Physics Free Body Diagrams

Name: _____

Assignment 3

Draw a free body diagram. Include ALL forces acting on the object. Find the Net force for each scenario. If the Net force is greater than 0, find the acceleration of the object.

1. A 12kg book is sitting still on a desk.

Free Body Diagram:

$F_W = 12(9.8) = 117.6N$

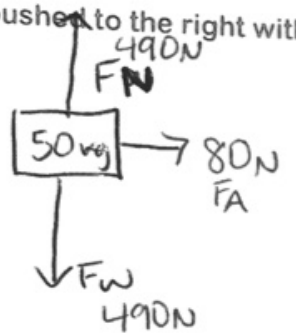
$F_N = 117.6N$

Net Force:

Net force = 0N

2. A 50kg box is being pushed to the right with 80N of force.

Free Body Diagram:



$F_W = 50(9.8)$

$F_W = 490N$

Net Force:

$F_{net} = F_A$

$F = ma$

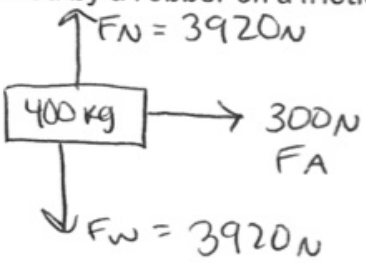
Acceleration:

$\frac{80N}{50} = \frac{50kg(a)}{50}$ $1.6 m/s^2$

$1.6 m/s^2$

3. A 400kg safe is pushed by a robber on a frictionless surface at 300 N to the right.

Free Body Diagram:



$F_W = mg$

$F_W = (400kg)(9.8 m/s^2)$

$F_W = 3920N$

Net force:

Acceleration: $0.75 m/s^2$

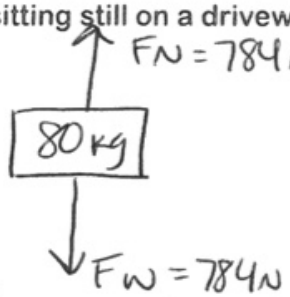
$F_A = F_{net}$

$F_{net} = ma$

$\frac{300}{400} = \frac{(400)a}{400}$ $a = .75 m/s^2$

4. An 80kg box is sitting still on a driveway.

Free Body Diagram:



$F_W = mg$

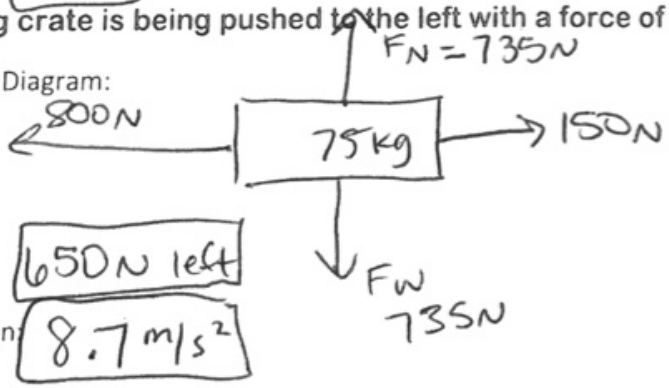
$F_W = (80kg)(9.8 m/s^2)$

$F_W = 784N$

Net force: 0N

5. A 75kg crate is being pushed to the left with a force of 800 N and the frictional force is 150 N.

Free Body Diagram:



$F_W = mg$

$(75kg)(9.8)$

$F_W = 735N$

Net force: 650N left

$F_{net} = F_A - F_f$ $F_{net} = 800 - 150$

$F_{net} = 650N$

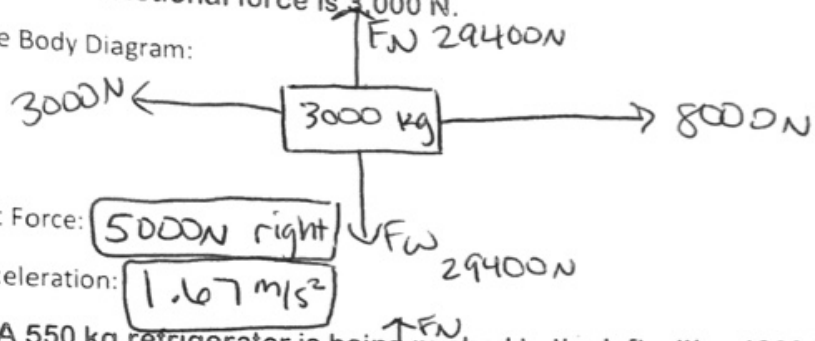
Acceleration: $8.7 m/s^2$

$F_{net} = ma$

$650 = 75kg(a)$ $a = 8.7 m/s^2$

6. A 3,000 kg car has broken down and is being pushed with an 8,000 N force to the right on a wet road. The frictional force is 3,000 N.

Free Body Diagram:



Net Force: 5000N right

Acceleration: 1.67 m/s²

$F_W = mg$

$F_W = (3000)(9.8)$

$F_W = 29400\ N$

$F_{net} = F_A - F_f$

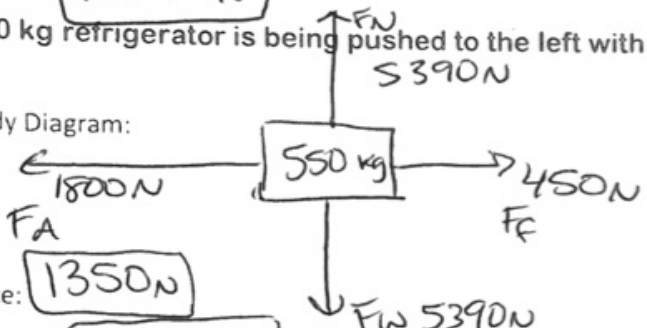
$8000 - 3000 = 5000N$

$F_{net} = ma$

$5000 = 3000(a)$ $a = 1.67\ m/s^2$

7. A 550 kg refrigerator is being pushed to the left with a 1800 N force and has a frictional force of 450 N.

Free Body Diagram:



Net Force: 1350N

Acceleration: 2.45 m/s²

$F_W = mg$

$F_W = (550)(9.8)$

$F_W = 5390N$

$F_{net} = F_A - F_f$

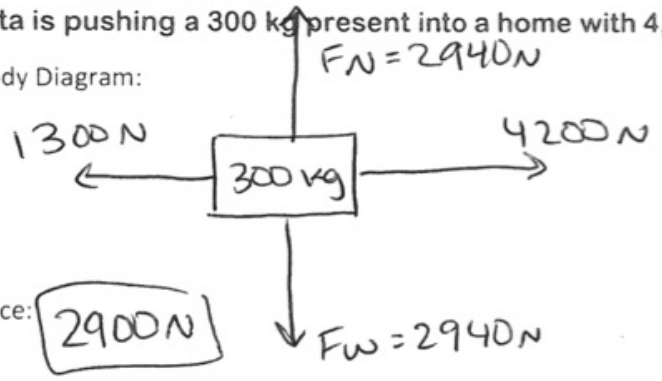
$1800N - 450N = 1350N$

$F_{net} = ma$

$1350N = 550kg(a)$

8. Santa is pushing a 300 kg present into a home with 4,200N of force. The frictional force is 1,300 N.

Free Body Diagram:



Net Force: 2900N

Acceleration: 9.67 m/s²

$F_W = mg$

$F_W = (300kg)(9.8)$

$2940N$

$F_{net} = F_A - F_f$

$4200 - 1300$

$F_{net} = 2900N$

$F_{net} = ma$

$\frac{2900N}{300} = \frac{300kg(a)}{300}$

$9.67\ m/s^2$