Name: _____ Date: _____

Section 1.5 Literacy Connect

Before Reading

The list of fields below all make use of trigonometry in some way or another. This does not mean that every professional in these fields uses trigonometry every day.

acoustics, *architecture*, *astronomy*, *cartography*, *chemistry*, *civil engineering*, *computer graphics*, *cryptography*, *geophysics*, *economics*, *electrical engineering*, *electronics*, *land surveying*, *mechanical engineering*, *machining*, *medical imaging*, *meteorology*, *music theory*, *navigation*, *number theory*, *oceanography*, *optics*, *pharmacology*, *phonetics*, *probability theory*, *psychology*, *seismology*, *statistics*, *visual perception*

Think about digging a huge tunnel under a city. Suppose you had to put a team of companies together. Highlight all of the fields from which you think you would need professionals to help you build the tunnel.

During Reading

As you read the article below, Microwaved Popcorn, Trigonometry, and Niagara Falls, continue to highlight fields in the list that you think would be needed to complete the project.

After Reading

A group of grade 10 students are introduced to the basics of trigonometry. They ask, "Why do we need to learn this stuff?" Write a brief paragraph to persuade the students that trigonometry is important.

Microwaved Popcorn, Trigonometry, and Niagara Falls

The next time you eat microwaved popcorn, think of trigonometry. It goes something like this. Your microwave receives electricity from the Ontario electrical grid. This grid operates on alternating current (AC for short). Without trigonometry, we would not understand how alternating current behaves, and you would be crunching on hard kernels of popcorn.

Speaking of electricity, did you know that Ontario is boring a huge tunnel under Niagara Falls? There is a lot of water flowing over the falls. Instead of all of it flowing over the falls, water will be diverted into the tunnel to the Sir Adam Beck electricity generating station. The new Niagara Tunnel will allow another 500 cm^3 of water per second to be used to generate electrical energy. The Ontario government says this is good news for Ontario, since electrical power from water does not produce nuclear waste or greenhouse gas emissions.

Ontario uses uranium in nuclear power plants, and coal in coal-fired generating plants to generate up to 70% of its electricity. Unfortunately, using uranium and coal produces different kinds of wastes that harm the environment. Also, both nuclear and coal are finite sources of energy.

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An incredible piece of equipment called the Tunnel Boring Machine makes the Niagara Tunnel possible. It is boring a huge 14.4-m diameter tunnel under the City of Niagara. Trigonometry plays a crucial role in the software that drives the laser-guided computer-controlled Tunnel Boring Machine.

Digging started near Queenston. The path the tunnel takes seems simple but the mathematics needed to ensure the path is followed accurately is complex. Over the first 1.5 km, the Tunnel Boring Machine will reach its maximum depth of about 140 m below the City of Niagara. Then, it will continue along a fairly level path for another 7.4 km. Over the final 1.5 km of the tunnel, it will rise about 110 m, reaching the top of Niagara Falls about 300 m up river from the falls.