Lesson 4: Tiling a Floor

SPECIFIC OBJECTIVES

Students will understand that

- The area of a rectangle is calculated as length x width.
- Area has units of ft^2 or in^2
- Some computed answers need to be rounded to whole numbers large enough to make sure you don't wind up underestimating materials.
- The estimate of the cost of a job depends on many variables including the rate of pay, the cost of materials, and any overhead percentage you add to your estimates.
- Creating an estimate by rounding without using calculators can be an important time-saving skill on the job.

Students will be able to

- Use dimensions stated in feet and inches.
- Combine the use of addition and multiplication in computing a total amount.
- Use both computational and rounding-based (non-calculator) methods in obtaining an estimate.
- Obtain reasonable estimates of the labor and material costs of tiling a floor.
- Convert between square inches and square feet.
- Apply a percentage overhead charge to an estimate.
- Calculate areas of rectangles and other shapes.

Problem Situation #1: Tiling a Floor

You have been asked by the college to tile the student lounge in Building B. The college doesn't want to spend too much money, so they've decided to use 12" by 12" glue-on vinyl tiles in a checkerboard pattern for the floor. You need to determine an estimate of the total cost of the job (labor and materials).

1. What information do you need to gather to determine the total cost (labor and materials) for the job?

Square footage of lounge

Cost of tile

Cost of labor

floor dimensions

glue

material costs

tools needed

\# of workers

black tiles vs. white tiles

how much time

Contingency → if something goes wrong

profit

Lesson 4: Tiling a Floor

As a class, you will now walk over to the student lounge and discuss strategies to estimate the area of the lounge. **Wait for complete instructions from the instructor.**

2. In the space below, write down your estimate for the area of the room, the strategy that you chose to use, and why you picked that strategy. If you needed to do any calculations, be sure to also show them below.

$400 \ ft^2 \rightarrow$ heel-to-toe walk... 20 feet
room looks about square $20 \times 20 = 400$

ceiling tiles: 10×10. they are 2×2 so also 400

Imagine a basketball hoop laying down
$20' \times 22' = 440 \ ft^2$

3. Use your area estimate from #2 to calculate how much you will charge in labor for the job. Note, you charge $5.75 per square foot for this type of work.

$400 \ ft^2 \times \$6/ft^2 = \$2400$ estimate

6
$500 \times \$5.75 \approx \$3000$ estimate

4. Now, go back to the student lounge and take measurements. Put your measurements on the lounge drawing provided by your instructor (be sure to include units). Measure in feet and inches and measure to the nearest inch.

$19'6'' \times 19'$ $19'1'' \times 19'7''$ $19' \times 19'5''$ $\boxed{19'1'' \times 19'6''}$

5. Update your calculation for how much you will charge for labor using the actual measurements of the lounge. Show your calculation below and include units in your answer.

Area: Length x Width
$19'1'' \times 19'6''$
sq.ft
$372.13 \ ft^2$

$\$5.75/ft^2 \times 372.13 \ ft^2$
$= \$2139.72$

6. Standard practice is to add 10% to the cost for the job to account for 'overhead.' So, take your answer from question 5 and determine how much you'll actually charge for labor. Round your answer to the nearest dollar. Show your work below.

Add 10% → 100% + 10%
= 110% of original
*

$2139.72 \times 1.1 = 2353.692$
$\boxed{\$2354}$

$2139.72 \times 0.1 = 213.972$
$+ 2139.72$
$\$2354$

Lesson 4: Tiling a Floor

7. Calculate the amount of materials you need to order:
    a. If the glue-on vinyl tiles come in boxes of 24 tiles calculate the number of boxes of tile you need to order for this job.

    → contain 24 ft² of tile

    $$372.13 \text{ ft}^2 \div 24 \frac{\text{ft}^2}{\text{box}} = 15.51 \text{ boxes}$$

    Round to <u>16 boxes</u>

    b. If one gallon of adhesive covers 190 square feet of floor, calculate how many gallons you need to order for this job.

    $$372.13 \text{ ft}^2 \div 190 \text{ ft}^2 = 1.95 \text{ gallons}$$

    $$327.13 \text{ ft}^2 - 190 \text{ ft}^2 = 182 \text{ ft}^2$$

    1 gallon + 1 gallon = <u>2 gallons</u>

8. Standard practice for construction work is to add 10% to the amount of materials you order to ensure you have enough on hand to complete the job. So, take your answers from question 7 and determine how much tile and glue you need to order.

    $$15.5 \times 1.1 = 17.05 \text{ boxes}$$
    $$16 \times 1.1 =$$

    | 18 boxes of tile |

    $$16 \times 10\% = 1.6$$
    $$16 \times 10\% - + 16$$
    $$\overline{17.6 \text{ boxes}}$$

    $$2 * 10\% = 0.2 \Big) = 2.2 \text{ gallons} \rightarrow \boxed{3 \text{ gallons}}$$
    $$+ \ 2$$

9. The price of the tile is $15.60 per box and the glue is $15.00 per gallon. Determine the total cost for materials for this job.

    $$\$15.60 \text{ per box} * \$18 \text{ boxes} = \$280.80$$

    $$\$15 \text{ per gallon} * 3 \text{ gallons} = \$45.00$$

    $$\boxed{\$325.80}$$

Lesson 4: Tiling a Floor

10. Again, standard practice is to add 10% to the cost for the job to account for 'overhead.' So, take your total material costs (answer from question 9) and determine how much you'll actually charge for materials. Round your answer to the nearest dollar. Show your work below.

$325.80 × 1.1

$280.8 × 1.1 = $308.88
.45 × 1.1 = $49.50
_____
$358

11. Finally, determine the price (labor and materials) you will quote the College. Show your work below and include units in your answer.

$358
$2 354
_____
$2 712

Problem Situation #2: Determining your Price

As stated earlier in the lesson, standard practice is to add 10% to the total cost for a construction job to account for 'overhead.' You did this by calculating the total labor cost and the total material costs separately and then adding them together.

12. **Predict** if you will get the same final price as you did in #11 if you instead add the labor and material costs together *first* and *then add* the 10% overhead to that total. State Yes or No and explain your reasoning.

No reason   10% labor
              10% materials) 20% ?

13. Now, *do the calculation*. Add 10% overhead to your total costs using your answers from questions #5 and #9. Round your answer to the nearest dollar. Show your work below.

Labor - $2139.72   10% of 2465.55 = 246.555
Materials - $358.80

$2465.55 + 246.555 = $2712

14. Do your answers to question #11 and #13 match? Why or why not?

Yes   0.1 (Labor) + 0.1 (Materials)
        0.1 (Labor + Materials)

Lesson 4: Tiling a Floor

Problem Situation #3: Rooms come in many shapes

In this, and other lessons, you have found the area of shapes that are all based on a rectangle. When you found the area of those shapes, you used the formula for the area of a rectangle. What happens when you get to a room/house/building that is a different shape? John Stephany provides his students with a formula packet to work with many different geometric shapes. Work with your group to use the formulas provided on John's formula set to calculate the area of the shapes given.

15. What is the area of the patio shown in the picture below. Be sure to show your work and include units in your answer.
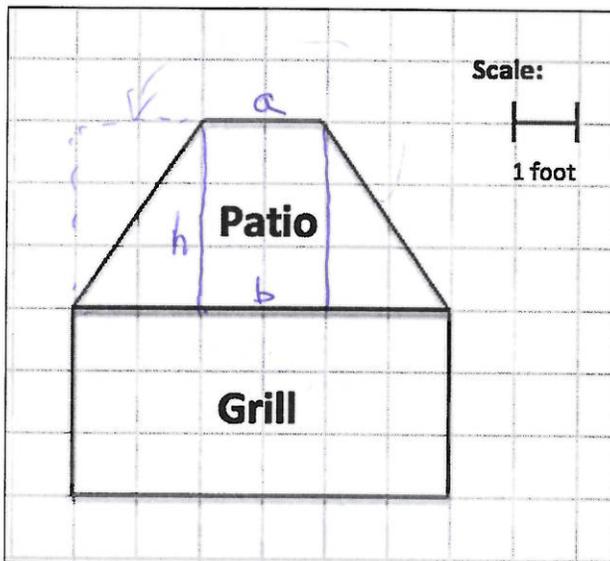
Trapezoid

$$\frac{a+b}{2} \times h$$

$$\frac{2' + 6'}{2} \times 3' = 12 ft^2$$

rectangle : $3 \times 2' = 6 ft^2$

triangle : $\frac{1}{2} bh$
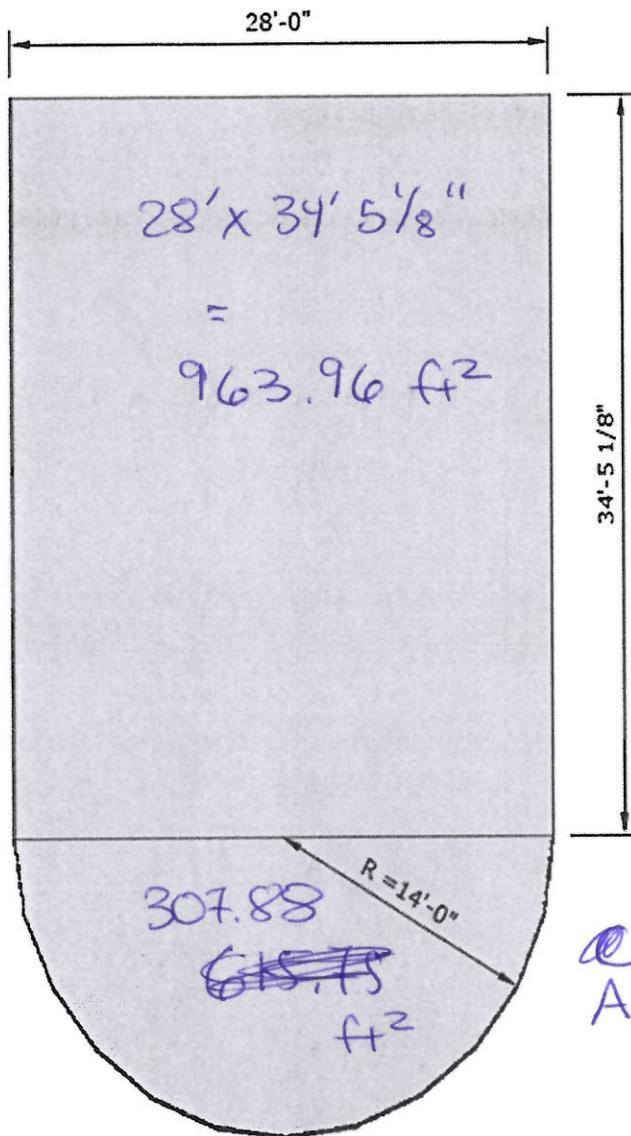
$$\frac{3 \times 2'}{2} = 3 ft^2$$

$$\frac{+ 3 ft^2}{12 ft^2}$$

Bethany Sansing-Helton

Lesson 4: Tiling a Floor

16. You have been hired to build a house with the crazy shape shown below. Calculate the area of floor.

28'-0"

28' x 34' 5⅛"

=

963.96 ft²

34'-5 1/8"

R =14'-0"

307.88

~~615.75~~

ft²

963.96
307.88
_____

~~to~~ 1271.84 ft²

A = πr²
π(14')²
= 615.75
½ of ↗ = 307.88

Lesson 4: Tiling a Floor

MAKING CONNECTIONS

Record the important mathematical ideas from the discussion.

PRACTICE
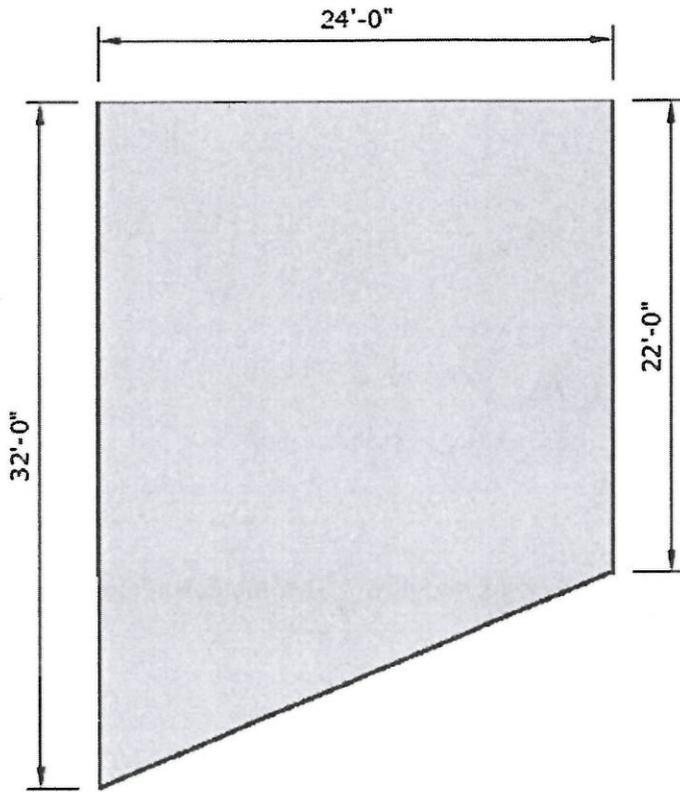Pg 85   1, 4, 7, 10
Pg 87   22
PG 101 2
PG 103 12

EXTRA PROBLEM
Redo 7a if the tiles are 8"x8"

Pg 86 15. You have been asked to give a price for the shingling job shown. The homeowner just wants a rough idea of the cost of this job.

1. Without using a calculator, estimate the square feet of roof covered.

2. You charge $1.85/sq ft for simple shingling jobs such as this. Again, without using your calculator, give a rough estimate of the cost of this job. Your estimate should be on the high side because it's always better to estimate high and charge less than to estimate low and charge more.

3. Time to get back to office and write up the proposal.
    a. Calculate the square footage of the roof. (Round you answer to the square foot.)
    b. How much will you charge the customer? (Round to the nearest dollar.)
    c. Now add 10% to the price you found in b. to cover overhead.
    d. Finally, determine how many bundles of shingles you should order if each bundle covers 33 sq ft of the roof.

Bethany Sansing-Helton

4. You have been hired to build a house with the crazy shape shown below. Calculate the area of floor.

Also

p. 121 #2

p. 122 #5