Math 310 - Dr. Miller - Homework #13: Proportional Equations

1. Use a proportional equation for solving these problems (they appear on the scaling/unit-rate HW also):
   (a) Allie bought half a dozen donuts for \$1.80. How much would 4 and a half dozen donuts cost?
   (b) On a map, $1\frac{1}{2}$ inch corresponds to 12 miles. Two cities are shown as 6 inches apart on the map. How far apart are they in reality?
   (c) Jimmy paid \$44 for 8 pizzas. How much will 20 pizzas cost?
   (d) My recipe calls for 5 cups of flour to 2 cups of sugar. How much flour do I need if I use 7 cups of sugar?
   (e) Two thirds of a cup of sugar is needed to make 6 dozen dainty candies. How many dozen candies can be made using 4 cups of sugar?
2. Three people want to split a lottery prize into a ratio of 4 to 2 to 1. How much will each person get if the total prize is \$1 million?
3. An inheritance of \$14,800,000 is to be shared among heirs in the ratio of $1\frac{1}{2} : 2\frac{1}{2} : 3 : 5 : 6\frac{1}{2}$. What sum does each of the heirs receive?
4. A certain non-alcoholic drink calls for 3 parts of 7-Up to 1 part of pineapple juice and 1/2 a part of cherry syrup. To make 6 gallons of this beverage, how much of each ingredient do you need?
5. My signature chili seasoning calls for 5 parts of ground chili peppers to 3 parts of cumin, 1 part of oregano, and 1/2 part of cayenne. If I make 38 pints of seasoning to sell at the farmers' market, how much of each spice will I need?
6. Kennedy worked for $3\frac{1}{2}$ hours on a project, Kevin worked for $1\frac{1}{2}$ and Keith worked for 2 hours. They got paid \$210 altogether. How should they fairly divide it?
7. Carol's popular grilling spice mix calls for 3 parts of black pepper to 2 parts of cumin, 2 parts of ground oregano, $1\frac{1}{2}$ parts of mild chili pepper, and $\frac{1}{4}$ of a part of cinnamon. To make 7 cups of the mix, how many cups of the mild chili pepper does she need?
8. The ratio of two numbers is 3 to 5. What are the numbers if ...
   (a) their sum is 96?
   (b) their sum is 792?
   (c) their difference is 32?
9. Right now, the ratio of cars to trucks in the parking lot is 3:2. If there are 100 vehicles in the lot, ...
   (a) ...how many more trucks must enter to bring the ratio down to 1:1?
   (b) ...how many cars must enter to change the ratio to 2:1?
   (c) ...how many vehicles, and of what kind, must enter to change the ratio to 6:5?
10. The ratio of women to men in my geometry class is 5:6. If there are 22 students, ...
    (a) ...how many women must enter to change the ratio to 1:1?
    (b) ...how many men must enter to change the ratio to 10:13?
    (c) ...how many people, and of which sex, must enter to change the ratio to 2:3?

1. (a) One possible equation is $\frac{0.5\ dozen}{\$1.80} = \frac{4.5\ dozen}{x}$. (Remember to label *within* your equation if you didn't use a labeled chart to create it.) Answer: \$16.20.

   (b) One possible equation is $\frac{1.5\ inches}{12\ miles} = \frac{6\ inches}{x}$. Answer: 48 miles.

   (c) One possible equation is $\frac{\$44}{8\ pizzas} = \frac{x}{20\ pizzas}$. Answer: \$110.

   (d) One possible equation is $\frac{5\ c.\ flour}{2\ c.\ sugar} = \frac{x}{7\ c.\ sugar}$. Answer: 17.5 cups of flour.

   (e) One possible equation is $\frac{2/3\ c.\ sugar}{6\ dozen\ candies} = \frac{4\ c.\ sugar}{x}$. Answer: 36 dozen candies.

2. Prop. Eqn: A chart has 4, 2, 1, and total 7 in the column labeled "Ratio." It has variables x, y, z, and total \$1,000,000 in the next column, labeled "Money" or something along those lines. The proportional equations are $\frac{4}{7} = \frac{x}{\$1,000,000}$, $\frac{2}{7} = \frac{y}{\$1,000,000}$, and $\frac{1}{7} = \frac{z}{\$1,000,000}$. The people get \$571,428, \$285,714, and \$142,857.

   Other algebraic method: The ratio 4 to 2 to 1 tells us that the money will be split into 7 shares, so $7x = \$1,000,000$, making x worth 1 million $\div 7$, or just over \$142,857. So one person gets $4x = 4 \times 142,857 = \$571,428$, the next gets $2x = 2 \times 142,857 = \$285,714$, and the last gets the flat $x = \$142,857$.

3. Prop. Eqn: A chart has $1\frac{1}{2}$, $2\frac{1}{2}$, 3, 5, $6\frac{1}{2}$ and total $18\frac{1}{2}$ in the column labeled "Ratio." It has variables a, b, c, d, e, and f, and total \$14,800,000 in the next column, labeled "Inheritance" or something along those lines. The heirs get \$1.2 million, \$2 million, \$2.4 million, \$4 million, and \$5.2 million.

   Other algebraic method: There are $18\frac{1}{2}$ shares, so $18\frac{1}{2}x = \$14,800,000$, making x worth $\$14,800,000 \div 18\frac{1}{2} = \$800,000$. The heirs get \$1.2 million, \$2 million, \$2.4 million, \$4 million, and \$5.2 million.

4. You need $3(1\frac{1}{3}) = 4$ gallons of 7-Up, $1\frac{1}{3}$ gallons of pineapple juice, and $\frac{1}{2}(1\frac{1}{3}) = \frac{2}{3}$ of a gallon of cherry syrup.

5. 20 pints of ground chili peppers, 12 pints of cumin, 4 pints of oregano, and 2 pints of cayenne.

6. Give Kennedy \$105, Kevin \$45, and Keith \$60.

7. 1.2 or $1\frac{1}{5}$ cups of mild chili

8. Make 3-row charts for these.

   (a) 36 and 60

   (b) 297 and 495

   (c) The bottom row of your chart should be about *differences*, not totals. The two numbers are 48 and 80.

9. (a) The "old ratio" chart should use cars and "all." It creates the equation $\frac{3}{5} = \frac{x}{100}$, so that there are 60 cars (and 40 trucks). The "new ratio" chart should use cars and (changing) trucks, for the equation $\frac{1}{1} = \frac{60}{x}$. There will be $x = 60$ trucks then; that's 20 more.

   (b) The "old ratio" chart tells us the same information: 60 cars and 40 trucks to start with. The "new ratio" chart should use (changing) cars and trucks, creating the equation $\frac{2}{1} = \frac{x}{40}$. That means we need $x = 80$ cars total, or 20 more.

   (c) The "old ratio" information is still the same. The "new ratio" information is not so clear, so let's first try the number of cars changing, with an equation of $\frac{6}{5} = \frac{x}{40}$. We need 48 cars altogether, but that's a decrease - not allowed. So try a changing number of trucks in this chart. The equation becomes $\frac{6}{5} = \frac{60}{x}$, so $x = 50$ trucks altogether, an increase of 10 trucks.

10. (a) Two more women must enter.

    (b) One more man must enter.

    (c) Three more men must enter.