

PERCENTAGES

LAMC INTERMEDIATE GROUP - 1/12/14

WARM UP!

The Math Circle instructors are baking cakes for a bake sale, but their recipes call for measurements which they can't seem to measure with their tools. Help them find a way to correctly fulfill the recipes!

- Morgan and Pax are in charge of timing the oven. They need a way to measure 15 minutes, but they only have a 7-minute hourglass and an 11-minute hourglass.

- Derek and Dustin need exactly 6 gallons of water, but they only have a 9-gallon bucket and a 4-gallon bucket. (the buckets do **not** have measurement markings on the sides, and there is an infinite source of water)

PROBLEMS

- (1) Fill in the blanks in the following two sentences:
- (a) To increase a number by 31% means to multiply it by _____.
 - (b) To decrease a number by 31% means to multiply it by _____.
- (2) A store secretly increased the price of their sweaters by 100%. The next day, they had a special 50% off sale on sweaters. How does the sale price compare to the original price (before they increased it by 100%)?
- (3) Pax and Derek have a bit of a junk food addiction.
- (a) Last week, Pax ate 20% more junk food than what he ate two weeks ago. This week, Pax will eat 20% less junk food than what he ate last week. Does Pax eat more junk food this week or two weeks ago?
 - (b) Last week, Derek ate 20% less junk food than what he ate two weeks ago. This week, Derek will eat 20% more junk food than what he ate last week. Does Derek eat more junk food this week or two weeks ago?

(4) The price of gas dropped by 20%. How much more gas can you buy for the same amount of money? (answer in percentage)

(5) Dustin and Derek were competing to sell candy. Derek offered the following deal: candy is 15% off, and if you are from the Math Circle you get an extra 15% off your total. Dustin offered 30% off. Originally, Dustin and Derek sold candy for the same price. Which is the better deal for Math Circle students?

(6) Morgan's favorite item was on sale for \$105 at the store. It usually costs \$150. What is the percent discount?

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- (7) At the beginning of the year, 40% of the Math Circle students were boys. After 6 more boys joined the Math Circle and 5 girls left the Math Circle, the number of girls and boys was equal. How many people were at the Math Circle in the beginning of the year.
- (8) This year, Shack (a basketball player with no affiliation to Shaq) attempted 30% more freethrows than last year. This year, he made 60% of his attempts. Last year, he made 80% of his attempts. Do you think he made more freethrows this year or last year?
- (9) Dustin is an avid cyclist, however, during some seasons he has more time to ride than others. Because of this his weight fluctuated throughout the year. In spring his weight dropped by 25%. In summer, it increased by 20%. In fall, it dropped 10%. In winter, it increased 20%. Do you think Dustin lost or gained weight in this year?

(10) As we know, Pax spends a lot of time at the gym. Last year, he went to the gym for 54000 seconds per day. This year, he has increased his time spent at the gym by some percentage. He now spends 64800 seconds per day at the gym. What is the percentage?

(11) Deven made some poor investments. He initially invested 7,500 dollars. The total value of his investments dropped twice by the same percentage and he ended up with 4,800 dollars. What was the percentage?

(12) **(review)** Write $.370370370 \dots$ as a fraction in lowest terms.

(13) **(review)** Write $\frac{51.2}{21.6}$ as a fraction (without any decimals) in lowest terms.

(14) You start with the number 51.2 and increase it three times by the same percentage. Then you decrease it three times by the same percentage. You end up with the number 21.6. What is the percentage?

(15) Derek and Pax live in the same building and leave for the Math Circle at the same time. Pax is a little taller, so his steps are 10% longer than Derek's. However, Pax also takes 10% fewer steps per second than Derek. Who arrives at Math Circle first?

HOMEWORK!

(1) Which is bigger: 27.13% of 13.27 or 13.27% of 27.13?

(2) Morgan is a much wiser investor than Deven. He initially invested 1000 dollars. His total increased twice by the same percentage. In the end, he had 1210 dollars. What was the percentage?