
Performance Tasks for Part 3: Trigonometric Functions

“Big Ideas” Addressed by the Tasks

The *Performance Tasks* in this section provide opportunities for students to

- demonstrate the relationships between the graphs and the equations of sinusoidal functions
- use radian measure in applications of trigonometric functions
- solve problems involving models of sinusoidal functions in various applications
- solve problems in two dimensions and three dimensions involving the measures of sides and angles in oblique, right, and acute triangles
- communicate mathematical reasoning clearly
- use graphing technology effectively
- solve multi-step problems

Curriculum Expectations

The *Performance Tasks* address the following:

- all of the Curriculum Expectations from the Trigonometric Functions strand of the Functions and Relations (university) course and the Functions (university/college) course
- the Curriculum Expectations from Tools for Operating and Communicating with Functions strand of the Functions and Relations (university) course and the Functions (university/college) course

Use of Technology

Students should have access to technology as they work with these tasks to explore sinusoidal functions. *The Geometer’s Sketchpad* helps students explore solving triangles. The appropriate technology is discussed in each *Performance Task*.

Trigonometric Functions

Overall Expectations Addressed by the Performance Tasks

- TFV.01 solve problems involving the sine law and the cosine law in oblique triangles
- TFV.02 demonstrate an understanding of the meaning and application of radian measure
- TFV.03 determine, through investigation, the relationships between the graphs and the equations of sinusoidal functions
- TFV.04 solve problems involving models of sinusoidal functions drawn from various applications

Specific Expectations

Solving Problems Involving the Sine Law and the Cosine Law in Oblique Triangles

- TF1.01 determine the sine, cosine, and tangent of angles greater than 90° , using a suitable technique (e.g., related angles, the unit circle), and determine two angles that correspond to a given single trigonometric function value
- TF1.02 solve problems in two dimensions and three dimensions involving right triangles and oblique triangles, using the primary trigonometric ratios, the cosine law, and the sine law (including the ambiguous case)

Understanding the Meaning and Application of Radian Measure

- TF2.03 represent, in applications, radian measure in exact form as an expression involving π (e.g., $\frac{\pi}{3}$, 2π) and in approximate form as a real number (e.g., 1.05)
- TF2.04 determine the exact values of the sine, cosine, and tangent of the special angles 0, $\frac{\pi}{6}$, $\frac{\pi}{4}$, $\frac{\pi}{3}$, $\frac{\pi}{2}$ and their multiples less than or equal to 2π
- TF2.05 prove simple identities, using the Pythagorean identity, $\sin^2 x + \cos^2 x = 1$, and the quotient relation, $\tan x = \frac{\sin x}{\cos x}$
- TF2.06 solve linear and quadratic trigonometric equations (e.g., $6 \cos^2 x - \sin x - 4 = 0$) 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.

Investigating the Relationships Between the Graphs and the Equations of Sinusoidal Functions

- 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

Solving Problems Involving Models of Sinusoidal Functions

- 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 various 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 various applications, and communicate the solutions with clarity and justification, using appropriate mathematical forms

Tools for Operating and Communicating with Functions

Overall Expectations Addressed by the Performance Tasks

- OCV.03 communicate mathematical reasoning with precision and clarity throughout the course

Specific Expectations

Communicating Mathematical Reasoning

- OC3.01 explain mathematical processes, methods of solution, and concepts clearly to others
- OC3.02 present problems and their solutions to a group, and answer questions about the problems and the solutions
- OC3.03 communicate solutions to problems and to findings of investigations clearly and concisely, orally and in writing, using an effective integration of essay and mathematical forms
- OC3.04 demonstrate the correct use of mathematical language, symbols, visuals (e.g., diagrams, graphs), and conventions
- OC3.05 use graphing technology effectively (e.g., use appropriate menus and algorithms; set the graph window to display the appropriate section of a curve)

Unless noted otherwise, all expectations are common to both the Functions course and the Functions and Relations course.

Expectations	Task								
	Task #1, text p. 555 Sunrise, Sunset (45–60 min)	Task #2, text p. 555 Amuse- ment Rides (45–60 min)	Task #3, text p. 555 Lawn Chairs (45–60 min)	Task #4, text p. 556 Solving Systems of Trigono- metric Equations (45–60 min)	Task #5, text p. 556 How High Is the Tower? (60–70 min)	Task #6, text p. 556 Proving Identities (60–70 min)	Task #7, text p. 557 The Tide is High. (60–120 min)	Task #8, text p. 557 A Trigono- metric Trip (60–120 min)	Task #9, text p. 558 Math Music (70–140 min)
TF1.01			X		X			X	
TF1.02			X		X			X	
TF2.03				X		X	X		
TF2.04				X		X			
TF2.05				X		X			X
TF2.06				X		X			
TF2.07				X		X			
TF3.01									X
TF3.02									X
TF3.03							X		
TF3.04							X		X
TF3.05	X	X					X		
TF4.01	X	X					X		X
TF4.02	X	X				X	X		X
TF4.03		X							
TF4.04	X	X					X		X
OC3.01			X		X	X			
OC3.02								X	
OC3.03	X	X					X	X	
OC3.04		X		X	X		X	X	X
OC3.05	X			X		X	X		X