, and she needs to run the ribbon around the edge 3 times to make it look nice. How much ribbon will she need?  
 A. 600 in      B. 50 in      C. 100 in      D. 200 in      **E. 300 in**

The ribbon goes around the edge, so this is perimeter.

Perimeter is  $20 + 20 + 30 + 30 = 100$  inches.

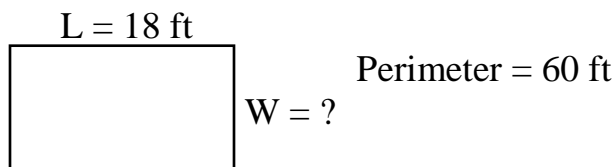
100 inches goes around the perimeter once. Multiply x 3 to go around 3 times.

$$3 \times 100 = 300 \quad \text{Answer: E. 300 in}$$

**\*\*\* → Multi-Step Challenger ← \*\*\***

A room has a perimeter of 60 feet and a length of 18 feet. If carpeting costs \$29 per square yard, how much will it cost to carpet the room?

- A. \$31,320      B. \$2,262      **C. \$696**      D. \$1,944      E. \$12,528



To solve this problem, you must first get area of the room in square yards, and then multiply x cost per square yard.

**Step 1 – Figure out the Width (so you can calculate area)**

You have to use the perimeter and length that are given to get the width you need.

$$P = L + L + W + W$$

$$60 = 18 + 18 + W + W$$

Subtract to get the size of both widths:  $60 - 18 - 18 = 24$  ft

(If you subtract both lengths from the total perimeter, you are left with both widths.)

24 ft is for both widths, so divide by 2 to get one width:  $24 \div 2 = 12$  ft = W

### Step 2 – Convert Feet to Yards

Now you know  $L = 18$  ft and  $W = 12$  ft. But, you need sq yd, not sq ft, because the cost is given in sq yd. So, convert  $L$  and  $W$  to yards before calculating the area.

$$18 \text{ ft} \div 3 = 6 \text{ yd} \quad \text{and} \quad 12 \text{ ft} \div 3 = 4 \text{ yd}$$

### Step 3 – Calculate Number of Square Yards

Calculate area in sq yd.  $6 \times 4 = 24$  sq yd

### Step 4 – Calculate Cost

Calculate cost by multiplying total sq yd  $\times$  cost per sq yd.  $24 \times \$29 = \$696$

**Answer: C. \$696**

**Note** – In Step 1, if you’re not sure what to do once you get to

$$60 = 18 + 18 + W + W, \text{ try the “guess and check” method.}$$

Take a guess at what width might be, and see if it works.

Guess that width is 8.

Does  $18 + 18 + 8 + 8 = 60$ ? No, it equals 52. Too small, try a bigger number.

Guess that width is 10.

Does  $18 + 18 + 10 + 10 = 60$ ? No, it equals 56. Too small, try a bigger number.

Guess that width is 14.

Does  $18 + 18 + 14 + 14 = 60$ ? No it equals 64. Too big, try a smaller number.

Guess that width is 12.

Does  $18 + 18 + 12 + 12 = 60$ ? Yes, it equals 60, so 12 is the correct width.

### Practice Five – “Covering an Area” Word Problems (page 13)

**1.** A hotel is putting new wooden flooring down in one of their function rooms. If the room is 60 feet long and 100 feet wide, and the wooden flooring comes in pieces that are 2 feet wide and 10 feet long, how many pieces of wooden flooring will be needed?

- A. 300**                  B. 500                  C. 350                  D. 12                  E. 8

You need to calculate the total square feet to be covered with wooden flooring, the number of square feet in each piece of flooring, and then divide.

Square feet to be covered:  $60 \times 100 = 6,000$  sq ft

Square feet in each piece of flooring:  $2 \times 10 = 20$  sq ft

$6,000 \div 20 = 300$  pieces of wooden flooring. **Answer: A. 300**



**2.** Deandra is covering one wall of her craft room with cork tiles. If the wall is 10 feet by 20 feet, and the tiles are 2 feet long and 1 foot wide, which expression represents the number of cork tiles needed?

- A.  $10 \times 20 \times 2$                       B.  $(10 + 20) \times 2$                       C.  $(10 + 20) \div 2$   
D.  $10 + 20 \div 2$                       E.  **$(10 \times 20) \div 2$**

You need to calculate the total square feet to be covered with cork, the number of square feet in each piece of cork, and then divide.

Note that you need an expression, not a numerical solution.

Square feet to be covered:  $10 \times 20$ .

Square feet in each piece of cork:  $2 \times 1$ , or 2.

Divide to get number of cork tiles needed:  $(10 \times 20) \div 2$

**Answer: E.  $(10 \times 20) \div 2$**

**3.** A kitchen is getting a new tile floor. The kitchen is 10 feet wide and 24 feet long, and the tiles are 2 feet by 3 feet. Which expression shows how many tiles are needed to cover the kitchen floor?

- A.  $\frac{6}{10 \times 24}$                       B.  $(10 \times 24) + (2 \times 3)$                       C.  **$\frac{10 \times 24}{6}$**   
D.  $10 \times 24 \times 6$                       E.  $10 + 24 + 2 + 3$

You need to calculate the total square feet to be covered with tile, the number of square feet in each piece of tile, and then divide.

Note that you need an expression, not a numerical solution.

Square feet to be covered:  $10 \times 24$ .

Square feet in each piece of tile:  $2 \times 3$

Divide to get number of tiles needed:  $(10 \times 24) \div (2 \times 3)$

None of the answer choices looks like this. Some are in fraction form, and some use the number 6 instead of the expression  $(2 \times 3)$ .

$(10 \times 24) \div (2 \times 3)$  becomes  $(10 \times 24) \div 6$ .

$(10 \times 24) \div 6$  can also be written as  $\frac{10 \times 24}{6}$  or  $\frac{24 \times 10}{6}$ .

**Answer: C.  $\frac{10 \times 24}{6}$**

**Tip** – What if you know that the expression is  $(10 \times 24) \div (2 \times 3)$ , but aren't sure which of the answer choices is the same as that? Calculate the value of your answer, then calculate the value of each answer choice until you get one that matches.

4. How many 4-inch-square tiles are needed to cover a kitchen backsplash area that is 4 feet by 5 feet?  
A. 5                      B. 720                      C. 360                      **D. 180**                      E. 810

You need to calculate the total square inches to be covered with tile, and the number of square inches in each piece of tile, and then divide. Note that the tiles are given in inches and the backsplash is given in feet, so convert both to the same unit before calculating.

**Remember** – “4-inch-square” means a square that is 4 inches on all sides, so a 4-inch-square piece of tile covers  $4 \times 4 = 16$  square inches.  
(4-inch-square **is not** the same as 4 square inches.)

Square inches to be covered: Convert 4 feet to inches:  $4 \times 12 = 48$  inches  
Convert 5 feet to inches:  $5 \times 12 = 60$  inches  
 $48 \times 60 = 2,880$  sq in

Square inches in each piece of tile:  $4 \times 4 = 16$  sq in

Divide to get number of tiles needed:  $2,880 \div 16 = 180$  tiles

**Answer: D. 180**

5. Suzanne is putting new wallpaper on both walls of her entryway. Each wall is 10 feet tall and 30 feet wide, and the wallpaper comes in rolls that are 3 feet wide and 10 feet tall. How many rolls of wallpaper will she need to cover both walls?  
A. 10                      **B. 20**                      C. 30                      D. 40                      E. 50

You need to calculate the total square feet to be covered with wallpaper for 1 wall, the number of square feet in each roll of wallpaper, and then divide to see how many rolls of wallpaper are needed for 1 wall. Then multiply by 2 because there are 2 walls to be covered.

Square feet to be covered for each wall:  $10 \times 30 = 300$  sq ft

Square feet in each roll of wallpaper:  $3 \times 10 = 30$  sq ft

$300 \div 30 = 10$  rolls for each wall

$10 \text{ rolls} \times 2 \text{ walls} = 20$  rolls for both walls

**Answer: B. 20**

6. Decorative mosaic tile wall covering comes in rolls that each cover 4 square feet. Which expression shows how many rolls will be needed to cover a 10 x 8 foot section of wall?

A.  $\frac{10 \times 8}{4}$

B.  $\frac{4}{10 \times 8}$

C.  $4 \times 8 \times 10$

D.  $\frac{4 \times 10}{8}$

E.  $10 \times 8 + 4$

You need to calculate the total square feet to be covered with tile, the number of square feet in each roll of tile, and then divide.

Note that you need an expression, not a numerical solution.

Square feet to be covered:  $10 \times 8$

Square feet in each roll of tile: 4, as stated in the problem

Divide to get number of rolls of tile needed:  $(10 \times 8) \div 4$

None of the answer choices look like this, so convert to fraction form.

**Answer: A.**  $\frac{10 \times 8}{4}$

**Note** – a roll that can “cover 4 square feet,” as stated in problem #6, means the area of the roll is 4 sq ft.

This is different from a roll that is 4-foot-square, which would mean a roll that is square shaped measuring 4 feet on each side, with an area of  $4 \times 4 = 16$  sq ft.

7. Pegboard is sold in 2-foot-square pieces that cost \$4.49 each. How much will it cost to cover a section of workshop wall that is 4 feet tall and 8 feet wide?

A. \$71.84

B. \$143.68

C. \$53.92

**D. \$35.92**

E. \$8

You need to calculate the total square feet to be covered with pegboard, and the number of square feet in each piece of pegboard. Then divide to get number of pieces of pegboard needed, and finally multiply x \$4.49 to get cost.

Square feet to be covered:  $4 \times 8 = 32$  sq ft

Square feet in each piece of pegboard:  $2 \times 2 = 4$  sq ft

(Remember “2-foot-square” means a square that is 2 feet on all sides.)

$32 \div 4 = 8$  pieces of pegboard needed

$8 \times \$4.49 = \$35.92$

**Answer: D. \$35.92**

8. A contractor needs to order enough drywall to cover 520 square feet of wall. How many 4 x 8 foot sheets of drywall should be ordered?

- A. 16                      B. 17                      C. 43                      D. 44                      E. 71

You need to calculate the total square feet of wall to be covered, the number of square feet in each sheet of drywall, then divide.

Square feet to be covered: 520 sq ft, as stated in the problem

Square feet in each sheet of drywall:  $4 \times 8 = 32$  sq ft

$520 \div 32 = 16.25$  sheets of drywall

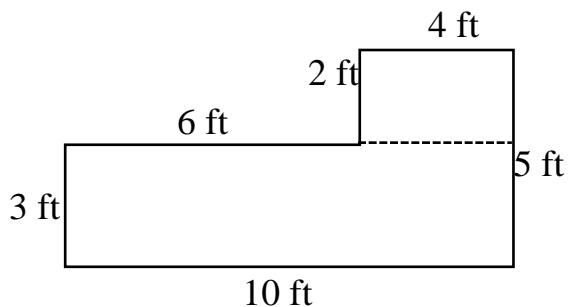
Don't round down, because 16 sheets will not be enough to do the job. Go up to 17.

**Answer: B. 17**

### **Practice Six – Area of L-Shaped Figures** (page 16)

1. What is the area of the diagram below?

- A. 38 sq ft              B. 58 sq ft              C. 50 sq ft              D. 68 sq ft              E. 24 sq ft



Top rectangle area:  $4 \times 2 = 8$  sq ft

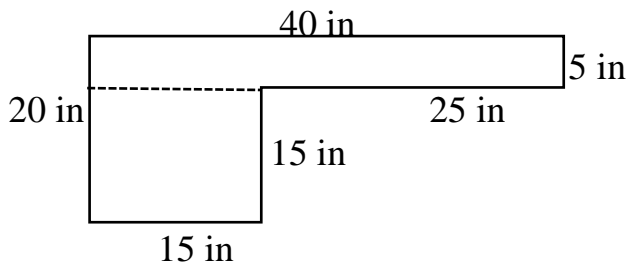
Bottom rectangle area:  $3 \times 10 = 30$  sq ft

Total area:  $30 + 8 = 38$  sq ft

**Answer: A. 38 sq ft**

2. What is the area of the figure below?

- A. 500 sq in              B. 800 sq in              C. 425 sq in              D. 300 sq in              E. 95 sq in



Area of top rectangle:  $5 \times 40 = 200$  sq in

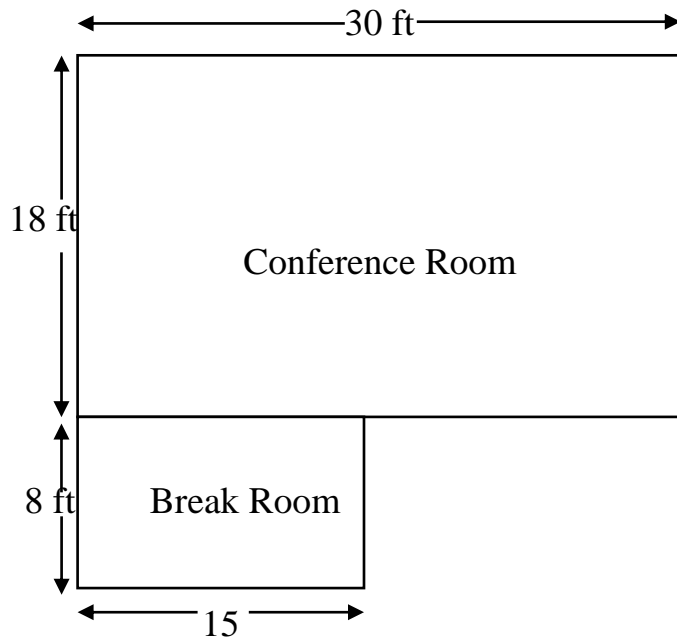
Area of bottom rectangle:  $15 \times 15 = 225$  sq in

Total area:  $200 + 225 = 425$  sq in

**Answer: C. 425 sq in**

3. What is the area of the corner of an office suite that holds the conference room and break room as shown in the diagram?

- A. 780 sq ft    B. 540 sq ft    C. 1,125 sq ft    **D. 660 sq ft**    E. 390 sq ft



Conference Room area:  $18 \times 30 = 540$  sq ft

Break Room area:  $8 \times 15 = 120$  sq ft

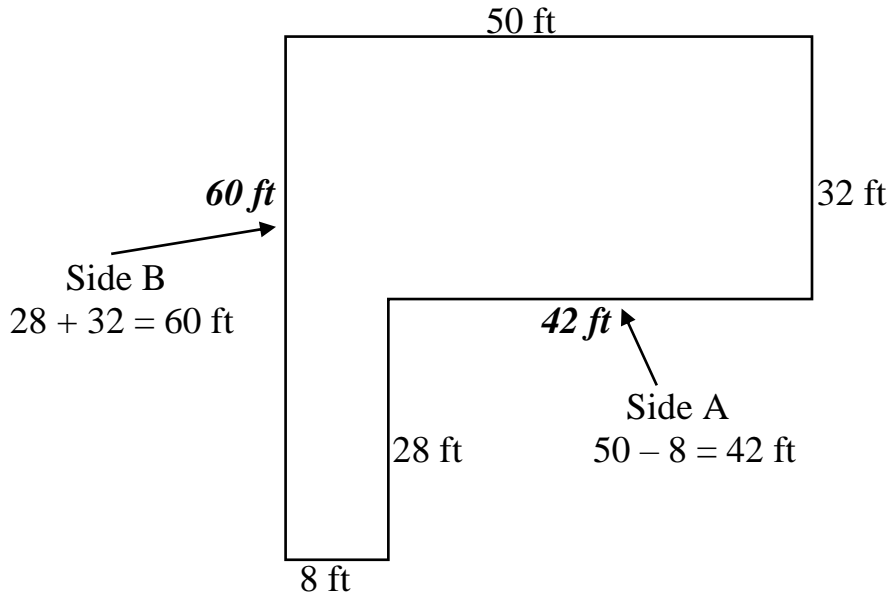
Total area:  $120 + 540 = 660$  sq ft

**Answer: D. 660 sq ft**

**Practice Seven – Missing Information In L-Shaped Figures** (page 20)

1. What is the perimeter of the figure shown below?

- A. 118 ft      B. **220 ft**      C. 212 ft      D. 110 ft      E. 400 ft



Calculate the two missing sides, then add up all the sides.

**Side A:** Use the other two sides that go in the same direction as Side A, 50 and 8.  
 $50 - 8 = 42 \text{ ft}$       Subtract because the missing side is shorter than 50.

**Side B:** Use the other two sides that go in the same direction as Side B, 28 and 32.  
 $28 + 32 = 60 \text{ ft}$       Add because the missing side is longer than both 28 and 32.

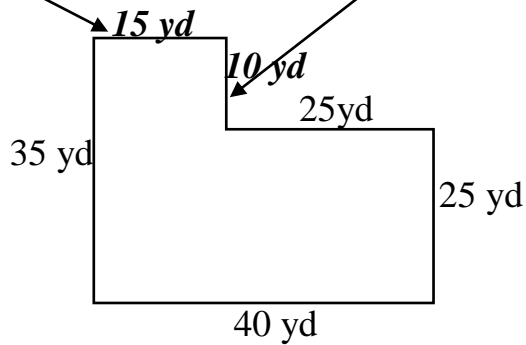
Add up all the sides:  $60 + 50 + 32 + 42 + 28 + 8 = 220 \text{ ft}$

**Answer: B. 220 ft**

2. How long will a fence need to be to surround the playground shown below?  
A. 125 yd      B. 140 yd      C. 115 yd      **D. 150 yd**      E. 110 yd

Side A:  $40 - 25 = 15$  yd

Side B:  $35 - 25 = 10$  yd



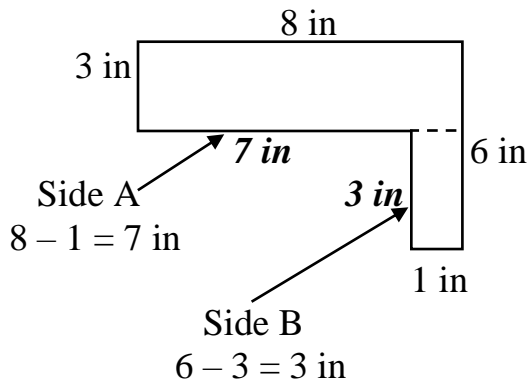
Side A:  $40 - 25 = 15$  yd

Side B:  $35 - 25 = 10$  yd

Add up all the sides:  $15 + 10 + 25 + 25 + 40 + 35 = 150$  yd

**Answer: D. 150 yd**

3. Lina needs 12 pieces of fabric shaped like the diagram below for the quilt she is making. How many square inches will these pieces cover?
- A. 27 sq in    B. 216 sq in    C. 28 sq in    D. 336 sq in    E. **324 sq in**



**Step 1:** Calculate the missing sides.

Side A:  $8 - 1 = 7$  in

Side B:  $6 - 3 = 3$  in

**Step 2:** Divide into 2 rectangles to get area.

Area of big rectangle:  $3 \times 8 = 24$  sq in

Area of small rectangle:  $1 \times 3 = 3$  sq in

Total area of 1 fabric piece:  $24 + 3 = 27$  sq in

**Step 3:** Multiply to get area of all 12 pieces.

Area of 12 fabric pieces:  $12 \times 27 = 324$  sq in

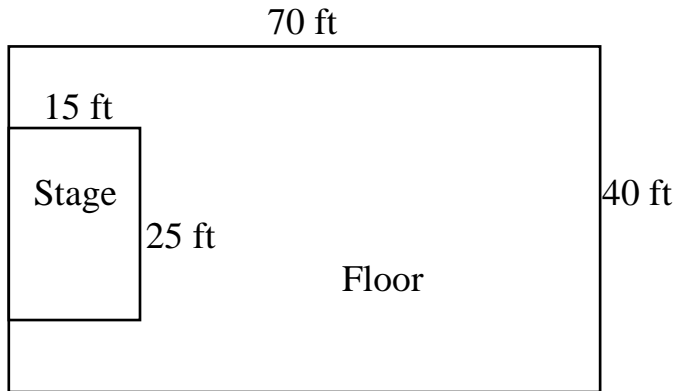
**Answer: E. 324 sq in**



**Practice Eight – Area of Figures with Cutouts** (page 24)

1. The auditorium below is getting a new wooden floor, except for the stage area which will have a painted floor. What is the area that will be covered with wooden flooring?

- A. 2,425 sq ft    B. 2,800 sq ft    C. 300 sq ft    D. 180 sq ft    E. 3,175 sq ft



Area of the whole auditorium (floor plus stage):  $70 \times 40 = 2,800$  sq ft

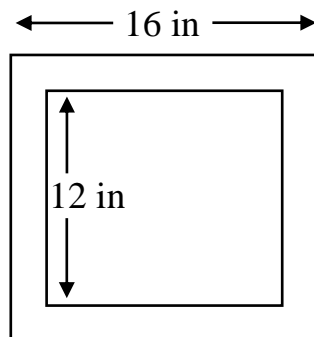
Area of the stage:  $15 \times 25 = 375$  sq ft

Subtract to get the floor area:  $2,800 - 375 = 2,425$  sq ft

**Answer: A. 2,425 sq ft**

2. A plain square wooden frame surrounding a square wall mirror is being decorated with mosaic tile. Based on the diagram below, what expression could you use to calculate the area of the frame?

- A.  $(16 \times 16) + (12 \times 12)$     B.  $(16 \times 16) - (12 \times 12)$     C.  $2(16 \times 12)$   
D.  $(12 \times 12) - (16 \times 16)$     E.  $(16 - 12) \times (16 - 12)$



Note that the problem tells you these are squares, so all sides of the frame are 16 in, and all sides of the mirror are 12 in.

Area of the frame plus mirror together:  $16 \times 16$

Area of the mirror:  $12 \times 12$

Subtract to get the area of the frame:  $(16 \times 16) - (12 \times 12)$

**Answer: B.  $(16 \times 16) - (12 \times 12)$**

3. A wall with two windows is getting painted with an accent color. The wall measures 10 x 18 feet, and each window is 3 x 4 feet. Which expression would you use to calculate the area of the wall that will be painted?

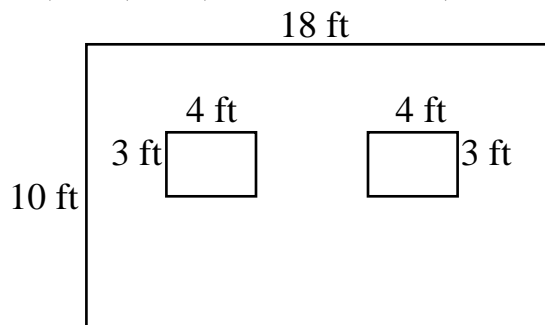
A.  $(10 \times 18) - (3 \times 4)$

B.  $(10 \times 18) + (3 \times 4)$

C.  $(10 \times 18) - 2(3 \times 4)$

D.  $(10 \times 18) \times 2(3 \times 4)$

E.  $2(10 + 18) - 4(3 + 4)$



Area of wall including windows:  $(10 \times 18)$

Area of each window:  $(3 \times 4)$

Area of both windows:  $2(3 \times 4)$

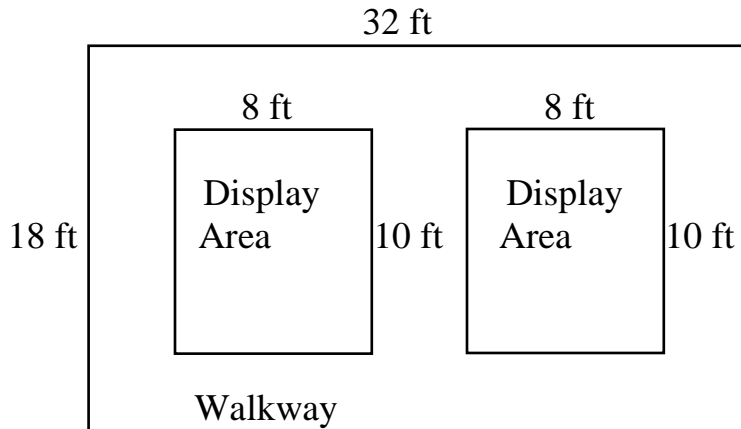
Subtract to get the area of the wall without the windows:  $(10 \times 18) - 2(3 \times 4)$

**Answer: C.  $(10 \times 18) - 2(3 \times 4)$**

**Note** – A number in front of parentheses means multiplication.

$2(3 \times 4)$  is the same as  $2 \times (3 \times 4)$ .

4. A sculpture display area at a museum has a walkway built around and through it, as shown below. To complete the project, the walkway will be tiled with tiles that cost \$4 per square foot, and a guardrail that costs \$12 per foot will be built around each 8 ft x 10 ft display area. How much will it cost to complete the project?
- A. \$1,664      B. \$3,584      C. \$2,624      D. \$2,096      E. **\$2,528**



**Step 1:** Calculate the cost of the tile for the walkway.

$$\text{Area: } (18 \times 32) - (8 \times 10) - (8 \times 10) = 416 \text{ sq ft}$$

$$\text{Cost: } \$4 \times 416 \text{ sq ft} = \$1,664$$

**Step 2:** Calculate the cost of the guardrails that goes around the two display areas.

Guardrails go around the edge, so calculate perimeter.

$$\text{Perimeter of one display area: } 8 + 8 + 10 + 10 = 36 \text{ ft}$$

$$\text{Perimeter of both display areas: } 2 \times 36 = 72 \text{ ft}$$

$$\text{Cost: } \$12 \times 72 \text{ ft} = \$864$$

**Step 3:** Add the two costs together.

$$\$1,664 + \$864 = \$2,528$$

**Answer: E. \$2,528**

## Practice Nine – More Word Problem Practice (page 25)

Questions 1 and 2 refer to the diagram below.

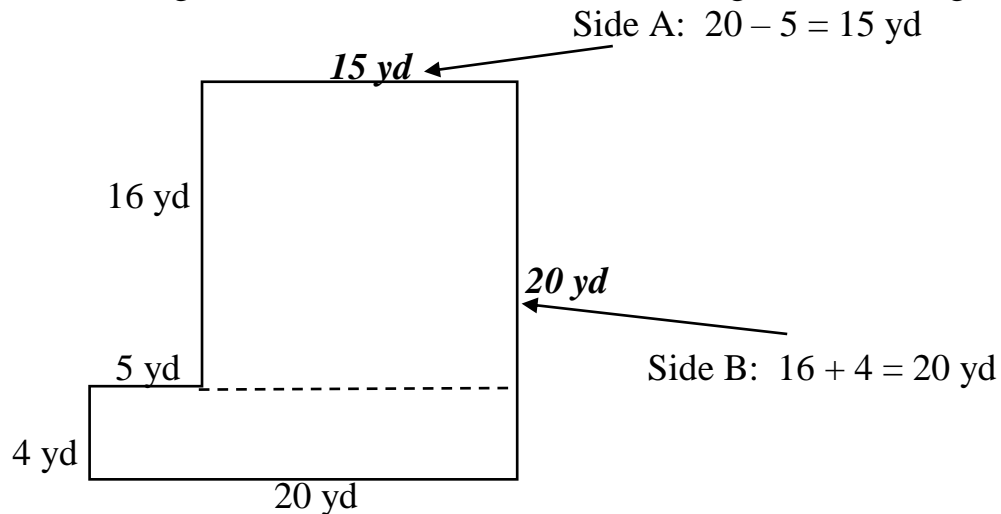
1. The area in the diagram will be paved with outdoor tile, and a border of stepping stones will be placed around the outside edge. How many square yards of outdoor tile will be needed?

- A. 400 sq yd    B. 80 sq yd    C. 300 sq yd    D. 325 sq yd    **E. 320 sq yd**

Square yards means to calculate area.

First, calculate the missing sides.

Then, divide into 2 rectangles, calculate the area of each rectangle, and add together.



Side A:  $20 - 5 = 15$  yd

Side B:  $16 + 4 = 20$  yd

Area of top rectangle:  $15 \times 16 = 240$  sq yd

Area of bottom rectangle:  $4 \times 20 = 80$  sq yd

Total area:  $240 + 80 = 320$  sq yd

**Answer: E. 320 sq yd**

2. How long will the stepping stone border be?

- A. 80 yd**    B. 60 yd    C. 85 yd    D. 45 yd    E. 65 yd

A border around the edge means perimeter. Add up the lengths of all the sides.

Perimeter =  $20 + 4 + 5 + 16 + 15 + 20 = 80$  yd

**Answer: A. 80 yd**

3. A micro-tile backsplash material is sold in 4 x 1 foot sections, and Adel wants to use it on her backsplash area that measures 3 x 8 feet. Which expression shows how many micro-tile sections are needed?

- A.  $\frac{4}{3 \times 8}$       B.  $(3 \times 8) \times 4$       C.  $\frac{3 \times 8}{4}$       D.  $2(3 + 8) + 2(4 + 1)$       E.  $3 \times 4 \div 8$

Total square feet to be covered, or area:  $3 \times 8$

The number of square feet in each micro-tile section:  $4 \times 1 = 4$

Divide to get number of sections:  $(3 \times 8) \div 4$

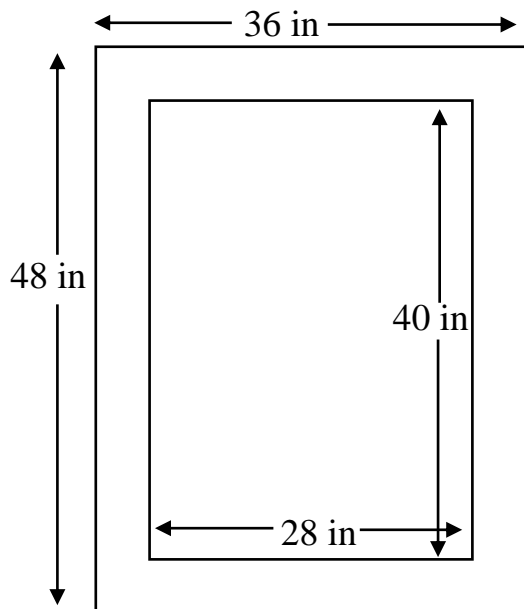
**Answer: C.**  $\frac{3 \times 8}{4}$

**Note** – The division sign is like a fraction bar.  $(3 \times 8) \div 4$  can also be expressed as:

$\frac{3 \times 8}{4}$       or       $\frac{8 \times 3}{4}$

4. Lenore is making posters to advertise a New Year's Eve party, as shown in the diagram below. Each poster will have a border made from fancy metallic fireworks pattern paper. Which expression could you use to calculate the number of square inches of fireworks pattern paper that Lenore will need?

- A.  $(48 \times 36) + (28 \times 40)$       B.  $(48 \times 36) - (28 \times 40)$       C.  $(48 \times 28) - (40 \times 36)$   
D.  $(48 \times 28) \times (40 \times 36)$       E.  $2(48 + 36) + 2(28 \times 40)$



Area of whole poster:  $48 \times 36$

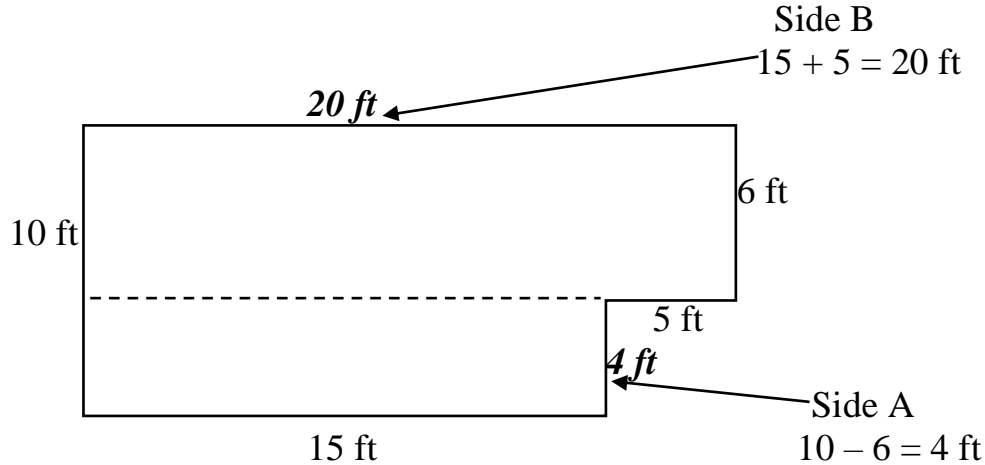
Area of center of poster:  $28 \times 40$

Subtract to get border:  $(48 \times 36) - (28 \times 40)$

Answer: **B.**  $(48 \times 36) - (28 \times 40)$

Questions 5 and 6 refer to the room in the diagram below.

5. How much will it cost to carpet the room if carpeting costs \$3.99 per square foot?  
A. \$180      B. \$143.64      C. \$430.92      **D. \$718.20**      E. \$798



**Step 1:** Calculate the missing sides.

Side A:  $10 - 6 = 4$  ft

Side B:  $15 + 5 = 20$  ft

**Step 2:** Calculate area.

Top rectangle:  $6 \times 20 = 120$  sq ft

Bottom rectangle:  $4 \times 15 = 60$  sq ft

Total area:  $120 + 60 = 180$  sq ft

**Step 3:** Calculate cost.

$180 \times \$3.99 = \$718.20$

**Answer: D. \$718.20**

6. How much will it cost to put crown molding around the edge of the ceiling if the molding costs \$4.99 per foot?

- A. \$60      B. \$294.90      **C. \$299.40**      D. \$359.28      E. \$748.50

Crown molding goes around the edge, so calculate perimeter by adding up all the sides, then multiply by cost per foot.

Perimeter:  $10 + 15 + 4 + 5 + 6 + 20 = 60$  ft

Cost:  $60 \times \$4.99 = \$299.40$

**Answer: C. \$299.40**

7. How many 2-foot-square ceiling tiles will be needed to cover the ceiling in a room that is 16 feet long and 20 feet wide?

- A. 160      B. 144      C. 36      D. 320      E. 80

Remember that 2-foot-square means a square that is 2 feet on all sides, so each tile has an area of  $2 \times 2 = 4$  sq ft. (2-foot-square **does not** mean 2 square feet.)

Divide total square feet to be covered by the number of square feet in each tile.

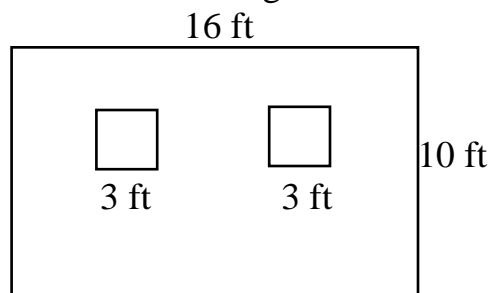
Total square feet to be covered:  $16 \times 20 = 320$  sq ft

Square feet in each tile:  $2 \times 2 = 4$  sq ft

$320 \div 4 = 80$  tiles

**Answer: E. 80**

Questions 8 – 10 refer to the diagram below of a wall with 2 square windows.



8. The wall in the diagram will be painted, not including the 2 windows. Which expression shows how many square feet of wall will be painted?

- A.  $(16 \times 10) - (3 \times 3)$       B.  $(16 \times 10) - 2(3 \times 3)$       C.  $2(16 \times 10) - (3 + 3)$   
D.  $2(16 \times 10) - 2(3 \times 3)$       E.  $(16 \times 10) \div 2(3 \times 3)$

Total area of wall including windows:  $16 \times 10$

Area of each window:  $3 \times 3$  (Windows are square – see note above diagram.)

Area of wall without windows:  $(16 \times 10) - 2(3 \times 3)$  **Answer: B.  $(16 \times 10) - 2(3 \times 3)$**

9. In the Gateway Apartment Complex, there are 26 walls exactly like the wall in the diagram that need to be painted. If one gallon of paint covers 400 square feet of wall, how many gallons of paint will need to be purchased to cover the 26 walls?

- A. 9      B. 10      C. 15      D. 8      E. 12

Square feet in 1 wall (from answer to problem #8):  $(16 \times 10) - 2(3 \times 3) = 142$  sq ft

Square feet in 26 walls:  $26 \times 142 = 3,692$  sq ft

Each gallon covers 400 sq ft, so divide square feet to be covered by 400.

$3,692 \div 400 = 9.23$  gallons

Normally, 9.23 would round down to 9.

In this problem you have to go up to 10 gallons because 9 gallons of paint would not be enough to do the job. **Answer: B. 10**

**10.** They are also putting new glass in all the windows in the 26 walls. If glass costs \$5 per square foot, what will it cost to buy the glass for all the windows?

- A. \$468      B. \$1,170      C. \$1,560      **D. \$2,340**      E. \$4,160

Number of windows needing glass:  $26 \times 2 = 52$

Square feet in each window:  $3 \times 3 = 9$  sq ft

Total glass needed:  $52 \times 9 = 468$  sq ft

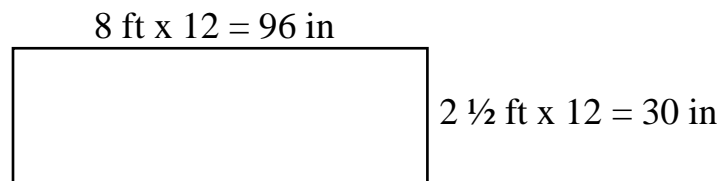
Cost of glass:  $\$5 \times 468 = \$2,340$

**Answer: D. \$2,340**

**11.** Decorative tiles for a kitchen backsplash measure 2 inches wide and 2 inches long. How many of these tiles will be needed to cover a backsplash area that is  $2\frac{1}{2}$  feet by 8 feet?

- A. 10      **B. 720**      C. 5      D. 1,440      E. 270

The tiles are measured in inches, and the area to be covered is measured in feet, so everything must be converted to the same unit. It will be easier to convert the feet to inches, than the inches to feet.



Area of each tile:  $2 \times 2 = 4$  sq in

Area to be covered:  $96 \times 30 = 2,880$  sq in

Tiles needed:  $2,880 \div 4 = 720$  tiles

**Answer: B. 720**

**12.** A 12 by 24 inch decorative wall quilt is being put together with pre-cut quilt pieces that are each 4 inches long and 1 inch wide. Which expression shows how many quilt pieces will be needed?

- A.  $(12 \times 24) \times 4$       B.  $2(12 + 24) \div 4$       **C.  $(12 \times 24) \div 4$**   
D.  $2(12 + 24) \times 4$       E.  $(12 \times 24) + 4$

Area of quilt:  $12 \times 24$

Area of each quilt piece:  $4 \times 1 = 4$

Divide to get number of pieces:  $(12 \times 24) \div 4$

**Answer: C.  $(12 \times 24) \div 4$**



- 13.** For the quilt being made in problem #12, the quilt pieces come in packs of 10 that cost \$2.75 per pack. How much will it cost to buy enough quilt pieces?  
A. \$72                  B. \$19.25                  C. \$27.50                  D. \$198                  E. \$22

Number of quilt pieces needed (from problem #12):  $(12 \times 24) \div 4 = 72$

Number of packs needed:  $72 \div 10 = 7.2 \rightarrow 8$

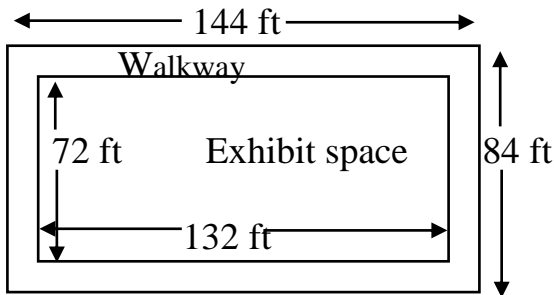
Go up to 8 packs, since 7 packs will not be enough to provide the 72 needed pieces.

Cost:  $8 \times \$2.75 = \$22$

**Answer: E. \$22**

- 14.** At the zoo, there is a rectangular wild bird exhibit space with a walkway going around all four sides, as shown in the diagram below. What expression would you use to calculate the area of the walkway?

- A.  $84 \times 144$                                   B.  $(84 \times 144) - (72 \times 132)$                   C.  $72 \times 132$   
D.  $(84 \times 144) + (72 \times 132)$                   E.  $(72 \times 144) - (84 \times 132)$



Total area of exhibit space plus walkway:  $84 \times 144$

Area of exhibit space:  $72 \times 132$

Subtract to get the area of the walkway:  $(84 \times 144) - (72 \times 132)$

**Answer: B.  $(84 \times 144) - (72 \times 132)$**

**15.** The bathroom shown is getting a new tile floor. Which expression could be used to show how many square feet of tile are needed, assuming that the bathtub area will not be tiled?

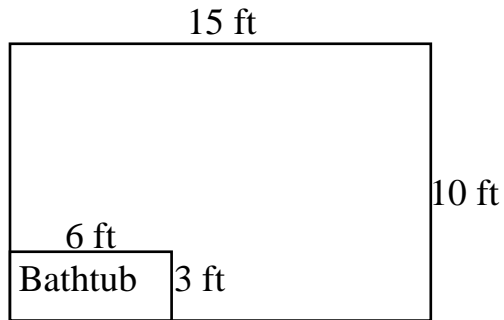
A.  $(15 \times 10) - (3 \times 6)$

B.  $(15 \times 10) + (3 \times 6)$

C.  $(15 \times 10) \times (3 \times 6)$

D.  $(15 \times 10) \div (3 \times 6)$

E.  $(15 \times 6) - (3 \times 10)$



Area of bathroom including bathtub:  $15 \times 10$

Area of bathtub:  $3 \times 6$

Subtract to get area to be tiled:  $(15 \times 10) - (3 \times 6)$

**Answer: A.  $(15 \times 10) - (3 \times 6)$**

**16.** Acoustical ceiling tile is being installed in a workroom that is 72 feet long and 44 feet wide. If each tile covers 8 square feet, which of the following expressions would you use to calculate the number of tiles needed?

A.  $72 \times 44 \times 8$

B.  $2(72 + 44) \div 8$

C.  $72 \div 8 + 44 \div 8$

D.  $2(72 + 44) \times 8$

E.  $(72 \times 44) \div 8$

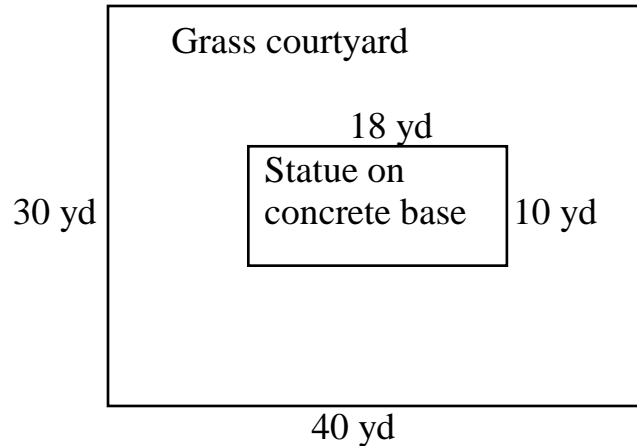
Square feet to be covered:  $72 \times 44$

Square feet in each tile: 8, as stated in the problem

Divide to get number of tiles needed:  $(72 \times 44) \div 8$

**Answer: E.  $(72 \times 44) \div 8$**

17. The grass courtyard at Boone Town Hall has a statue on a concrete rectangular base as shown in the diagram. If the grass part of the courtyard is being reseeded at a cost of \$1.75 per square yard, how much will the reseeding job cost?
- A. \$1,785      B. \$1,200      C. \$1,020      D. \$686      E. \$1,875



Area of courtyard including concrete base:  $30 \times 40 = 1,200$  sq yd

Area of concrete base:  $10 \times 18 = 180$  sq yd

Area of grass part of courtyard alone:  $1,200 - 180 = 1,020$  sq yd

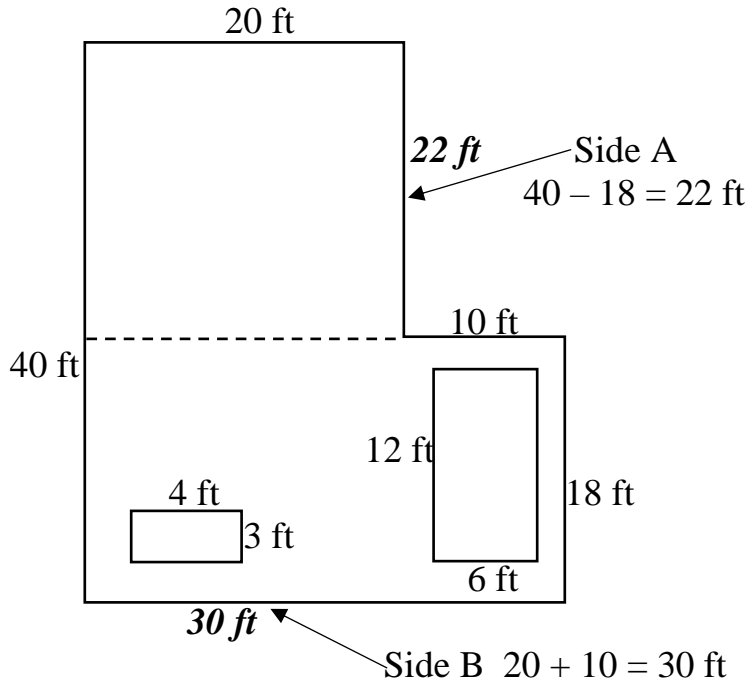
Cost:  $1,020$  sq yd  $\times$  \$1.75 per sq yd = \$1,785

**Answer: A. \$1,785**

**\*\*\* → Multi-Step Challenger ← \*\*\***

The layout of Primo Coffee Corner is shown below. There is a 12 by 6 foot counter/coffee station and a 3 by 4 foot condiment station. New wood flooring is being installed everywhere except under these two stations. How much will it cost to install the flooring if the charge is \$8 per square foot?

- A. \$5,728      B. \$8,928      C. \$7,618      **D. \$7,168**      E. \$1,120



**Step 1:** Divide into 2 rectangles and calculate any missing sides that are needed to get area.

Side A:  $40 - 18 = 22 \text{ ft}$

Side B:  $20 + 10 = 30 \text{ ft}$

**Step 2:** Calculate area.

Top Rectangle:  $20 \times 22 = 440 \text{ sq ft}$

Bottom Rectangle:  $30 \times 18 = 540 \text{ sq ft}$

Total Area:  $440 + 540 = 980 \text{ sq ft}$

**Step 3:** Calculate area of two stations that will not get flooring, and subtract from total area.

Big Station:  $6 \times 12 = 72 \text{ sq ft}$

Small Station:  $3 \times 4 = 12 \text{ sq ft}$

Area that will get flooring:  $980 - 72 - 12 = 896 \text{ sq ft}$

**Step 4:** Calculate Cost

$896 \text{ sq ft} \times \$8 \text{ per sq ft} = \$7,168$

**Answer: D. \$7,168**

## Appendix: Tips for Converting Distance Measurements

Sometimes when doing conversions, you may be unsure whether to divide or multiply. For example, if you need to convert 12 ft to yards, you may know that the conversion to use is 1 yd = 3 ft, but aren't sure whether to take the 12 ft and multiply x 3 or take the 12 ft and divide by 3.

Below are two methods that may help you to do distance conversions. If conversions are not a problem for you, feel free to skip this section.

**Method One:** If you are familiar with proportions, set up a proportion to do the conversion.

**Example 1: Convert 12 feet to yards.**  $\frac{\text{yards}}{\text{feet}} \frac{1}{3} = \frac{x}{12}$   $x = 12 \times 1 \div 3 = 4$   
**12 feet = 4 yards**

**Example 2: Convert 24 feet to inches.**  $\frac{\text{feet}}{\text{inches}} \frac{1}{12} = \frac{24}{x}$   $x = 12 \times 24 \div 1 = 288$   
**24 feet = 288 inches**

**Method Two:** If you are not familiar with proportions, try the following method. I have found that some students find it helpful and some students find it confusing.

Figure out if the number you need is bigger or smaller than what you are starting with. Multiply if you need a bigger number. Divide if you need a smaller number.

**Example 1: Convert 12 feet to yards.** You know 3 ft = 1 yd, but aren't sure whether to multiply 12 ft x 3, or divide 12 ft ÷ 3.

The problem is: 12 ft = ? yd  
Compare to conversion: 3 ft = 1 yd

Looking at the conversion, you can see that the number of yards (1) is smaller than the number of feet (3). This will always be true, so for your problem, you need a smaller number than the 12 feet you are starting with. To get a smaller number, divide.

**Divide: 12 ft ÷ 3 = 4 yards**

**Think about it** – Why will the number of yards always be smaller than the number of feet? Yards are bigger than feet, so you need fewer of them to cover the same distance.

**Important** – Keep the measurement you are starting with on the left of the equal sign, and the measurement you want to end up with on the right side of the equal sign throughout the problem.

**Example 2: Convert 24 feet to inches.** You know  $1 \text{ ft} = 12 \text{ in}$ , but aren't sure whether to multiply  $24 \text{ ft} \times 12$ , or divide  $24 \text{ ft} \div 12$ .

The problem is:  $24 \text{ ft} = ? \text{ in}$

Compare to conversion:  $1 \text{ ft} = 12 \text{ in}$

Looking at the conversion, you can see that the number of inches (12) is bigger than the number of feet (1). So, you need a number bigger than the 24 feet you are starting with. To get a bigger number, multiply.

**Multiply:  $24 \times 12 = 288$  inches**

**Think about it** – Why will the number of inches always be bigger than the number of feet? Inches are smaller than feet, so you need more of them to cover the same distance.

**Conversion Practice** *Answers – p. 62*

1. Convert 48 inches to feet
2. Convert 4 yards to feet
3. Convert 2 yards to inches
4. Convert 7 feet to inches
5. Convert 72 inches to yards
6. Convert 12 feet to yards

## Answers for Conversion Practice

1. Convert 48 inches to feet. **Answer: 4 feet**

The problem is: 48 in = ? ft

Compare to conversion: 12 in = 1 ft

Since 1 is smaller than 12, the number you need will be smaller than 48, so divide.

**48 inches  $\div$  12 = 4 feet**

**OR**, use a proportion  $\frac{\text{feet}}{\text{inches}} \frac{1}{12} = \frac{x}{48}$   $x = 48 \times 1 \div 12 = \mathbf{4 \text{ feet}}$

2. Convert 4 yards to feet. **Answer: 12 feet**

The problem is: 4 yd = ? ft

Compare to conversion: 1 yd = 3 ft

Since 3 is bigger than 1, the number you need will be bigger than 4, so multiply.

**4 yards  $\times$  3 = 12 feet**

**OR**, use a proportion  $\frac{\text{yards}}{\text{feet}} \frac{1}{3} = \frac{4}{x}$   $x = 3 \times 4 \div 1 = \mathbf{12 \text{ feet}}$

3. Convert 2 yards to inches. **Answer: 72 inches**

The problem is: 2 yd = ? in

Compare to conversion: 1 yd = 36 in

Since 36 is bigger than 1, the number you need will be bigger than 2, so multiply.

**2 yards  $\times$  36 = 72 inches**

**OR**, use a proportion  $\frac{\text{yards}}{\text{inches}} \frac{1}{36} = \frac{2}{x}$   $x = 2 \times 36 \div 1 = \mathbf{72 \text{ inches}}$

4. Convert 7 feet to inches. **Answer: 84 inches**

The problem is: 7 ft = ? in

Compare to conversion: 1 ft = 12 in

Since 12 is bigger than 1, the number you need will be bigger than 7, so multiply.

**7 feet  $\times$  12 = 84 inches**

**OR**, use a proportion  $\frac{\text{feet}}{\text{inches}} \frac{1}{12} = \frac{7}{x}$   $x = 7 \times 12 \div 1 = \mathbf{84 \text{ inches}}$

**5.** Convert 72 inches to yards. **Answer: 2 yards**

The problem is:  $72 \text{ in} = ? \text{ yd}$

Compare to conversion:  $36 \text{ in} = 1 \text{ yd}$

Since 1 is smaller than 36, the number you need will be smaller than 72, so divide.

**$72 \text{ inches} \div 36 = 2 \text{ yards}$**

**OR,** use a proportion  $\frac{\text{inches}}{\text{yards}} \frac{36}{1} = \frac{72}{x}$   $x = 72 \times 1 \div 36 = 2 \text{ yards}$

**6.** Convert 12 feet to yards. **Answer: 4 yards**

The problem is:  $12 \text{ ft} = ? \text{ yd}$

Compare to conversion:  $3 \text{ ft} = 1 \text{ yd}$

Since 1 is smaller than 3, the number you need will be smaller than 12, so divide.

**$12 \text{ feet} \div 3 = 4 \text{ yards}$**

**OR,** use a proportion  $\frac{\text{feet}}{\text{yards}} \frac{3}{1} = \frac{12}{x}$   $x = 12 \times 1 \div 3 = 4 \text{ yards}$