February 2000
Activity 1: How Many Shingles?

Solutions

1. First use the end of the roof, as shown in Figure 2 from the activity.

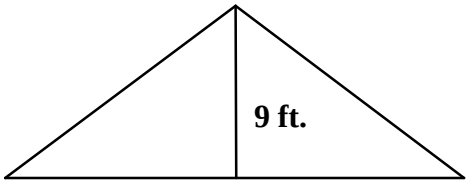
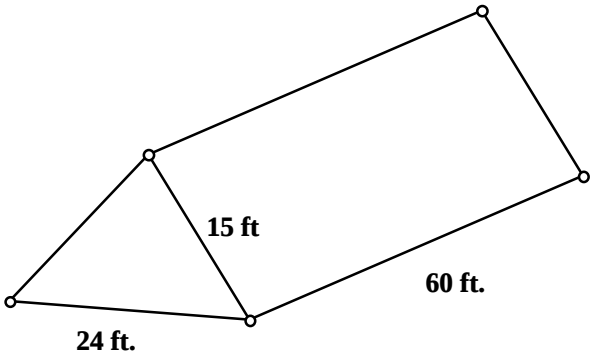


Figure 2. The end of the roof with dimensions shown.

To determine the area of the roof, find the length of the slanted portion of the roof.

Use the diagram and apply the Pythagorean theorem:
$(9 \text{ ft.})^2 + (12 \text{ ft.})^2 = (\text{slant height})^2$
$81 \text{ ft.}^2 + 144 \text{ ft.}^2 = (\text{slant height})^2$
$225 \text{ ft.}^2 = (\text{slant height})^2$
$(225) \text{ ft.}^2 = 15 \text{ ft.} = \text{slant height}$

Now students can determine the area of roof. See the figure below.



15 ft. x 60 ft. x 2 = 1800 square feet

To determine the number of squares, divide the area of the roof by 100.
1800 ft.^{2} ÷ 100 ft.^{2}/square = 18 squares of shingles

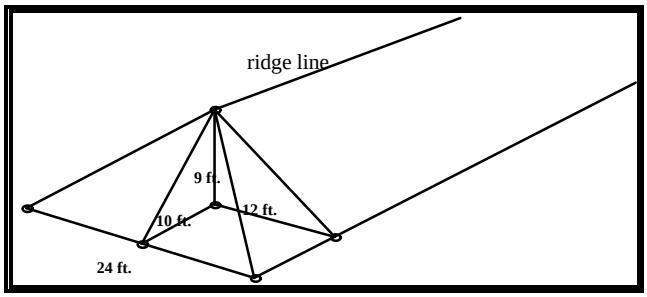
To determine the number of bundles of shingles, multiply the number of squares by 3.
18 squares x 3 bundles/square = 54 bundles of shingles required to re-roof this house.

2. a. The area of the gable roof is determined by two rectangles. The area of the hip roof is determined by two triangles and two trapezoids.

b. To calculate the area of the hip roof, students must first determine the altitude of the triangles and the altitude of the trapezoids.

Since the ridge line length is 2/3 the length of the building, it must have length 2/3(60) = 40 feet.

c. See the figure below.



The right triangle that determines the altitude of the triangles forming the roof has legs measuring 10 feet and 9 feet, therefore the altitude of the triangles can be found using the Pythagorean theorem.

(10 ft.)^2 + (9 ft.)^2 = (altitude)^2
100 ft.^{2} + 81 ft.^{2} = (altitude)^2
181 ft.^{2} = (altitude)^2
(181) = 13.45 ft. = altitude

The right triangle that determines the altitude of the trapezoids forming the roof has legs measuring 12 feet and 9 feet, therefore the altitude of the trapezoids can be found using the Pythagorean theorem.

(12 ft.)^2 + (9 ft.)^2 = (altitude)^2
144 ft.^{2} + 81 ft.^{2} = (altitude)^2

$225\ ft.^2 = (altitude)^2$
$(225) = 15\ ft. = altitude$

The area of the hip roof is calculated:
(15/2(40 + 60)2) + (1/2)(24)(13.45)2) =
1500 + 322.8
1822.8 = 1823 square feet

To determine the number of squares of shingles, divide the area of the roof by 100.
$1823\ ft.^2 \div 100\ ft.^2$/square = 18.23 squares of shingles

To determine the number of bundles of shingles, multiply the number of squares by 3.
18.23 squares x 3 bundles/square = 54.69 bundles of shingles required to re-roof this house. Since you cannot buy 0.69 of a bundle, you should purchase 55 bundles.