GED Science
Day 3

What do these words mean in relation to science?

Drawing conclusions: ???

Experiment: ???

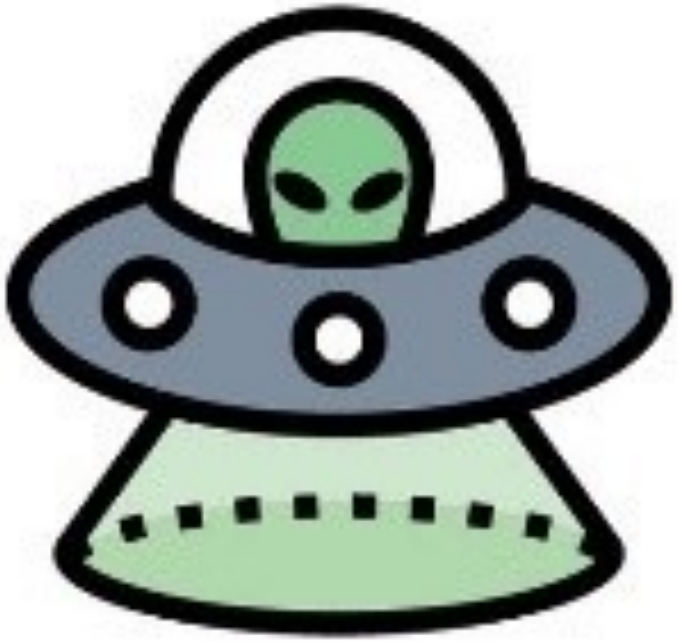
Trial: ???

Evidence: ???

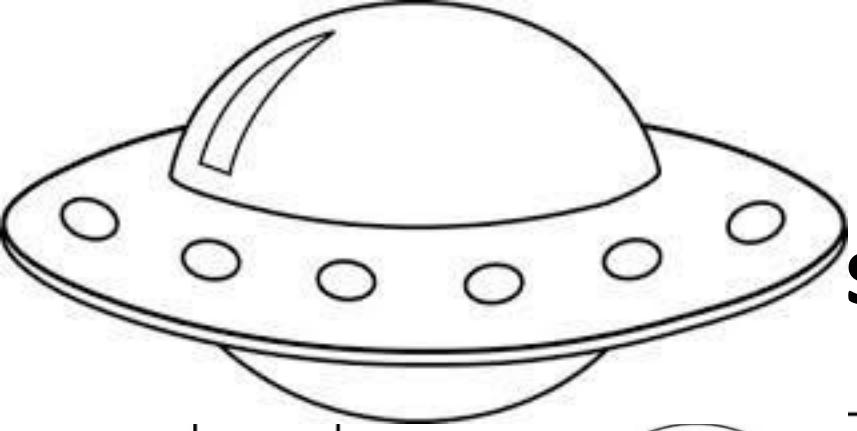
Drawing conclusions is looking at evidence and deciding what it means (what its significance is). In a science experiment, a trial is one repetition. The more repetitions, the more evidence you will have. More evidence will make drawing conclusions easier.

Newton’s Law of Motion

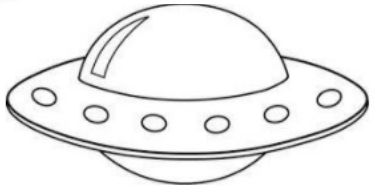
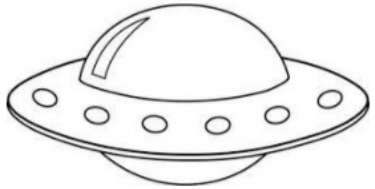
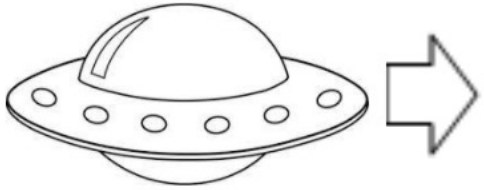
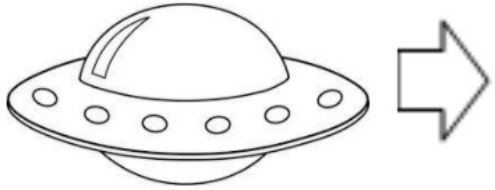
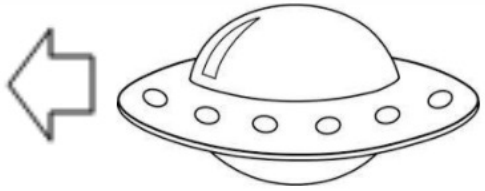
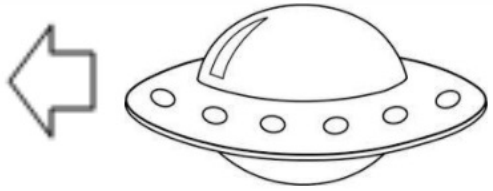
This is Isaac. Isaac is a space alien.



Isaac likes two things: flying in outer space in his spaceship and studying motion. He thinks, “Why can’t I do both?

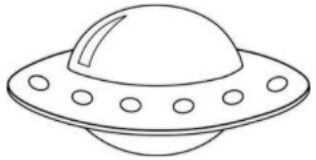
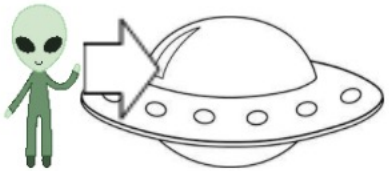
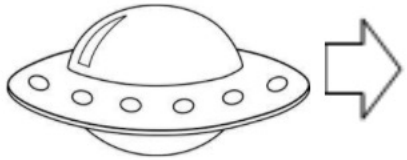
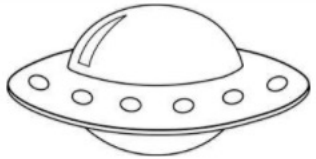
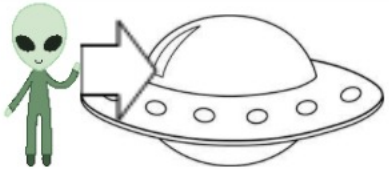
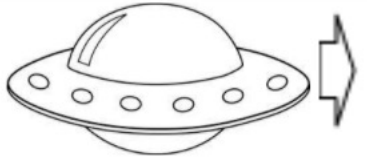
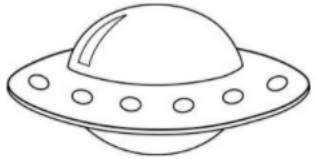
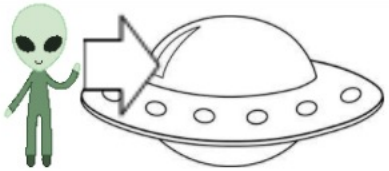
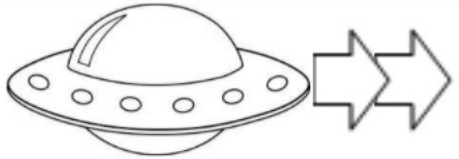


a series of <u>experiments</u> in outer spaceship. Below are his results:

Trial 1	 Isaac's spaceship is not moving.	Isaac does nothing.	 Isaac's spaceship is still not moving.
Trial 2	 Isaac's spaceship is moving to the right.	Isaac does nothing.	 Isaac's spaceship is still moving to the right.
Trial 3	 Isaac's spaceship is moving to the left.	Isaac does nothing.	 Isaac's spaceship is still moving to the left.

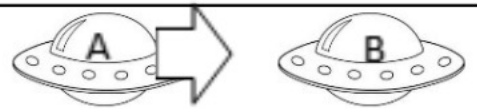
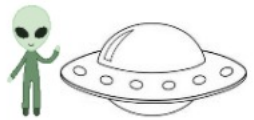
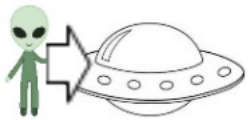
Based on Isaac's 1st experiment, <u>what conclusions can you draw</u> about the **motion of the spaceship**?

“That was fun!” thinks Isaac. He decides to do a second experiment with his spaceship. Here are the results of his 2nd experiment:

Trial 1	 Isaac’s spaceship has a mass of 100kg.	 Isaac pushes the spaceship to the right.	 Isaac’s spaceship is now moving to the right.
Trial 2	 Isaac puts bricks inside his spaceship. Now its mass is 200kg.	 Isaac pushes the spaceship to the right.	 Isaac’s spaceship is now moving to the right, but only half as much.
Trial 3	 Isaac takes out the bricks and removes the roof of his spaceship. Now its mass is only 50kg.	 Isaac pushes the spaceship to the right.	 Isaac’s spaceship is now moving to the right, but it is going twice as fast as the first trial.

Based on the results of the 2nd experiment, what new conclusions can you draw about motion?

Isaac decides to do one final experiment. In the first two trials, he uses two spaceships, Spaceship A and Spaceship B. The spaceships are identical (the same in every way). Here are the results of his 3rd experiment:

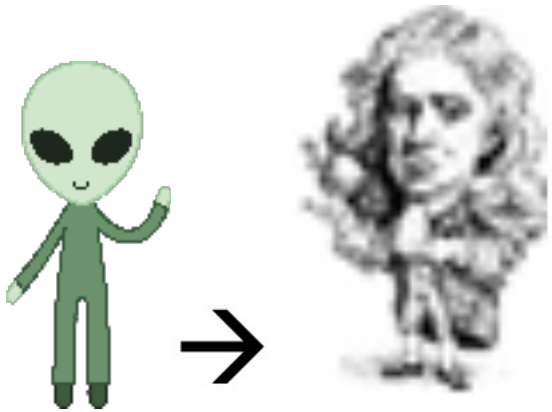
Trial 1	 Spaceship A is moving to the right. Spaceship B is not moving. 	 They collide!	 Now Spaceship B is moving to the right. Spaceship A is not moving. 
Trial 2	 Spaceship A is moving to the right. Spaceship B is moving to the left.	 They collide!	 Now Spaceship A is moving to the left. Spaceship B is moving to the right.
Trial 3	 Isaac is floating in outer space, holding his spaceship. The spaceship has more mass than him. They are not moving.	 Isaac pushes the spaceship away from him to the right.	 The big spaceship floats slowly to the right, but little Isaac floats quickly to the left.

Based on the results of the 3rd experiment, what new conclusions can you draw about motion?

Congratulations! You just learned about **Newton's 3 Laws of Motion**!!!

- **Sir Isaac Newton** was an English mathematician and scientist. He lived from 1643 to 1727. He made many discoveries, including calculus and a theory of gravity. Below, you can learn more about his laws (rules) of motion.

Sadly, Isaac Newton was not a space alien.



1st Law of Motion:

"Objects in motion tend to stay in motion, and objects at rest tend to stay at rest, unless acted upon by an unbalanced force."

- *At rest* means *not moving*
- This law means that objects want to keep doing the same thing.
- If it's moving, it keeps moving.
- It it's not moving, it stays still.
- The law is sometimes called "the Law of Inertia"
- This is similar to Isaac the Alien's 1st experiment.
- When Isaac does not interact with the spaceship, there is no change in motion.

2nd Law of Motion:

“Force equals mass times acceleration.” (F = ma) .”

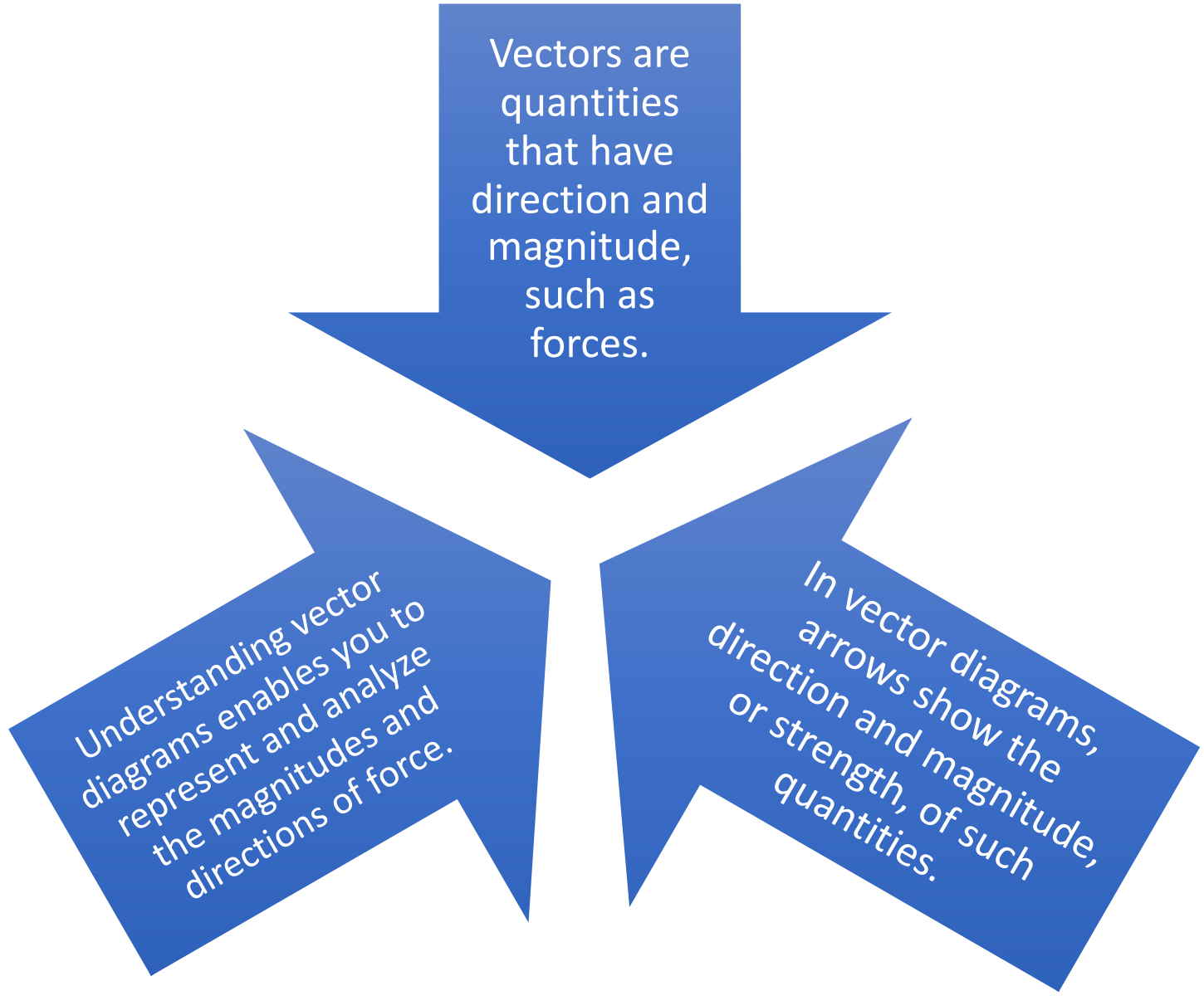
- *Acceleration* means a *change in speed*.
- This law means that using *more force* means *more acceleration*.
- Also, *more mass* means *less acceleration*. / *Less mass* means *more* acceleration.
- This is similar to Isaac the Alien’s 2nd experiment.
- He always pushes with the same force, but the spaceship’s acceleration depends on its mass.

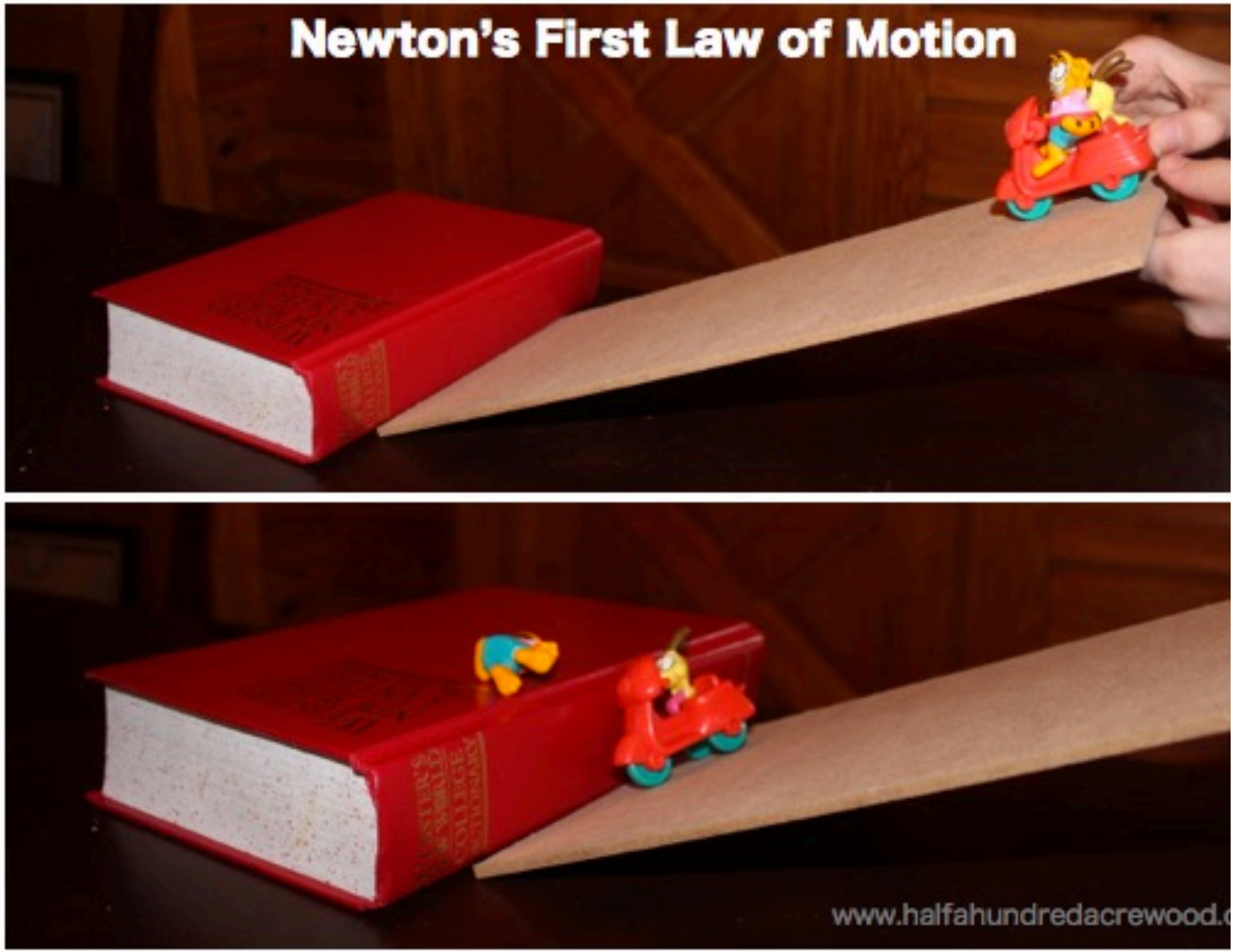
3rd Law of Motion:

“For every action, there is an equal and opposite reaction.”

- This means that every time a force affects an object, that object pushes back with the same force.
- This is similar to Isaac the Alien’s 3rd experiment.
  - In Trial 1, the force from Spaceship A makes Spaceship B go to the right. However, Spaceship B pushes back against Spaceship A, so Spaceship A stops moving.
  - In Trial 2, each spaceship pushes against the other. They bounce off and go backwards.
  - In Trial 3, Isaac pushes his spaceship to the right. It moves a little bit to the right, but it pushes back on Isaac. Because Isaac has much less mass, he moves faster to the left (because of the 2nd Law of Motion).

Understand Vector Diagrams

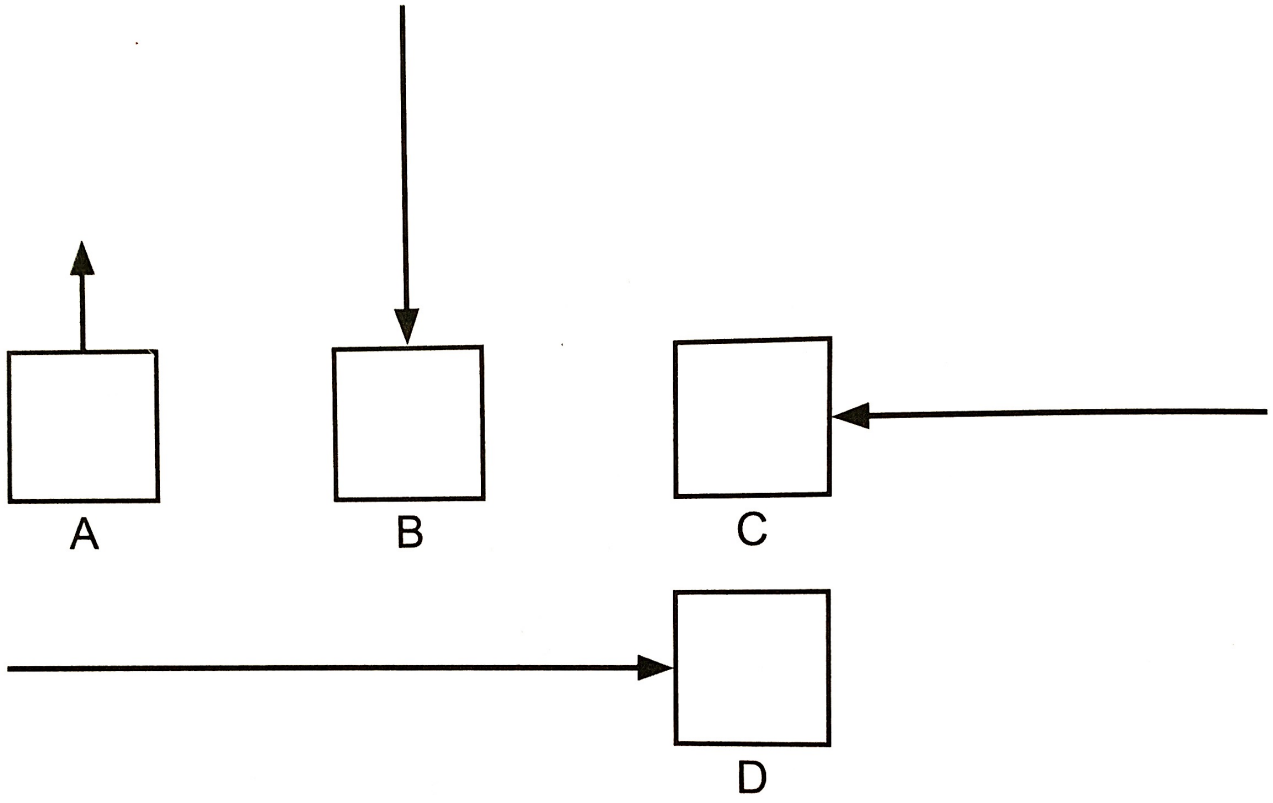




Thinking about Newton's 1st law of motion…

- A force can be measured in newtons (N) and is described by both its magnitude and its direction, as in "10 N downward"

Vector diagrams can be used to show the magnitudes and directions of forces. The diagram shows four objects of equal mass at rest and a force that is acting on each of them. One of the forces is pulling a force; the others are pushing forces.



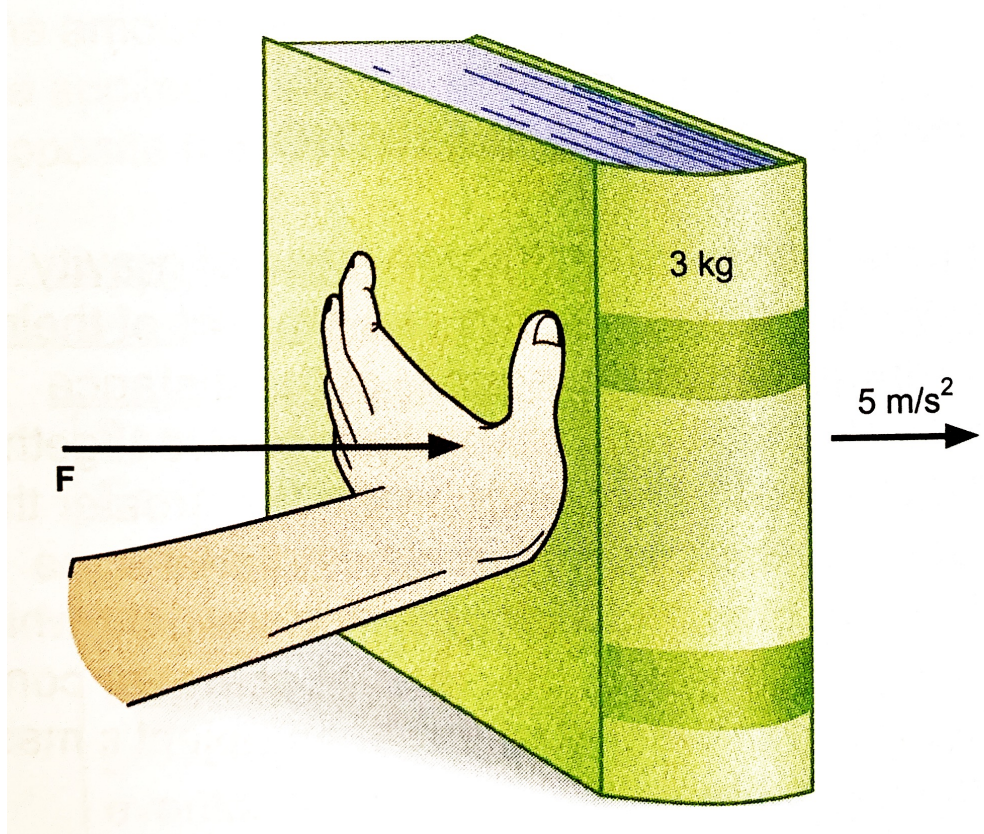
1. The magnitudes of the forces shown in the diagram are 2 N, 7 N, 9 N, and 15 N. Which force has a magnitude of 7 N?

A. Force A
B. Force B
C. Force C
D. Force D

DIRECTIONS: Study the information and diagram, read each question, and choose the **best** answer.

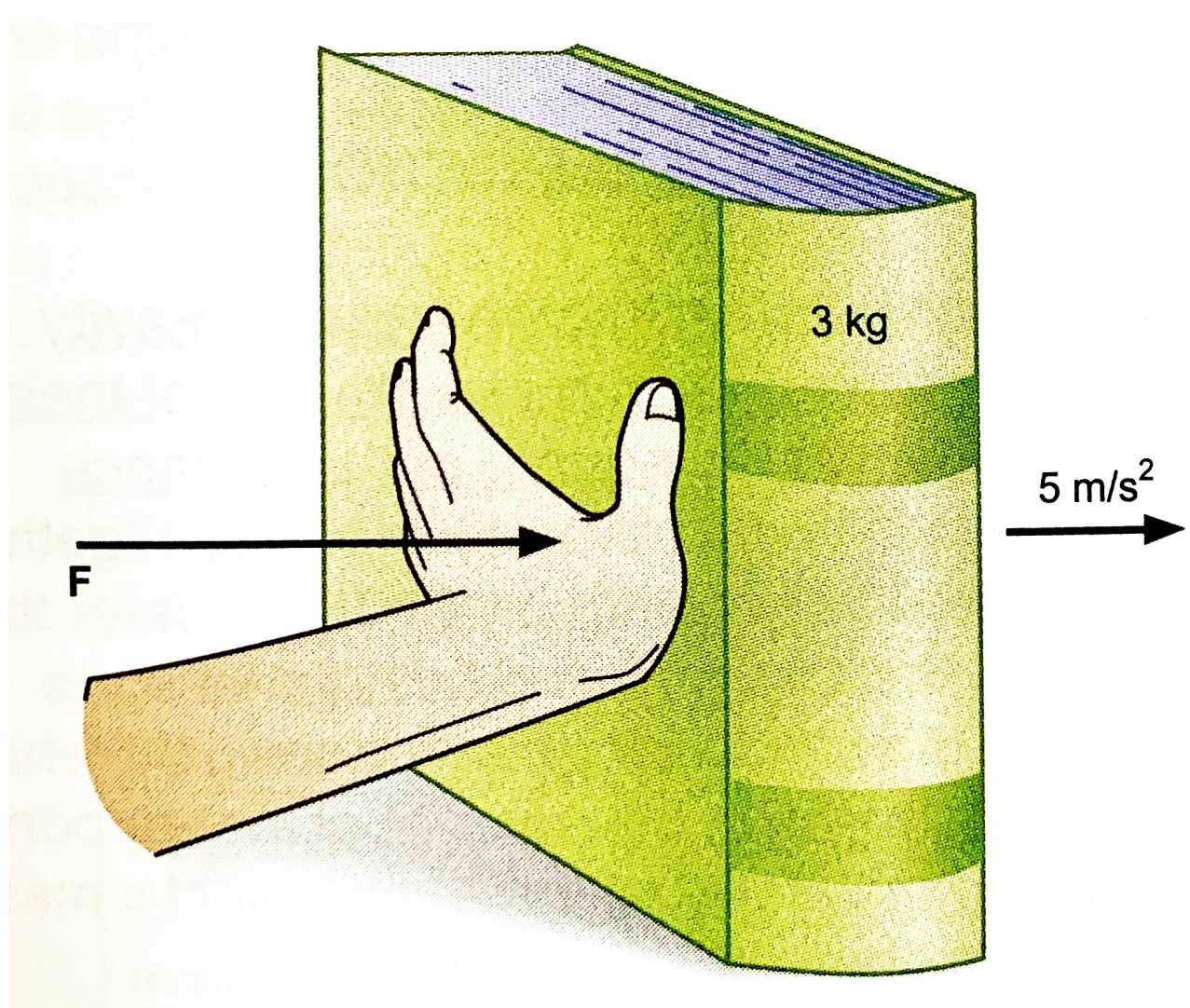
NEWTON'S SECOND LAW AND VECTORS

Newton's second law of motion states that the net force on an object equals the mass of the object multiplied by the object's acceleration. This can be written as ***F = ma,*** where ***F*** represents the net force, ***m*** represents the object's mass, and ***a*** represents the object's acceleration. The diagram below represents the second law of motion and shows the object's mass in kilograms (kg) and its acceleration in meters per second squared (m/s^2).



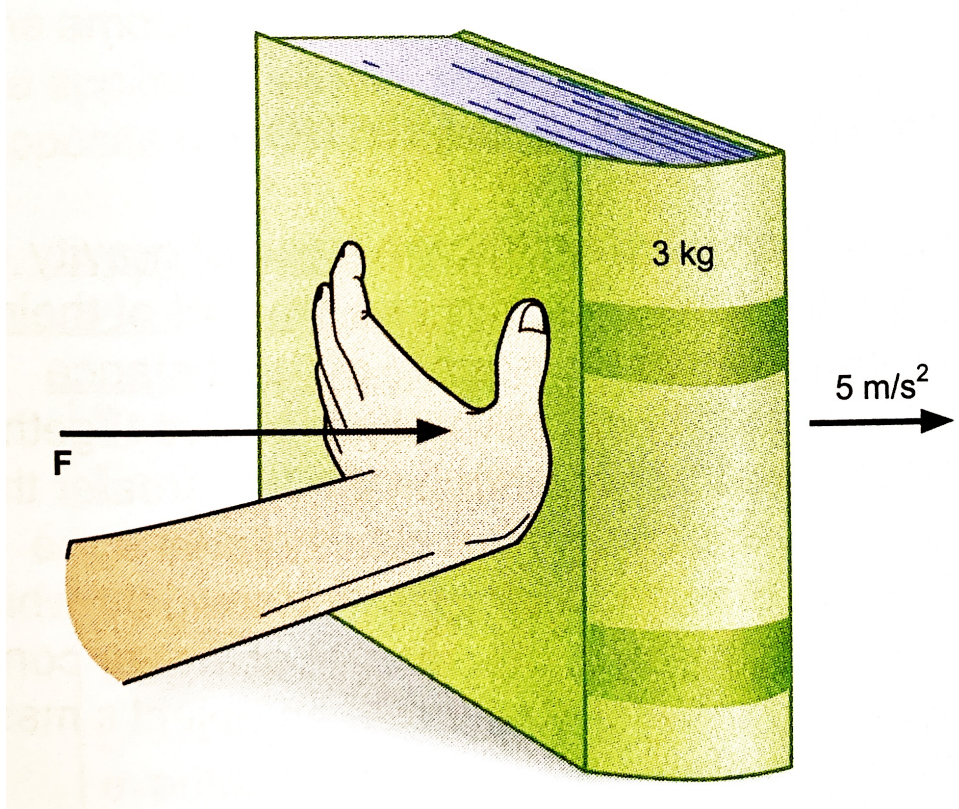
2. The diagram shows a force being applied toward the right. How much force is being applied?

A. 0.6 N
B. 3 N
C. 8 N
D. 15 N



3. If a person were to apply the same force to move a book having a greater mass, how would the arrows representing the vectors for force and acceleration change in the diagram?

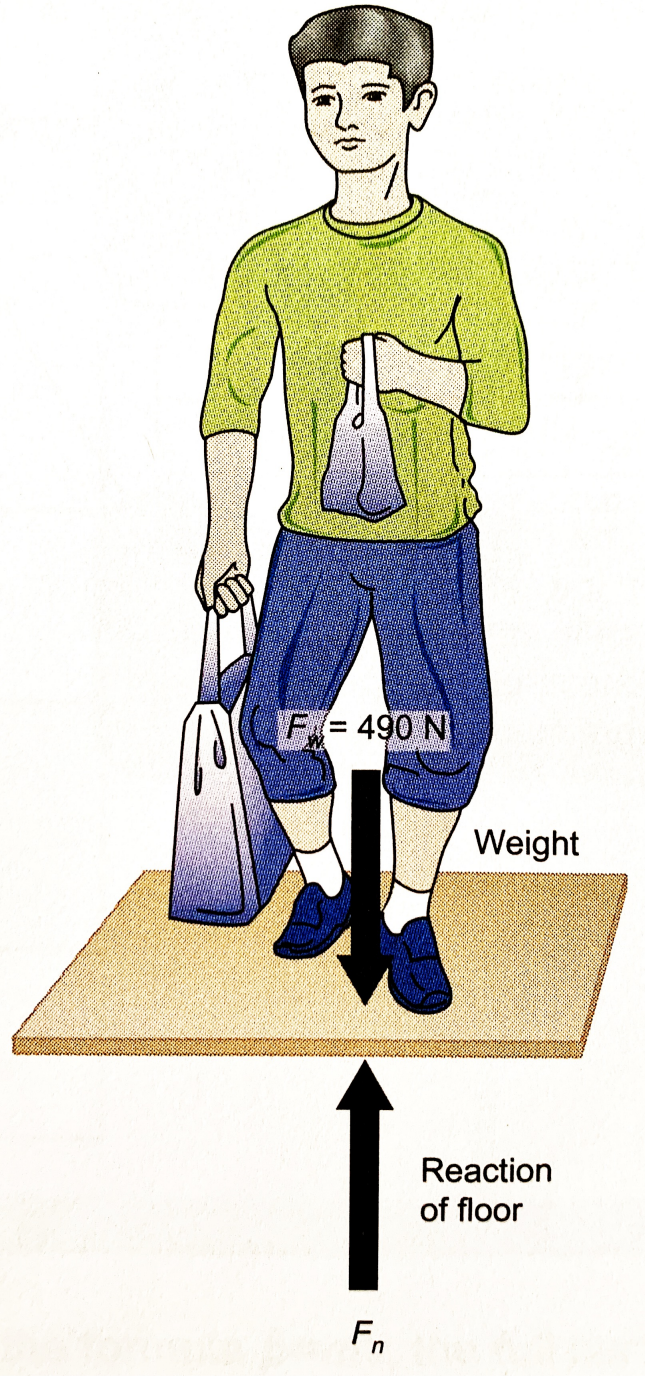
A. The arrow showing force would be shorter, and the arrow showing acceleration would be longer.
B. The arrow showing force would not change, and the arrow showing acceleration would be shorter.
C. The arrow showing force would not change, and the arrow showing acceleration would be longer.
D. The arrow showing force would be longer, and the arrow showing acceleration would be shorter.



NEWTON'S THIRD LAW AND VECTORS

Newton's third law of motion states that for every force there is an equal and opposite force. For example, when a person stands on the floor, the person's weight pushes down on the floor. To hold the weight, the floor pushes up on the person's feet with an equal and opposite force.

In the diagram below, the person has a mass of 50 kg. The force he exerts on the floor is equal to his weight. Near Earth's surface, an object's weight is equal to its mass in kilograms times 9.8. Therefore, the force the person exerts is 50 kg x 9.8, or 490 N.

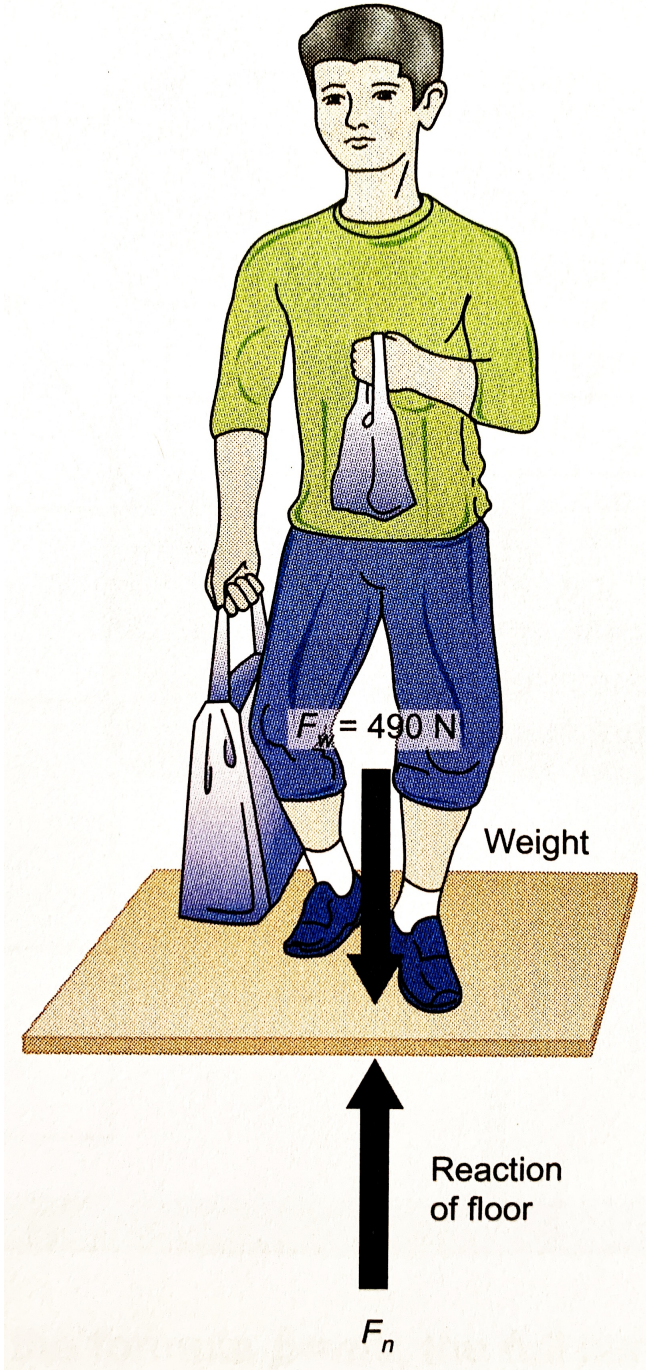


4. What is the value of F_n?

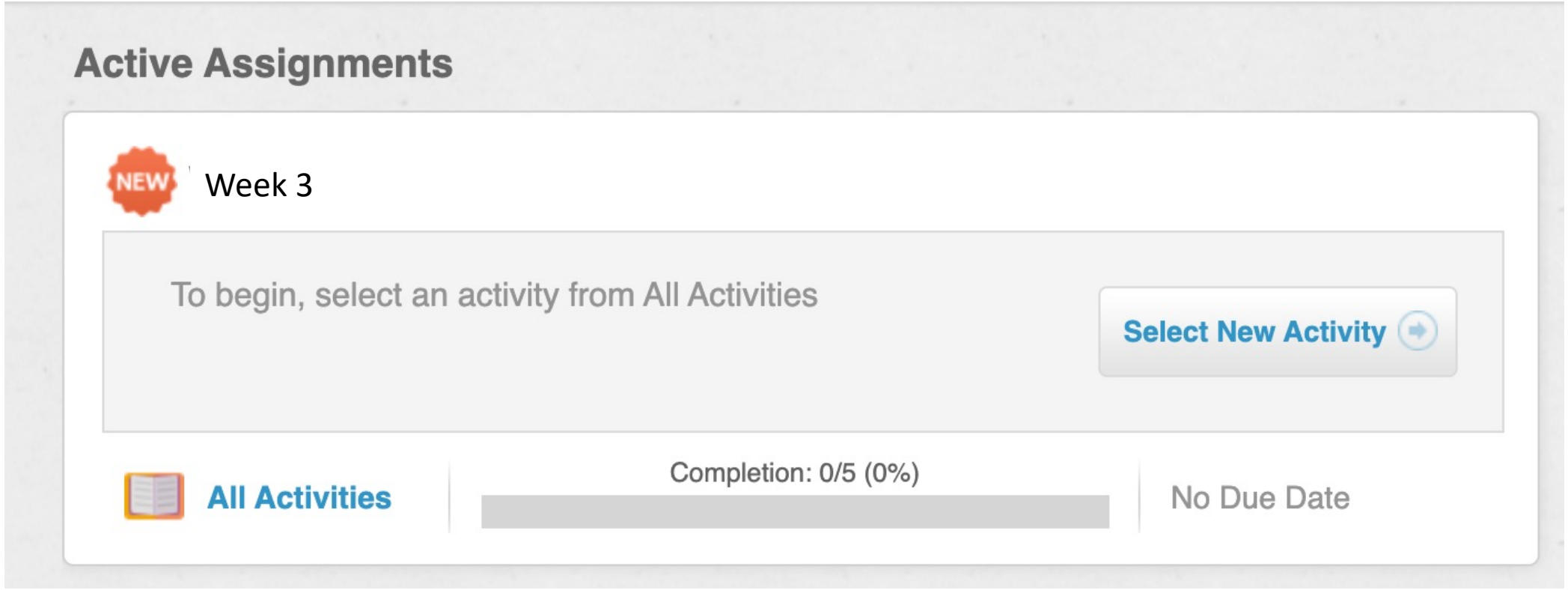
A. 9.8 N
B. 19.6 N
C. 50 N
D. 490 N

5. What is the value of F_n for a person who has a mass of 65 kg?

A. 9.8 N
B. 65 N
C. 637 N
D. 1,274 N



Homework!


Active Assignments
NEW
Week 3
To begin, select an activity from All Activities
Select New Activity
All Activities
Completion: 0/5 (0%)
No Due Date