

$\Sigma F = ma$

$W = mg$

$F_f = \mu F_N$

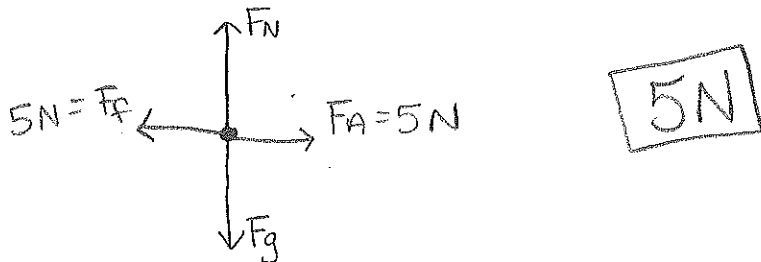
# Physics

## Unit 3: forces - Review Part I

Name: \_\_\_\_\_ Block: \_\_\_\_\_

Solve the following problems. Use Free Body Diagrams when appropriate. You must show your work.

1. In order to keep an object weighing 30 N moving at a constant speed along a horizontal surface, a force of 5 N is required. What is the force of friction between the surface and the object?



2. A net force of 7.2 N accelerates a 25 kg scooter across a level parking lot. What is the magnitude of the scooter's acceleration?

$\Sigma F = 7.2 \text{ N}$

$m = 25 \text{ kg}$

$a = ?$

$\Sigma F = ma$

$7.2 = 25a$

$a = 0.288 \text{ m/s}^2$

3. A wagon with a weight of 200.0 N is accelerated across a level surface at  $1.5 \text{ m/s}^2$ . What net force acts on the wagon?

$W = 200 \text{ N}$

$a = 1.5 \text{ m/s}^2$

$\Sigma F = ?$

$\Sigma F = ma$

$\Sigma F = (20.4)(1.5)$

$\Sigma F = 30.6 \text{ N}$

$W = mg$

$200 = m(9.8)$

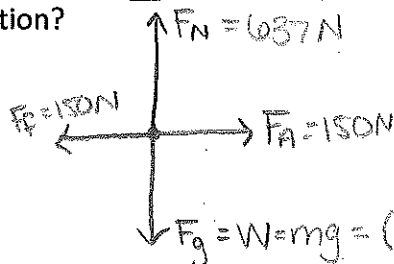
$m = 20.4 \text{ kg}$

4. A 65 kg crate is pulled at a constant speed horizontally across the floor by a 150 N force. What is the coefficient of friction?

$m = 65 \text{ kg}$

$F_A = 150 \text{ N}$

$\mu = ?$



$F_f = \mu F_N$

$150 = \mu(637)$

$\mu = 0.24$

5. An elevator weighing  $3.00 \times 10^4 \text{ N}$  is supported by a steel cable. What is the tension in the cable when the elevator is accelerated upward at a rate of  $2.50 \text{ m/s}^2$ ?

$W = 30000 \text{ N}$

$F_T = ?$

$a = 2.50 \text{ m/s}^2$



$\Sigma F = ma$

$F_T - F_g = ma$

$F_T - 30000 = (3061.2)(2.5)$

$F_T - 30000 = 7653.06$

$F_T = 37653.06 \text{ N}$

$W = mg$

$30000 = m(9.8)$

$m = 3061.2 \text{ kg}$

$$\Sigma F = ma$$

$$W = mg$$

$$F_f = \mu F_N$$

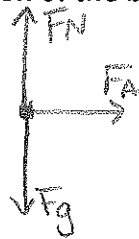
6. A horizontal 15 N force is applied to a box that is sliding across a frictionless surface. The box weighs 25 N.

What is the acceleration of the box?

$$F_A = 15 \text{ N}$$

$$W = 25 \text{ N}$$

$$a = ?$$



$$\Sigma F = ma$$

$$15 = (2.55)a$$

$$a = 5.88 \text{ m/s}^2$$

$$W = mg$$

$$25 = m(9.8)$$

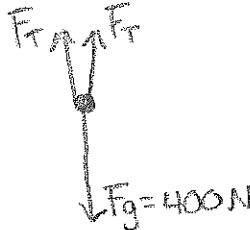
$$m = 2.55 \text{ kg}$$

7. A child whose weight is 400 N hangs from the middle of a bar supported by two vertical strands of rope.

What is the tension in each strand?

$$W = 400 \text{ N}$$

$$F_T = ?$$



200 N

8. What is the mass of a dog that weighs 110 N?

$$W = 110 \text{ N}$$

$$W = mg$$

$$110 = m(9.8)$$

$$m = 11.22 \text{ kg}$$

9. How much does a 4.0-kg bag of marbles weigh?

$$m = 4 \text{ kg}$$

$$W = mg$$

$$W = (4)(9.8)$$

$$W = 39.2 \text{ N}$$

10. What is the maximum resultant possible when adding a 3-N force to a 7-N force?

$$10 \text{ N}$$

11. A 7-N force and a 25-N force act in the same direction on an object. What is the net force on the object?

$$\Sigma F = 7 + 25 = 32 \text{ N}$$

12. What is the minimum resultant possible when adding a 7-N force to a 10-N force?

$$\Sigma F = 10 - 7 = 3 \text{ N}$$

13. A 10-N force and a 35-N force act on an object in opposite directions. What is the net force on the object?

$$\Sigma F = 35 - 10 = 25 \text{ N}$$