

LAMC Beginners 2: Review Handout

June 7th, 2020

Quick Math! Use the methods we taught you!

1. 65^2
2. 95^2
3. 103×105
4. 106×107
5. 97×96
6. 95×94

Distance and Rates:

1. 80 mathletes can harvest 160 fields in 40 days. How long will it take 40 mathletes to harvest 20 fields?
2. Doug and Cassandra decide to repaint the UCLA Math-Sciences building. By himself, Doug can paint $\frac{1}{40}$ th of the building in 3 days. And by herself, Cassandra can paint $\frac{1}{50}$ th of the building in 2 days. If they work together, how many WHOLE days will it take them to pass the half-way mark?
3. Ashin and Vi are 100 meters apart. Ashin can skip at 140 meters per minute while Vi can only skip at 100 meters per minute. After 5 minutes, how far apart are they?

Trade:

1. Chynna in SoCal and Cassandra in NorCal both produce watermelons and create hats. They would like to see if they can trade with one another to be better off. They both work 8 hours a day. Chynna can pick 5 watermelons an hour but can only make 2 hats an hour. Cassandra can make 5 hats an hour, but can only pick 2 watermelons an hour. What is the range of exchanges between watermelons and hats that Cassandra and Chynna are willing to trade to be better off?
2. Ashin and Vi can both produce shoes and pick oranges. Again they both work 8 hours a day. Ashin can pick 1 box of oranges an hour or make 2 pairs of shoes an hour. Vi is faster at both and can pick 4 boxes of oranges or make 5 pairs of shoes an hour. Is there a trade that will make them better off? If yes, provide an example. If not, explain why not.
3. Suppose Ashin can still pick 1 box of oranges an hour or make 2 pairs of shoes an hour, but Vi gets burnt out from working too fast and can now only pick 2 boxes of oranges or make 4 pairs of shoes an hour. Is there a trade that will make them better off? If yes, provide an example. If not, explain why not.

Sticks and Stone:

1. Chynna baked a dozen (12) cookies. She looked in her cupboard and found that she only has M&M's and sprinkles. She likes having options, so she decided that she is willing to leave some cookies plain and mix the two together. How many different ways can she season the cookies if
 - a. She wants at least 1 of each flavor?
 - b. She is willing to not make a certain flavor?
 - c. She wants at least 2 of each flavor?
 - d. She doesn't want more than 3 cookies of the same type? (so 3 is allowed)
2. Pat is to select six cookies from a tray containing only chocolate chip, oatmeal, and peanut butter cookies. There are at least six of each of these three kinds of cookies on the tray. How many different assortments of six cookies can be selected?
3. There are 20 students in Math Circle and 5 instructors: Ashin, Cassandra, Chynna, Doug, and Vi. How many ways can the instructors be seated if they want to sit in between two students? (No need to multiply it out, just show your work!)
4. Suppose Cassandra picked 20 indistinguishable apples. She has 3 baskets in front of her: one for each of her siblings. How many different ways can she distribute the apples? (Note: the baskets are different!)

Riddles (If there's extra time)

1. If it took 5 people twelve days to build a house, how long will it take 7 people to build the same house?
2. How do you go from 98 to 720 using just one symbol?
3. My twin lives at the reverse of my house number. The difference between our house numbers ends in two. What are the lowest possible numbers of our house?
4. How many sides does a circle have?
5. You decide to hammer a nail into the trunk of your favorite tree to mark your height. Five years later, you decide to come back to see how much higher the nail was. If the tree grew by five centimeters each year, how much higher would the nail be?
6. If there are 10 apples and you take away 2, how many apples do you have?

Answers:

Quick Math!:

1. 4225
2. 9025
3. 10815
4. 11342
5. 9312
6. 8930

Distance and Rates:

1. 10 days
2. 28 days! It would take them exactly 27 and $\frac{3}{11}$ days to paint half!
3. Four answers:
 - a. 300: they both face the same direction, with Vi behind Ashin
 - b. 100: they both face the same direction, with Ashin behind Vi
 - c. 1300: they both face outwards
 - d. 1100: they face each other

Trade:

1. Chynna is willing to trade a watermelon for at least $\frac{2}{3}$ of a hat while Cassandra is willing to receive a watermelon for at most $\frac{5}{2}$ hats. So the range of trading rates to let both be better off would be Chynna trading one watermelon for between $\frac{2}{3}$ and $\frac{5}{2}$ hats.
2. Yes, trade would still be possible to let them both be better off. Even though Vi is superior at creating both, the opportunity costs are still different. For example, Vi is willing to trade 3 boxes of oranges for 5 pairs of shoes. From Vi's point of view, any trade rate between 0.5-0.8 boxes of oranges for 1 pair of shoes works.
3. No. Both their opportunity costs are the same.

Sticks and Stones:

1.
 - a. $11 \cdot 10 \cdot 9 / 6 = 165$
 - b. $15 \cdot 14 \cdot 13 / 6 = 455$
 - c. $7 \cdot 6 \cdot 5 / 6 = 35$
 - d. 1! Trick question :P
2. 28
3. $19 \cdot 18 \cdot 17 \cdot 16 \cdot 15 = 1,395,360$
4. $22 \cdot 21 / 2 = 231$. Even though the baskets are different, the sticks are still indistinguishable!

Riddles:

1. None! The house is already built!
2. Spell out ninety eight and add a multiplication (* or x) in between!
3. 19 and 91
4. Two: the inside and outside.
5. The same height. Trees grow from the top, and the trunk grows one ring each year, but that doesn't make the trunk higher.
6. You took 2!