**Science of NFL football Notes**

_____ _____
Physical Science
Mr. Pickett

_____ _____ _____

Watch the "Science of the NFL" videos and then work to answer the following questions with your group.

**Vectors – Quarterbacks "Threading the Needle"**

A _____ has both speed and direction. The moment a football leaves a quarterback's hand it has velocity with includes both a _____ and a _____. An NFL quarterback can throw a ball at a speed of between _____ and _____ miles per hour. A velocity vector can be represented with an _____. The parallelogram method can be used to find the _____ of two vectors.

Draw a diagram showing the quarterback's velocity vector, a receivers velocity vector, the ball's velocity vector and the vector of the sum of the quarterback's and the ball's motion. (Use the parallelogram method)

**Kinematics – Running Backs avoiding tacklers**

Kinematics uses three concepts to describe _____. These are: _____, _____, and _____. _____ is the location on the field. _____ is the direction and speed of the back. _____ is how fast the back's speed is changing. A running back _____ until he reaches top speed.

Calculate the average speed of the running back if he runs 40 yards in 4.26 seconds.
(s = d/t) s= speed d= distance t= time

Calculate the acceleration of the running back if he reaches a top speed of 31.5 ft/sec in 1.2 seconds
($a = \frac{v_f - v_i}{t_f - t_i}$) $v_f$ = final velocity vi = initial velocity t = time

Sketch a graph showing the difference between instantaneous time and average time.

**Projectile Motion and Parabolas – Punters**

An NFL punter can punt the ball up to _____ feet in the air at _____ miles per hour. Once the ball is in the air, it becomes what scientists would call a _____ and travels in a path called a _____. The two main components of velocity that affect the ball are _____ velocity and _____ velocity. The greater the speed the _____ the velocity vector. As gravity tries to slow the ball down, the _____ velocity vector gets smaller. _____ eventually causes the ball to stop rising at the top of it trajectory. As it falls, the vertical velocity vector points _____. The _____ velocity remains the same throughout the flight of the ball.

Draw the path of a football traveling in a flight that could be described as a parabola.