Practice for Proficiency
Introduction to $F_{net} = ma$

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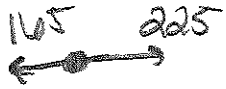
1. A 15kg rock is placed on a table with a light string attached. The string is given a pull and the rock accelerates up. Answer the following questions.
   a. Draw a force diagram of this scenario. Depict the rock simply as a dot and add the vectors. $F_g = 15 \cdot 10 = 150N$
   b. Calculate the net force. $\Sigma F = 200 - 150 = 50N$
   c. Calculate the acceleration of the rock. $\Sigma F = ma \quad a = \frac{\Sigma F}{m} \quad \frac{50}{15} = 3.3\ m/s^2$


Fa ≥ Fg
Arrow must touch dot

2. Two horizontal forces, 225 and 165 are placed on a 100kg canoe. The direction is not specified.
   a. What is the maximum net force and acceleration of the canoe?
   b. What is the minimum net force and acceleration of the canoe?

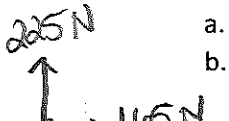

$a = \frac{\Sigma F}{m}$

$390N \quad \frac{390}{100} = 3.9 m/s^2$




$\Sigma F = 60N \quad a = \frac{60}{100} = 0.6 m/s^2$

3. Two forces are placed on a 100kg canoe. A 225N force Northward and a 165N force eastward.
   a. What is the net force on the canoe?
   b. What is the acceleration?





$a^2 + b^2 = c^2 \quad (225)^2 + (165)^2 = c^2 \quad a = \frac{\Sigma F}{m}$

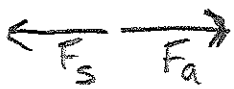
$c = 279N \quad \frac{279}{100} = 27.9\ m/s^2$

4. A net force of 10N acts on a hockey puck causing the puck to accelerate at 50m/s. Calculate the mass of the puck.

$\Sigma F = ma \quad \frac{\Sigma F}{a} = m \quad \frac{10}{50} = 0.2 m/s^2$

only 1 force

5. A 70.0kg astronaut pushes on a spacecraft with a force F in space. The space craft has a total mass of 1.0E4kg. During the push, the astronaut accelerates to the right with an acceleration of $0.36 m/s^2$. Determine the magnitude of the acceleration of the spacecraft.




$F = ma \quad 70 \cdot .36 = 25.2N$

$a = \frac{\Sigma F}{m} \quad \frac{25.2}{1000} = 0.025\ m/s^2$

6. A 400N rock is brought to planet Mercury. How much would it weight if the value of g is $3.6 m/s^2$.

Earth
$F = ma$
$400 = m\ 10$
$m = 40$

Mercury
$F = ma$
$40 \cdot 3.6 = 144N$