Session 2.4

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Recap of last time

1. Ratios are things we have already seen before

   (a) Convert the ratio into **equivalent fractions** to solve

   $$3:5 \text{ as } 9:\underline{\ ?\ } \implies \frac{3}{5} = \frac{9}{?} \implies \frac{3}{3} * \frac{3}{5} = \frac{9}{\boxed{15}}$$

   (b) Use cross multiplication (introduce a variable)

   $$3:5 \text{ as } 9:x \implies \frac{3}{5} = \frac{9}{x} \implies 3*x = 9*5 \implies x = 9*5 \div 3 = \boxed{15}$$

2. Memorize a couple of standard fractions

   (a) $\frac{1}{2} = 0.5$

   (b) $\frac{1}{8} = 0.125$

   (c) $\frac{1}{3} = 0.\overline{3}$

   (d) $\frac{1}{6} = 0.1\overline{6}$

   (e) $\frac{1}{9} = 0.\overline{1}$

   (f) $\frac{1}{11} = 0.\overline{09}$

Main problems

1. Do the following word ratio problems.

   (a) Chris is 3 times heavier than Sebastian. If Chris weighs 52 kg, how heavy is Sebastian?

   (b) Jeremiah is 2 times older than Erick, and Erick is 3 times older than Thewfic. If Thewfic is 2 years old, how old is Jeremiah?

   (c) If humans who are 6 feet tall need 9 pounds of food, then how much food does a 10 foot giant need?

2. Complete the following rate problems:

   (a) If we can pour 160 pounds of cement in 20 minutes, we can pour $\underline{\ ?\ }$ pounds/hour?

   (b) If we can pour 160 pounds of cement in 20 minutes, how much cement can we pour in 45 minutes? What about 2 hours and 15 minutes?

   (c) If we can pour 160 pounds of cement in 20 minutes, how long does it take to cover a block that requires 1000 pounds of cement?

   (d) If Ian can complete 4 tasks in 6 minutes, how many tasks can Ian complete in 21 minutes? What about 25 minutes?

   (e) If Abraham can beat 3 Pokemon gyms in 45 minutes, how much time does he need to beat all 8 Pokemon gyms and reach the elite four?

   (f) If Dominic solves 7 problems/hour and Jonathan solves 13 problems/hour, then, as a team, Dominic and Jonathan solve $\underline{\ ?\ }$ problems/hour

(g) If Osvaldo can wash 2 loads of laundry in 4 hours and Sergio can wash 6 loads in 8 hours, then as a team, how many loads can Osvaldo and Sergio do in 10 hours? What is the ratio between Osvaldo's productivity and Sergios productivity?

(h) If Aiden can wrap in 5 presents in 6 minutes and Joseph can wrap 7 presents in 9 minutes, then, as a team, Aiden and Joseph wrap _?_ presents/minute? How long does it take them to wrap 58 presents?

(i) If Amir designs 2 algorithms/hour and Jose designs 3 algorithms/hour, how many algorithms can they design in a work session that lasts 3 hours? How long does it take them to design 11 algorithms?

Extra problems

1. In a group of kangaroos, the two lightest kangaroos weigh 25% of the total weight of the group. The three heaviest kangaroos weigh 60% of the total weight. How many kangaroos are in the group?

2. In a school, there are lockers 1–100 that all start off closed. Jose gets bored and decides to flip the state of the lockers (if open, close it, and if closed, open it) in the following way. Starting at 2, Jose flips the state of lockers 2, 4, 6, ..., and then flips 3, 6, 9, ..., and so on all the way until 100.
   Which locker numbers are closed when Jose finishes?

3. Assume that $\dfrac{1111}{101} = 11$ is true. What is the value of $\dfrac{3333}{101} + \dfrac{6666}{303}$?

4. Let S be the number of squares among the integers from 1 to 2013^6. Let Q be the number of cubes among the same integers. Then

   (a) $S = Q$

   (b) $2 * S = 3 * Q$

   (c) $3 * S = 2 * Q$

   (d) $S = 2013 * Q$

   (e) $S * 3 = Q * 2$

5. The diagram shows a shaded quadrilateral KLMN drawn on a grid. Each cell of the grid has sides of length 2 cm. What is the area of KLMN?
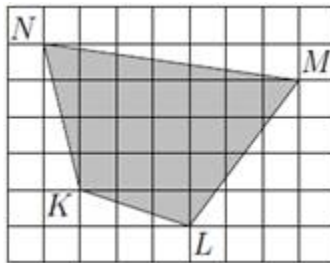
6. A class of students had a test. If each boy had gotten 3 points more on the test, then the average result of the class would have been 1.2 points higher. What percentage of the class are girls?

7. Problems from 2011 AMC 8