NAME_____ DATE
Math

Reading Activity

Objective: Students will be able to use reading comprehension and critical thinking skills to apply math concepts to real-world situations.

Gravity and the Quadratic Function by J. Fraioli

We see objects all around us that are in the shape of a **parabola.** A parabola is a symmetrical, U-shaped curve that opens upward or downward. Archways, sagging electric cables, the letters "U" and "n," and rainbows are all examples of objects in the shape of a parabola.

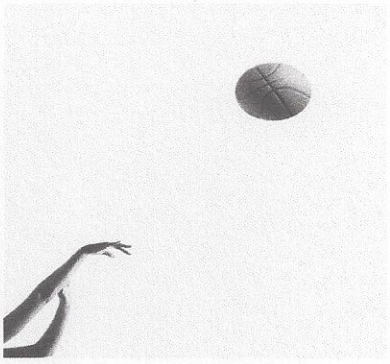
But perhaps one of the most important representations of a parabola is something that we can't see – **gravity**. Gravity is a force that attracts objects to the center of the Earth. When we throw, drop, or exert force on to something, the object follows a **parabolic path** downward.

Have you ever looked at the path of a basketball as someone was shooting a free throw? When there is no other interference with the basketball, the ball follows a perfect parabolic path. The player exerts a force on the ball, sending it upward until it reaches its peak (the **vertex** of the parabola) and then the ball falls to the ground.

Another example that is visible to us is the fireworks in a night sky. These tiny "rockets" are shot into the air with great force, only to come back down to Earth after reaching their peak. As the firework remains lit, it traces a parabola in the air that can be seen with the naked eye.

If we look at the standard form of the quadratic function, $y = ax^2 + bx + c$, we see that the variable, y, is equal to three terms. Gravity of an object is represented by the quadratic function, $h = -16t^2 + vt + c$, where h represents the height of the object and t represents the time in seconds. The coefficient v represents the initial **velocity** (speed) applied to the object, and the c-value represents the height of the object before any time has elapsed.

Let's look at an example. Marcus throws a basketball at the free-throw line. The path of the basketball can be represented by the function $h = -16t^2 + 24t + 6$.



Remember, h represents the height of the basketball after t seconds. Gravity applies a force that is represented by $-16t^2$. Marcus applies a force to the ball causing it to initially travel at 24 feet per second (ft/s). And finally, Marcus holds the ball 6 feet above the ground before shooting it.

Answer the following questions using the example above.

1. What is the height of the ball at 0 seconds?

2. How many seconds does it take for the ball to reach its maximum height?

3. What is the maximum height of the basketball?

4. If the height of the basketball hoop is 10 feet, about how long does it take Marcus to make a basket? (Remember, the ball will reach the hoop on the way down.)

5. Approximately how long does it take for the ball to reach the ground? (Hint: What is the height of the ball when it hits the ground?)

6. Graph the path of Marcus' free throw on a sheet of graph paper.