Chapter 2

Sinusoidal Functions

Curriculum Expectations

Trigonometric Functions

Connecting Graphs and Equations of Sinusoidal Functions

C2.1 make connections between the sine ratio and the sine function and between the cosine ratio and the cosine function by graphing the relationship between angles from 0° to 360° and the corresponding sine ratios or cosine ratios, with or without technology (e.g., by generating a table of values using a calculator; by unwrapping the unit circle), defining this relationship as the function $f(x) = \sin x$ or $f(x) = \cos x$, and explaining why the relationship is a function

C2.2 sketch the graphs of $f(x) = \sin x$ and $f(x) = \cos x$ for angle measures expressed in degrees, and determine and describe their key properties (i.e., cycle, domain, range, intercepts, amplitude, period, maximum and minimum values, increasing/decreasing intervals)

Sample problem: Describe and compare the key properties of the graphs of $f(x) = \sin x$ and $f(x) = \cos x$. Make some connections between the key properties of the graphs and your understanding of the sine and cosine ratios.

C2.3 determine, through investigation using technology, the roles of the parameters d and c in functions of the form $y = \sin (x - d) + c$ and $y = \cos (x - d) + c$, and describe these roles in terms of transformations on the graphs of $f(x) = \sin x$ and $f(x) = \cos x$ with angles expressed in degrees (i.e., vertical and horizontal translations)

Sample problem: Investigate the graph $f(x) = 2 \sin (x - d) + 10$ for various values of d, using technology, and describe the effects of changing d in terms of a transformation.

C2.4 determine, through investigation using technology, the roles of the parameters a and k in functions of the form $y = a \sin kx$ and $y = a \cos kx$, and describe these roles in terms of transformations on the graphs of $f(x) = \sin x$ and $f(x) = \cos x$ with angles expressed in degrees (i.e., reflections in the axes; vertical and horizontal stretches and compressions to and from the x- and y-axes)

Sample problem: Investigate the graph $f(x) = 2 \sin kx$ for various values of k, using technology, and describe the effects of changing k in terms of transformations.

C2.5 determine the amplitude, period, and phase shift of sinusoidal functions whose equations are given in the form $f(x) = a \sin (k(x - d)) + c$ or $f(x) = a \cos (k(x - d)) + c$, and sketch graphs of $y = a \sin (k(x - d)) + c$ and $y = a \cos (k(x - d)) + c$ by applying transformations to the graphs of $f(x) = \sin x$ and $f(x) = \cos x$

Sample problem: Transform the graph of $f(x) = \cos x$ to sketch $g(x) = 3 \cos (x + 90°)$ and $h(x) = \cos (2x) - 1$, and state the amplitude, period, and phase shift of each function.

C2.6 represent a sinusoidal function with an equation, given its graph or its properties

Sample problem: A sinusoidal function has an amplitude of 2 units, a period of 180°, and a maximum at (0, 3). Represent the function with an equation in two different ways, using first the sine function and then the cosine function.

Chapter 2 Planning Chart

Section	Study Guide and Exercise Book Pages	Teacher's Resource Blackline Masters	Assessment	Tools
2.1 Graphs of Sinusoidal Functions	23–26	• G–5 Trigonometric Graph Paper • G–6 Graphs of the Sine and Cosine Functions • T–4 The TI-Nspire™ CAS Calculator • BLM 2–1 Chapter 2 Prerequisite Skills • T2–1 How to Draw the Sine Curve From the Unit Circle Using TI-83 Plus/TI-84 Plus • T2–2 How to Draw the Cosine Curve From the Unit Circle Using TI-Nspire™ CAS • T2–3 How to Do Section 2.1 #8 Using TI-83 Plus/TI-84 Plus and TI-Nspire™ CAS	• BLM 2–2 Chapter 2 Self-Assessment Checklist • A–6 Representing	• grid paper • graphing calculator
2.2 Translations of Sinusoidal Functions	27–29	• G–5 Trigonometric Graph Paper • T–4 The TI-Nspire™ CAS Calculator • T2–4 How to Do Section 2.2 #11 and 12 Using TI-83 Plus/TI-84 Plus and TI-Nspire™ CAS		• grid paper • graphing calculator • coloured pens, pencils, or markers
2.3 Stretches, Compressions, and Reflections of Sinusoidal Functions	30–32	• G–5 Trigonometric Graph Paper • T–4 The TI-Nspire™ CAS Calculator • T2–5 How to Do Section 2.3 #11 and 12 Using TI-Nspire™ CAS		• grid paper • graphing calculator
2.4 Combining Transformations of Sinusoidal Functions	33–35	• G–5 Trigonometric Graph Paper • T–4 The TI-Nspire™ CAS Calculator	• A–6 Representing	• grid paper • graphing calculator • coloured pens, pencils, or markers
2.5 Representing Sinusoidal Functions	36–38	• G–5 Trigonometric Graph Paper • T–4 The TI-Nspire™ CAS Calculator		• grid paper • graphing calculator
2.6 Solving Problems Involving Sinusoidal Functions	39–42	• G–5 Trigonometric Graph Paper • T–4 The TI-Nspire™ CAS Calculator • BLM 2–3 Chapter 2 Review • BLM 2–4 Chapter 2 Practice Test • BLM 2–5 Chapter 2 Case Study		• grid paper • graphing calculator

Chapter 2 Blackline Masters Checklist

	BLM	Title	Purpose
2.1 Graphs of Sinusoidal Functions			
	G–5	Trigonometric Graph Paper	Student Support
	G–6	Graphs of the Sine and Cosine Functions	Student Support
	T–4	The TI-Nspire™ CAS Calculator	Technology
	BLM 2–1	Chapter 2 Prerequisite Skills	Practice
	BLM 2–2	Chapter 2 Self-Assessment Checklist	Assessment
	T2–1	How to Draw the Sine Curve From the Unit Circle Using TI-83 Plus/TI-84 Plus	Technology
	T2–2	How to Draw the Cosine Curve From the Unit Circle Using TI-Nspire™ CAS	Technology
	T2–3	How to Do Section 2.1 #8 Using TI-83 Plus/TI-84 Plus and TI-Nspire™ CAS	Technology
	A–6	Representing	Assessment
2.2 Translations of Sinusoidal Functions			
	G–5	Trigonometric Graph Paper	Student Support
	T–4	The TI-Nspire™ CAS Calculator	Technology
	T2–4	How to Do Section 2.2 #11 and 12 Using TI-83 Plus/TI-84 Plus and TI-Nspire™ CAS	Technology
2.3 Stretches, Compressions, and Reflections of Sinusoidal Functions			
	G–5	Trigonometric Graph Paper	Student Support
	T–4	The TI-Nspire™ CAS Calculator	Technology
	T2–5	How to Do Section 2.3 #11 and 12 Using TI-Nspire™ CAS	Technology
2.4 Combining Transformations of Sinusoidal Functions			
	G–5	Trigonometric Graph Paper	Student Support
	T–4	The TI-Nspire™ CAS Calculator	Technology
	A–6	Representing	Assessment
2.5 Representing Sinusoidal Functions			
	G–5	Trigonometric Graph Paper	Student Support
	T–4	The TI-Nspire™ CAS Calculator	Technology
2.6 Solving Problems Involving Sinusoidal Functions			
	G–5	Trigonometric Graph Paper	Student Support
	T–4	The TI-Nspire™ CAS Calculator	Technology
	BLM 2–3	Chapter 2 Review	Practice
	BLM 2–4	Chapter 2 Practice Test	Practice
	BLM 2–5	Chapter 2 Case Study	Practice
	BLM 2–6	Chapter 2 BLM Answers	Answers