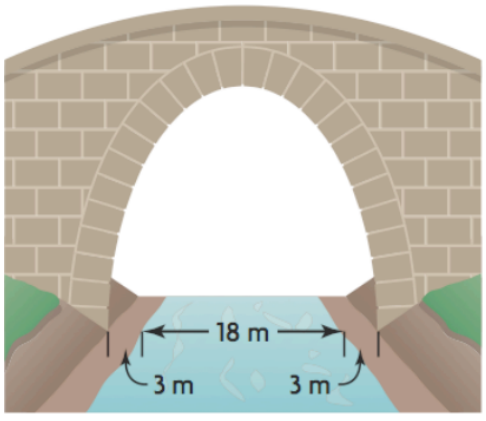
BIG PICTURE of this UNIT:	• How do we WORK WITH & EXTEND the concept of "functions" • Why are quadratic equations written in different forms? • How do we EXTEND and APPLY our knowledge of quadratic functions, beyond the basics of IM2?

This lesson will be based upon a STUDENT DIRECTED DISCUSSION model ….. in your groups, you should be having DISCUSSIONS about how to think and work through and then present the solutions to the following questions. So, discuss & prepare solutions to the following questions. Record the key ideas of your discussions/solutions in your notebook. Then, once you have had your discussions, present your solutions on the board. Solutions do NOT necessarily NEED to be correct – they simply form the basis for DISCUSSIONS!!!! If your group has (i) multiple solutions that lead to the same answers OR (ii) same/different solutions that lead to different answers, present them ANYWAY!!

1. Solve the following quadratic equations, using the method required, either the square root method (on the left side) or the completing the square method (on the right side) {2,7,9}

SOLVE BY SQUARE ROOT METHOD	Complete the Square & then Square Root
(a) Solve $(x-2)^2 = 16$	(a) Solve $x^2 - 4x - 12 = 0$
(b) Solve $(x+5)^2 = 36$	(b) Solve $x^2 + 10x - 11 = 0$
(c) Solve $(x-4)^2 = 3$	(c) Solve $x^2 - 8x + 13 = 0$
(d) Solve $2(x+3)^2 = 12$	(d) Solve $2x^2 + 12x + 6 = 0$

2. A bridge is going to be constructed over a river. The underside of the bridge will form a parabolic arch (as shown in the picture.) The river is 18 m wide and the arch will be anchored on the ground, 3 m back from the riverbank on both sides. The maximum height of the arch must be between 22 m and 26 m above the surface of the river. Create two different algebraic models to represent the parabolic arches that satisfy these conditions. Then use technology to graph your equations on the same grid. {17,18}



3. Go online and find out what the "quadratic formula" is. Then use it to solve the following quadratic equations: {10}

   a. Solve $0 = 6x^2 + 5x - 4$

   b. Solve $0 = 2x^2 + x - 7$

   c. Solve $6(x-1)^2 - 5(x-1)(x+2) - 6(x+2)^2 = 0$ ➔ CHALLENGE ➔Try "factoring" strategies instead??

4. Among all rectangles that have a perimeter of 20 feet, find the dimensions of the one with the largest area. To "play" with this question a bit, come get 20 "pipe cleaners" and "build" your various rectangles (HINT: To help you out, write an equation for (i) the perimeter of the rectangle and (ii) the area of the rectangle and the show that $A(w) = w(10 - w)$.) {2,9,17}

5. Solve the following quadratic equations using the completing the square technique. (OR alternatively, write each equation in vertex form using ANY method you want and then inversing operations) {9,11}

   (a) Solve $x^2 - 6x + 8 = 0$ by c/s

   (b) Solve $x^2 - 6x + 2 = 0$ by c/s

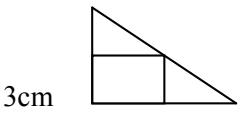
   (c) Solve $x^2 + 8x - 3 = 0$ by c/s

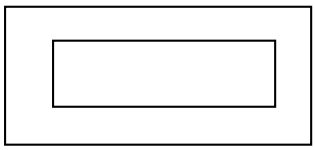
   (d) Solve $x^2 + 4x + 1 = 0$ by c/s

   (e) Solve $x^2 + 7x + 6 = 0$ by c/s

   (f) Solve $x^2 - 6x + 10 = 2(3x + 10)$

6. Find the area of the largest rectangle that can be inscribed in a right triangle with legs of lengths 3 cm and 4 cm if two sides of the rectangle lie along the legs as shown in the figure. (Hint: set the triangle with the right angle at the origin of a graph and write the equation of the line containing the hypotenuse) {2,9,17}





7. The border around a picture is 2½ cm wide. The picture enclosed inside the frame is 5 cm longer than it is high. If the area of the picture itself is 300 cm^2, what are the dimensions of the outer frame? (see diagram above) {2,9,17}

Higher Level Questions for More Complex Concepts OR an EXTENSION of basic concepts involved with Quadratic Functions.

1. Write the equation of a quadratic function with rational coefficients having $2 - 4\sqrt{3}$ as one of its roots.

2. Use the set of complex numbers to solve the following quadratic equations: {23}

   a. $x^2 + 2x + 5 = 0$

   b. $x^2 - 2x + 10 = 0$

   c. $3x^2 - 2x + 3 = 0$

   d. $2x^2 - 5x + 8 = 0$

3. Multiplying with Complex Numbers. Use the distributive property to multiply the following complex numbers: {24}

   a. $2i(3 - 4i)$

   b. $(2i - 1)(3 - 4i)$

   c. $(2 - i)(5 - 2i)$

   d. $(3 - i)(3 + i)$

   e. $(4 - 3i)^2$

   f. $\sqrt{5 - 4i}$