Algebra 1

Out of This World

At the beginning of a basketball game the referee holds the ball at a height of 3 ft. above the floor. He tosses the ball upward with a velocity of 24 ft. per second. The ball is subject to acceleration due to gravity at the earths surface, which is approximately 32 ft. per second squared.

The vertical motion of the basketball can be described by the quadratic model below:

$$H_{(t)} = -\tfrac{1}{2} gt^2 + v_0 + h_0$$

In this project you will compare the vertical motion of the basketball on earth with its vertical motion on each of the other 8 planets. On each planet, assume that the initial vertical height of the ball is 3 ft. and the initial velocity of the ball is 24 ft. per second. However, the acceleration due to gravity near the surface of each planet is different from that on the earth.

Project Criteria

CCSS:
A-REI Solve quadratic equations in one variable.
F-IF.7 Graph quadratic functions

You will use the tables below to get information about the gravity on all 8 planets. Based on this information, you will write a one to two-page paper, typed, with a cover page, describing new rules for the sport of basketball on a chosen planet.

You must write at least 5 rules and compare/contrast each rule with basketball rules here on earth. You must justify each rule based on the equations, your calculations, and the gravity on the planet that you've chosen (except Earth).

Once you've completed your tables and your paper, you will join a small group with 5-6 other students with the same chosen planet and meet for 10 minutes to talk about your findings, any differences in your numbers, and then your group will present to the class for 5 minutes.

In addition, complete the following:

1. Pick a planet (you can use your chosen planet) and graph the path of the ball from 0 to 5 seconds.
2. Find, and name if possible any planets on which the ball would never reach a height of 10 ft.
3. Complete all tables below

- If you are not interested in basketball, you need to look for a sport that an object is thrown and talk to me for approval.
- All calculations including those done on scrap paper must be turned in.

Algebra 1

The table below contains the acceleration due to gravity near the surface of each planet as a fraction of that on earth (as a portion of earth).

Activity 1: Complete the table

Planet	Gravity At Surface (as a fraction of Earth's)	Gravity at Surface, $g(ft/s^2)$	Vertical height model: $H_{(t)}=- ½ gt^2 + v_0 t+ h_0$
Mercury	0.37		
Venus	0.88		
Earth	1.00	32	$H_{(t)}=-16t^2+ 24t + 3$
Mars	0.38		
Jupiter	2.64		
Saturn	1.15		
Uranus	1.15		
Neptune	1.12		
Pluto	0.04		

Activity 2:

4. Complete the table below by using the quadratic functions obtained in activity 1. Use a graphing calculator to obtain approximate values.

Planet	Maximum height of basketball	Time required to reach maximum height	Time required to return to planet's surface	Time required to reach a height of 10 ft.
Mercury				
Venus				
Earth				
Mars				
Jupiter				
Saturn				
Uranus				
Neptune				
Pluto				

Activity 3:
Refer to the table in activity 2 to answer the following questions:

1. On which planet would the basketball achieve the highest maximum height?
2. On which planet would the basketball achieve the lowest maximum height?
3. Make a generalization about the relationship between the acceleration due to gravity, g, and the maximum height, h, that is reached.