# In - Class Assessments

Problem 1: An arrow shot from a bow follows a path that is very close to parabolic. An archer, therefore, aims the arrow above, rather than straight at, the target. The flight of the arrow illustrated below might be represented by the function

$$h = -0.00033x^2 + 0.036x + 4.75$$

where h is the height above ground level and x is the horizontal distance from the archer's hand. (Both h and x are measured in feet.)
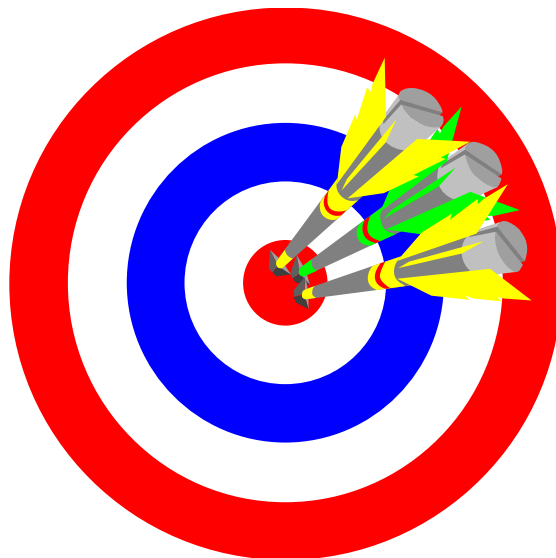
a   How high is the arrow at the moment it leaves the bow?

b   How high is the arrow 25 feet after leaving the archer's hand? after 75 feet?

c   When does the arrow achieve a height of 5 feet?

d   What is the greatest height the arrow reaches during its flight?

e   If the center of the target is 4 feet above the ground and 120 feet from the archer, and if the bull's eye is 9.6 inches in diameter, does the archer score a bull's eye? Does the arrow land above or below the center of the target? above, below, or within the bull's eye area? Explain and give mathematical evidence for your answer. (We will assume that the arrow does not veer to the right or left as it flies. This is not entirely reasonable, of course, but the sideways motion would make a seperate problem.)

f   Re-write the arrow function in factored form

Problem 2: Jack has 15.4 meters of fencing with which to build a rectangular-shaped holding pen for his sheep. The pen is to be located next to a corner and wall of an existing shed as shown in the diagram below. Fencing is not needed along the shed walls.

Use the information above and in the diagram to answer the following questions:

a   Prove that the dimensions of the pen, in meters, (the length and width) are $x + 2.8$ and $12.6 - 2x$
b   Write a formula, in terms of x, for the area (A) of the pen.
c   Draw a graph which represents the abstract area function you wrote in question b. Label the coordinates of the vertex of the graph.
d   What is the maximum area possible for the pen?
e   What are the dimensions of the length and width of the pen that gives the maximum area?
f   What is the domain of the area function; that is, what values of x make sense in the real world situation?

x meters

2.8 m