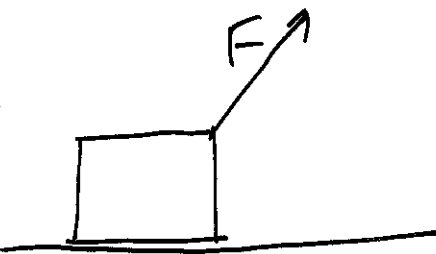Pulling upward on a block: A flowchart →

A – Break the applied force into components and find the force of gravity (weight)

→ if vertical component of the applied force is greater then the weight → The person picks up the block!

else ↓

find the normal force and maximum force of static friction

→ if the horizontal applied force is less than max static friction → - The block Does not move.
- Frictional force = horizontal applied force

else ↓

the box maes! → - frictional force is kinetic friction
$F_{Frh} = \mu_k \cdot F_N$

- find net force and acceleration.

For full credit on each of these problems, you must clearly and carefully show your work. Imagine that you are not only trying to give the correct answer, but convince someone who doesn't believe you that you *have* the correct answer.

Also, every free-body diagram must be drawn on the diagram with the following guidelines:
- Each force arrow must be draw emanating from the point at which that point is applied.
- For each force on the box, you must indicate the *name* of the force and the *magnitude* of the force correctly.
- The length of each arrow should correlate roughly to the relative magnitude of each force.
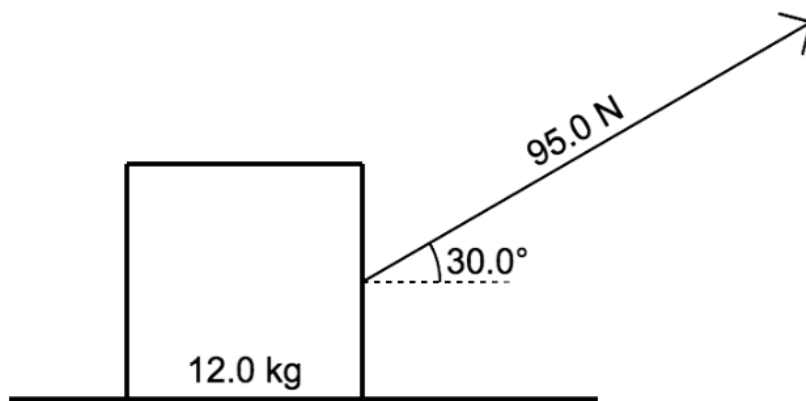1.
A box is dragged at an angle along a flat surface, as shown in the diagram below.
The coefficient of static friction between the box and the floor is 0.6
The coefficient of kinetic friction between the box and the floor is 0.3
Draw a free-body diagram of this situation:

Which of the following situations takes place:
A) the box does not move
B) the box begins to accelerate
C) The box is lifted upward

Explain how you determined your answer:

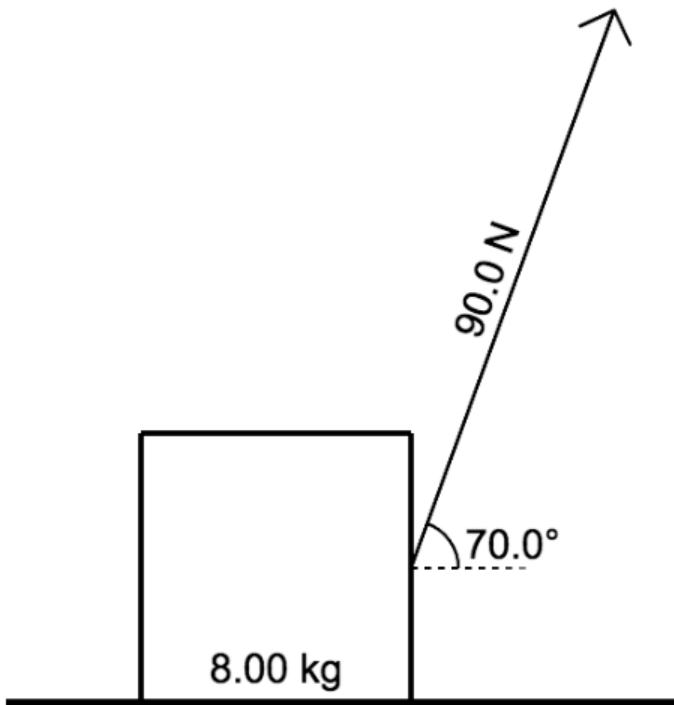If you selected B) above, find the acceleration of the block.

2.

A box is dragged at an angle along a flat surface, as shown in the diagram below.
The coefficient of static friction between the box and the floor is 0.55.
The coefficient of kinetic friction between the box and the floor is 0.4.
Draw a free-body diagram of this situation:

90.0 N

70.0°

8.00 kg

Which of the following situations takes place:
A) the box does not move
B) the box begins to accelerate
C) The box is lifted upward

Explain how you determined your answer:

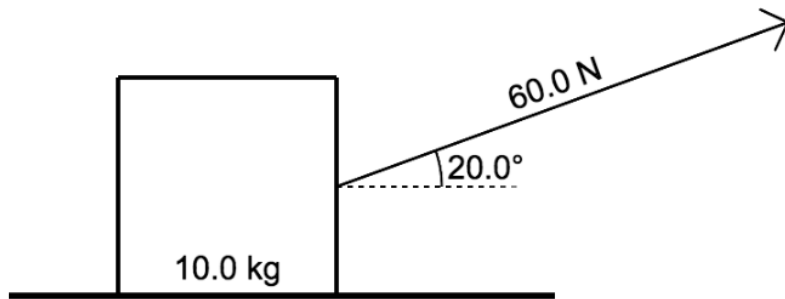If you selected B) above, find the acceleration of the block.

3.

A box is dragged at an angle along a flat surface, as shown in the diagram below.
The coefficient of static friction between the box and the floor is 0.5.
The coefficient of kinetic friction between the box and the floor is 0.2.
Draw a free-body diagram of this situation:

Which of the following situations takes place:
A) the box does not move
B) the box begins to accelerate
C) The box is lifted upward

Explain how you determined your answer:

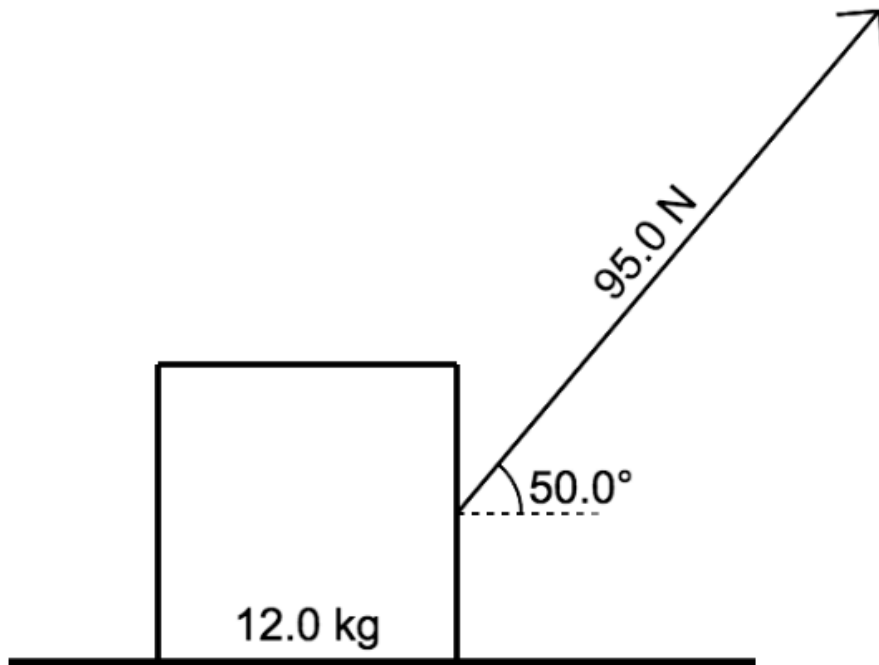If you selected B) above, find the acceleration of the block.

4.

A box is dragged at an angle along a flat surface, as shown in the diagram below.
The coefficient of static friction between the box and the floor is 0.6.
The coefficient of kinetic friction between the box and the floor is 0.4.
Draw a free-body diagram of this situation:

95.0 N

50.0°

12.0 kg

Which of the following situations takes place:
A) the box does not move
B) the box begins to accelerate
C) The box is lifted upward

Explain how you determined your answer:

If you selected B) above, find the acceleration of the block.

Box dragged at an angle numericName _____

Answers:

1. box is moving
2. box is picked up
3. box is moving
4. box is not moving

number 1:

F_g = 117.6 N
F_x = 82.272 N
F_y = 47.5 N
F_n = 70.1 N
max static friction = 42.06 N, this force is overcome by the forward force so the box moves
F_{fr} = 21.03
net force = 61.242 N
acceleration = 5.10 m/s2

number 2:

F_g = 78.4 N
F_x = 30.78 N
F_y = 84.57 N
box is lifted off the ground because the upward force is greater than gravity

number 3:

F_g = 98 N
F_x = 56.38 N
F_y = 20.52 N
F_n = 77.48 N
max static friction = 38.74, the box moves because the forward force exceeds this force
F_{fr} = 15.496
net force = 40.884 N
acceleration = 4.09 m/s2

number 4:

Fg = 117.6 N
Fx = 61.065 N
Fy = 72.774 N
Fn = 44.826 N
max static friction = 26.8956, the box moves because the forward fore exceeds this force
Ffr = 17.903 N
net force = 43.162 N
acceleration = 3.60 N