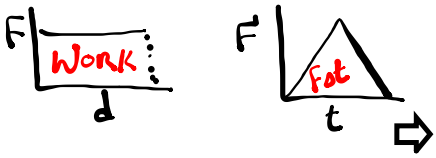
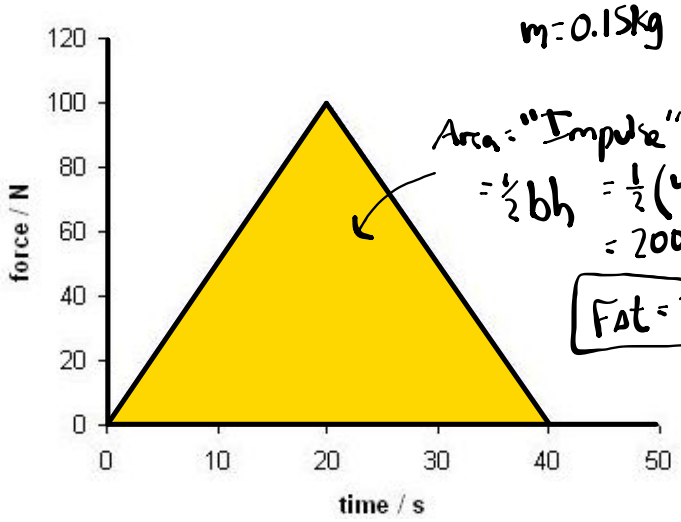
L03 – Impulse Graphs



In a force-time graph, the area under the line is the impulse.

$\vec{F}\Delta t$

Q3: An object of mass 0.15kg is initially at rest. A variable force, as depicted below, is applied to the object. Its final speed is ***a*.*bc*** x10^{d}, where ***a***, ***b***, ***c***, and ***d*** are ____, ____, ____, and ____.



$m = 0.15kg$

Area = "Impulse"

$= \frac{1}{2}bh = \frac{1}{2}(40)(100)$

$= 2000\,Ns$

$F\Delta t = 2000\,Ns$

1	3	3	4

$F\Delta t = m\Delta v$

$2000 = (0.15)\Delta v$

$\Delta v = 13,333.\overline{3}\ m/s$

$v_i = 0$

$v_f = 1.33 \times 10^{4}\ m/s$

$a.bc \times 10^{d}$

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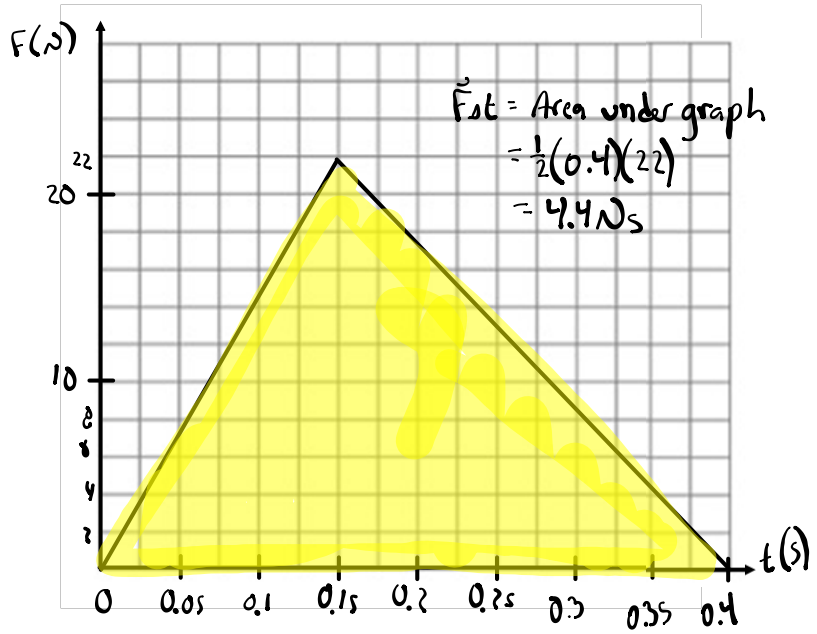
Q4: Draw a graph of net force as a function of time for a 0.650 kg basketball being shot. During the first 0.15 s, F_{Net} increases linearly from 0 N to 22 N. During the next 0.25 s, F_{Net} decreases linearly to 0 N.



The impulse acting on the basketball is ***a*.*bc*** x10^{d}, where ***a***, ***b***, ***c***, and ***d*** are ____, ____, ____, and ____.

$F_{net} = 4.4\ Ns$

4.40×10^{0}

$a.bc \times 10^{d}$

4	4	0	0

The final speed of the basketball is _____ x 10^{w} m/s.

(Record your **two-digit answer** in the numerical-response section on the answer sheet.)

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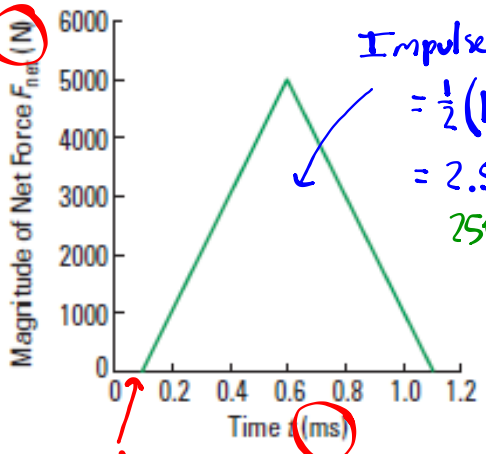
Q5: Looking at Example 9.4 on Pg 462, why must you be careful when solving this problem?

Example 9.4

A golfer hits a long drive sending a 45.9-g golf ball due east. Figure 9.22 shows an approximation of the net force as a function of time for the collision between the golf club and the ball.

(a) What is the impulse provided to the ball?

(b) What is the velocity of the ball at the moment the golf club and ball separate?



Newtons

Impulse = Area

$= \frac{1}{2}(1.0\times10^{-3})(5000)$

$= 2.5\ Ns$

2500

Doesn't start at zero

$\times10^{-3}$ s

$F_{net} = ma$

$2.5 = (0.0459)\,\Delta v$

$\Delta v = 54.466\ m/s$

$v_f = 5.45\times10^{1}\ m/s\ [E]$

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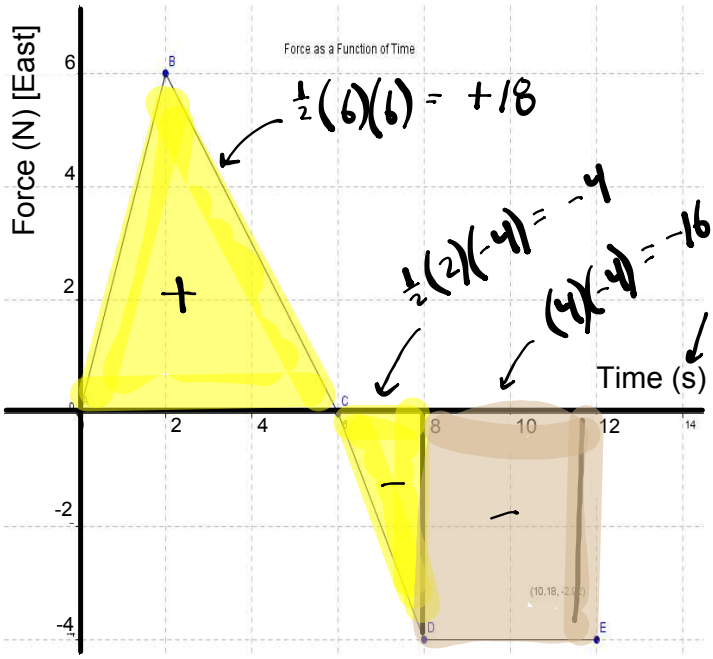
Q6: An object of mass 2.0 kg experiences a variable force, as depicted below. The impulse of this graph is is _____ x 10^{w} Ns.

$\vec{F}\Delta t = 2.00 \times 10^{0}\ Ns\ [W]$

(Record your **two-digit answer** in the numerical response section on the answer sheet.)

2	.	0	



Q7: If the object were initially travelling at 15m/s [E], the final velocity of the object is ***a*.*bc*** x10^{d}, where ***a***, ***b***, ***c***, and ***d*** are _____, _____, _____, and _____.

$\vec{F}\Delta t = m\Delta v$

$2\ Ns\ [W] = (2kg)\Delta v$

$\div 2 \quad \div 2$

$\Delta v = 1\ m/s\ [W]$

$\vec{F}\Delta t = +18 - 4 - 16$

$= -2\ Ns\ [E]$

$= +2\ Ns\ [W]$

$\vec{v}_i = +15\ m/s\ [E]$

$\Delta\vec{v} = -1\ m/s\ [E]$

$\vec{v}_f = ?$

$\Delta\vec{v} = \vec{v}_f - \vec{v}_i$

$-1 = v_f - (+15)$

$-1 = v_f - 15$

$+15 \quad +15$

$+14 = v_f$

$\vec{v}_f = 14\ m/s\ [E]$

$a.bc \times 10^{d}$

1.40×10^{1}

1	4	0	1