

Video: <https://youtu.be/nLr6NaNQ_Go>

**Video Summary:**

Manufacturers need to make sure that their products are meeting the buyers’ specifications. In order to ensure quality of their product, they often run tests on samples as they have gathered from their facility. When looking at the data, employees need to make sure that the data is correct and is following the specifications for the product. If the product is not meeting specifications, they must problem solve to figure out why the data is not accurate.

**Common Core Mathematical Content Standards:**

**6.SP.2:** Understand that a set of data collected to answer a statistical question has a distribution which can be described by its center, spread, and overall shape.

**6.SP.3:** Recognize that a measure of center for a numerical data set summarizes all of its values with a single number, while a measure of variation describes how its values vary with a single number.

**6:SP.4:** Display numerical data in plots on a number line, including dot plots, histograms, and box plots.

**6.SP.5c:** Summarize numerical data sets in relation to their context, such as by: Giving quantitative measures of center (median and/or mean) and variability (interquartile range and/or mean absolute deviation), as well as describing any overall pattern and any striking deviations from the overall pattern with reference to the context in which the data were gathered.

**Common Core Mathematical Practice Standards:**

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Model with mathematics.

**Teacher note:** *Please preview the entire video and pre-work solutions in order to anticipate students’ needs, misconceptions and materials unique to your classroom.*

The student work page at the end of the lesson will give students a place to jot down ideas and work through answers as they are following along with the video.

**Rockline Industries- Biography:**

Rockline is one of the largest producers of consumer products, specializing in wet wipes and coffee filters.  Our passion is delivering customer solutions based on innovation, service, and best value.   We are a family owned company since 1976, and have grown from 35 people to an organization of over 2,500 Associates developing, making, and shipping our products around the world.   These products include disposable paper products like coffee filters, disposable wipes, and baking cups.

One thing that hasn’t changed throughout our history is our desire to be the best in the world.   Our values are best expressed in our desire to do business **RRITE**.  To us this means we must:

**Renew** - As a family owned business with no stock price or dividend pressures, we invest all earnings back into the business. This is both in process and in our people to drive growth and continuous improvement.  We recruit top talent in all areas, and provide the best technology available.

**Respect** - We foster a culture of respect in all of our relationships. This includes our Associates, customers, suppliers, the environment, and the communities in which we operate. Our Operating Principles support high performance and guide our decision making. We treat others as we want to be treated.

**Integrity**- Nothing is more important than Rockline’s reputation. We strive to “Do the right thing” - always.

**Teamwork** – Our Associates work together in cross functional teams to meet customer needs and expectations, as well as internal goals and objectives. Individual goals are secondary to team goals.

**Excellence** - Achieving best in the world status starts with our Associates. We strive to be “Best in class” in all we do.

Rockline’s most valued assets are our Associates and the knowledge and experience they possess. From our President and CEO, Randy Rudolph - ***“ At Rockline, we are about our people – good people. Quality  people.  People you can depend on who take pride in their work. These people are what we call the Rockline Advantage .”***

**Pre-Activity Discussion**

Question to ask students: How do we know if the coffee filters are doing their job correctly? What do you think would happen if the filter is too thin? What if the filter was too thick? How do companies test their products?

Discussion: Rockline Industries uses something called a Flow Rate Test to find out if the coffee filters are in the specifications that their customers need. The testing device is called a Manzo tester and was invented by a Rockline employee to help them determine how fast the water is flowing through the coffee filter. (This could be a great discussion that as an employee, your thoughts and ideas on improving manufacturing is often appreciated. Work smarter, not harder!)

If the coffee filters are too thin, the water will flow through too fast and the coffee will be watery and not much flavor. If the coffee filters are too thick the water will not be able to flow through on time and the coffee grounds will overflow into the coffee.

These tests are done daily at the company.

**Part 1**

* Play Video (0:00-0:53), pause at (0:53) to answer the discussion questions.
* The employees have done some Flow Rate tests and have a list of data. They are trying to determine if the water is flowing through the filters at the correct specifications for the customer. The students will need to find the average of the data.
* Have students work through this problem. Discuss methods and answers as necessary.
* Answers:

|  |  |  |
| --- | --- | --- |
| Lot 1 | 875 | ml/min |
| Lot 2 | 851 | ml/min |
| Lot 3 | 865.2 | ml/min |
| Lot 4 | 858 | ml/min |
| Lot 5 | 900.5 | ml/min |
| Lot 6 | 867.5 | ml/min |
| Lot 7 | 880.28 | ml/min |
| Lot 8 | 937.12 | ml/min |
| Lot 9 | 770.5 | ml/min |
| Lot 10 | 903.14 | ml/min |

Average = (875 + 851 + 865.2 + 858 + 900.5 + 867.5 + 880.28 + 937.12 + 770.5 + 903.14)

10 lots

Average = 8708.24 ÷ 10 = 870.824 milliliters per minute

**Part 2**

* Play Video (0:53 – 1:27), pause at (1:27) to answer the discussion questions.
* The employees think that the average of the data is falling between the specifications, but they need to make sure that it also fits within the range specifications. Students should calculate the range of the data.
* Have students work through this problem. Discuss methods and answers as necessary.
* Answers:

Range = maximum – minimum

Range = 937.12 – 770.5

Range = 166.62

**Part 3**

* Play Video (1:27 – 2:15), pause at (2:15) to answer the discussion questions.
* When the employees realize that the range is larger than the specified range, they take a closer look at all the data. Students should look at each individual piece of data to see if they can find out what piece of data is not fitting within the range.
* Answers:

Looking at the data, Lot 9 does not fit because it is too low at 770.5 milliliters per minute.

**Part 4**

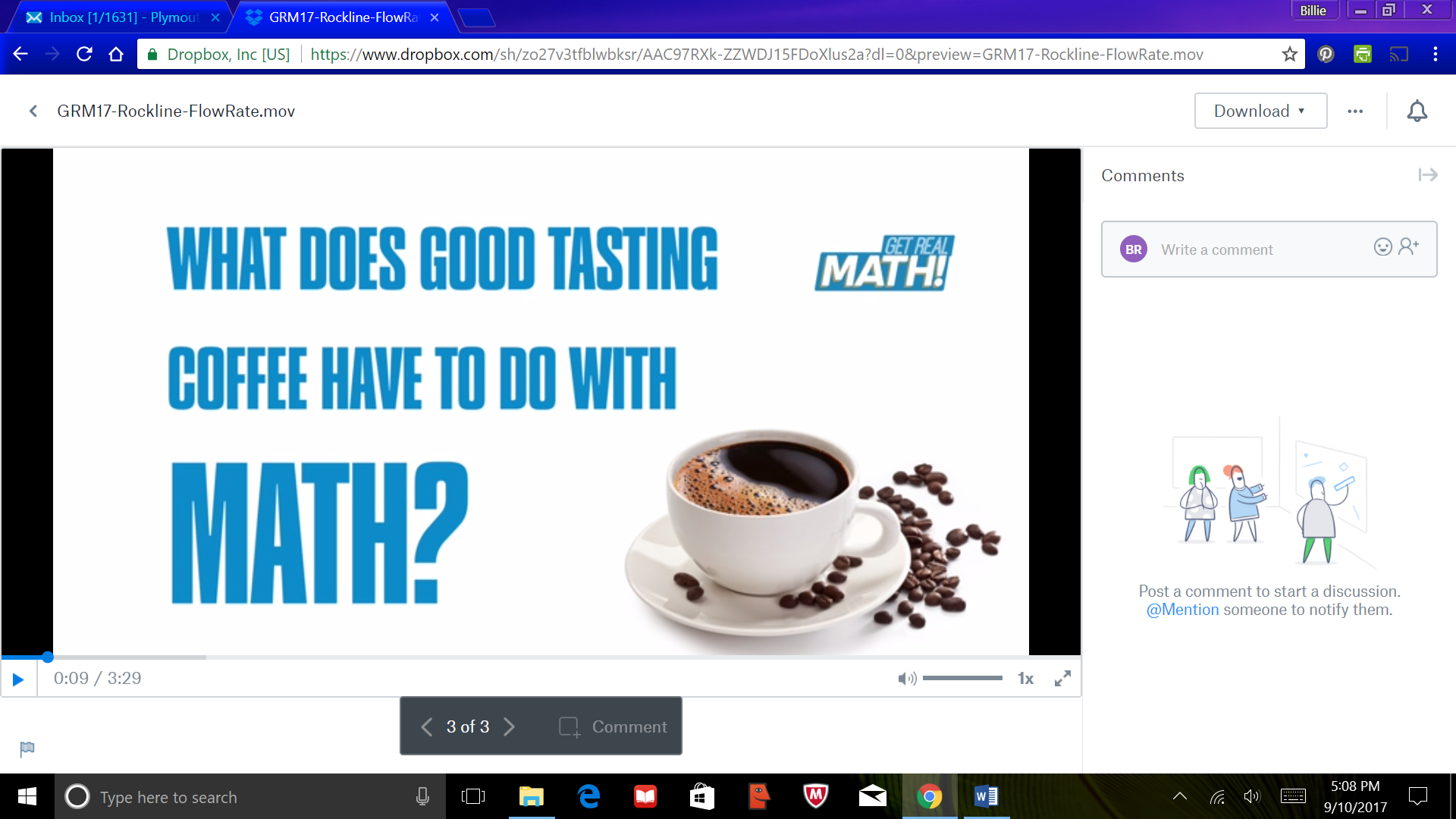
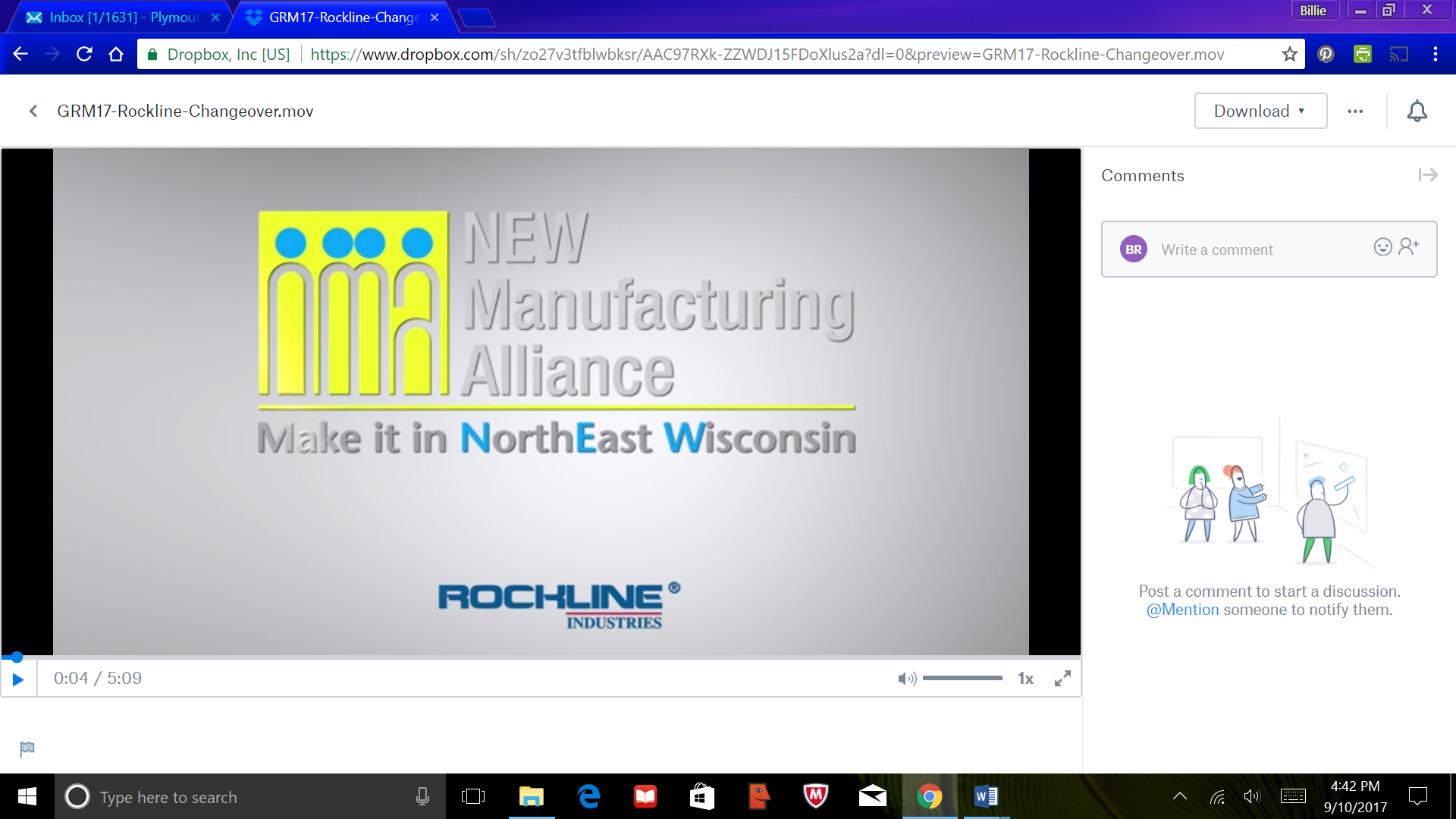
* Play Video (2:15 – 2:39), pause at (2:39) to answer the discussion questions.
* Sometimes it is easier to see exactly how far off a piece of data might be by graphing the data. Have the students graph the data to see if they can recognize which piece of data is out of specifications.
* Answers:

From the graph, the employees and students should be able to see that Lot 9 is very low compared to the rest of the samples. Why might this be?

**Part 5**

Play Video (2:39 – 3:26).

Student Work Page



Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Part 1**

Calculate the average of the Flow Rate data.

|  |  |  |
| --- | --- | --- |
| Lot 1 | 875 | ml/min |
| Lot 2 | 851 | ml/min |
| Lot 3 | 865.2 | ml/min |
| Lot 4 | 858 | ml/min |
| Lot 5 | 900.5 | ml/min |
| Lot 6 | 867.5 | ml/min |
| Lot 7 | 880.28 | ml/min |
| Lot 8 | 937.12 | ml/min |
| Lot 9 | 770.5 | ml/min |
| Lot 10 | 903.14 | ml/min |

**Part 2**

Calculate the range of the data.

**Part 3**

Which piece of data does not fit within the customer specifications of 940 milliliters per minute and 775 milliliters per minute?

**Part 4 – Graph the data.**