

### Specific Expectations Addressed in the Chapter

The following expectations are common to both the Functions and Relations course and the Functions course.

- TF1.01 determine the sine, cosine, and tangent of angles greater than  $90^\circ$ , using a suitable technique (e.g., related angles, the unit circle), and determine two angles that correspond to a given single trigonometric function value
- TF2.01 define the term radian measure
- TF2.02 describe the relationship between radian measure and degree measure
- TF2.03 represent, in applications, radian measure in exact form as an expression involving  $\pi$  (e.g.,  $\frac{\pi}{3}$ ,  $2\pi$ ) and in approximate form as a real number (e.g., 1.05)
- TF2.06 solve linear trigonometric equations on the interval  $0 \leq x \leq 2\pi$
- TF2.07 demonstrate facility in the use of radian measure in solving equations and in graphing
- TF3.01 sketch the graphs of  $y = \sin x$  and  $y = \cos x$ , and describe their periodic properties
- TF3.02 determine, through investigation, using graphing calculators or graphing software, the effect of simple transformations (e.g., translations, reflections, stretches) on the graphs and equations of  $y = \sin x$  and  $y = \cos x$
- TF3.03 determine the amplitude, period, phase shift, domain, and range of sinusoidal functions whose equations are given in the form  $y = a \sin(kx + d) + c$  or  $y = a \cos(kx + d) + c$
- TF3.04 sketch the graphs of simple sinusoidal functions [e.g.,  $y = a \sin x$ ,  $y = \cos kx$ ,  $y = \sin(x + d)$ ,  $y = a \cos kx + c$ ]
- TF3.05 write the equation of a sinusoidal function, given its graph and given its properties
- TF3.06 sketch the graph of  $y = \tan x$ ; identify the period, domain, and range of the function; and explain the occurrence of asymptotes
- TF4.01 determine, through investigation, the periodic properties of various models (e.g., the table of values, the graph, the equation) of sinusoidal functions drawn from a variety of applications
- TF4.02 explain the relationship between the properties of a sinusoidal function and the parameters of its equation, within the context of an application, and over a restricted domain
- TF4.03 predict the effects on the mathematical model of an application involving sinusoidal functions when the conditions in the application are varied
- TF4.04 pose and solve problems related to models of sinusoidal functions drawn from a variety of applications, and communicate the solutions with clarity and justification, using appropriate mathematical forms

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## What “big ideas” should students develop in this chapter?

Students who have successfully completed the work of this chapter and who understand the essential concepts and procedures will know the following:

- Many real-life phenomena are cyclical. Each phenomenon repeats itself in exactly the same way, over and over again in a predictable manner.
- Some periodic phenomena are trigonometric and the shape of their graphs may be sinusoidal.
- A trigonometric relation can be a function of an angle of rotation, which is measured in degrees or in radians.
- A trigonometric relation can also be a function of distance or time whose units are real numbers.
- A trigonometric function can be transformed in the same way as a quadratic function, through vertical or horizontal stretches and compressions, horizontal or vertical translations, and reflections in the horizontal axis.
- Trigonometric or periodic data can be modelled algebraically for describing and solving problems.
- Use a graphing calculator to draw scatter plots, develop sinusoidal models, and solve problems.

## What do students already know about the work of the chapter?

In the grade 10 course (academic), students have

- developed the primary trigonometric ratios, using the properties of similar triangles
- determined the measures of the sides and angles in right triangles, using the primary trigonometric ratios
- used the inverse key on a calculator to determine the measure of an angle
- applied transformations to the parabola  $y = x^2$
- drawn graphs from tables
- used a graphing calculator to make scatter plots and used linear regression and quadratic regression to draw the curve of best fit and determine an equation that models the data
- used a graphing calculator to graph a linear equation and a quadratic equation
- determined maximum and minimum values and the zeros of quadratic relations
- solved linear equations both algebraically and graphically