Name: _____

Class: _____

Due Date: _____

Physics Topic 9 – Free Body Diagrams

Answer the following questions. The solutions to this worksheet can be found on the YouTube channel Go Physics Go.

1. C: What are the steps to drawing and labeling a *free body diagram*?

2. C: Label the forces on the following diagrams.

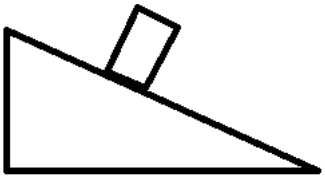
   a. A block is at rest on a horizontal surface.

   b. A man is pushing a block to the left with a horizontal force on a rough horizontal surface. The block does not move.

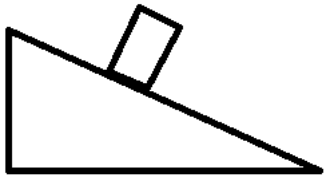
c. An object is being pushed to the left on a wall.

d. A man is pushing a block on a slope which is 20° from the horizontal on a rough horizontal surface. **The block does not move.**

The man is pushing the block downwards. The push is parallel to the slope.

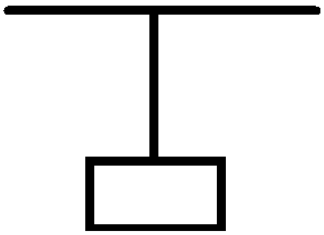


The man is pushing the block upwards. The push is parallel to the slope.

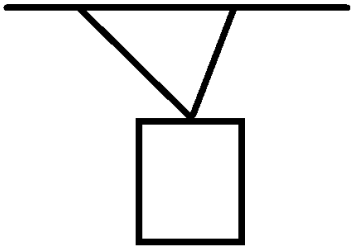


e. A dead fish is floating on top of the plastic radioactive ocean water.

f. A block is at rest and is hanging from the ceiling by one massless string.

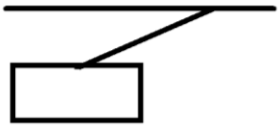


g. A block is at rest and is hanging from the ceiling by two massless strings.

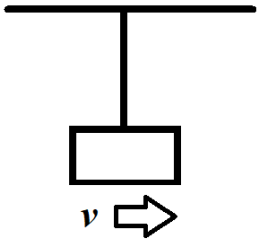


h. A block is tied to a massless string and is raised up at an angle θ from the vertical.

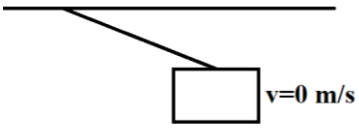
The block is released from rest.



The block is now at the bottom of its motion.



The block is now at the top of its motion.



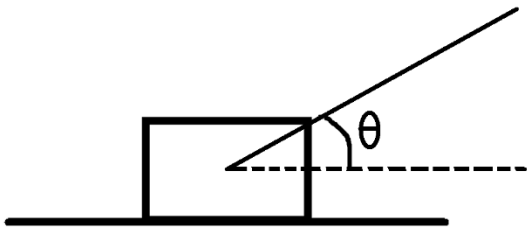
i. A car is moving in a straight line to the right with a constant speed

on a smooth horizontal surface. on a rough horizontal surface.

j. A car is moving in a straight line to the right on a rough horizontal surface.

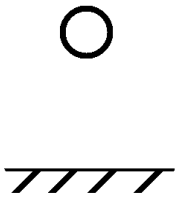
The car is slowing down (decelerating). The car is speeding up (accelerating).

k. A man pulls a massless string which is attached to a block with a constant speed at an angle θ above the horizontal on a rough surface. Label the forces on the block, not the man.

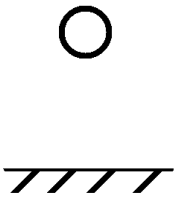


l. A ball is thrown vertically up and is moving upwards.

There is **no** force of air friction.

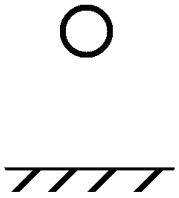


There **is** a force of air friction.

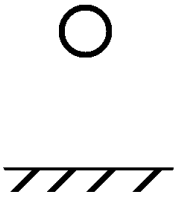


m. A ball is thrown vertically up and is at its maximum height.

There is **no** force of air friction.

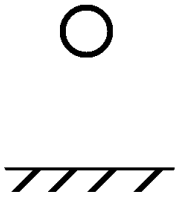


There **is** a force of air friction.

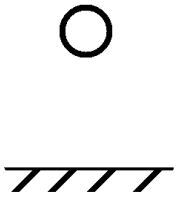


n. A ball is **<u>dropped</u>** from rest from the top of a very tall building. There is no force of air friction. Draw a free body diagram of the ball ….

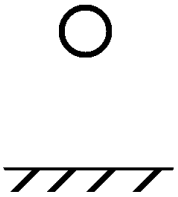
the moment the ball is dropped.



when the ball is halfway down.

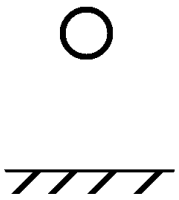


just before ball strikes the ground.

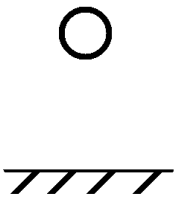


o. A ball is **<u>thrown</u>** downwards from the top of a tall building. Draw a free body diagram of the ball the moment after the ball is thrown when ….

there is **<u>no</u>** force of air friction.

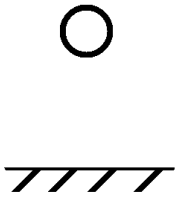


there **<u>is</u>** a force of air friction.

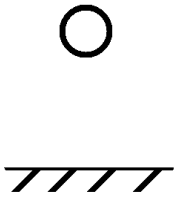


p. A ball is released from rest from the top of a very tall building. There is air friction. Draw a free body diagram of the ball….

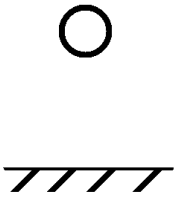
a few seconds before the ball reaches its terminal velocity.



the exact moment the ball reaches its terminal velocity.

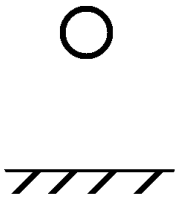


a few seconds after the ball reaches its terminal velocity.

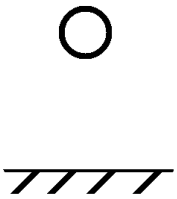


q. A ball is thrown at an angle $\theta = 45°$ north of east from a horizontal surface. Draw a free body diagram of the ball the moment the ball is thrown when ….

there is **<u>no</u>** force of air friction.

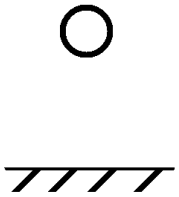


there **<u>is</u>** a force of air friction.

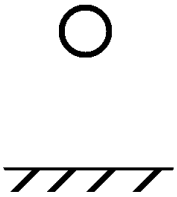


r. A ball is thrown at an angle $\theta = 45.0°$ north of east from a horizontal surface. The ball is at its maximum vertical height.

There is **no** force of air friction.

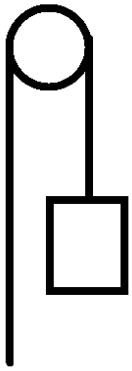


There **is** a force of air friction.

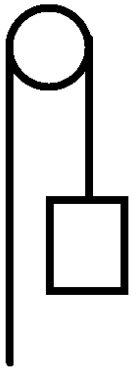


s. A block is being pulled vertically upwards by a massless string pulley.

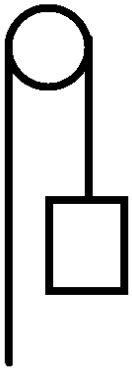
The speed of the block is constant.



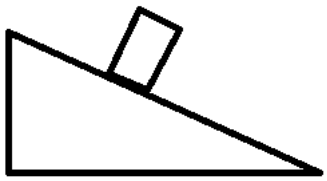
The block is accelerating.



The block is slowing down (decelerating).

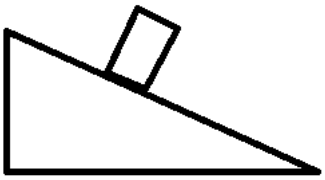


t. A block is at rest on an incline. There is surface friction.

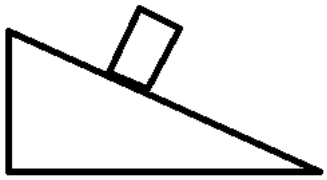


u. A block moves down an incline. There is surface friction.

The speed of the block is constant.

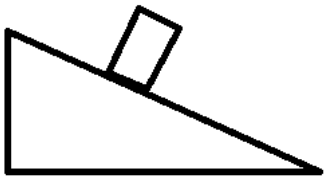


The block accelerates.

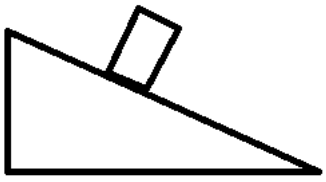


v. A block is pushed up an incline. There is surface friction.

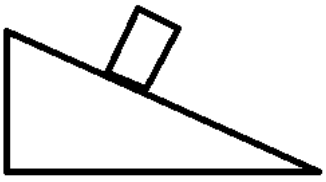
The block slows down (decelerates).



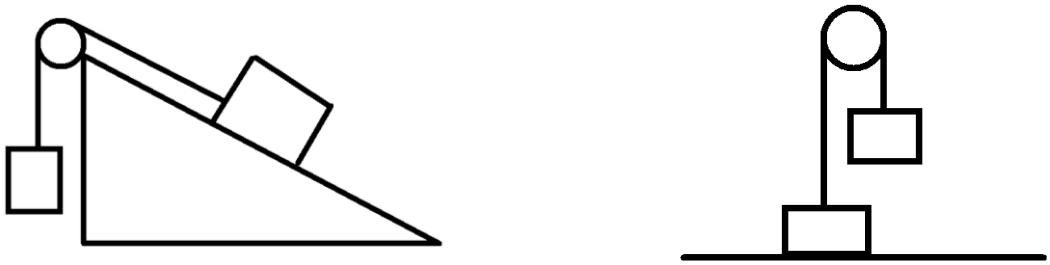
The speed of the block is constant.



The block speeds up (accelerates).



w. Two blocks are attached to each other by a common string. There is surface friction.



x. A mass lying on a rough horizontal surface is attached to a spring and is stretched from its equilibrium position. It is then released.