Chapter 6 Motion in 2 Dimensions

Key idea: Mutually perpendicular vectors are independent.
(They have no effect on each other)

Projectile: An object fired through the air.
Trajectory: The path taken by a projectile

Example:

http://jersey.uoregon.edu/vlab/Cannon/index.html

Simple problem: A projectile is fired horizontally

Consider how long it takes to land -
1. Does it depend upon the launch velocity?
2. If fired from a gun, does it depend upon the muzzle velocity?
3. Does it depend upon the height?
4. Does it depend upon the mass of the projectile?
5. Does it depend upon the day of the month?

Solving projectile problems:
1. Assume no horizontal acceleration once the projectile is in flight.
2. Assume gravity acts as usual
3. Break the problem into two problems, horizontal and vertical.
Only the time (a scalar) is common.

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You accidentally throw your car keys horizontally at 8.0 m/s from a cliff 64 m high. How far from the base of the cliff should you look for the keys?

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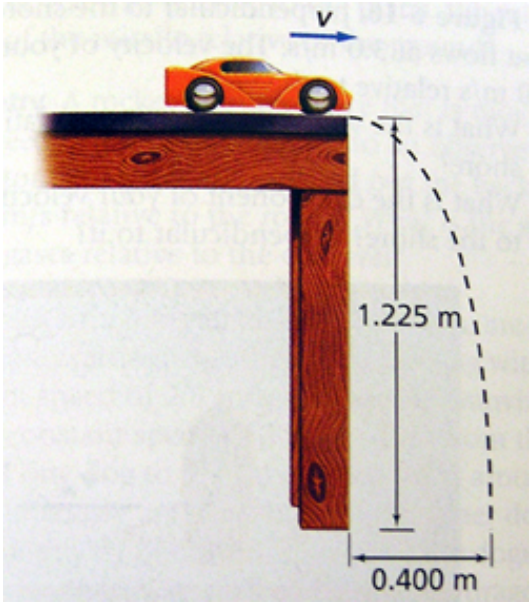
The toy car runs off the edge of a table that is 1.225 m high. The car lands 0.40 m from the base of the table. How fast was the car going on the table?



Problems:
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#53. A dart player throws a dart horizontally at 12.4 m/s. The dart hits the board 0.32 m below the height from which it was thrown. How far away is the player from the board?

#54. You take a running leap off a high-diving platform. You were running at 2.8 m/s and hit the water 2.6 s later. How high was the platform and how far from the edge of the platform did you hit the water? (Ignor air resistance.)

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#58. An airplane traveling 1001 m above the ocean at 125 km/h is going to drop a box of supplies to shipwrecked victims below.

(A) How many seconds before the plane is directly overhead should the box be dropped?

(B) What is the horizontal distance between the plane and the victims when the box is released?

Uniform Circular Motion

Centripetal Acceleration

Centripetal Force

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#61. A 615 kg racing car completes one lap in 14.3 seconds around a circular track with a radius of 50.0 m. The car moves at a constant speed. What is the acceleration of the car? What must be the force exerted on the tires to produce the acceleration?

HOMEWORK: Page 166 # 62

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65. Friction provides the force needed for a car to travel around a flat, circular race track. What is the maximum speed at which a car can safely travel if the radius of the track is 80.0 m and the coefficient of friction is 0.40?
Does the mass of the car matter?
Can you find a general equation relating the maximum speed to the radius?

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#74. Early skeptics of the idea of a rotating Eart said that the fast spin of Earth would throw people at the equator into space. The radius of Earth is about 6.38 x10^3 km. Show why this idea is wrong by calculating

(a) the speed of a 97 kg person at the equator

(b) the force needed to accelerate the person in circle.

(c) the weight of the person

(d) the normal force of Earth on the person (the person's apparent weight)

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84. a 3-Point jump shot is released 2.2 m above the ground and 6.02 m from the basket. The basket is 3.05 m above the floor. For launch angles of 30 degrees and 60 degrees, find the speed the ball needs to be thrown to make the basket.