Determining an Individual Force Value

Lesson Notes

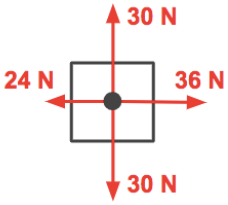
Newton's Second Law:

When the individual forces acting on an object are NOT balanced, the object accelerates. The acceleration value is ...

$$a = F_{net} / m$$

What is Net Force?

F_{net} is the net force (in Newtons). It refers to the result of adding all the forces as vectors. As shown at the right, the four forces add up to 15 N, right.

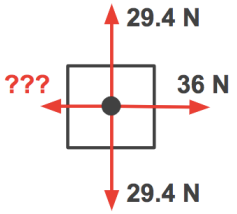


Determining an Individual Force

In this Lesson, Newton's second law is rearranged to form

$$F_{net} = m \bullet a$$

If values of **m** and **a** are known, the F_{net} can be calculated … and then used to determine the *missing force value* in a free-body diagram.



m is often found from $F_{grav} = m \bullet (9.8 N/kg)$.

In the problem depicted at the right, three forces and the value of acceleration are known. The fourth force must be calculated.

a = 4.0 m/s/s, right

m = _____

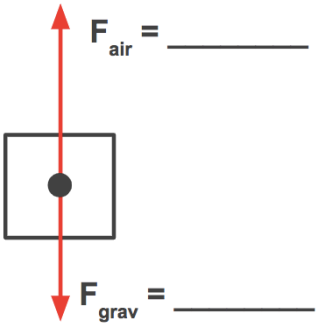
F_{net} = _____

??? = _____

Example 1:

A 62-kg skydiver is accelerating downward at 4.6 m/s^2. Determine the air resistance force.

Solution:



F_{air} = _____

F_{grav} = _____

m = 62 kg

a = 4.6 m/s^2, up

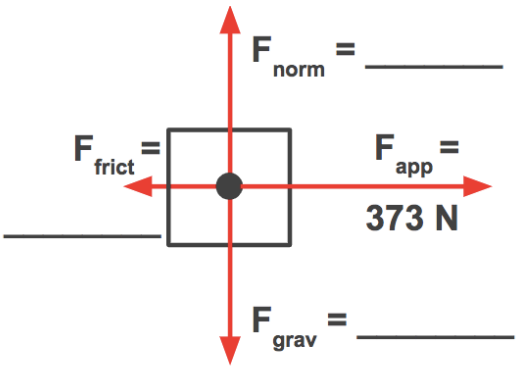
F_{net} = _____

F_{air} = _____

Example 2:

A rightward force of 373 N is applied to a 118-kg object to accelerate it rightward at 1.24 m/s^2. Determine the friction force.

Solution:



m = 118 kg

a = 1.24 m/s/s, Rt

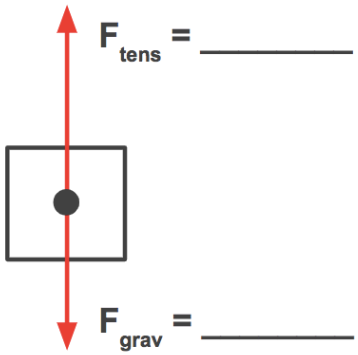
F_{net} = _____

F_{frict} = _____

Example 3:

Determine the tension force required to accelerate a 4.80-kg bucket upward out of a well at 0.825 m/s^2.

Solution:



m = 4.80 kg

a = 0.825 m/s^2, up

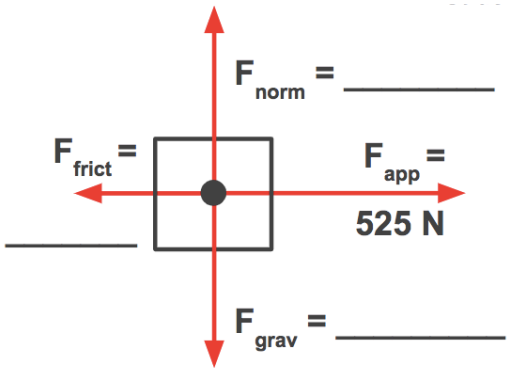
F_{net} = _____

F_{tens} = _____

Example 4:

A 525-N rightward force is applied to accelerate a 65.0-kg object at 4.16 m/s^2. Determine the coefficient of friction.

Solution:



m = 65.0 kg

a = 4.16 m/s^2, rt

F_{net} = _____

F_{frict} = _____

μ = _____

Solving for an individual force value:

- Draw a free-body diagram.
- Identify values of all known forces … and of the mass and the acceleration.
- Calculate the net force (F_{net} = m•a)
- Use the value of F_{net} to determine all missing force values.