Lesson Plan

Assembly Line Grade 7 Determine Ratios

CCSSM: Grade 7

DOMAIN: Ratios and Proportional Relationships

Cluster: Analyze proportional relationships and use them to solve real-world and mathematical problems.

Standard: 7.RP.1: Compute **unit rates** associated with **ratios** of fractions, including ratios of lengths, areas and other quantities measured in like and or different units.

Standard: **7.RP.2:** Recognize and represent **proportional relationships** between quantities.
2a. Decide whether two quantities are in a **proportional relationship**.

Clarification: The clarification is an explanation of the indicator and objective and how these math concepts appear in the puzzle.

Materials and/or Set Up*: Interactive Resource 1, Interactive Resource 2, Assessment*, Colored Index Cards

Relevant Vocabulary: Ratio

Note to Teacher – Students should have attempted Level 1 of the Assembly Line puzzle before this lesson plan is implemented. The ratios in this lesson can be written as 1:2, 1 to 2, or $\frac{1}{2}$.

Activities:

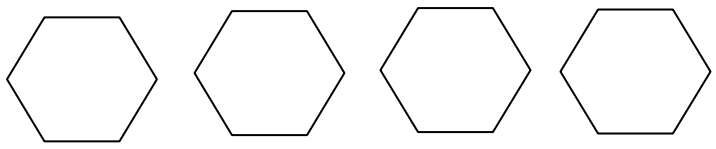
1. After students have played level 1 of Assembly Line, ask them to share their experiences. Have them describe the relationships between the numbers on the gears, spaces on the conveyor belt, numbers of cans, and numbers of starred cans.
2. Have the students look at the shirt colors of the students in the classroom. Choose several colors to determine the **ratio** within the room. For example, what is the **ratio** of red shirts to blue shirts?
3. Choose two shirt colors that are common within the room and have several students line up to represent a pattern such as red, red, red, blue, red, red, red, blue. Ask the students how they would determine the **ratio** of red shirts to blue shirts when given this information. Note: if sufficient shirt color options are not available, hand out colored index cards to represent the shirt colors.
4. Distribute ***Interactive Resource 1***. Guide the students to determine the **ratio** of star cans to plain cans in Assembly Line A. (*3 to 15*) Ask the students to simplify the **ratio**. (*1 to 5*) Make a connection to the shirt patterns.
5. Have the students independently determine the **ratios** of star cans to plain cans for Assembly Line B (*1 to 1*) and Assembly Line 3 (*1 to 3*).

6. Look again at Assembly Line A. Ask the students what is the **ratio** of star cans to the total number of cans. (*3 to 18*) Guide the students to simplify this **ratio**. (*1 to 6*)
7. Have the students independently determine the **ratios** of star cans to the total number of cans for Assembly Line B (*1 to 2*) and Assembly Line C (*1 to 4*).
8. Distribute ***Interactive Resource 2***. Guide the students to select a pair of gears in Assembly Line D that have the same **ratio** as the **ratio** of star cans to total cans as Assembly Line A on Interactive Resource 1. (*5 to 30)*
9. Have the students independently determine the gears for Assembly Line E (*3 to 6 and 4 to 8*) and Assembly Line F. (*4 to 16 and 5 to 20)* Note that although some assembly line puzzles have several gear choices that provide the correct **ratio**, only one pair will solve the puzzle. The lines on the conveyor belt will clue students into choosing the correct ratio.

Differentiation Suggestions:

- To assist in understanding equivalent ratios, work with parts of HEXAGONS, using actual Pattern Blocks, many hexagons drawn on a printed sheet, or virtual Pattern Blocks: http://nlvm.usu.edu/en/applets/controller/query/query.htm?qt=pattern+blocks

- Have students divide hexagons into halves, thirds, and sixths, twelfths, etc., then talk about how many sixths would be equivalent to $\frac{1}{2}, \frac{1}{3}, \frac{1}{12}$ etc.: $\frac{1}{2} = \frac{?}{6}$, $\frac{1}{3} = \frac{?}{6}$, $\frac{4}{12} = \frac{?}{6}$



($\frac{1}{2} = \frac{3}{6}$, $\frac{1}{3} = \frac{2}{6}$, $\frac{4}{12} = \frac{2}{6} = \frac{1}{3}$)

- For students who have successfully determined the correct ratios, have them design their own pattern of cans and sets of gears for a partner to solve.

Assessment

- Distribute the ***Assessment*** resource sheet.

Answers:

1. $\frac{16}{20}$ or *4 to 5*

2. *1 to 3*

Follow Up:

- Have students return to the puzzle to apply what they learned in the lesson. Ask: Did the lesson help you to clarify the math in the puzzle? How so? What other strategies could you have used to help you solve the puzzle? Additionally, check teacher stats in the game to determine students' level of understanding.
- Provide students with the following problem:

  2 of the 20 students on your team are left-handed. If this same ratio holds throughout your school, how many of the 800 students would you expect to be "lefties"?

Real World Connection:

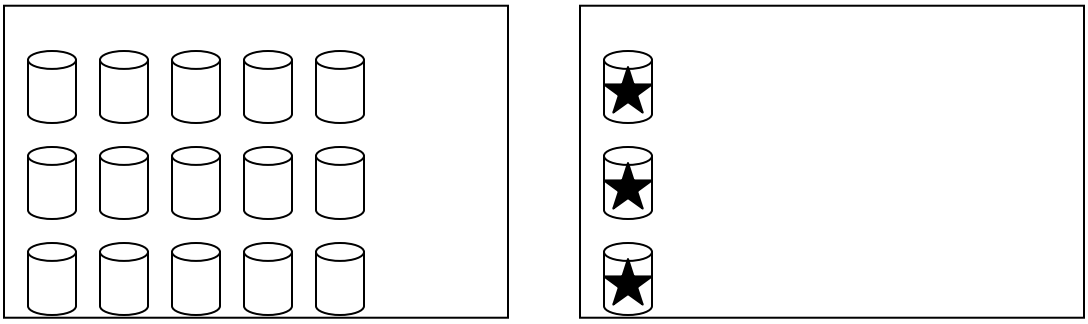
- Provide students with the following scenario:

  Jack was taking inventory of the cars on his used car lot. He noted 15 blue cars, 27 red cars, and 9 silver cars. What is the ratio of each car color to the total number of cars? (*Blue: 5 to 17, Red: 9 to 17, Silver: 3 to 17)*

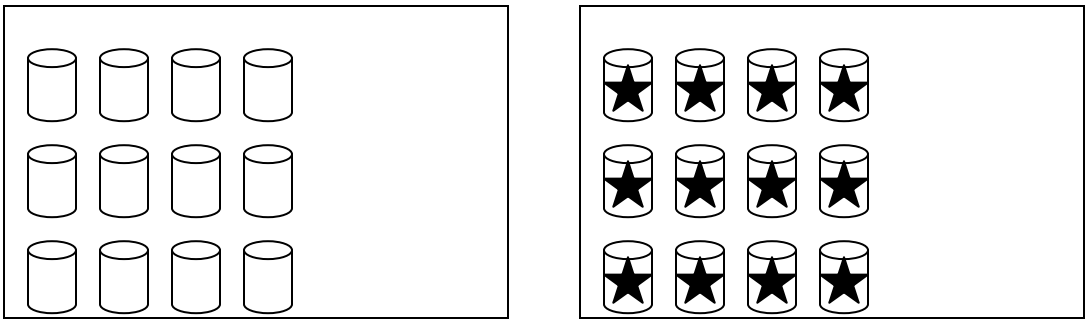
- Ask the students to describe a situation where ratios are used. Have the students provide data for someone to determine the ratio between two categories.

Interactive Resource 1

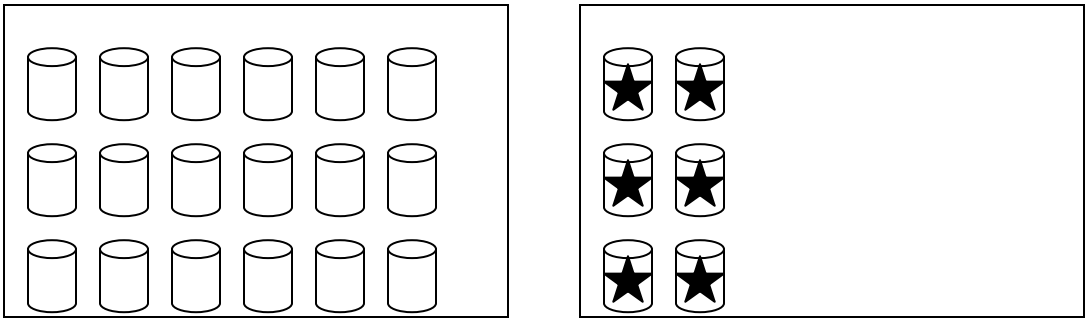
Assembly Line A



Assembly Line B

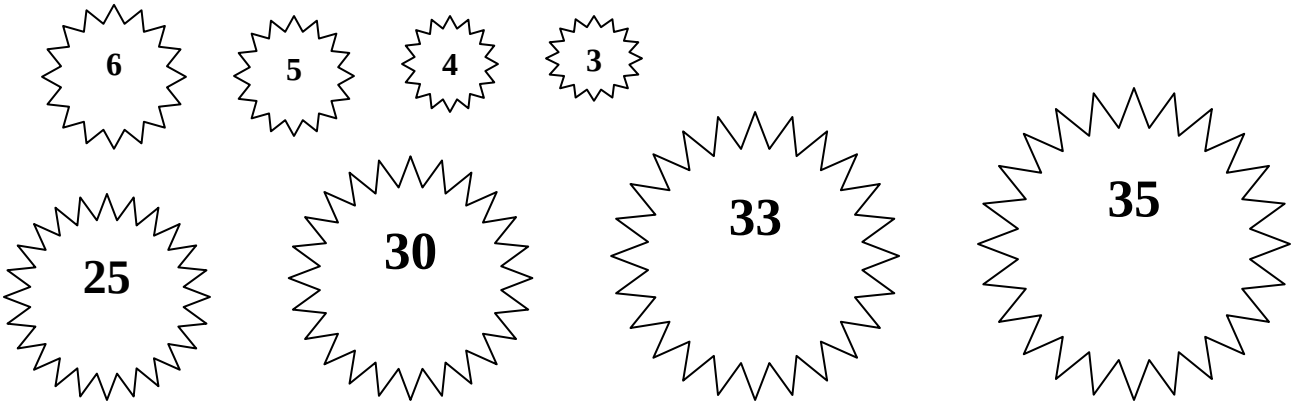


Assembly Line C

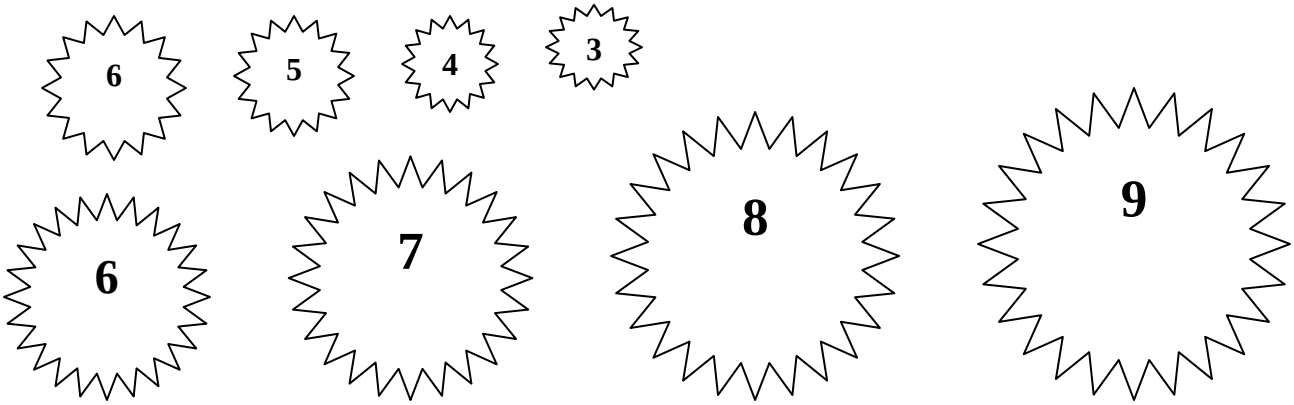


Interactive Resource 2

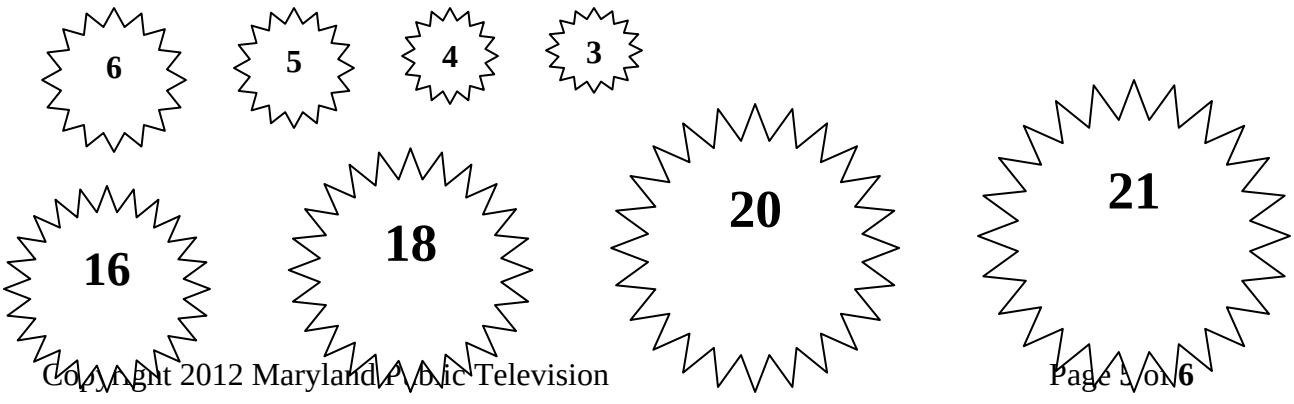
Assembly Line D



Assembly Line E



Assembly Line F



Assessment

1. John answered 16 questions as true on a twenty-question true/false test. What is the ratio of true answers to total answers?

2. Simplify the ratio: 15 to 45.