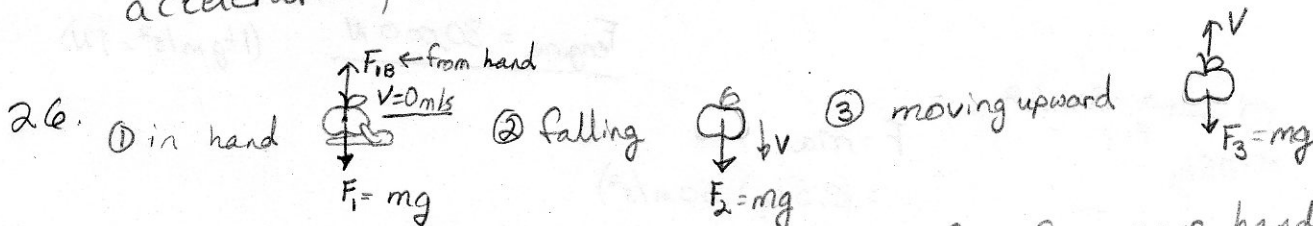


Concept: Ch 4: 2, 26, 30, 40

Prob: Ch 4: 4, 6, 17

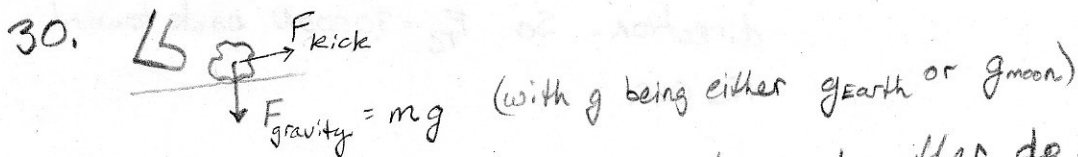
Conceptual

2. Yes, a force is exerted on you while moving at a constant speed in a circle. While moving in a circle, the direction you are travelling is constantly changing. Though your speed remains constant, velocity is both speed and direction. So having a changing direction means there is a changing velocity. By definition, a change in velocity over time is an acceleration. In order to have an acceleration, there must be a force causing it.



In case ①, the apple is at rest. There is a force from your hand cancelling out the force due to gravity on the apple. So in case ① the net force is zero.

In cases ② and ③ the only force acting on the apple is due to gravity. So, in both of these cases the net force on the apple is 2N.

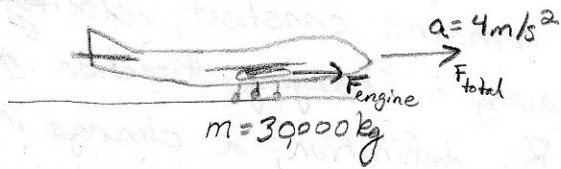


Forces that are perpendicular to each other do not affect each other. It does not matter whether the astronaut is on the moon or Earth since the force of the kick is perpendicular to the force due to gravity. The kick will hurt her foot the same in either place since the force on her foot is equal in magnitude to the force she exerted on the rock, just in the opposite direction. (This is Newton's 3rd Law)

40. The other member of the force pair is the force of the ball on the pitcher. It is equal in magnitude but in the opposite direction of the force the pitcher exerts on the ball.

Problems

4.



4 engines each with thrust F_{engine}

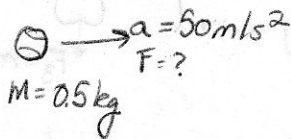
$$F_{\text{total}} = 4 \times F_{\text{engine}}$$

$$F_{\text{total}} = ma \Rightarrow ma = 4 \times F_{\text{engine}}$$

$$\Rightarrow F_{\text{engine}} = \frac{ma}{4} = \frac{30,000 \text{ kg} (4 \text{ m/s}^2)}{4}$$

$$\underline{F_{\text{engine}} = 30,000 \text{ N}} \quad (1 \text{ kg m/s}^2 = 1 \text{ N})$$

6.

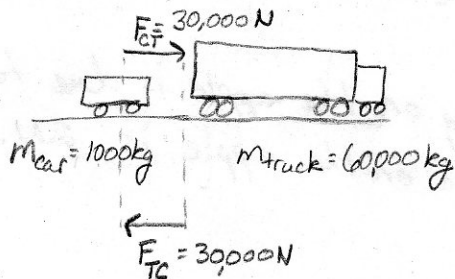


$$F = ma$$

$$= (0.5 \text{ kg}) (50 \text{ m/s}^2)$$

$$\underline{F = 25 \text{ N}}$$

17.



The force of the car on the truck is $30,000 \text{ N}$ towards the front of the truck. The force of the truck on the car is equal in magnitude but in the opposite direction. So $F_{T|C} = 30,000 \text{ N}$ back toward the car.