Lesson 19: Computing Actual Areas from a Scale Drawing

Classwork

Examples: Exploring Area Relationships

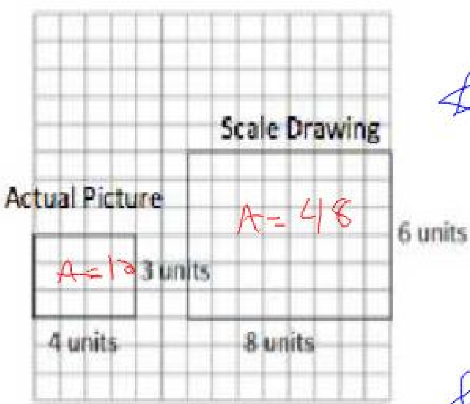
Use the diagrams below to find the scale factor and then find the area of each figure.

$r = \frac{N}{O}$

$r = \frac{6}{3} = 2$

$y = 2x$

Example 1



Scale factor: 2

Actual Area = 12

Scale Drawing Area = 48

$A = L \times W$

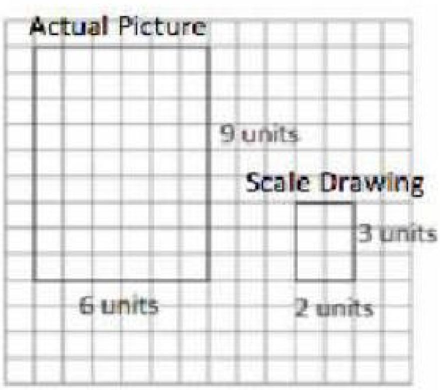
$A = 6 \times 8 = 48$

Value of the Ratio of the Scale Drawing Area to the Actual Area: 4

$\frac{\text{area of New}}{\text{area of original}} = \frac{48}{12} = 4$

Example 2

$r = \frac{N}{O} = \frac{3}{9} = \frac{1}{3}$



Scale factor: $\frac{1}{3}$

Actual Area = 54

Scale Drawing Area = 6

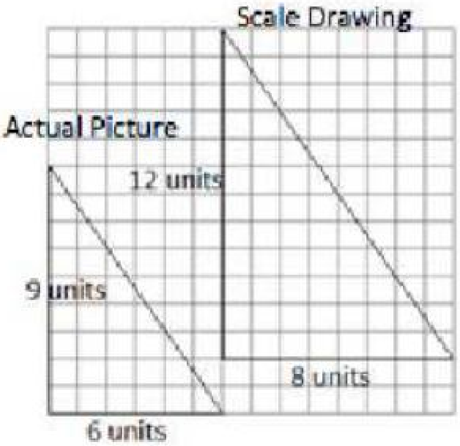
Value of the Ratio of the Scale Drawing Area to the Actual Area: $\frac{1}{9}$

$\frac{\text{area of New}}{\text{area of original}} = \frac{6}{54} = \frac{1}{9}$

$r = \frac{N}{O}$

$r = \frac{8}{6} = \frac{4}{3}$

Example 3



Scale factor: $\frac{4}{3}$

Actual Area = 27

$A = \frac{1}{2}bh$
$= \frac{1}{2}(9 \times 6)$
$= 27$

Scale Drawing Area = 48

$A = \frac{1}{2}bh$
$= \frac{1}{2}(8 \times 12)$
$= 48$

Value of the Ratio of the Scale Drawing Area to the Actual Area: $\frac{16}{9}$

$\frac{48}{27} \frac{\div 3}{\div 3} \frac{16}{9}$

Results: What do you notice about the ratio of the areas in Examples 1–3? Complete the statements below.

When the scale factor of the sides was 2, then the value of the ratio of the areas was 4. $2 \times 2 = 4$

When the scale factor of the sides was $\frac{1}{3}$, then the value of the ratio of the areas was $\frac{1}{9}$. $\frac{1}{3} \times \frac{1}{3} = \frac{1}{9}$

When the scale factor of the sides was $\frac{4}{3}$, then the value of the ratio of the areas was $\frac{16}{9}$. $\frac{4}{3} \times \frac{4}{3} = \frac{16}{9}$

Based on these observations, what conclusion can you draw about scale factor and area?

The ratio of areas is the value of the scale factor multiplied by itself. (squared)

If the scale factor of the sides is r, then the ratio of the areas is $(r \times r)$ or (r^2).

$r^2 \longrightarrow$ ratio of Areas

Example 4: They Said Yes!

The Student Government liked your half-court basketball plan. They have asked you to calculate the actual area of the court so that they can estimate the cost of the project.

Based on your drawing below, what will the area of the planned half-court be?

$r = \frac{N}{O}$

$r = \frac{15}{1} = 15$

$y = 15x$

$r^2 = 15 \times 15$

$r^2 = 225$

Let x = area of scale drawing

Let y = actual area

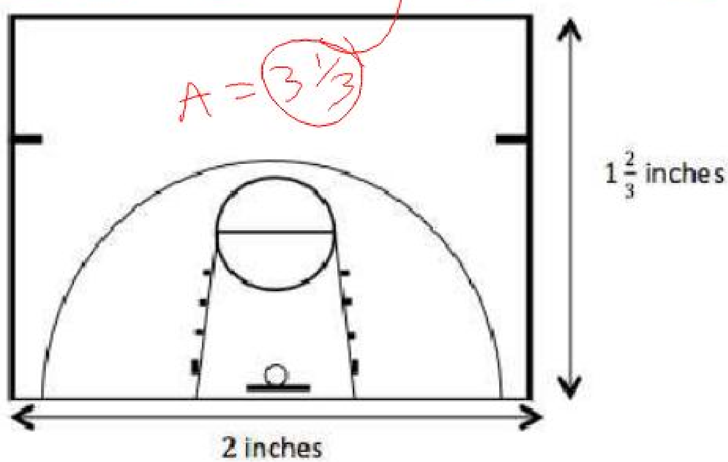
$y = 225x$

$y = 225(3\frac{1}{3})$

$y = 750$ sq. ft

Scale Drawing: 1 inch on the drawing corresponds to 15 feet of actual length

$A = 3\frac{1}{3}$



$A = l \times w$

$A = 2 \times 1\frac{2}{3}$

$A = 3\frac{1}{3}$

Does the actual area you found reflect the results we found from Examples 1–3? Explain how you know.

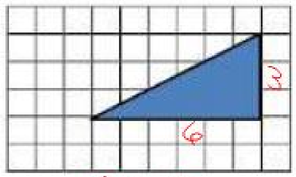
Exercises

1. The triangle depicted by the drawing has an actual area of 36 square units. What is the scale of the drawing? (Note: Each square on the grid has a length of 1 unit.)

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

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

$A = 9$



$A = 9$

Actual

$A = 36$

OG

$r^2 = \frac{\text{area of New}}{\text{original area}}$

$r^2 = \frac{9}{36} \; \frac{\div 9}{\div 9} \; \frac{1}{4}$

$r^2 = \frac{1}{4}$

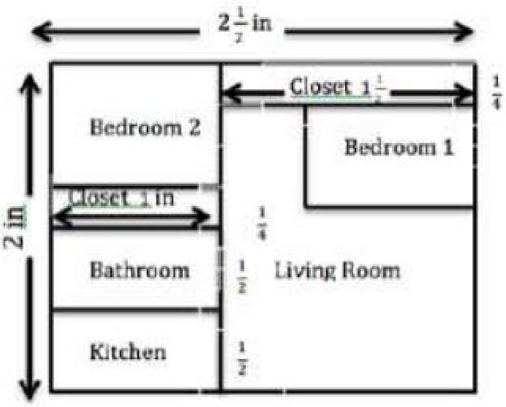
$r \times r \quad r^2$

$\frac{1}{2} \cdot \frac{1}{2} = \frac{1}{4}$

$r = \frac{1}{2}$

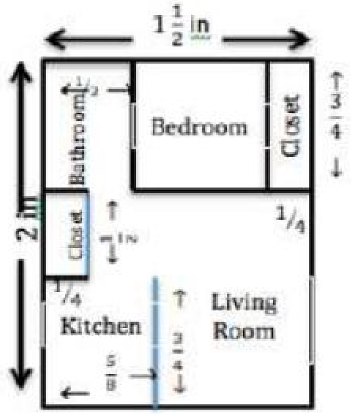
2. Use the scale drawings of two different apartments to answer the questions. Use a ruler to measure.

Suburban Apartment



Scale: 1 inch on scale drawing corresponds to 12 feet in the actual apartment.

City Apartment



Scale: 1 inch on scale drawing corresponds to 16 feet in actual apartment.