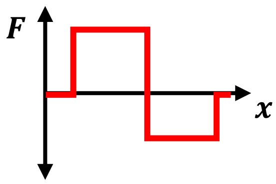
CONCEPT: CALCULATING IMPULSE FROM FORCE VS. TIME GRAPHS

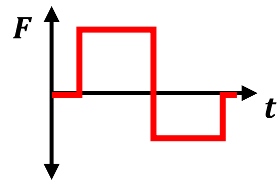
● You'll need to know how to calculate **Impulse** when given an F vs. t graph.



$W = F\Delta x$

● Area under the F vs. x graph ⇒ **WORK**

- Areas *above* **x** axis ⟶ **[+ | –]** Work
- Areas *below* **x** axis ⟶ **[+ | –]** Work

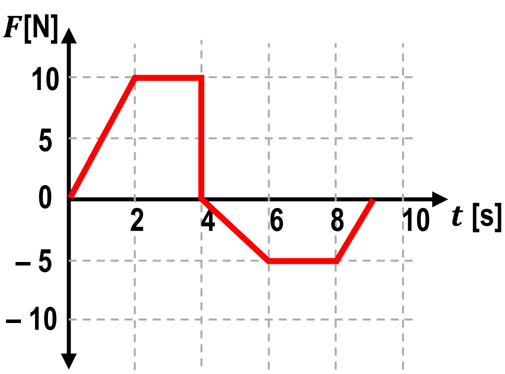


$J = F\Delta t$

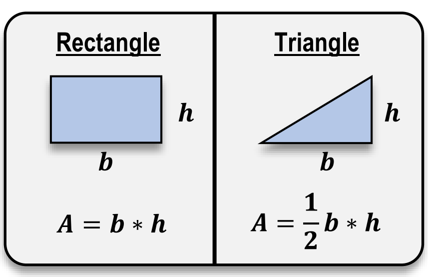
● Area under the F vs. t graph ⇒ ____________

- Areas *above* **x** axis ⟶ **[+ | –]** Impulse
- Areas *below* **x** axis ⟶ **[+ | –]** Impulse

EXAMPLE: A remote-controlled toy car moves forwards and backwards along the x-axis, and the electric motor supplies a changing force as shown by the graph below. **a)** Calculate the impulse delivered to the toy car. **b)** If the car has a mass of 2kg and starts from rest, calculate the final speed of the toy car.

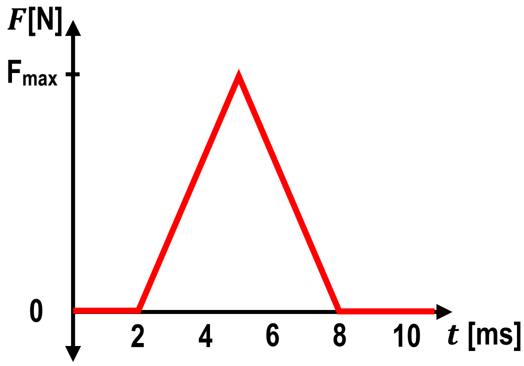


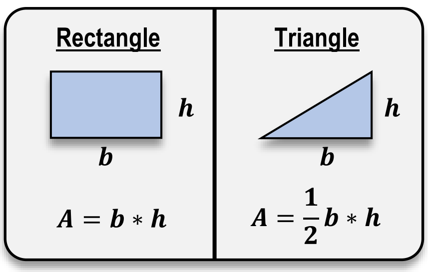
MOMENTUM
$p = mv$
$J = F\Delta t = \Delta p = mv_f - mv_0$



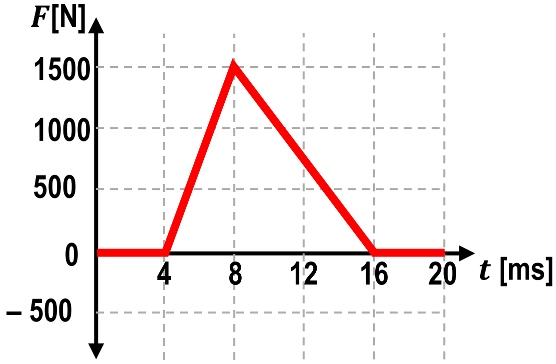
PROBLEM: An object experiences a force given by the graph below. What value of Fmax would give an impulse of 6 N·s?

MOMENTUM
$p = mv$
$J = F\Delta t = \Delta p = mv_f - mv_0$





PROBLEM: When you hit a baseball with a baseball bat, you exert an enormous amount of force in a very short time. A graph of the Force vs. time for this situation is shown below. **a)** Calculate the impulse delivered to the baseball. **b)** If the baseball is initially at rest and has a mass of 200 g, calculate the final speed of the baseball after the impulse.



MOMENTUM
$p = mv$ $J = F\Delta t = mv_f - mv_0$