**Math 20-2: U3L3 Teacher Notes**

**Proving and Applying the Cosine Law**

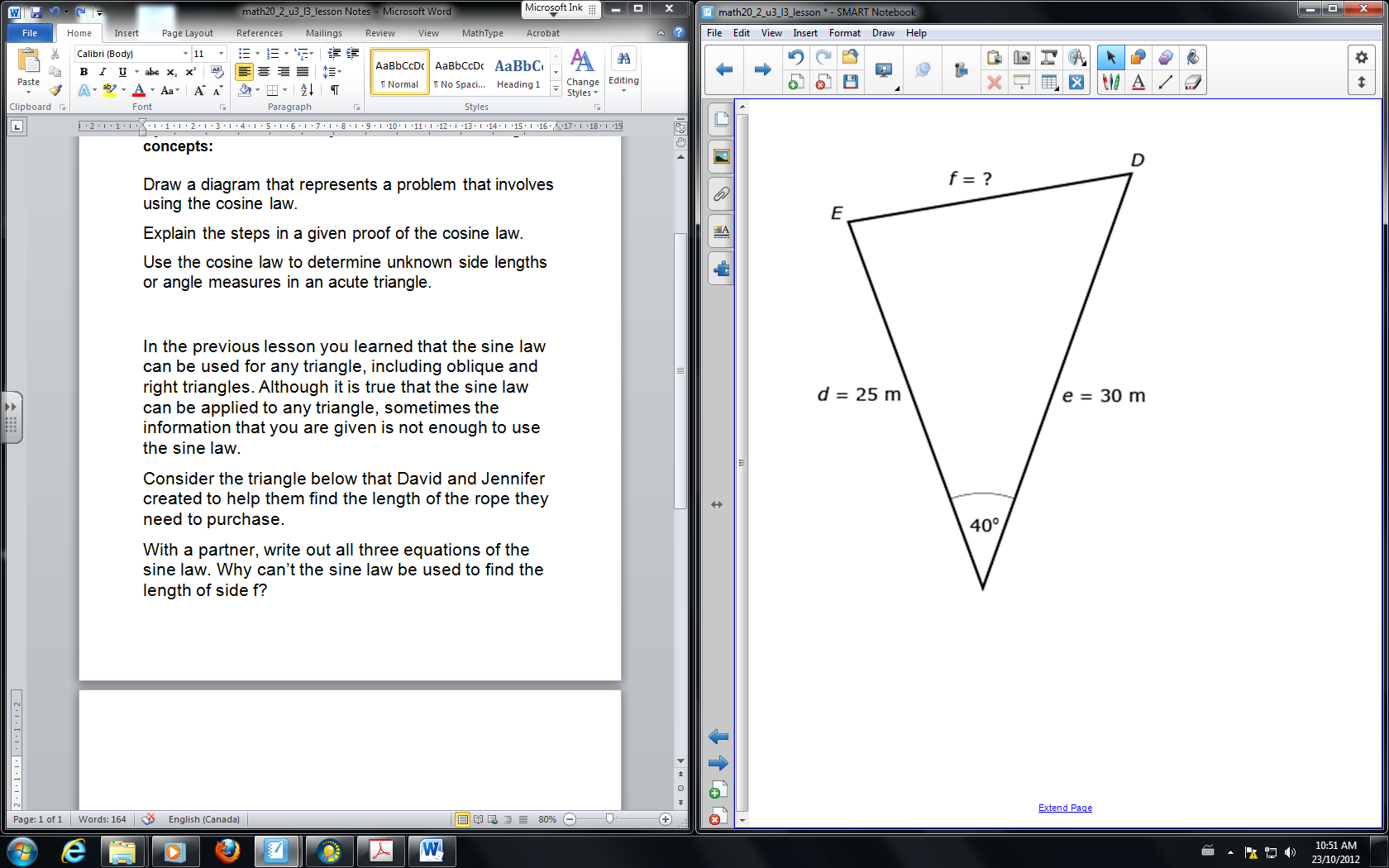
**Key Math Learnings:**

**By the end of this lesson, you will learn the following concepts:**

* Draw a diagram that represents a problem that involves using the cosine law.
* Explain the steps in a given proof of the cosine law.
* Use the cosine law to determine unknown side lengths or angle measures in an acute triangle.

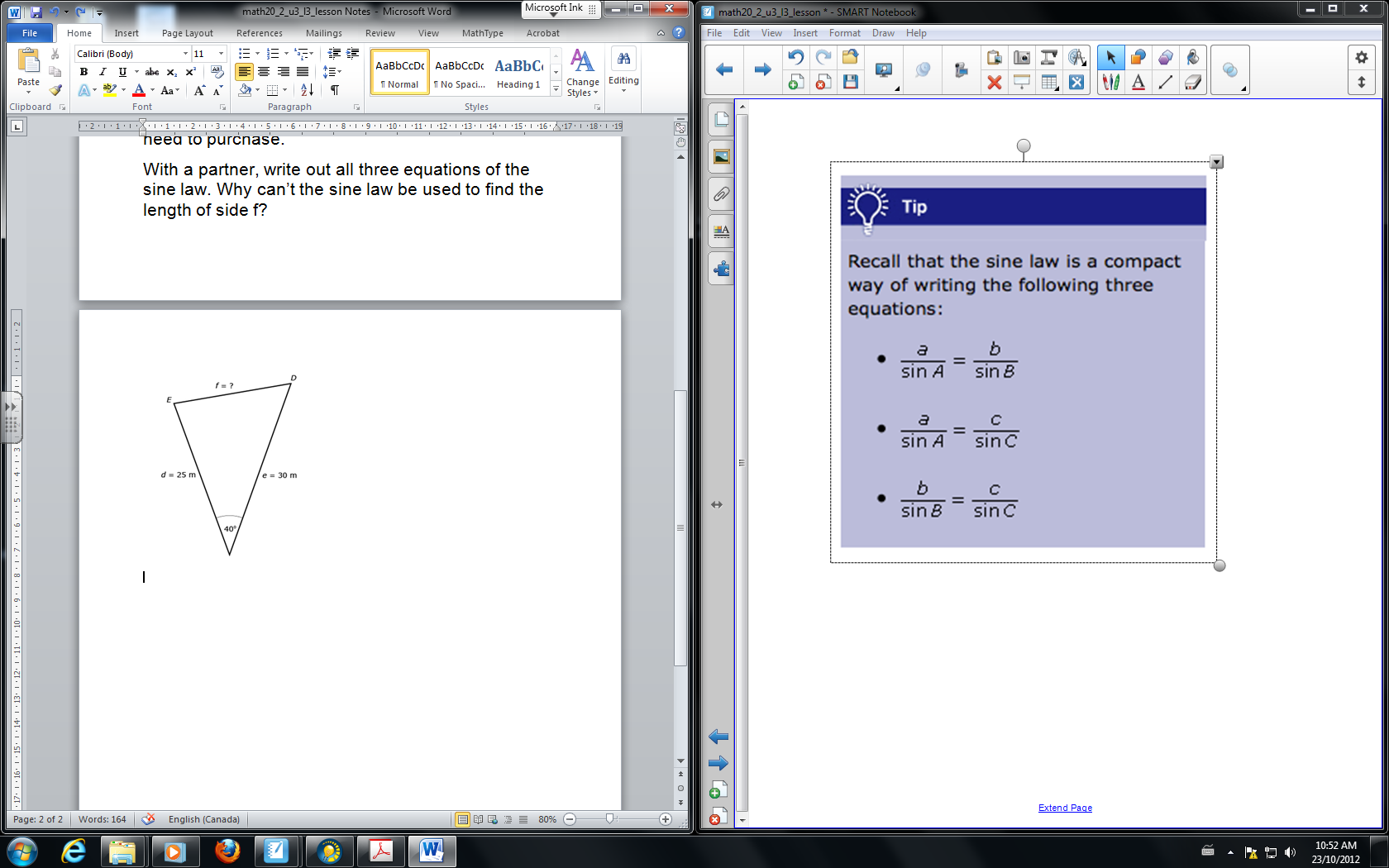
In the previous lesson you learned that the sine law can be used for \_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_, including oblique and right triangles.

Although it is true that the sine law can be applied to any triangle, sometimes the information that you are given is not enough to use the sine law.



Consider the triangle below that David and Jennifer created to help them find the length of the rope they need to purchase.

With a partner, write out all three equations of the sine law. Why can’t the sine law be used to find the length of side f?



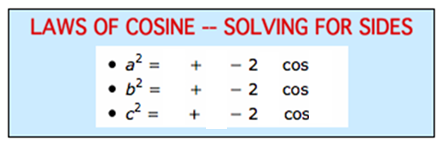
Watch the animation titled Jennifer and David’s Solution to see a method for solving the problem.

http://www.learnalberta.ca/content/t4tes/courses/senior/math20-2/mm/m1/m20\_2\_m1\_014/m20\_2\_m1\_014.html

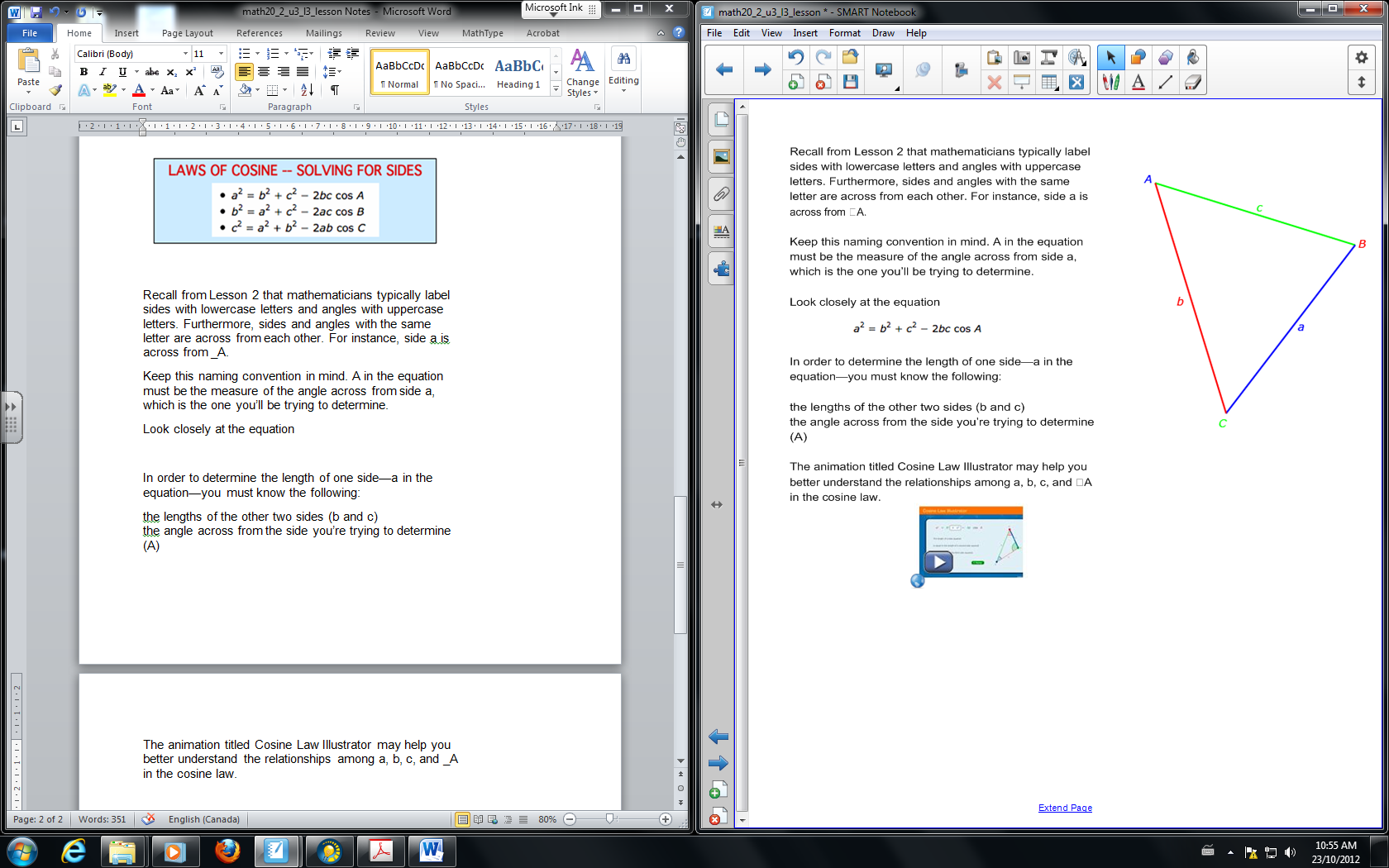
**Using the Cosine Law to Solve for Sides**

What Jennifer and David did in their solution was to derive an equation   
called the cosine law.

The cosine law is usually written in the following way:



Recall from Lesson 2 that mathematicians typically label \_\_\_\_\_\_\_\_\_\_\_\_ with **lowercase letters** and \_\_\_\_\_\_\_\_\_ with **uppercase letters**.



Furthermore, sides and angles with the same letter are across from each other. For instance, side a is across from angel A.

Keep this naming convention in mind. A in the equation must be the measure of the angle across from side a, which is the one you’ll be trying to determine.

Look closely at the equation. In order to determine the length of one side—a in the   
equation—you must know the following:

* the lengths of the other two sides (b and c)
* the angle across from the side you’re trying to determine   
  (A)

The animation titled Cosine Law Illustrator may help you better understand the relationships among a, b, c, and Angel A in the cosine law.

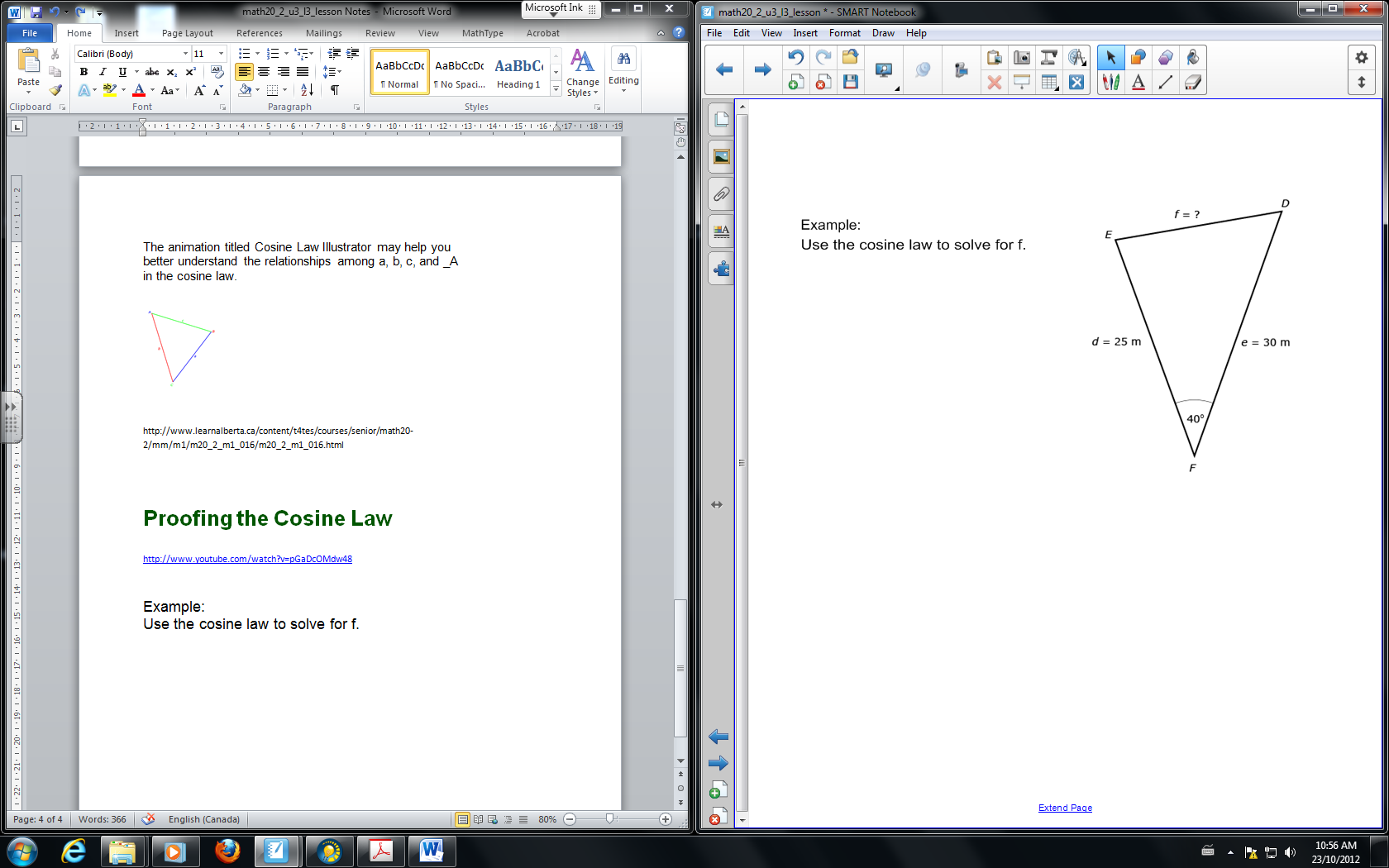
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**Proofing the Cosine Law**

<http://www.youtube.com/watch?v=pGaDcOMdw48>

**Example:**

Use the cosine law to solve for f.



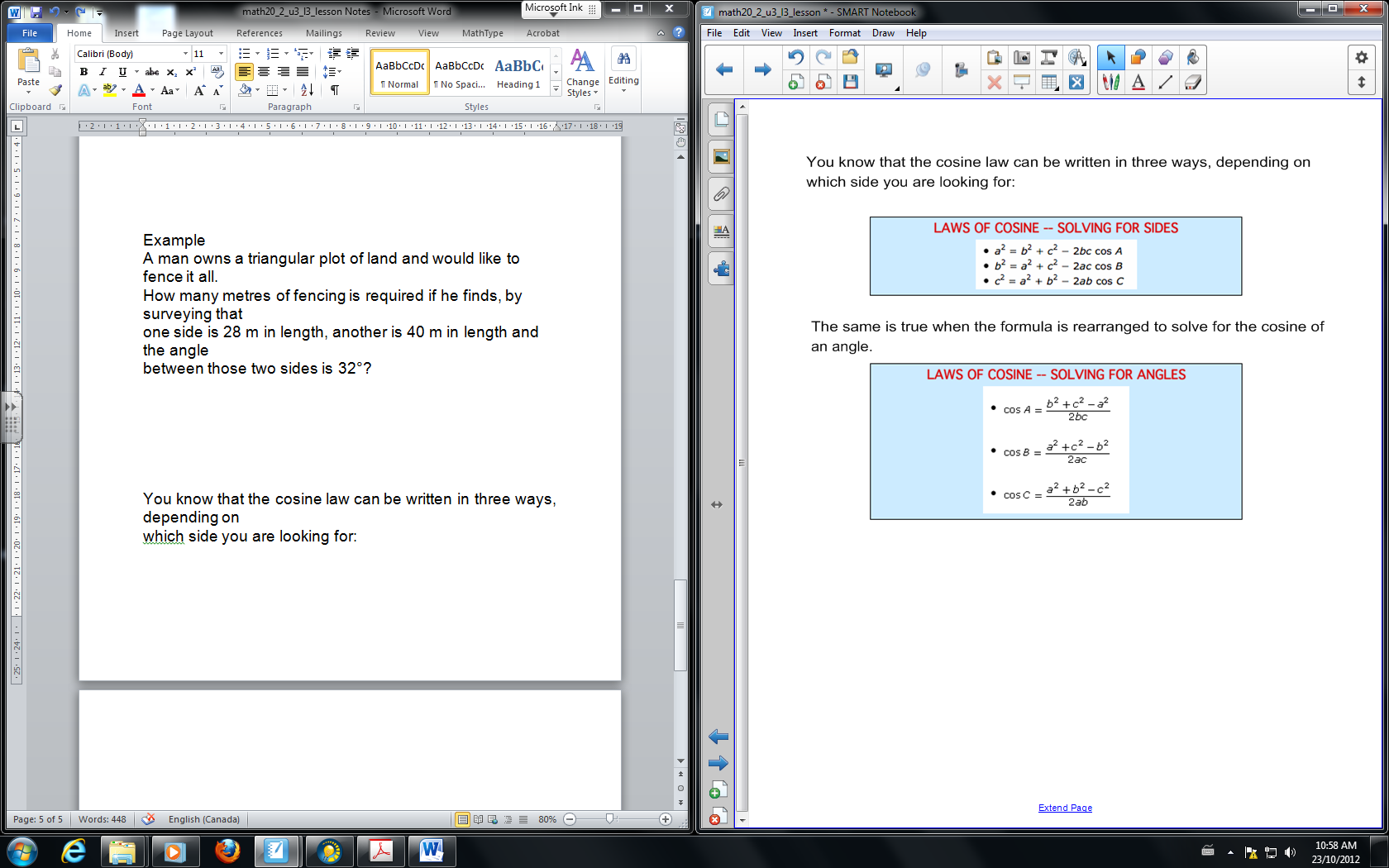
**Example:**

Complete “Practising” questions 2 on page 151 of your textbook.

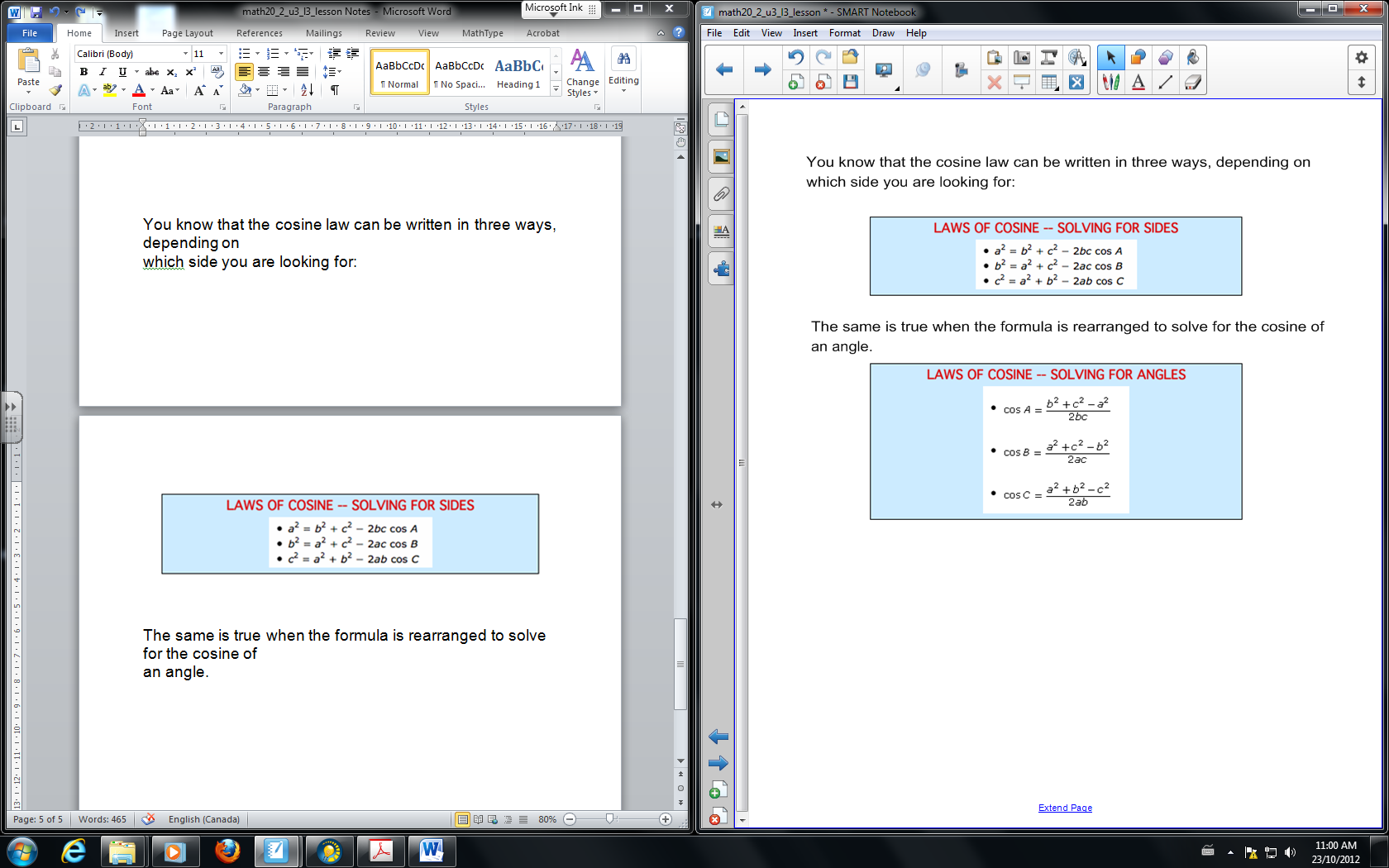
**Example**

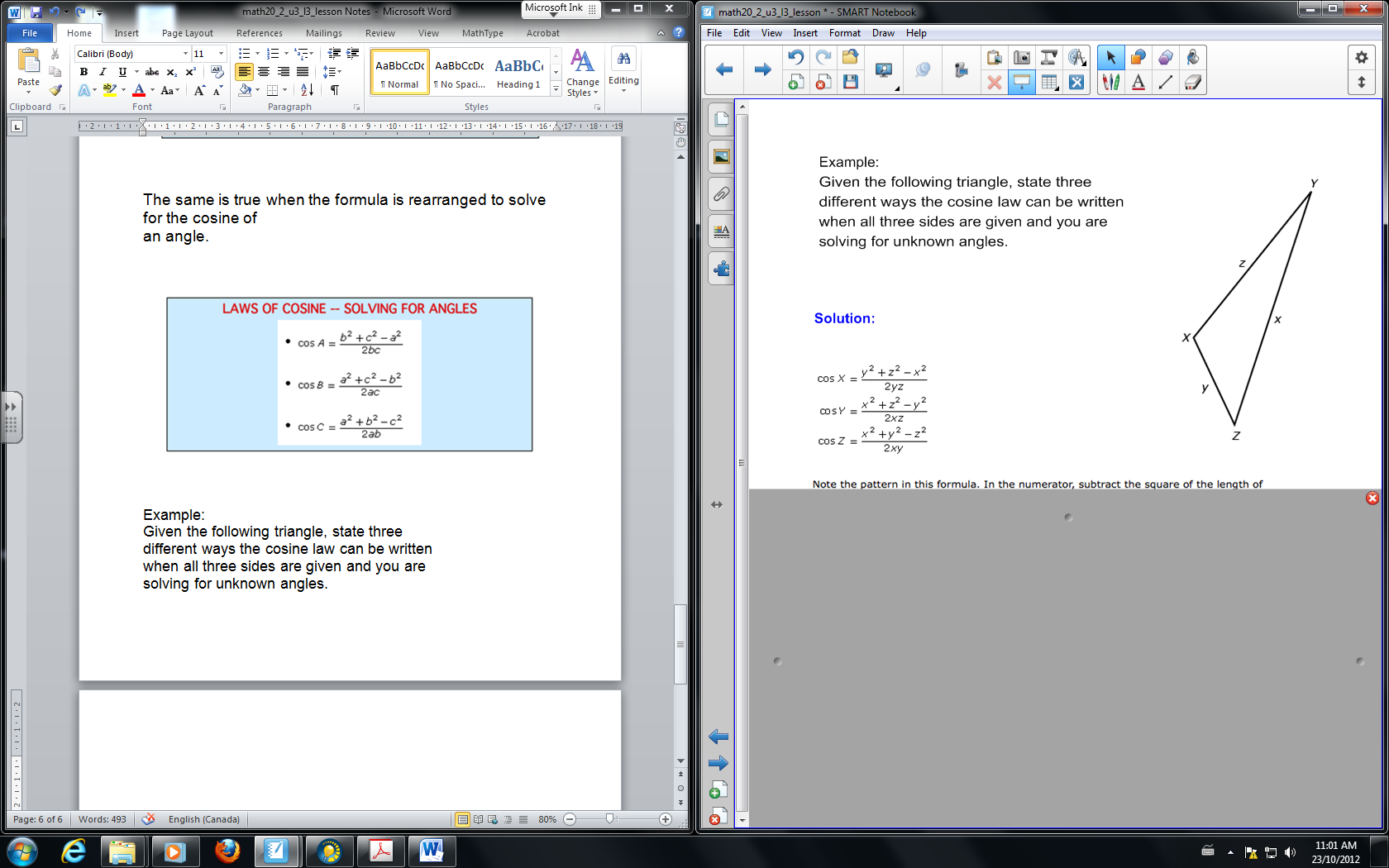
A man owns a triangular plot of land and would like to fence it all.   
How many metres of fencing is required if he finds, by surveying that   
one side is 28 m in length, another is 40 m in length and the angle   
between those two sides is 32°?

You know that the cosine law can be written in three ways, depending on   
which side you are looking for:



The same is true when the formula is rearranged to solve for the cosine of   
an angle.

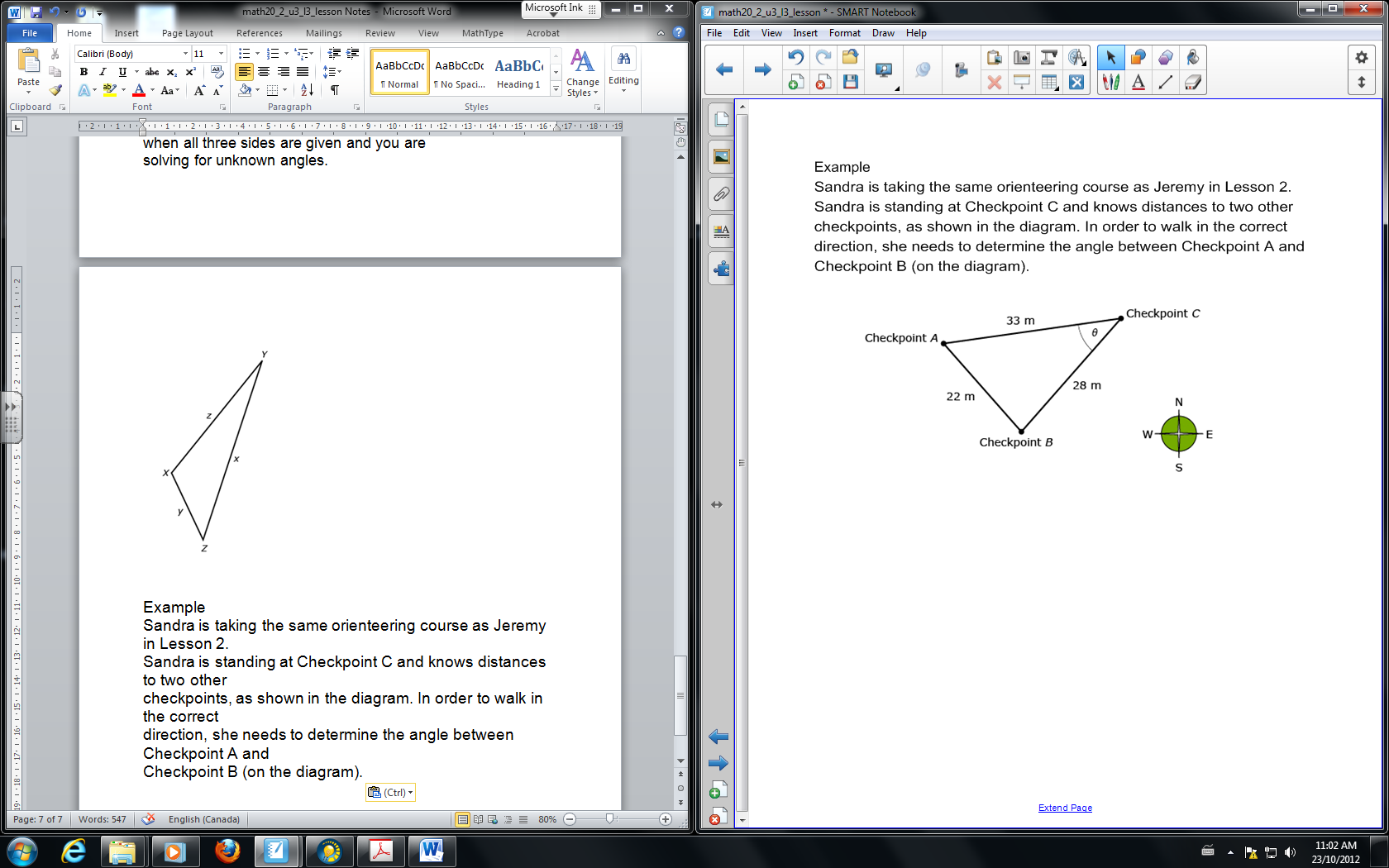


**Example:**

Given the following triangle, state three different ways the cosine law can be written when all three sides are given and you are solving for unknown angles.

Example

Sandra is taking the same orienteering course as Jeremy in Lesson 2.   
Sandra is standing at Checkpoint C and knows distances to two other   
checkpoints, as shown in the diagram. In order to walk in the correct   
direction, she needs to determine the angle between Checkpoint A and   
Checkpoint B (on the diagram).



Example:

Complete “Practising” questions 3 on pages 151 of your textbook.

Example

Find angle A in the triangle given

