

Specific Expectations Addressed in the Chapter

- LC1.01U construct a geometric model (e.g., a diagram created by hand, a diagram created by using dynamic geometry software) to represent a described locus of points; determine the properties of the geometric model; and use the properties to interpret the locus (e.g., the locus of points equidistant from two fixed points is the right bisector of the line segment joining the two fixed points)
- LC1.02U explain the process used in constructing a geometric model of a described locus
- LC1.03U determine an equation to represent a described locus [e.g., determine the equation of the locus of points equidistant from $(-2, 7)$ and $(5, 4)$]
- LC1.04U construct geometric models to represent the locus definitions of the conics
- LC1.05U determine equations for conics from their locus definitions, by hand for simple particular cases [e.g., determine the equation of the locus of points the sum of whose distances from $(-3, 0)$ and $(3, 0)$ is 10]
- LC2.01U identify the standard forms for the equations of parabolas, circles, ellipses, and hyperbolas having centres at $(0, 0)$ and at (h, k)
- LC2.02U identify the type of conic, given its equation in the form $ax^2 + by^2 + 2gx + 2fy + c = 0$
- LC2.03U determine the key features (e.g., the centre or the vertex, the focus or foci, the asymptotes, the lengths of the axes) of a conic whose equation is given in the form $ax^2 + by^2 + 2gx + 2fy + c = 0$, by hand in simple cases (e.g., $x^2 + 9y^2 - 6x + 36y - 36 = 0$)
- LC2.04U sketch the graph of a conic whose equation is given in the form $ax^2 + by^2 + 2gx + 2fy + c = 0$
- LC2.05U illustrate the conics as intersections of planes with cones, using concrete materials or technology
- LC3.01U describe the importance, within applications, of the focus of a parabola, an ellipse, or a hyperbola (e.g., all incoming rays parallel to the axis of a parabolic antenna are reflected through the focus; the planets move in elliptical orbits with the sun at one of the foci)
- LC3.02U pose and solve problems drawn from a variety of applications involving conics, and communicate the solutions with clarity and justification (Sample problem: A parabolic antenna is 320 m wide at a distance of 50 m above its vertex. Determine the distance above the vertex of the focus of the antenna)
- LC3.03U solve problems involving the intersections of lines and conics

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:

- Geometric figures and relationships can be defined by locus definitions as well as by equations and graphs and in other ways.
- Conic sections are “slices” from a cone, representing circles, ellipses, parabolas, and hyperbolas.
- A conic can be defined by a locus definition and by standard and general forms of equations.
- Transformations such as translations can be applied to equations and graphs of conics.
- Any conic can be represented by an equation in general form.
- Many things in real life — satellite dishes, automobile headlights, and satellite orbits — can be modelled by a conic, that is, a circle, a parabola, an ellipse, or a hyperbola.

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

In the grade 10 academic course, students have

- determined and graphed the equation of a circle with centre $(0, 0)$ and radius r
- determined the vertex of a parabola from an equation and a graph
- identified the effect of simple transformations on the graph and equation of $y = x^2$
- recognized the roles of a , h , and k in $y = a(x - h)^2 + k$
- graphed the parabolas $y = a(x - h)^2 + k$ and $y = ax^2 + bx + c$
- used methods, such as completing the square, for moving between the general and standard forms of the equation of a parabola
- determined the equation of a line
- determined the point of intersection of two linear relationships graphically and algebraically
- determined formulas for the midpoint and the length of a line segment and solved multi-step problems involving these concepts
- solved quadratic equations by factoring and by using graphing calculators or graphing software
- solved quadratic equations using the quadratic formula

Using this Chapter with Functions / Functions and Relations Courses

This chapter is part of the Functions and Relations course, but not part of the Functions course. Teach this chapter in its entirety using instructional and assessment strategies suggested in the text and the *Teacher Resource*.

In some cases, such as a small school population or alternative educational situations, you may be faced with teaching both courses, Functions and Relations and Functions, to the same class. This situation is not ideal. The following suggestions are meant to help the teacher who may be faced with this dilemma.

- Guide students through this chapter, but include some independent study.
- Set aside one day per week for the students in the Functions course to work on additional applications of other chapters or to develop their skills, while you teach students in the Functions and Relations course a section of this chapter.
- Set up groups of students in the Functions and Relations course to independently study part of this chapter.
- Students in the Functions and Relations course could access additional online resources from the Nelson Mathematics student Web site at www.math.nelson.com, which would allow them to work independently.
- The Chapter Problem, challenges, and/or Performance Tasks for this chapter will help the teacher and students make connections with the various sections of the text if they are taught or studied over an extended period of time.