

Answer Key: Designing RATIOnally

Activity Sheet 1: Ratio Basics

“A Fresh, Clean Design”

- 1 312,500. $5/2 = x/125,000$. $x = 312,500$
- 2 19.5 feet tall. $1/6 = 3.25/x$, $x = 19.5$
- 3 78. $3/2 = 117/x$. $x = 78$
- 4 \$250,000. $1/25 = x/6,250,000$. $x = \$250,000$

NOW TRY THIS!

- 5 2:2:1

Activity Sheet 2: Unit Rate

“A First-Rate Design”

- 1 The $2\frac{1}{2}$ -gallon drum for \$27.50 is the better buy. Its unit rate is \$11.00 per gallon ($\$27.50 \div 2.5 = \11.00) while the $5\frac{1}{2}$ -gallon drum has a unit rate of \$15.91 (rounded) per gallon ($\$87.50 \div 5.5 = \15.91). Additionally, buying 40 drums of the $2\frac{1}{2}$ -gallon size equals exactly 100 gallons whereas $18\frac{2}{11}$ drums of the $5\frac{1}{2}$ -gallon size equals 100 gallons. So 19 drums of the larger-size drum would be needed with some left over, making it an even more expensive option.
- 2 416,667 gallons per hour (rounded) would be produced by the facility, which is enough to meet the community's needs. $10,000,000 \div 24 = 416,666\frac{2}{3}$.
- 3 The Smithtown Highway. The Smithtown Highway takes a little under 6 hours ($320.5 \div 55 = 5.83$) while the Devil's Highway takes over 7 hours ($165.4 \div 22.5 = 7.35$ hours).
- 4 Both contractors have a unit rate of 14 filters per day ($28 \div 2 = 14$ and $98 \div 7 = 14$). So the two contractors are equally speedy.

NOW TRY THIS!

- 5 Option 1. If the job takes 36 hours, the bill will amount to $\$4,000 + 36 \times \$100 = \$7,600$ under option 1, but will be $36 \times \$250 = \$9,000$ under option 2. Option 1 has the added advantage of costing less if the job takes more than 36 hours.

Activity Sheet 3: Ratio and Percentage Problems

“Keeping It All in Proportion”

- 1 20%. The bricklaying company can lay 350 square feet in a 10-hour day ($10 \times 35 = 350$). After 4 days, 1,400 square feet will be completed. Set up the proportion $1,400/7,000 = x/100$. The scale factor for 7,000 to 100 is to divide by 70. So, divide 1,400 by 70 = 20, and $20/100 = 20\%$.
- 2 a. 6,400 tiles. First, recognize that the mural's measurements are given in feet while the tile's dimensions are given in inches. So, first determine how many tiles are needed for one square foot. Each tile is 9 square inches ($3'' \times 3''$) and a square foot is 144 square inches ($12'' \times 12''$). Set up the proportion $1/9 = x/144$. The scale factor for the denominator is 16, so x (the number of tiles in a square foot) = $16 \times 1 = 16$ tiles. Next, recognize that the mural takes up 400 square feet ($10' \times 40' = 400$ square feet). Set up another proportion $16/1 = t/400$, i.e., if 16 tiles are needed for one square foot, how many are needed for 400 square feet?) In this case, looking at the denominators, the scale factor is 400, so $t = 16 \times 400 = 6,400$ tiles.
b. 6,656 tiles should be ordered. The defect rate is $2/50$ or 4%. Set up a proportion $2/50 = x/6,400$, where x represents the total number of defective tiles. Looking at the denominator, the scale factor is 128, and applying the scale factor to the numerator results in $2 \times 128 = 256$ defective tiles. So, to have enough tiles, order 6,400 tiles plus 256 more to account for defective tiles for 6,656 in all.
- 3 252,000,000 milligrams (which converts to 252,000 grams) per week. First multiply 16,000,000 liters/day by 7 days = 112,000,000 liters. Then multiply 112,000,000 by the 2.25 mg/l rate = 252,000,000 mg.

NOW TRY THIS!

- 4 \$302,812.50. First calculate the municipal discount by setting up a proportion $15/100 = d/375,000$, where d is the amount of the discount. Looking at the denominators, the scale factor is 3,750. Applying the scale factor to the numerators, $d = 15 \times 3,750 = \$56,250$. So the price after the municipal discount is $\$375,000 - \$56,250 = \$318,750$. To apply the 5% cash discount, set up another proportion $5/100 = d/318,750$. Looking at the denominators, the scale factor is 3,187.5. Multiplying 3,187.5 by 5 = \$15,937.50. The price after the cash discount is therefore $\$318,750 - \$15,937.50 = \$302,812.50$.