

# Review Set Theory. Other Homework problems

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- My dear, you love math more than me!
- Of course not, how could you think such a thing!
- Prove it!
- Let  $A$  be the set of the objects I love. . .

Play a daily set puzzle at: [http://setgame.com/set/puzzle\\_frame.htm](http://setgame.com/set/puzzle_frame.htm)

Register for Math Kangaroo at <http://www.mathkangaroo.org/> (optional)

## Review

These are some important puzzles from previous homework. If you didn't do them, try again. If you did, refresh your answers. (Note that puzzle 2 is fixed).

**Exercise 1.** Once Tanya made a very difficult quiz. Those students who failed came to the next make-up round of the quiz. Each round, one third of the students plus one third of a student passed the quiz. What is the minimal possible number of students who failed all of the rounds, if there were 5 rounds?

**Exercise 2.** Tanya is teaching her students to count. As a challenge problem, Tanya asked her students to count their pens, pencils and markers. Out of 40 students ten have the same number of pens as pencils, and 15 have a different number of pens and markers. Prove that there are at least 15 students who have a different number of pencils and markers.

**Exercise 3.** Mike and Bob stepped on the escalator going down. While Mike was walking down he stepped on 50 steps. Bob was walking 3 times faster and stepped on 75 steps. Assuming they were not skipping steps, how many steps would they have needed to step if the escalator weren't moving?

## Competition Practice

**Exercise 4.** Calculate:

$$\frac{0.4 + 8 \left( 5 - 0.8 \cdot \frac{5}{8} \right) - 5/2\frac{1}{2}}{\left( 1\frac{7}{8} \cdot 8 - \left( 8.9 - 2.6/\frac{2}{3} \right) \right) \cdot 34\frac{2}{5}} \cdot 90.$$

**Exercise 5. 1985 AMC 8, Problem 23.** King Middle School has 1200 students. Each student takes 5 classes a day. Each teacher teaches 4 classes. Each class has 30 students and 1 teacher. How many teachers are there at King Middle School?

**Exercise 6. 1987 AMC 8, Problem 24.** A multiple choice examination consists of 20 questions. The scoring is +5 for each correct answer, -2 for each incorrect answer, and 0 for each unanswered questions. John's score on the examination is 48. What is the maximum number of questions he could have answered correctly?

## Challenge Problems

**Exercise 7.** There are 10 sets of 10 coins. You know how much the coins should weigh. You know all the coins in one set of ten are exactly a hundredth of an ounce off, making the entire set of ten coins a tenth of an ounce off. You also know that all the other coins weight the correct amount. You are allowed to use an extremely accurate digital weighing machine only once.

How do you determine which set of 10 coins is faulty?

**Exercise 8.** How many different sets are there in the game of set? How many first(second/third/fourth) order sets are there?