Common Core Math in 6th Grade

In sixth grade different number and arithmetic concepts come together and are used in interesting ways. Students are going to use their knowledge of multiplication and division to understand problems involving ratios and proportions. They'll increase their skill with fractions to include dividing fractions. And they'll begin to use equations and expressions with variables. Along the way, they'll also fill in the number line with one more type of number as they begin to understand and work with negative numbers.

These topics are all highly interrelated. Students will use tables, graphs, number lines, and diagrams to represent a situation with ratios as different approaches to problem solving and to highlight different structure. For example, suppose a juice blend uses 5 cups of grape juice for every 2 cups of peach juice. A student could use a table to find "easy" combinations of peach and grape juice like 10 cups of grape juice and 4 cups of peach juice, then 15 cups and 6 cups, etc. noticing that each time the amount of grape juice increased by 5 while the peach juice increased by 2. Graphing these pairs on a coordinate plane would show further structure and prompt further insights. The standard approach of "cross multiplying" will be a natural result of a solid understanding of the meaning of ratios in seventh grade. Finding the unit rate for ratios involving fractions will add a further context for fraction division then as well. (For further explanation see http://commoncoretools.files.wordpress.com/2012/02/ccss_progression_rp_67_2011_11_12_corrected.pdf)

Examples:

Security Camera: https://www.illustrativemathematics.org/illustrations/115 (see reverse)

This example gives a sense of how students might get to tie together several different concepts in a single context. For this task students must work with fractions, reason about areas and shapes, calculate percentages — all in a context that has some grounding in the real world. It also highlights the mathematical practices that are so important. This is not a problem that's a breeze-through if you understood the examples in the text. Kids are going to have to do some reasoning. They'll have to stick with it. They'll have to communicate why they know they've found the *best* answer. It is possible for nearly every student to begin working on the problem, but there are many opportunities for pushing kids beyond the original problem if they are ready for that too. (Is putting the cameras at grid lines realistic? Does our answer change if we don't have to do that?)

Tips for parents:

- Be patient if your child struggles, especially if math has been relatively easy in the past. Make sure to emphasize that this struggle is not an indication of failure and mistakes are just opportunities to learn (see Carol Dweck's work on mindset).

- Continue to have your child practice math as it comes up in your everyday interactions. (e.g. If it has taken us 3 hours to get two thirds of the way to the cabin, how long do you expect the whole trip will take? Will I have enough money to get 2 pairs of pants and 3 shirts?)

- Because middle school begins a transition to more realistic modeling situations, ask your child to notice assumptions you make to solve everyday problems with math. For example, if 6 oz. costs $3.25, how much will 15 oz. cost? Multiplying the cost by 2½ assumes that you *can* purchase 15 oz., and that the unit price is the same for larger quantities.

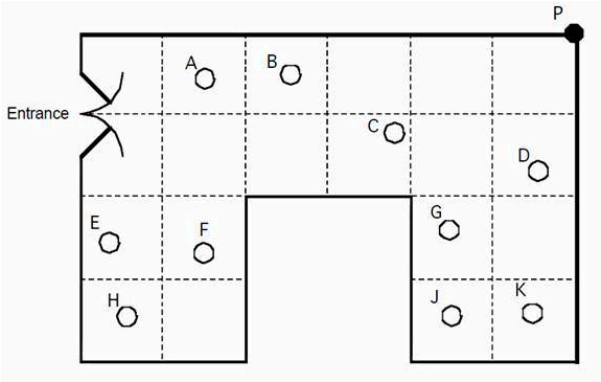
Provided by Tricia Bevans and Dev Sinha of the
University of Oregon Department of Mathematics
October 2014

For further information see:
ime.math.arizona.edu/progressions
and illustrativemathematics.org

Example: Security Camera

https://www.illustrativemathematics.org/illustrations/115

A shop owner wants to prevent shoplifting. He decides to install a security camera on the ceiling of his shop. Below is a picture of the shop floor plan with a square grid. The camera can rotate 360°. The shop owner places the camera at point P, in the corner of the shop.



1. The plan shows where ten people are standing in the shop. They are labeled A, B, C, D, E, F, G, H, J, K. Which people cannot be seen by the camera at P?
2. What percentage of the shop is hidden from the camera? Explain or show work.
3. The shopkeeper has to hang the camera at the corners of the grid. Show the best place for the camera so it can see as much of the shop as possible. Explain how you know that this is the best place to put the camera.

Commentary:

The last question has more than one answer, in the sense that there are three spots that could be considered "best." These three locations all cover the same amount of the store while at the same time miss less of the store than all other possible spots.

Solutions:

1. With the camera at point P, shoppers F and H are hidden from the camera.
2. There are 20 squares on the grid. If a line is drawn from point P to point T and beyond, the region that is hidden from the camera has an area of 3 squares (this region is composed of a triangle with an area of 1 square and a rectangle with an area of 2 squares; see the figure below). There are a total of 17 out of 20 squares visible from point P. $17/20 = 0.85$, so 85% of the store is visible, and 15% of the store is hidden from point P.
3. Looking at the figure below, the best places to place the camera are Q, R, and S.