Name _____

Interaction Forces (p. 102 – 107)

Examples:
- Rockets
- Guns

I. Identifying Interaction Forces

1. **Forces always come in pairs.**

p. 102

Circle One : (True) False

2. **What is the difference between $F_{A \text{ on } B}$ and $F_{B \text{ on } A}$?** (Interaction Pair)

Equal each other!

$F_{A \text{ on } B}$ = Force of object A on object B

$F_{B \text{ on } A}$ = Force of object B on object A

Opposite direction!

3. **Define the term interaction pair (*action-reaction pair of forces*).**

Interaction Pair – two forces in opposite directions ~~that~~ have equal magnitude

4. **Two forces exist together or not at all.**

Circle One : (True) False

II. Newton's Third Law

1. **Define Newton's Third Law.**

Snapping Rubber Band

Newton's Third Law – all forces come in pairs

(Two forces in a pair act on different objects and are equal in strength and opposite in direction.)

2. **Write out the formula to determine Newton's Third Law.**

$$F_{A \text{ on } B} = -F_{B \text{ on } A}$$

p. 103

3. **If a soccer ball is sitting on a table, why are the table and Earth not considered an interaction pair?**

Acting on same object (soccer ball), but not each other. (in this system)

4. **What are the two interaction pairs of the soccer ball on the table?**

1. $F_{\text{ball on table}} = -F_{\text{table on ball}}$

2. $F_{\text{ball on Earth}} = -F_{\text{Earth on ball}}$

5. **An interaction pair must consist of two forces of equal magnitude pointing in the ~~same~~ opposite direction.**

Circle One : True (False)

Name _____

6. **Why can acceleration caused by the force of an object interacting with Earth be ignored?**

- Too small a value. (Relative size of object to Earth is very small.)

III. Force Of Ropes & Strings

1. **Define the term tension.**

Tension – force exerted by a string or rope

2. **All ropes or strings in calculations are assumed to be** massless.

3. **What are the two forces of a rope that interact when an object is hanging below?**

p. 105 Top

1. $F_{top\ on\ bottom}$
2. $F_{bottom\ on\ top}$

4. **The tension of rope is equal to the weight of objects held by it.**

p. 105 Bottom

Circle One : (True) False

Tension everywhere in the rope is equal to bucket's weight.

5. **How is the tension on a tug-of-war rope determined?**

500 N 500 N

Total tension equals 500 N

$F_{A\ on\ rope} = F_{right\ on\ left}$

$F_{B\ on\ rope} = F_{left\ on\ right}$

Not 1000 N!

IV. The Normal Force

1. **Define the term normal force.**

Normal Force – perpendicular contact force exerted by a surface on another object

2. **Which statement is <u>false</u> concerning the normal force?**

p. 107

a. The downward force that opposes the normal force is gravity due to Earth.
b. The normal force is always perpendicular to the plane of contact.
c. The normal force involves contact between two objects.
d. The normal force is equal to the weight of the object. (not always)

3. **Assume that a box with a string tied to it is sitting on a table. If you lift the box with the string or press down on the box, identify the forces involved.**

1. F_N (Normal force)
2. $F_{string\ on\ box}$ (Force applied by person)
3. F_g (Weight)

$F_N = F_g - F_{string\ on\ box}$

4. **How does the normal force of the table compare to the box when the box is :**

Not lifted too!

Lifted : Normal force of table is less than box

Pressed Down : Normal force of table is more than box

doesn't break