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1. Max says that  $\frac{2}{\frac{3}{4}}$  is not a rational number because it is not an integer over a non-zero integer. Molly says it is a rational number. Who is right and why?
2. Let  $a, b$  and  $c$  be integers. Is it true that  $\frac{a}{\frac{b}{c}} = \frac{a}{b}$ . If it is true, prove it. If not, give a counterexample.
3. If you rewrote the above question in terms of division what property of division am I really asking about?
4. (a) Puppies at the SPCA need  $1\frac{3}{4}$  teaspoons of vitamins every day. Sally noticed that there are only  $7\frac{2}{3}$  teaspoons of vitamins left in the jar. How many puppies can Sally give vitamins to?  
  
(b) The answer to  $7\frac{2}{3} \div 1\frac{3}{4}$  is  $4\frac{8}{21}$ . What does  $\frac{8}{21}$  measure in the previous problem?  
  
(c) How can you use  $\frac{8}{21}$  to figure out how many teaspoons of vitamins are left after Sally feeds 4 puppies?

5. (a) You give Max the problem  $\frac{2}{3} \div \frac{7}{5}$ . He computes it in the following way. Is Max's answer correct?

$$\frac{2}{3} \div \frac{7}{5} = \frac{2 \div 7}{3 \div 5} = \frac{\frac{2}{7}}{\frac{3}{5}} = \frac{2}{7} \cdot \frac{5}{3} = \frac{10}{21}$$

- (b) Compute the problem  $\frac{4}{5} \div \frac{8}{3}$  using Max's method.

- (c) Will Max always get the right answer doing it this way? If so, prove that  $\frac{a}{b} \div \frac{c}{d} = \frac{a \div c}{b \div d}$ . If not, give Max an example to show that his method will not always work.

6. (a) You ask Max to compute  $\frac{2}{3} \div \frac{1}{9}$ . He does the following. Does Max get the correct answer?

$$\frac{2}{3} = \frac{6}{9}$$

Since  $6 \div 1 = 6$ , then  $\frac{2}{3} \div \frac{1}{9} = 6$

- (b) You then ask him to compute  $\frac{2}{3} \div \frac{1}{4}$ . He uses the same method, but now he needs to change both fractions. Does Max get the correct answer?

$$\frac{2}{3} = \frac{8}{12}$$

$$\frac{1}{4} = \frac{3}{12}$$

Since  $8 \div 3 = \frac{8}{3} = 2\frac{2}{3}$ , then  $\frac{2}{3} \div \frac{1}{4} = 2\frac{2}{3}$ .

- (c) Use Max's method to compute  $\frac{5}{6} \div \frac{2}{5}$ .

- (d) The method Max uses consists of two steps. First get a common denominator, then divide the numerators. Prove that if you divide two fractions with a common denominator, you need only divide the numerators. In other words, prove that  $\frac{a}{c} \div \frac{b}{c} = a \div b$ .

- (e) Explain to Max why his method works.