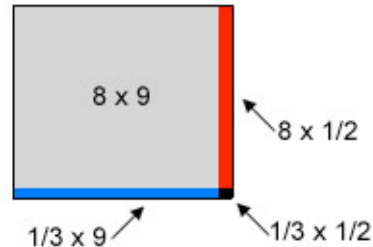


Solutions & Comments for Mentors, #4
week of October 27, 2014

1. (a) The mixed number $8\frac{1}{3}$ is defined as $8 + \frac{1}{3}$. Similarly, $9\frac{1}{2} = 9 + \frac{1}{2}$.
- (b) $(8 + \frac{1}{3})(9 + \frac{1}{2})$ can be simplified using the distributive property, more precisely, the special case of it called F.O.I.L. (foil). Most CB kids know it.
- The First terms multiply to give 72, the Outer ones give 4, the Inner ones 3, and the two fractions, which appear Last, multiply to give $\frac{1}{6}$.
- Doing all that, $(8 + \frac{1}{3})(9 + \frac{1}{2}) = 8 \times 9 + 8 \times \frac{1}{2} + \frac{1}{3} \times 9 + \frac{1}{3} \times \frac{1}{2}$ which simplifies to $72 + 4 + 3 + \frac{1}{6} = 79\frac{1}{6}$

Another method is to convert the given mixed numbers to (two) (improper) fractions, find their common denominator, add them and then convert back to a mixed number. That's ok, but more work than necessary.

Note: To help your student literally "see" the reality of F.O.I.L., you can point out that this problem is the same as finding the area of a rectangle (*base \times height*) with height $8\frac{1}{3}$ and base $9\frac{1}{2}$.



2. First, notice that 8 and 16 are powers of 2, specifically, $8 = 2^3$ and $16 = 2^4$.
- (a) Since $2^x = 2^3$, the value of x had better be 3. For one thing, replacing x by 3 in $2^x = 2^3$ makes it say that something (2^3) is equal to itself. Also, any other value of x makes the equation say that two different things are equal, which would destroy the foundations of mathematics and common sense.
- (b) By the same reasoning as in part (a), here we have $2^{x-1} = 2^3$ so the equal exponents are $x - 1$ and 3. That is, $x - 1 = 3$, so $x = \underline{4}$.
- (c) Similarly, here $2^{2x} = 2^4$, so that $2x = 4$ and so $x = \underline{2}$.

3. The square is 2 by 2, so its area is $2 \times 2 = 4$. The diameter of the circle must also be 2, so the radius is half of that, or 1, which in turn requires the area of the circle to be $\pi r^2 = \pi 1^2 = 1\pi = \pi$. Cutting away the circle leaves $4 - \pi$ for the gray portion.

