What is the acceleration of a 200 g cabbage if the net force on it is 1790 N?

8950 m/s^2

$$a = F / m$$

$$\frac{1790\ N}{200\ g * (1\ kg/1000\ g)}$$

An advertisement claims that a sports car can accelerate from rest to 125 km/hr in 9.3 sec. What is its acceleration in m/s^2?

3.7 m/s^2

A = change in v / t

$$\frac{125 \text{ km/hr} * (1000 \text{ m} / 1 \text{ km}) * (1 \text{ hr} / 3600 \text{ s})}{9.3 \text{ s}}$$

1.5 min

A force of 150 N is exerted on an object in one direction, and a force of 375 N is exerted on the same object in a perpendicular direction. What is the net force on the object?

404 N

2 min

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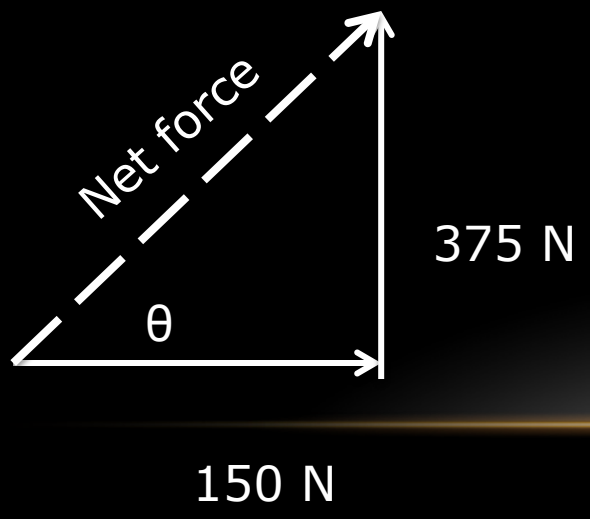


Can use Pythagorean Theorem:
$C^2 = A^2 + B^2$
$\text{Net Force}^2 = (150\ \text{N})^2 + (375\ \text{N})^2$

Can use trig in 2 steps:
$\tan \theta = (375\ \text{N}) / (150\ \text{N})$, get θ
$\sin \theta = 375\ \text{N} / \text{Net Force}$
Solve for Net Force, knowing θ

A 230 N force acts in a SE direction. A second 230 N force must be exerted in what direction so that the net force points South?

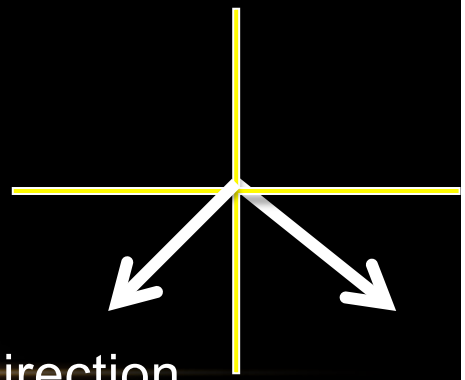
SW

2 min

A 230 N force acts in a SE direction. A second 230 N force must be exerted in what direction so that the net force points South?

Want x components of 2 vectors to cancel so we only have a y component (N pointing force)

The magnitude of the 2 vectors are equal, so the magnitude of their x and y components will also be equal.



The x component of the first force points E.

Therefore, need the second force's x

component to point W, in the opposite direction, for x direction magnitudes to cancel each other.

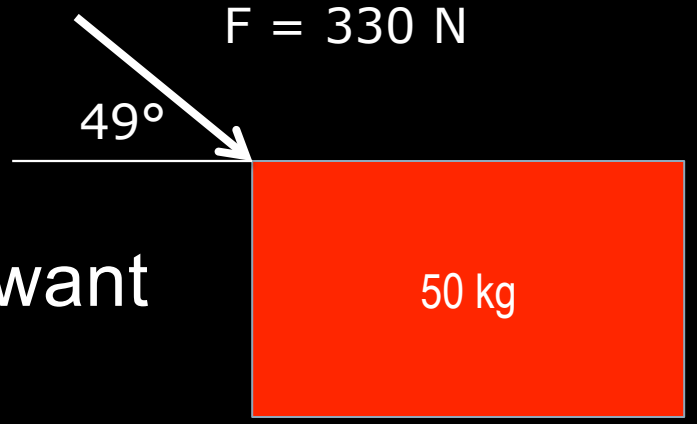
A 65 kg sprinter exerts a force of 900 N at an angle of 45° on a starting block. What is the acceleration of the sprinter?

9.79 m/s^2

- Acceleration is only in the x direction, need to find the F in the x direction
- Fx = Fy = 900 * cos (45 deg) = 900 * sin (45 deg) = 636.4 N
- Fx / m = a = 9.79 m/s^2

A 50 kg box is pushed across a driveway with a constant force of 330 N. What is the acceleration of the box?

4.33 m/s^2



This is the same as the previous problem, but you want

Fx = F * cos (49 deg)

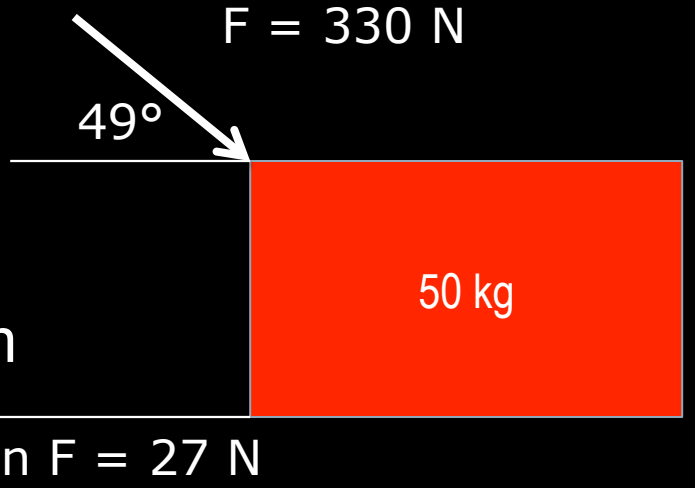
a = 330 * cos (49 deg) / 50 kg

There is a friction force of 27 N acting on the box. What is the acceleration of the box?

3.79 m/s^2

Newtons 2nd law is for the TOTAL force on an object.

We have to modify the solution to the previous problem



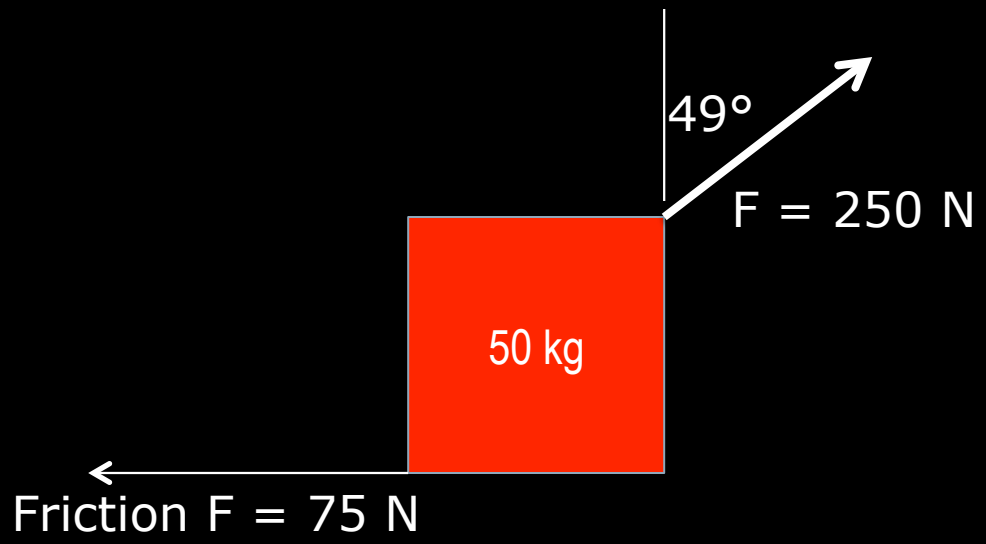
to include the frictional force

$$a = \frac{[330\ N * \cos(49\ deg)] - 27\ N}{50\ kg}$$

A 50 kg box is pulled across a 16 m wide driveway. How long would it take to move the box across the driveway if it starts at rest?

a. 3.75 s

5 min



A 50 kg box is pulled across a 16 m wide driveway. How long would it take to move the box across the driveway if it starts at rest?

If we look at all of the equations we have for motion, we can see that we need to use

$d = v_0 t + \frac{1}{2} a t^2$. This is valid because we're pulling with a constant force – so it is a constant acceleration problem. We know $v_0 = 0$, because it starts at rest (if not indicated in the problem, you can assume this). We need to find the TOTAL acceleration on the box.

Use a similar technique to the previous problem to find the net, or total acceleration

A 50 kg box is pulled across a 16 m wide driveway. How long would it take to move the box across the driveway if it starts at rest?

$$a = \frac{[250\ N * \sin(49\ deg)] - 57\ N}{50\ kg}$$

or, $a_{TOTAL} = 2.27\ m/s^2$

Plug this into the previous equation, and solve for t:

$d = v_0 t + \frac{1}{2} a t^2$, where $v_0 = 0$

$t = \text{sqrt}(2 d / a) = \text{sqrt} (2 * 16\ m / 2.27\ m/s^2)$