

Sangam SKM College Nadi

Year 11

Physics

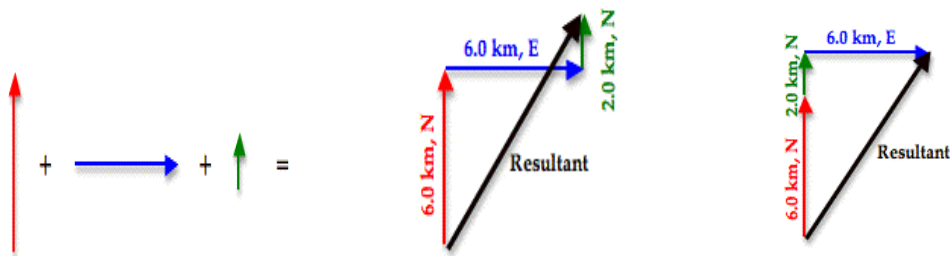
Worksheet 5 – Detailed Solutions

Question

1. 1. A student drives his car 6 km, North before making a right hand turn and driving 6 km to the East. Finally, the student makes a left hand turn and travels another 2 km to the north.

- a. Draw a vector diagram for the situation.

*Like any problem in physics, a successful solution begins with the development of a mental picture of the situation. The construction of a diagram like that below often proves useful in the visualization process.*



- b. What is the magnitude of the overall displacement of the student?

*Using Pythagoras theorem,  $c^2 = a^2 + b^2$*

$$c^2 = 6^2 + (6 + 2)^2$$

$$c^2 = 36 + 64$$

$$c^2 = 100$$

$$c = \sqrt{100}$$

$$\underline{c = 10\text{km}}$$

2. Luke drops a pile of roof shingles from the top of a roof which is located 8.52 meters above the ground.

- a. Determine the initial velocity of the pile of roof.

*Since the ball is undergoing free fall, we would say that  $v_i = 0\text{m/s}$*

- b. Determine the time required for the shingles to reach the ground.

*It is important to list down the data given in the question so that we can find final velocity.*

$$v_i = 0\text{m/s} \quad d = 8.52\text{m} \quad a = 10\text{m/s} \quad v_f = ?$$

*Using the 3<sup>rd</sup> equation of motion*

$$\begin{aligned}(v_f)^2 &= (v_i)^2 + 2ad \\(v_f)^2 &= (0)^2 + 2(10)(8.52) \\(v_f)^2 &= 165 \\v_f &= \sqrt{165} \\v_f &= 12.85\text{m/s}\end{aligned}$$

*Since we know our final velocity we can use 1<sup>st</sup> or 2<sup>nd</sup> equation of motion to find time elapsed.*

$$v_f = v_i + at$$

$$12.85 = 0 + 10t$$

$$t = \left(\frac{12.85}{10}\right)$$

$$\mathbf{t = 1.29 \text{ seconds}}$$

3. Use your own words and answer the theoretical question that follow.

- a. How can Newton's laws be used to explain how rockets are launched into space?

*Newton's third law would tell us that when the rocket pushes out fire with a specific amount of force, the rocket will move in the opposite direction, but with the same amount of force. This is what causes the rocket to shoot up into the air.*

- b. Explain how each of Newton's laws affects a game of Tug of War

First Law: *The rope will stay in the same place until the tugging starts (a new force is introduced)* Second Law: *We could measure a team's force that they can pull the rope with based on their body masses and the acceleration that they are causing the rope to move at.*

Third Law: *one team pulls the rope towards themselves with a certain amount of force and the opposing team is also putting force on the rope. The same amount of force is applied from the ground to the people as they are putting on the ground.*

- c. Describe why you hold your gun next to your shoulder while deer hunting.

*3<sup>rd</sup> Law*

*When you pull the gun's trigger, it forces the bullet out of the gun, but at the same time, the gun is forced in the opposite direction of the bullet (towards you). Your shoulder is a new force that is introduced in order to keep your gun from flying away from you.*