

Video: <https://youtu.be/9TWgHRyfTRo>

**Video Summary:**

How do can companies get their product from an existing conveyor to a different conveyor? What would they do if there were objects in the way that they wanted to be able to go over? How would this affect the length of chain needed for the conveyor? In this video, you will calculate the length of a conveyor ramp that needs to go up and over existing obstacles. You will need to use the Pythagorean Theorem to determine the length of chain and trigonometry to calculate the angle of the ramp.

**Nercon Eng. & Mfg., Inc. - Biography**

**Nercon Eng. & Mfg., Inc.**has been engineering and manufacturing conveyor and consumer goods packaging equipment for over 38 years.  We are known for our expertise in design.  Our growing business currently employs about 150 people.  With the Nercon Corporate and Engineering office located in Neenah, Wisconsin and the production facility in Oconto, Wisconsin, our local family-owned business has been an active part of both the Fox Valley and Oconto area communities.

**Common Core Mathematical Content Standards:**

**8.G.7:** Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions.

-For 8th grade, students could solve the angle measure by creating a diagram on graph paper and measuring the angle with a protractor.

**HS.G.STR.8:** Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems.

**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.

**Pre-Activity Discussion**

Question to ask students: How might companies change the height of a conveyor? How could this affect the length of the chain needed for the conveyor?

Discussion: The conveyors in this video are for industry and look much different than the conveyor belts in grocery stores. The conveyor belts are referred to as “chain”. The company can use links of the chain to create conveyors of many different lengths and shapes. Ramps, or inclines, are used to change the height of conveyors and can be used when a conveyor is already in place and needs to change to go over an existing obstacle.

**Part 1**

* Play Video (0:00-1:01), pause at (1:01) to answer the discussion questions.
* Students may want to use the diagram of the incline and label all the dimensions to calculate the length of the incline. Use the Pythagorean Theorem to solve.
* Have students work through this problem. Discuss methods and answers as necessary.
* Answers:

Pythagorean Theorem

*a*2 + *b*2 = *c*2

(height)2 + (length)2 = (incline)2

(91)2 + (440)2 = *c*2

8,281 + 193,600 = *c*2

201,881 = *c*2

449.31 = *c*

**Part 2**

* Play Video (1:02 – 2:58), pause at (2:58) to answer the discussion questions.
* The students need to use a trigonometry function to solve the angle measure. (For 8th grade teachers, you can have the students re-create the incline on a piece of graph paper (make sure it is to scale!) and then they can use a protractor to measure the angle of the incline.)
* Have students work through this problem. Discuss methods and answers as necessary.
* Answers:

Trigonometry for angle calculation

tan() =

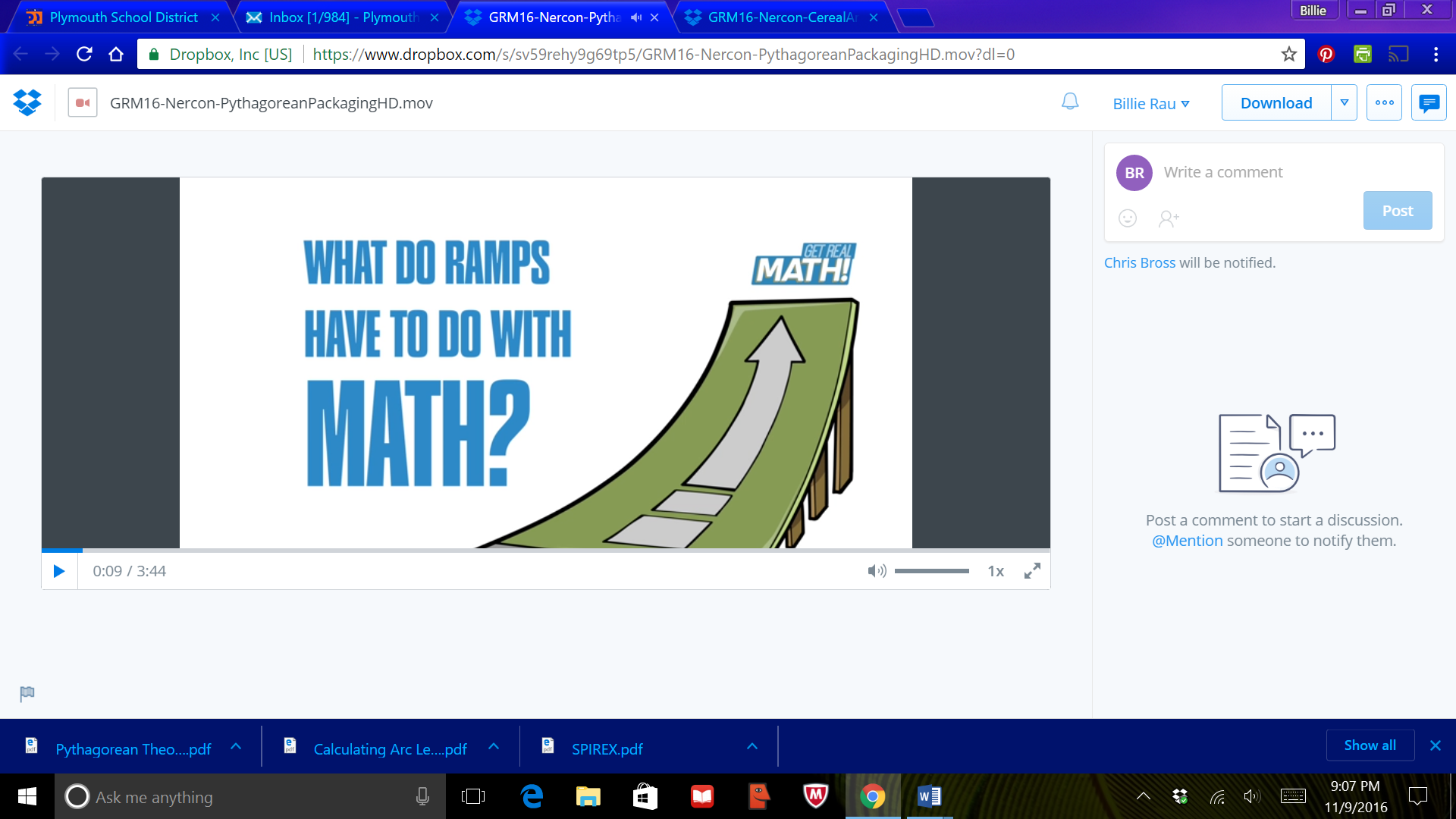
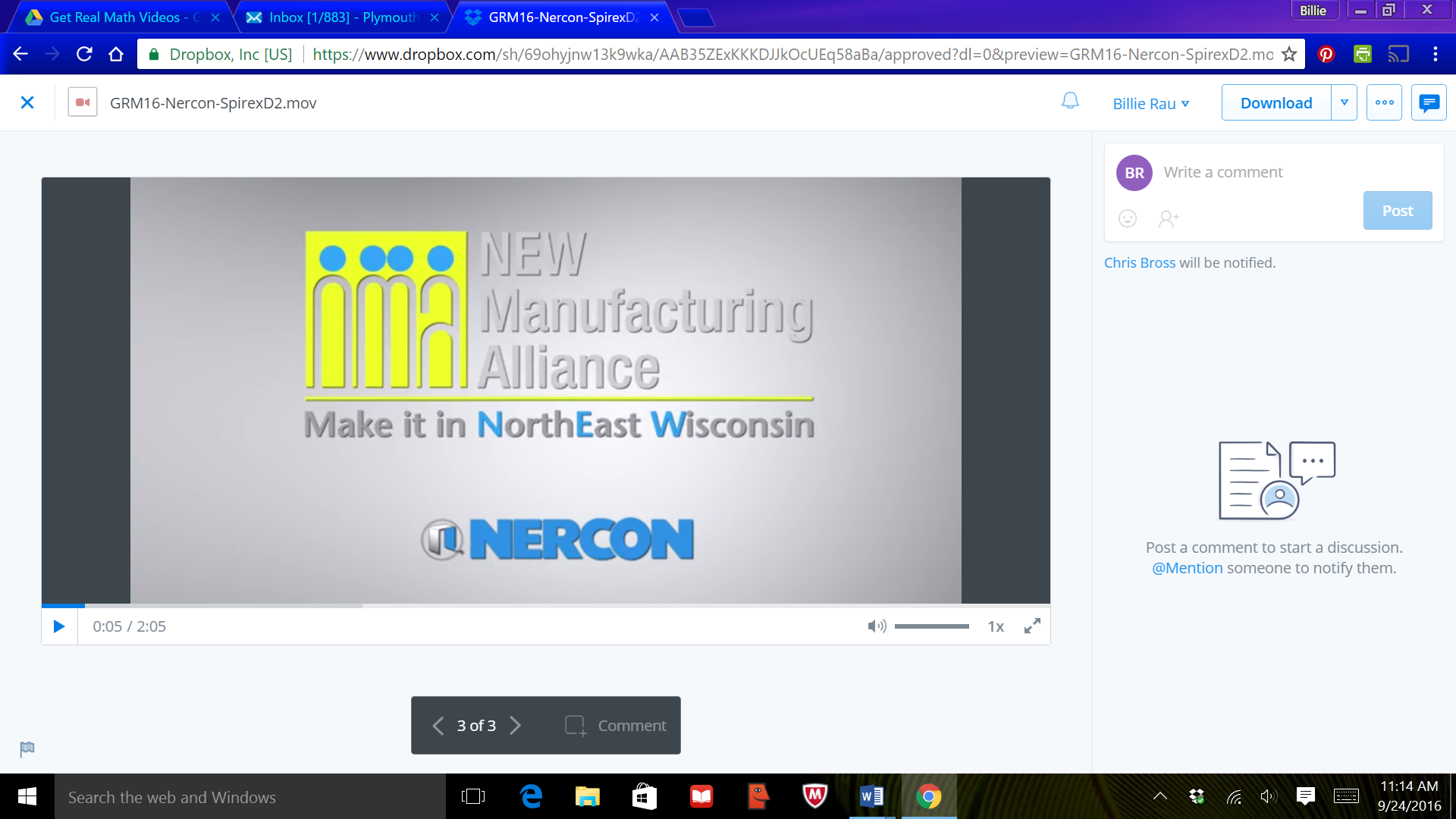
tan(

)

**Part 3**

* Play Video (2:59 – 3:44).
* Discuss the incline and whether or not it will be at a small enough angle to keep the product from tipping over.

Student Work Page



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

What is an incline? How can we find distances that need to go up an incline?

**Part 1**

Label the diagram with all the dimensions. Use the Pythagorean Theorem to find the length of the incline.



**Part 2**

Calculate the angle of the incline. Will the incline be small enough to keep the product upright?