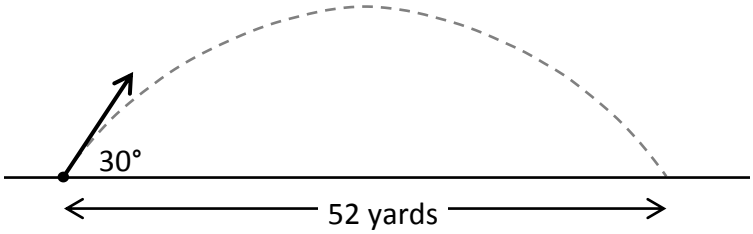
Projectile Motion FRQ

2D Kinematics – HW#4

Name: _____

Date: _____ Period: _____

You have been hired by a football team to use physics to improve their kicking game. Before you can give any recommendations to the coach, you will need to gather some data first. You go out on the field and watch the kicker make kicks starting from ground level on the flat horizontal field.

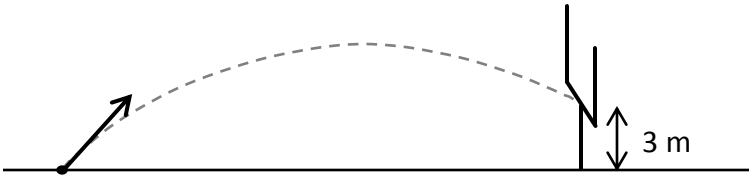


During one of these kicks, you measure the angle of the kick to be 30° with respect to the ground and that the football travels a horizontal range of 52 yards.

(a) What was the range of the football in meters? (1 yd = 0.9144 meters)

(b) Based on this kick, what initial velocity, in meters per second, is the kicker capable of giving to a football?

(c) Calculate the maximum possible range, in meters, that the kicker could kick a football.



The picture shows a regulation football field with the goal post. The bottom bar of the goal post is 3 meters above the ground. A field goal must clear this height when it reaches the goal post.

Based on the information gathered during practice, you are going to report back to the coach the maximum field goal range of the team's kicker. This information is extremely valuable to the football coach in order to determine what the team should do on 4^{th} down. If the ball is outside the maximum field goal range of the kicker, then the team will have to punt. However, if they are within the kicker's range, the team can score more points by kicking a field goal.

(d) Based on the kicker's ideal kick that you calculated in part (c), how much time will it take for the football to reach the goal post?

(e) Using the time from part (d), calculate the maximum field goal range of the kicker, in yards. This is the maximum distance the kicker can be away from the goal post and still clear the bottom bar.