Physics with Synno – Motion-2 – Lesson 9

M.3 DYNAMICS

Dynamics is the study of the causes of motion, in particular the forces acting on a body.

M.3.1 Force as a Vector

From our general science classes we know that a force is a push or a pull. Some forces act when in contact eg opening a door, others do not have to be in contact eg when a magnet attracts a nail.

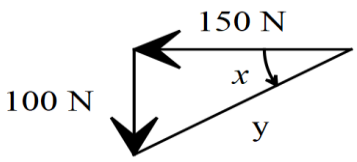
Since when we change the angle that we apply a force the effect may be different, force is a vector and has a direction. The net force is the sum of the forces acting, so vector addition must be used.

Mathematically this is: $\sum F = F_1 + F_2 + \ldots.$

In the first part of this topic we learned about vectors. The examples are a reminder of how we use vectors.

Example.

While playing at the beach, Sally and Ken kick a stationary beach ball simultaneously with forces of 100 N south and 150 N west respectively.
The ball moves as if it were only subjected to the net force.
In what direction will it travel, and what is the magnitude of the net force on the ball?

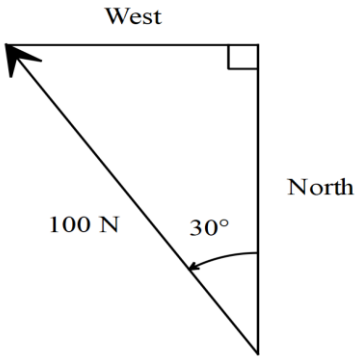


$y^2 = 150^2 + 100^2$
$y^2 = 22500 + 10000$
$y = \sqrt{32500}$
$y = 180.28\ N$
$x = \tan^{-1}\left(\frac{100}{150}\right)$
$x = 33.7°$

Net Force is 180.28 N, S 56.3º W (or W 33.7º S)

A force can also be split into components. Commonly we look at North – South and East – West components.

Example. A stationary hockey ball is struck with a force of 100 N in the direction N30°W. What are the northerly and westerly components of this force?



$North = 100\ \cos 30°$
$North = 86.6\ N$

$West = 100\ \sin 30°$
$West = 50\ N$

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