

Mathematics for College Technology, Grade 12 (MCT4C)

Course Description

Course Title: Mathematics for College Technology **Course Type:** College
Course Code: MCT4C **Credit Value:** 1.0
Grade: 12 **Prerequisite:** MCF3M or MCR3U

- **This course builds on** your knowledge from grade 11 University/College mathematics
- **It leads you** on a direct path to college apprenticeship programs, or to MHF4U & MHV4U
- **This can lead you to many careers such as:** Automotive Technician, Game Developer, Rehabilitation Therapist, Youth Advocate

Official Ontario Ministry of Education secondary curriculum available here:
<http://www.edu.gov.on.ca/eng/curriculum/secondary/math.html>

This course focuses on four main strands:

Exponential Functions

Polynomial Functions

Trigonometric Functions

Applications of Geometry

Mathematics for College Technology, Grade 12 (MCT4C)

Course Description

Exponential Functions:

Students will solve problems involving exponential equations by analyzing both their algebraic and graphical representations. They will investigate the use of these types of functions to describe phenomenon that occur in the natural world, such as the intensity of sound and the pH of chemicals, or to calculate the growth of an investment.

Problem: \$5 000.00 is invested in a savings account with a 3% interest rate compounded annually. How many years until you have \$6 000.00 in the investment?

Solution:

This problem can be solved algebraically or graphically

$$\begin{aligned} 6000 &= 5000(1.03)^t && \boxed{t = \text{time in years}} \\ \frac{6000}{5000} &= \frac{5000(1.03)^t}{5000} \\ \frac{6}{5} &= 1.03^t \\ \log_{10} \frac{6}{5} &= \log_{10} 1.03^t \\ \log_{10} \frac{6}{5} &= t \log_{10} 1.03 && \rightarrow \begin{aligned} \frac{\log_{10} \frac{6}{5}}{\log_{10} 1.03} &= t \\ 6.2 &= t \end{aligned} \\ &&& \text{It will take 6.2 years for} \\ &&& \text{the initial investment of} \\ &&& \$5\,000.00 \text{ to grow to} \\ &&& \$6\,000.00. \end{aligned}$$

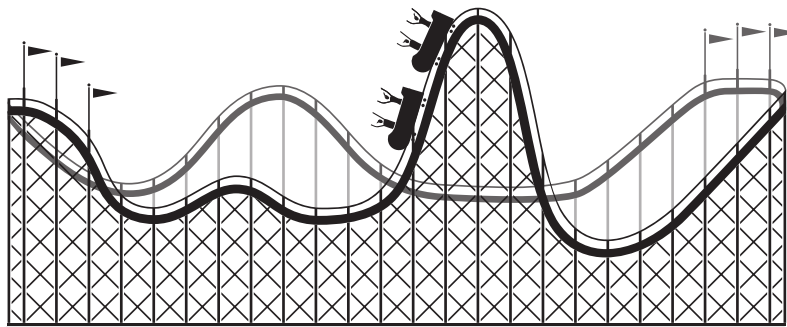
Mathematics for College Technology, Grade 12 (MCT4C)

Course Description

Polynomial functions:

Students will investigate the use of polynomial functions in real world scenarios, such as determining the pressure at certain depths of water by analyzing the algebraic and graphical representations of polynomial functions, or examining the movement of a car on a roller coaster.

$$Ax^4 + Bx^3 + Cx^2 + Dx + E$$



If the height above ground for a roller coaster is modelled by

$$h = 4t^4 + 3t^3 - t^2 + 5t - 1$$

What is the height(cm) of the roller coaster at $t = 5$ sec

$$\begin{aligned} h &= 4(5)^4 + 3(5)^3 - (5)^2 + 5(5) - 1 \\ &= 2847 \text{ cm} \\ &= 28.47 \text{ m} \end{aligned}$$

Mathematics for College Technology, Grade 12 (MCT4C)

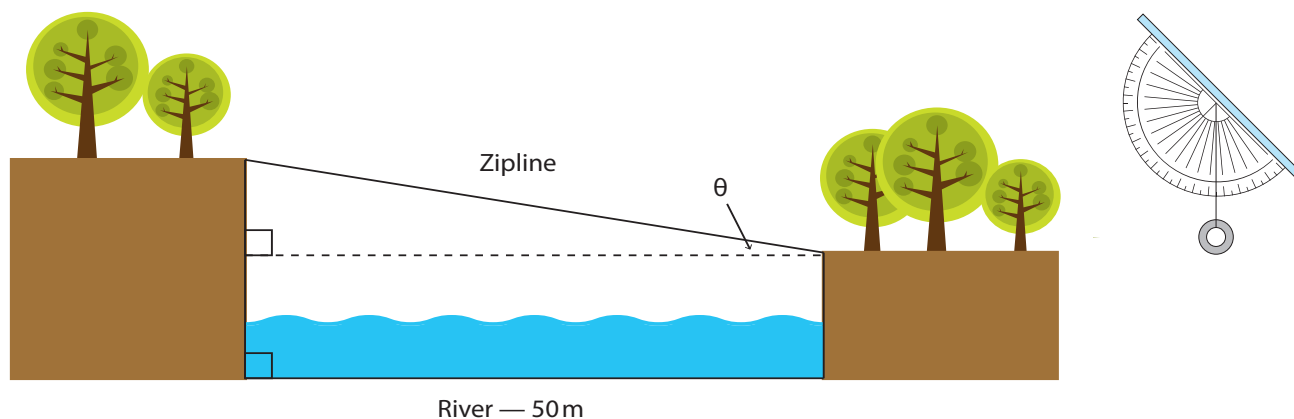
Course Description

Trigonometric functions:

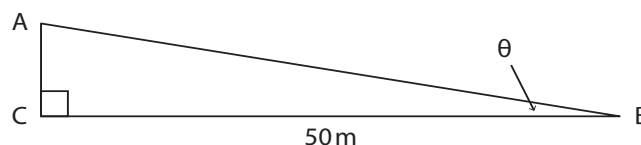
Students will use their knowledge of trigonometric ratios to solve real-world scenarios, such as calculating the height of an inaccessible object through the use of a measuring tape and a clinometer (shown below). They will also investigate the algebraic and graphical representations of periodic and trigonometric functions, and apply their knowledge to problems such as calculating the rotational speed of a spinning circular object.

Problem: Zippy adventures is installing a new zipline across a 50 m river as illustrated by the diagram below. Describe how you could determine the length of wire needed to construct the zipline if you had no materials other than your clinometer. You can take a path to get to the other side of the river to take any measurements necessary.

Solution:



I would use the clinometer to determine angle θ , then would use one of the primary trigonometric ratios to determine the length of AB.



$$\cos \theta = \frac{BC}{AB}$$

$$\cos \theta = \frac{50\text{m}}{AB}$$

$$AB \cos \theta = 50\text{m}$$

$$AB = \frac{50\text{m}}{\cos \theta}$$

For example, if we measured θ to be 30° then we could calculate side AB.

$$AB = \frac{50\text{m}}{\cos 30}$$

$$AB = \frac{50\text{m}}{0.866}$$

$$AB = 57.74\text{m}$$

Trigonometric Table

Angle in degrees	Angle in Radians	Sine	Cosine	Tangent
30°	0.524	0.500	0.866	0.577
31°	0.541	0.515	0.857	0.600
32°	0.559	0.530	0.848	0.625
33°	0.576	0.545	0.839	0.649
34°	0.593	0.559	0.829	0.675

Mathematics for College Technology, Grade 12 (MCT4C)

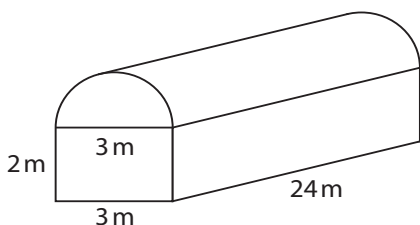
Course Description

Applications of Geometry:

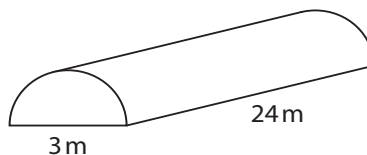
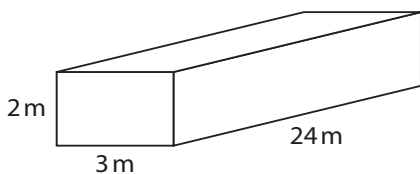
Students will investigate 2D and 3D figures, such as the construction of a medicine wheel and vectors in 2D, to solve problems like this: Calculate the total displacement of a boat travelling 100 m north and then 300 m west. Students will also develop strategies for solving real world problems that involve vectors, two and three dimensional shapes and circle properties. They will also solve applied problems, such as:

You are working for the CANARAIL company as a HVAC (Heating, Ventilation, and Air Conditioning) consultant. The standard CANARAIL passenger trains have dimensions as those in the following diagram. There are three sizes of heating systems that can be purchased for commercial use on passenger trains. Which of the following three heating systems should they purchase?

Solution:



Size	Capacity
S	100 m ³
M	200 m ³
L	300 m ³
XL	400 m ³



$$v = h \times b \times w$$

$$v = 2\text{m} \times 3\text{m} \times 24\text{m}$$

$$v = 144\text{m}^3$$

$$v \text{ cylinder}$$

$$v = \pi r^2 h$$

$$v = 3.1415 \cdot (1.5)^2 \cdot 24$$

$$v = 169.6\text{m}^3$$

$$\frac{1}{2}v = \frac{1}{2}169.6\text{m}^3$$

$$\frac{1}{2}v = 84.8\text{m}^3$$

$$\begin{aligned} \text{Total volume} &= 144\text{m}^3 + 84.8\text{m}^3 \\ &= 228.82\text{m}^3 \end{aligned}$$

You should purchase the large heating system because the total volume is 228.32 m³, so the medium (200 m³) is too small, but the large (300 m³) is sufficient.