February 2000
Activity 2: Pricing a Deck

Solutions

Figure 2. Horizontal pattern deck.

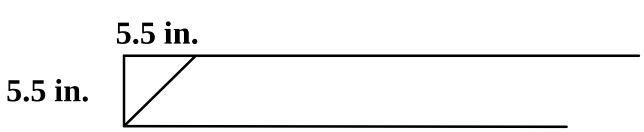
To determine the number of boards necessary to cover the deck, divide the length of the deck in inches by 5 ½ in., the actual width of a 2 in. x 6 in. board.

18 ft x 12 in./ft ÷ 5 ½ in = 39 boards 16 feet long

Two 2 in. x 6 in. x 8 ft. boards are cheaper than one 2 in. x 6 in. x 16 ft. board, therefore it would be less expensive to use two 8 ft. boards rather than one 16 ft. board. To cover the deck requires 78 of the 2 in. x 6 in. x 8 ft. boards. With the price of a 2 in. x 6 in. x 8ft. board at $5.79, the minimum cost of the deck is 78 boards x $5.79 = $451.62.

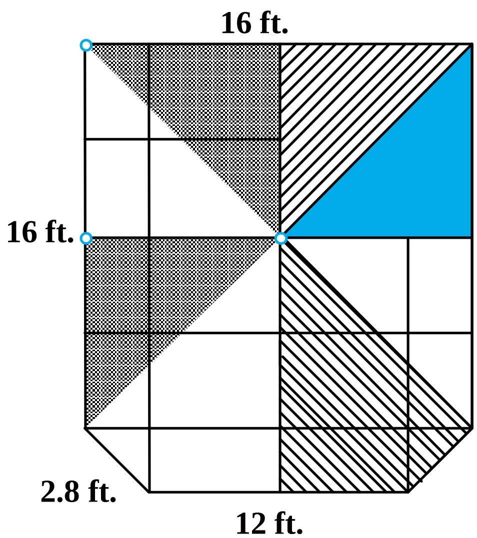
Figure 3. X-pattern deck.

From the drawing of this pattern, it is clear that the ends of each board will have to be cut at a 45 angle. To find the width of the board, apply the Pythagorean theorem.



$(5.5)^2 + (5.5)^2 = (\text{diagonal width})^2$
$30.25 + 30.25 = (\text{diagonal width})^2$
$60.50 = (\text{diagonal width})^2$
$(60.5) = 7.77 \quad 7.8 = \text{diagonal width}$

Consider the following diagram.



The cross-hatched region in the upper right hand corner (in the shape of a right triangle) is repeated in each of the five regions. Determining the number of boards and their lengths for one cross-hatched region gives the value for the other regions, too. The length of the side of the right triangle divided by 7.8 determines the number of boards needed.

Determining the lengths of the boards requires the use of right triangles with sides increasing by 7.8 inches. The hypotenuse of each of these triangles determines the lengths of boards. Using these lengths and choosing the least expensive board minimizes the costs.

To determine the required lengths of the hypotenuse, create a table with values found by using the Pythagorean theorem.

Side (in.)	Hypotenuse (ft.)
7.8	0.91
15.6	1.9
23.4	2.8
31.2	3.7
39.0	4.6
46.8	5.5
54.6	6.4
62.4	7.4
70.2	8.3
78.0	9.2
85.8	10.11
93.6	11.0
96.0	11.3

Using the table, one such region requires:
2 boards 2 in. x 6 in. x 12 ft.
2 boards 2 in. x 6 in. x 10 ft.
2 boards 2 in. x 6 in. x 8 ft.
2 boards 2 in. x 6 in. x 6 ft.
2 boards 2 in. x 6 in. x 4 ft.

The rest can be covered from scrap material. All six regions would require 12 of each type board. The minimum cost of the decking for this portion of is:
12 x $8.49 + 12 x $6.99 + 12 x $5.79 + 12 x $4.99 + 12 x $4.29 = $366.60

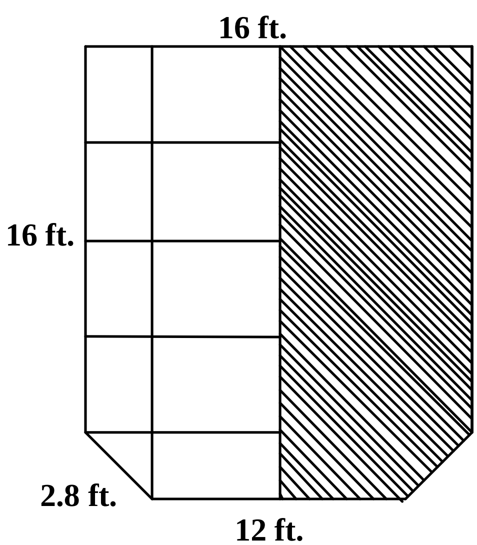
The portion of the of the lower right-hand region that is cross-hatched requires:
5 boards 2 in. x 6 in. x 12 ft.
2 boards 2 in. x 6 in. x 10 ft.
2 boards 2 in. x 6 in. x 8 ft.
2 boards 2 in. x 6 in. x 6 ft.
2 boards 2 in. x 6 in. x 4 ft.

The rest can be covered from scrap material. With its duplication, to cover the left-hand side, the minimum cost is:
10 x $8.49 + 4 x $6.99 + 4 x $5.79 + 4 x $4.99 + 4 x $4.29 = $173.14

All together, this pattern costs a total of $366.60 + $173.14 = $539.74

Figure 4. Inverted V-pattern deck.

As the following figure shows, the cross-hatched region is repeated twice. To determine the number of boards necessary to cover the deck in this manner, use the same table created for the X-shaped pattern.



From that table and with aid of the drawing, this deck pattern requires:

19 boards 2 in. x 6 in. x 12 ft.
4 boards 2 in. x 6 in. x 10 ft.
4 boards 2 in. x 6 in. x 8 ft.
4 boards 2 in. x 6 in. x 6 ft.
4 boards 2 in. x 6 in. x 4 ft.

The rest can be covered from scrap material. When doubled, the minimum cost is:
38 x $8.49 + 8 x $6.99 + 8 x $5.79 + 8 x $4.99 + 8 x $4.29 = $499.10