Name Answer Key

Honors Physics

Period _____

A

Date _____

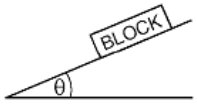
Forces WS #7H

Mrs. Nadworny

Inclined Plane

Directions – Read textbook pages 132 – 133. Solve the following problems using the GUESS method and correct significant figures. Be sure to show ALL work!

1. In the diagram below, a block rests on a ramp, making angle θ with the horizontal. If angle θ is increased, what will occur?



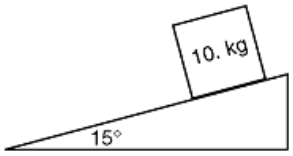
A) The block's mass will decrease

B) The block's weight will increase

C) The block's component of weight parallel to the ramp will decrease

D) The block's component of weight parallel to the ramp will increase

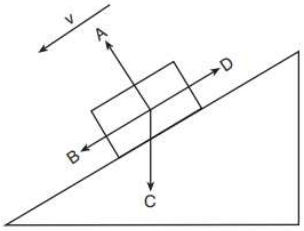
2. In the diagram at right, a 10. – kilogram block is at rest on a plane inclined at 15° to the horizontal.



As the incline is increased to 30.°, the weight of the block will

A) increase B) decrease C) remain the same

3. The diagram at left represents a box sliding down an incline at constant velocity.



Write the letter of the arrow that best represents the direction of the frictional force acting on the box in the space below. D

4. When the sum of all the forces acting on a block on an inclined plane is zero, the block

A) must be at rest B) must be accelerating

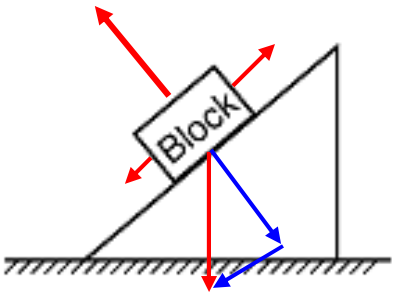
C) may be slowing down D) may be moving at constant speed

5. A box weighing 46 newtons rests on an incline that makes an angle of 25° with the horizontal. What is the magnitude of the component of the box's weight perpendicular to the incline?

A) 19 N B) 42 N C) 21 N D) 46 N

Continued on the next page

6. A 39 kg rubber block is pushed up a dry concrete ramp inclined at 32^0 by applying a force of 231 newtons parallel to the incline. Draw a free body diagram of the situation. Calculate the acceleration of the block.



   a. Calculate the weight of the box.

$$F_{grav} = mg = 39kg(-9.81\tfrac{m}{s^2}) = 380N \text{ down}$$

   b. Calculate the parallel component of the weight.

$$F_{g\parallel} = F_{grav}\sin\theta = (-380N)(\sin 32°) = 2.0\times10^2 N \text{ downhill}$$

   c. Calculate the perpendicular component of the weight.

$$F_{g\perp} = F_g\cos\theta = (-380\ N)(\cos 32°) = 320N \text{ into the hill}$$

   d. Calculate the force of friction acting on the box.

$$F_{fric} = \mu F_{norm} = (0.68)(^+320N) = 220N \text{ downhill}$$

   e. Calculate the net force acting on the box. [Hint: consider ALL of the forces acting along the plane of acceleration.]

$$F_{net} = F_{app} - F_{fric} - F_{g\parallel} = 231N - 220N - 2.0\times10^2 N = 190N \text{ downhill}$$

   f. Calculate the acceleration of the box.

$$a = \frac{F_{net}}{m} = \frac{-190N}{39kg} = 4.9\tfrac{m}{s^2} \text{ downhill}$$

Answers in size order: 4.9, 190, 2.0 x 10^2, 220, 320, 380