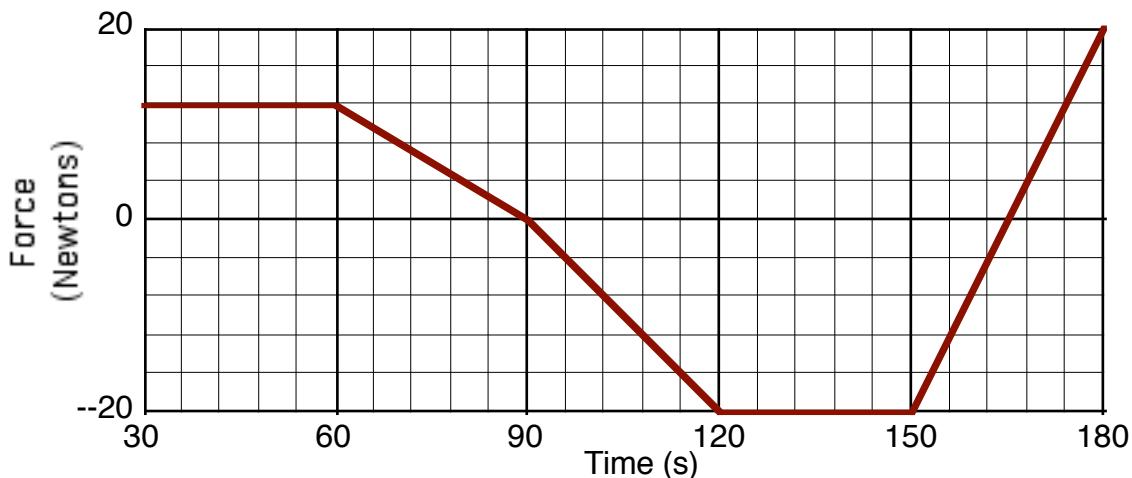


Impulse Graph

K

Calvin & Hobbes, 45 kg, are sleigh riding down a hill. The hill they are on is irregular shaped, slopes up and down and has snow of varying depths and textures. Below is a force vs. time graph of the force acting on their sled. The initial velocity when they hit the part of the hill depicted on the graph at 11 m/s.

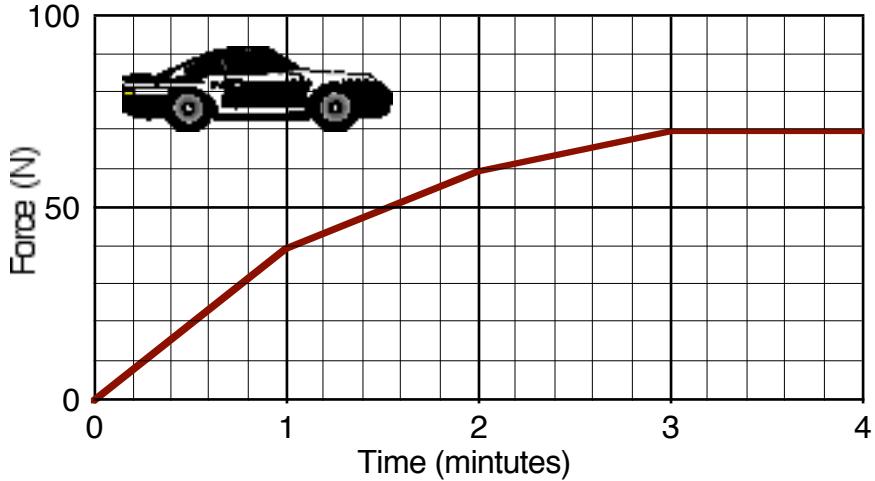


- (a) How do you find the impulse from 30 to 60 seconds?
- (b) Which 30 seconds time interval contains a net negative impulse?
- (c) What is the impulse from 30 to 60 seconds?
- (d) What is the impulse from 90 to 120 seconds?
- (e) What is the impulse from 150 to 180 seconds?
- (f) Using the information from text above combined with the graph; calculate the final velocity **at the 60-second mark**.
- (g) Calculate the final velocity **at the 120-second mark**.
- (h) Calculate the final velocity at the end of the ride?
- (i) What was the average velocity for the entire ride?
- (j) What is the (average) acceleration over the entire ride?
- (k) What must the initial velocity be so that Calvin and Hobbes come to a rest at the end of the ride?

Impulse Graph

2

A toy car, 3.0 kg exerts the force shown on the graph. This is the world's fastest child's toy.

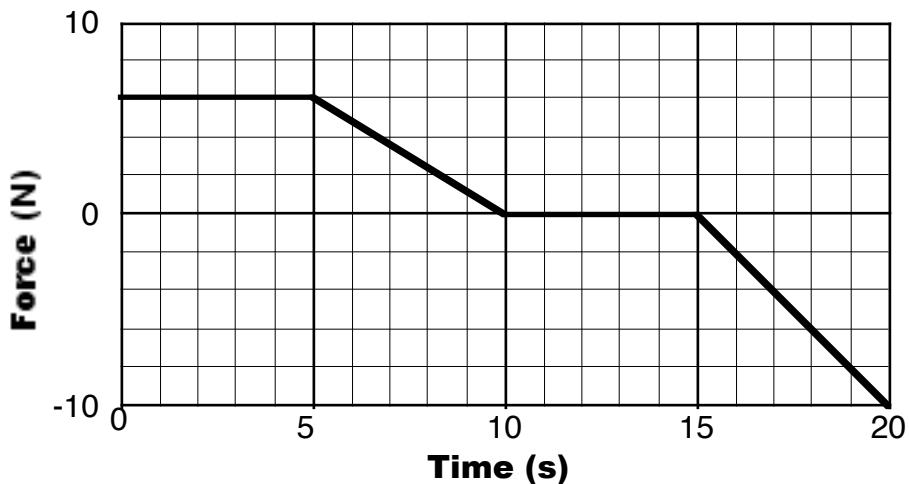


Express all answers in standard S.I. units.

- What is the change in speed from 1 to 2 minutes?
- What is the change in speed from 2 to 3 minutes?
- If the final velocity at 3 minutes is 10 m/s, then what is the initial velocity at 2 minutes?
- If the initial velocity is of the car is 5 m/s at 1 minute, then what is the velocity of the car at 2 minutes?
- If the car starts from rest at 0 minutes, then what is the velocity of the car after the first 4 minutes?
- What is the momentum of the car at 3 minutes if the car started from rest?

Impulse Graph

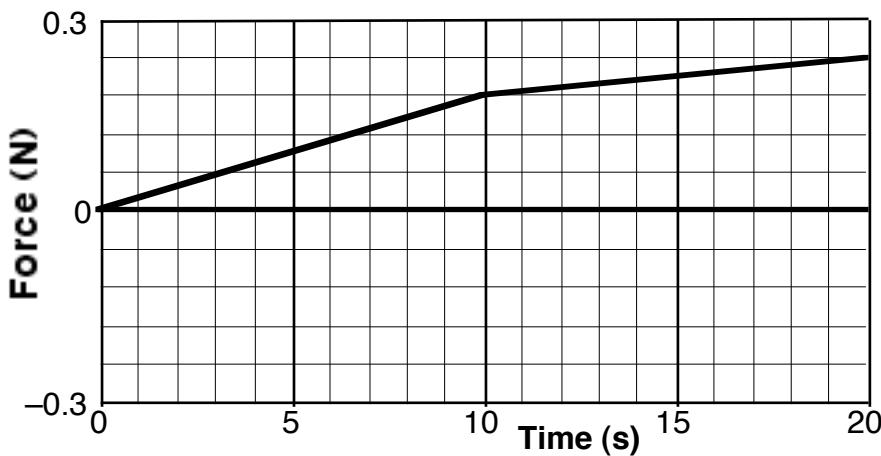
To the right is a force versus time graph for a child's toy car. The toy is malfunctioning and is producing the force shown.



37 What is velocity of the toy car, 0.756 kg, after 20 seconds if it starts from rest?

38 What is velocity of the toy car, 0.756 kg, after 20 seconds if it starts from 10 m/s?

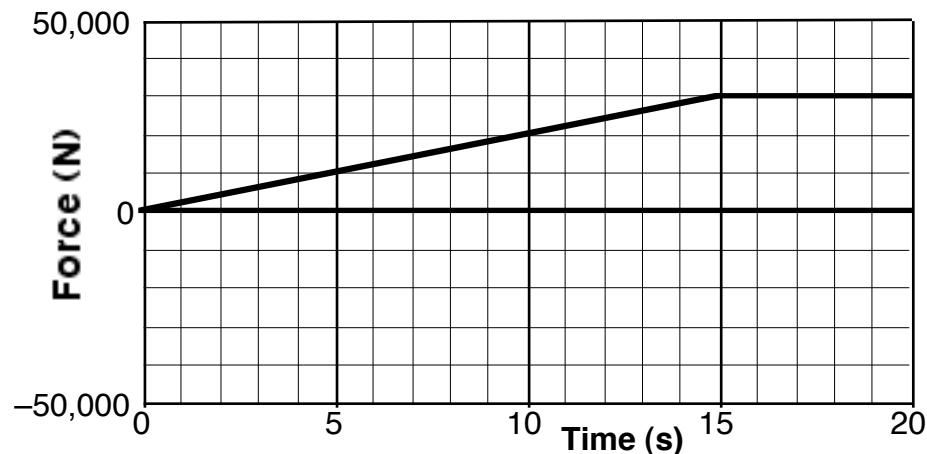
To the right is a force versus time graph for a child's toy dart gun. The toy is malfunctioning and is producing the force shown.



39 What is the mass of the dart if the change in velocity is 25 m/s during the 20 s?

To the right is a force versus time graph for an automobile.

40 If the partially loaded tractor trailer truck is traveling 20 m/s when a force accelerated it to 30 m/s

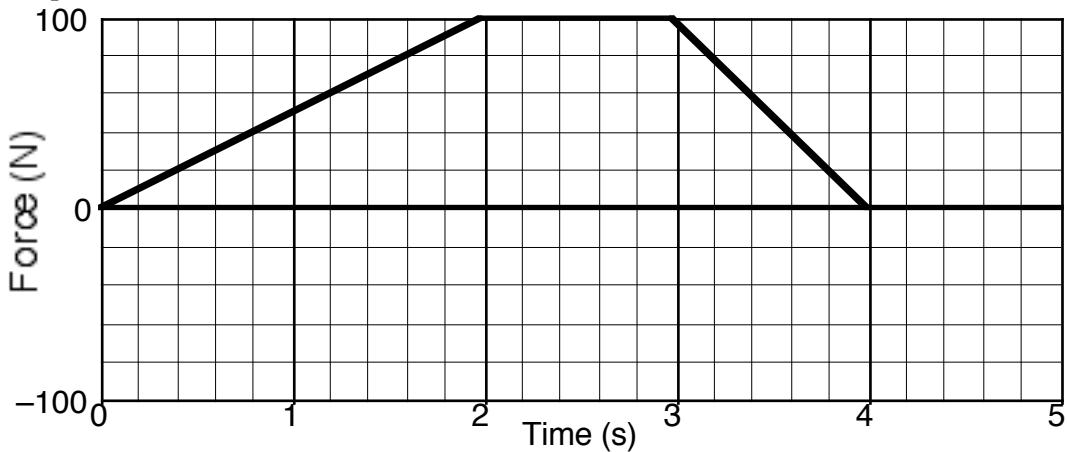


Impulse Graph

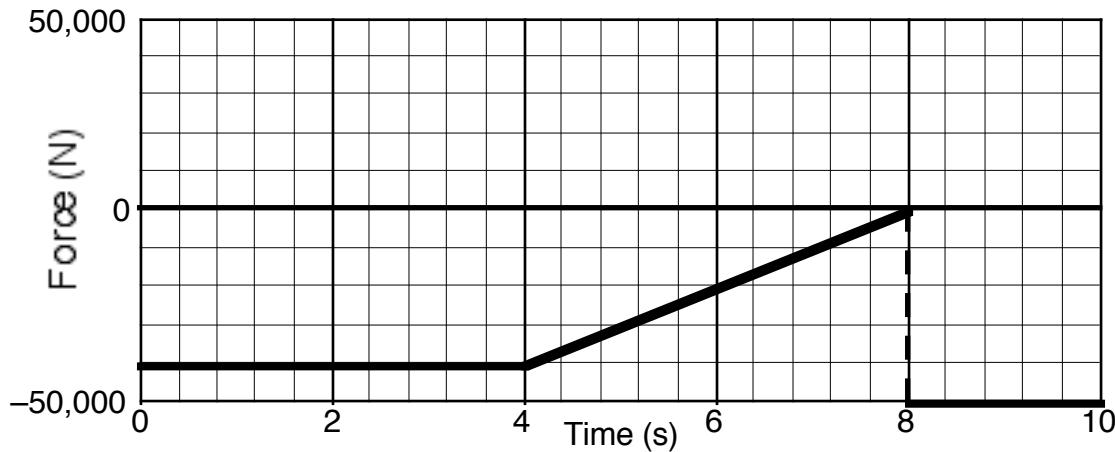
after 15 seconds, then what is the mass of the truck?

Impulse Graph

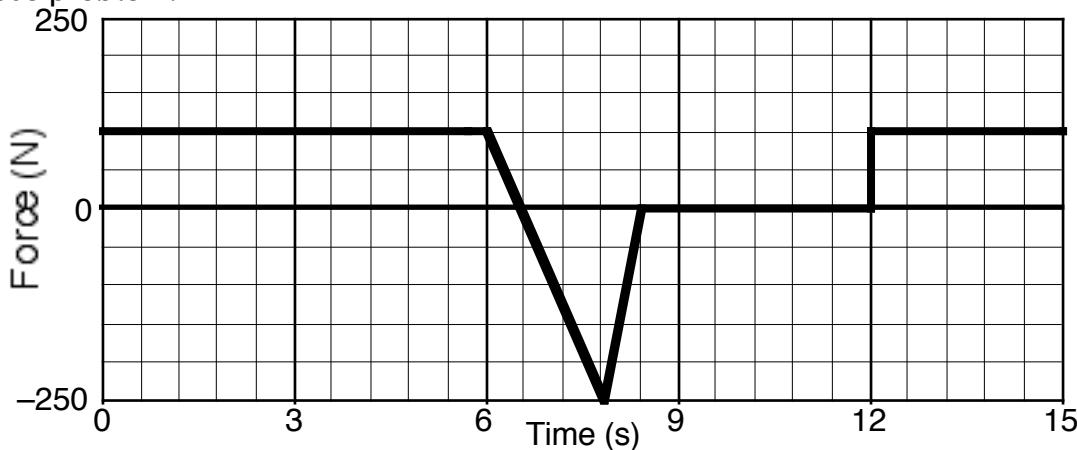
5



50. A toy car experiences the force graph above as it travels from 2 m/s to 20 m/s during the first 3 seconds of the graph. What is the mass of the car?



51. A large truck slows down according to the force graph above. The car's initial velocity is 35 m/s. After 10 seconds, what is the truck's final velocity if its mass is 11,000 kg?
52. What is the magnitude of the average force that slowed the truck mentioned in the previous problem?



53. A device shoots a heavy rock. The device is very dramatic and takes 15 seconds to launch the rock according to the force graph above. If the rock has a mass of 50 kg, then what is the change in velocity of the rock across after the 15 seconds above?
54. How much force did this take?

