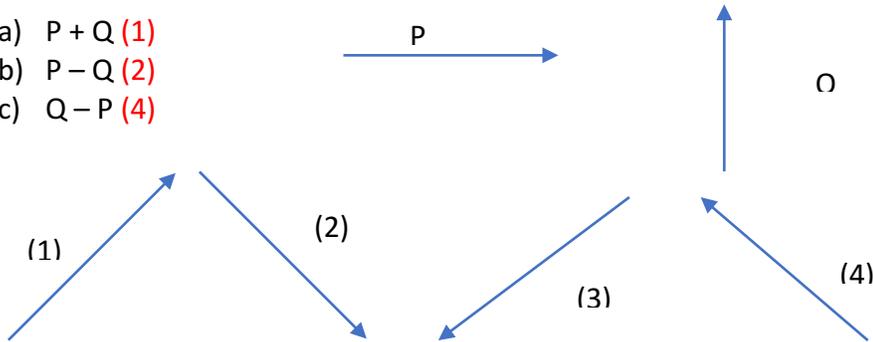


Physics 111 SI Session 2

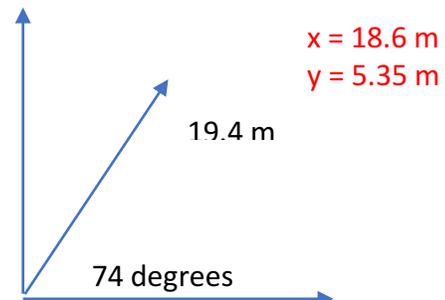
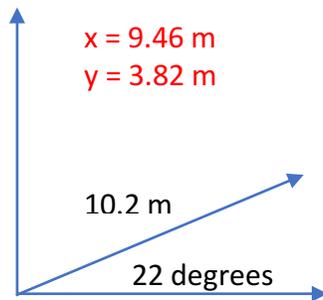
1) A minivan can accelerate from 0 mph to 60 mph in 9 seconds. What is its acceleration in m/s^2 ? $1 \text{ mi} = 1.61 \text{ km}$. **2.98 m/s^2**

2) Find:

- a) $P + Q$ (1)
- b) $P - Q$ (2)
- c) $Q - P$ (4)



3) Decompose the following vectors into their x and y components:



4) Illustrate and find the magnitude of the following vectors:

- a) $\langle 4, 5.6 \rangle$ **6.88**
- b) $\langle -3, 4 \rangle$ **5**
- c) $\langle 12, 6 \rangle$ **13.4**

5) A ball is thrown at an angle of 32 degrees with an initial velocity of 6 m/s. What are its initial horizontal and vertical velocities? **Horiz. = 5.09 m/s, vert. = 3.18 m/s**

6) (didn't get to this one so ill give you the solution) I'm on a cliff 20 meters above the ocean, throwing rocks at seagulls. I throw a rock straight up with an initial speed of 10 m/s, but it misses the seagull.

a) What is the acceleration of the rock? 9.80 m/s^2 (downwards)

b) At what point does the rock have the least speed? Find the time after I throw the rock when this occurs (at the highest point, the rock has no speed)

$V^2 - V_0^2 = 2a*r$, $V_0 = 10 \text{ m/s}$, $V = 0 \text{ m/s}$. r is the maximum height of the rock in this case, $r = 5.10 \text{ m}$.

$r = X_0 + V_{0x}*t + \frac{1}{2} a*t^2$, $X_0 = 0$, $r = 5.10 \text{ m}$, $V_0 = 10 \text{ m/s}$, so if we plug all of these into the equation, we find $t = 1.02 \text{ s}$

c) How fast does the rock hit the ocean?

We can start with the rock at its highest point, which is $5.10\text{m} + 20\text{m} = 25.1\text{m}$. It has no speed at this point, so $V_0 = 0$. Use the equation $r = \frac{1}{2} a*t^2$ to find $t = 2.26\text{s}$, then $v = a*t$, $v = 22.2 \text{ m/s}$

7) Red cars go faster than blue cars. So on the highway, the red car is going 90 mph, and it overtakes the blue car going 70 mph. **PAY ATTENTION TO THE DIFFERENCE IN SIGNS THAN WHAT WE DISCUSSED IN SESSION**

a) What is the relative velocity, V_{rb} ?

$$V_{rb} = V_{rg} + V_{gb}$$

$$V_{rb} = 90 \text{ mph} + (-70 \text{ mph}) = +20 \text{ m/s}$$

b) What is the relative velocity, V_{br} ?

$$V_{br} = V_{bg} + V_{gr}$$

$$V_{br} = 70 \text{ mph} + (-90 \text{ mph}) = -20 \text{ m/s}$$

c) (CHALLENGE:) You're in the red car and see I'm driving the blue car when you pass, so you throw a rock at me when you're 50 feet ahead. How fast do you have to throw the rock so it hits my car, in ft/s?