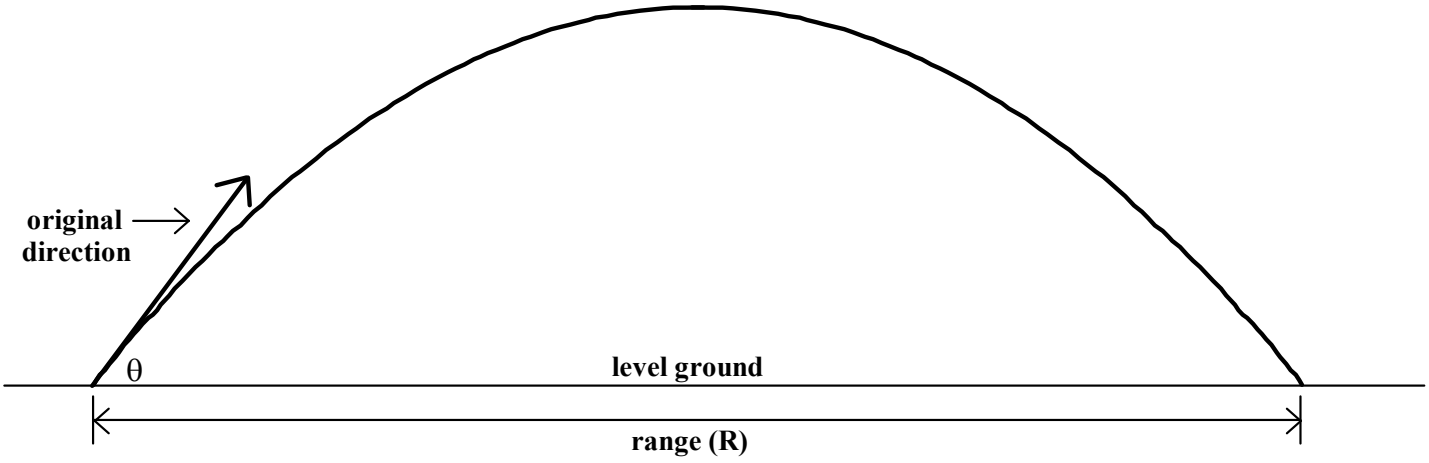
Advanced Challenge Level 2 Problem #7 _____

Consider a situation in which an object is propelled through the air with an initial velocity of v_i fps at an angle θ (degrees) with the horizontal. (See the diagram below.)



The path that the object follows can be described using parametric equations. (For simplicity, any effect due to air resistance will be ignored.) If x represents the horizontal distance the object has traveled in t seconds, then $x = ct$, where $c = v_i \cos \theta$. If y represents the height of the object above the level ground after t seconds, then $y = dt - 16t^2$, where $d = v_i \sin \theta$.

Note that $0 \leq t \leq k$, where k is the time in seconds when the object hits the ground.

For this problem, you are given that $v_i = 200$ fps. You must do each of the following for each value of θ given below.

1. **Find the value of k.**
2. **Find the range.**
3. **Find the maximum height attained by the object.**

Values of θ : 10° , 20° , 30° , 40° , 45° , 50° , 60° , 70° , 80° , 90°

You must also make an <u>accurate scale drawing</u> showing the flight path of the object from t = 0 seconds, when the object is propelled, until it hits the ground. <u>You are only required to do this for one value of θ.</u> The angle that you will use depends on the month in which you were born according to the table below.

Month	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Angle	10°	20°	30°	30°	40°	45°	45°	50°	60°	60°	70°	80°