A Pokémon trainer pushes a bag of Pokéballs with a force of 115 N across a horizontal surface. The coefficient of friction between the bag and the surfaces 0.70. The bag accelerates at 4.7 m/s^2. What is the mass of the bag?

Golem uses strength to move a 100 kg boulder. The force he is able to apply is 900 N. Psyduck tries to help but instead pushes downwards with a force of 150 N. If the boulder accelerates at a rate of 6.8 m/s^2, determine the coefficient of friction between the boulder and the ground.

An elevator moving downwards at 1.4 m/s slows to a stop over a distance of 3.0 m. A 65 kg person in the elevator stands on a scale which shows force in Newtons.

a) What does the scale read?
b) Compared to when the elevator is at rest, is the scale reading greater, lower or the same? Use principles of physics to explain your answer.

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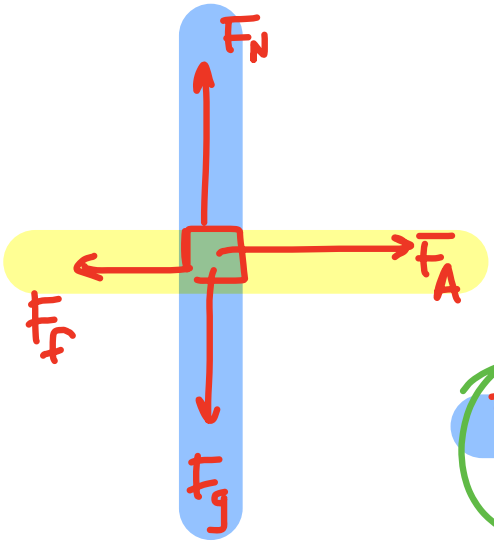

$F_N = F_g$

$= mg$

$F_{NET} = ma$

$F_A - F_f = ma$

$F_A - \mu F_N = ma$

$F_A - \mu mg = ma$

$F_A = ma + \mu mg$

$F_A = m(a + \mu g)$

$$m = \frac{F_A}{a + \mu g}$$

$$= \frac{115}{4.7 + (0.70)(9.8)}$$

$$= \boxed{9.95 \text{ kg}}$$

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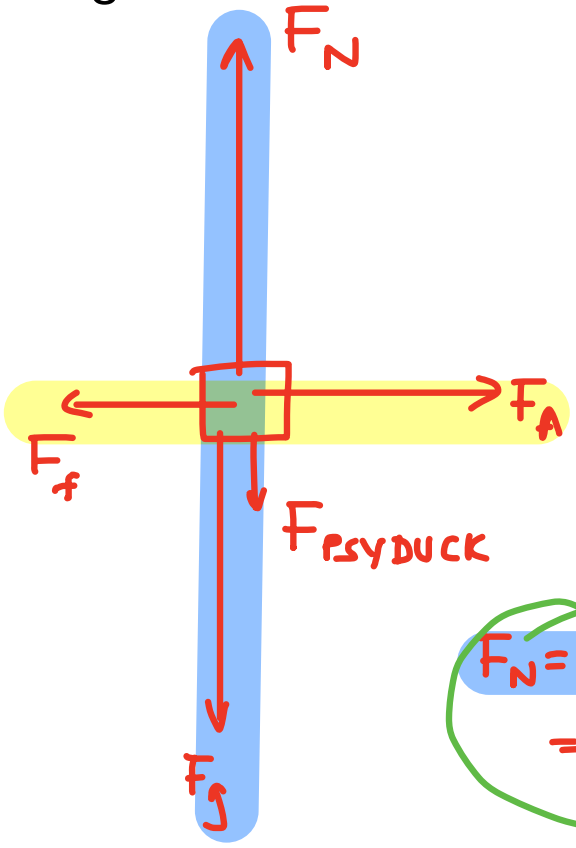


$F_{NET} = ma$

$F_A - F_f = ma$

$F_A - \mu F_N = ma$

$F_A - \mu(mg + F_{PSYDUCK}) = ma$

$F_N = F_g + F_{PSYDUCK}$

$= mg + F_{PSYDUCK}$

$$\mu = \frac{F_A - ma}{mg + F_{PSYDUCK}}$$

$$= \frac{900 - (100)(6.8)}{(100)(9.8) + 150}$$

$$= \boxed{0.195}$$

An elevator moving downwards at 1.4 m/s slows to a stop over a distance of 3.0 m. A 65 kg person in the elevator stands on a scale which shows force in Newtons.

a) What does the scale read?

$v_i = -1.4 \frac{m}{s}$

$v_f = 0$

$d = -3.0\ m$

$a = ?$

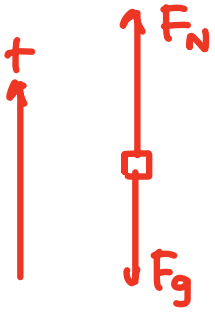
$v_f^2 = v_i^2 + 2ad$

$a = \frac{-v_i^2}{2d}$

$= \frac{-(-1.4)^2}{2(-3.0)}$

UP

$= +0.32\overline{6} \frac{m}{s^2}$



$F_{NET} = ma$

$F_N - F_g = ma$

$F_N - mg = ma$

$F_N = ma + mg$

$= m(a+g)$

$= 65(0.32\overline{6} + 9.8)$

$= \boxed{658\ N}$

b) Compared to when the elevator is at rest, is the scale reading greater, lower or the same? Use principles of physics to explain your answer.

GREATER

- WHEN HE IS AT REST, NEWTON'S FIRST LAW STATES THAT THE FORCES MUST BE BALANCED. BECAUSE THERE ARE ONLY TWO FORCES ACTING ON THE PERSON, THE NORMAL FORCE MUST BE EQUAL TO THE FORCE OF GRAVITY.

- WHEN HE IS MOVING DOWN SLOWING TO A STOP, HE HAS AN UPWARDS ACCELERATION. BY NEWTON'S SECOND LAW, THIS UPWARDS ACCELERATION MUST BE THE RESULT OF AN UPWARDS NET FORCE. BECAUSE THERE ARE ONLY TWO FORCES ACTING ON THE PERSON, AND BECAUSE THE FORCE OF GRAVITY DOES NOT CHANGE, THE NORMAL FORCE MUST INCREASE TO PROVIDE THE UPWARDS NET FORCE.