Handout Page 4

Functions/Functions and Relations, Grade 11
Trigonometric Functions

Overall Expectations

By the end of this course, students will:

- solve problems involving the sine law and the cosine law in oblique triangles;
- demonstrate an understanding of the meaning and application of radian measure;
- determine, through investigation, the relationships between the graphs and the equations of sinusoidal functions;
- solve problems involving models of sinusoidal functions drawn from a variety of applications.

Specific Expectations

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

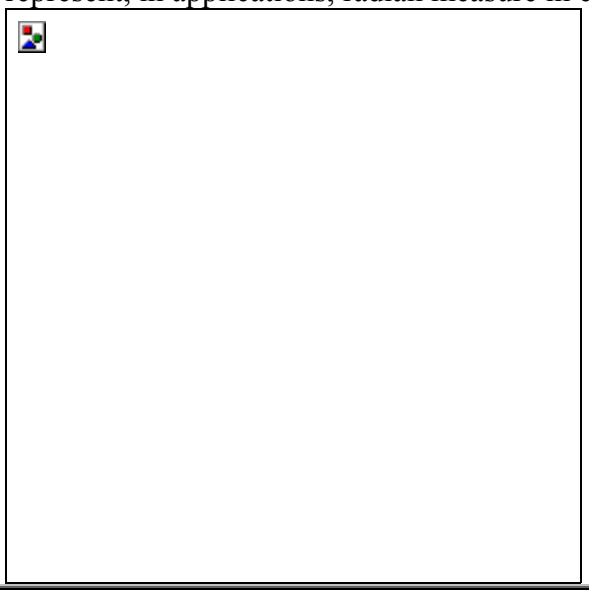
By the end of this course, students will:

1. 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;
2. 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

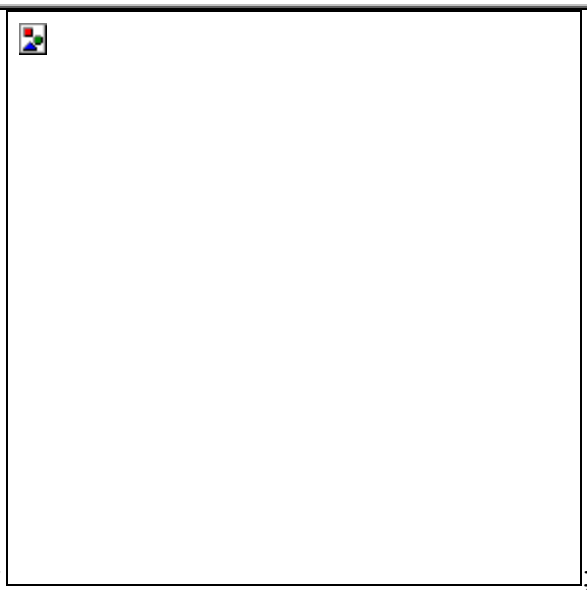
By the end of this course, students will:

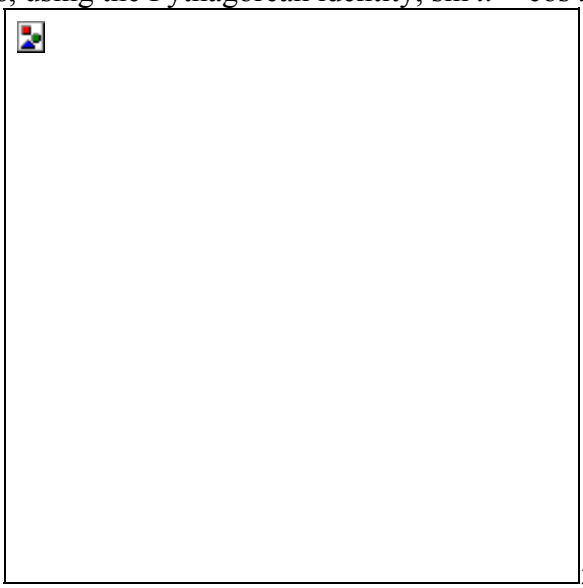
1. define the term *radian measure*;
2. describe the relationship between radian measure and degree measure;
3. represent, in applications, radian measure in exact form as an expression involving



(e.g. $\frac{\pi}{3}$, 2π) and in approximate form as a real number (e.g., 1.05);

4. 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  ;

5. prove simple identities, using the Pythagorean identity, $\sin^2 x + \cos^2 x = 1$, and the quotient relation, $\tan x = \dfrac{\sin x}{\cos x}$  ;
6. solve linear and quadratic trigonometric equations (e.g., $6\cos^2 x - \sin x - 4 = 0$) on the interval $0 \le x \le 2\pi$;
7. demonstrate facility in the use of radian measure in solving equations and in graphing.

Handout Page 5

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

By the end of this course, students will:

1. sketch the graphs of $y = \sin x$ and $y = \cos x$, and describe their periodic properties;
2. 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 $y = \cos x$;
3. 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 $y = a \cos(kx + d) + c$;
4. sketch the graphs of simple sinusoidal functions [e.g., $y = a \sin x$, $y = \cos kx$, $y = \sin(x + d)$, $y = a \cos kx + c$];
5. write the equation of a sinusoidal function, given its graph and given its properties;
6. sketch the graph of $y = \tan x$; identify the period, domain, and range of the function; and explain the occurrence of asymptotes.

Solving Problems Involving Models of Sinusoidal Functions

By the end of this course, students will:

1. 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;
2. 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;
3. predict the effects on the mathematical model of an application involving sinusoidal functions when the conditions in the application are varied;
4. 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.