Kinematics at an angle.

Kinematics at an angle are different than projectile motion.

Projectile motion: an object is thrown, launched, or hit. After it is launched, the projectile has only acceleration due to gravity and no x-direction acceleration. Because the acceleration and initial velocity are at different angles, you must separate them first.

Kinematics at an angle: an object is under ITS OWN power and therefore has ITS OWN acceleration. Kinematics at angle, as the name implies, uses a kinematic equation at an angle. Examples of kinematics at an angle: planes, rockets, cars going at angles, etc.—anything that has its own acceleration. Treat it as a basic kinematic equation, then tilt it. The kinematics equtions is finding information about the hyponetuse. Once you know the length, speed, acceleration (etc) of the hypotenuse, you can then find the x or y components of the motion.

3) A rocket is fired from a Navy Cruiser at 40° to the horizon initially shot at 130 m/s. Since it has its own engine, it accelerates with 10 m/s² for 20 seconds before its engine cuts out.

A) Find the altitude of the rocket when its engine cuts out.
B) Find the rocket's final velocity.
C) How fast would a jetplane helicopter staying along the water have to go to keep up with the helicopter when its engines cut out.

at 40°:

$V_i = 130$ m/s

$a_{40} = 10$ m/s²

$t = 20$ sec

$\Delta x_{40} = ?$

$V_{f_{40}} = ?$

A) $\Delta x_{40} = v_i(\Delta t) + \frac{1}{2}a(\Delta t)^2$

$x = 130(20) + \frac{1}{2}(10)400$

$= 4600$ m at 40°

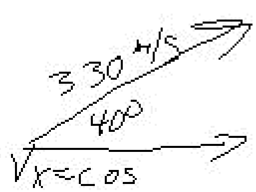
B) $v_f = v_i + a\Delta t$

$V_f = 130 + 10(20)$

$= 130 + 200$

$= 330$ m/s at 40°

C) if the plane's $V_f = 330$ m/s at 40°, use trig. to find the Vx-comp. for the plane.



$V_x = \cos 40°(330)$

$= 253$ m/s