Velocity Time Graph Practice
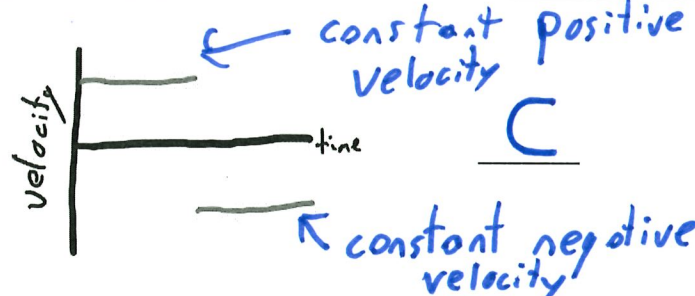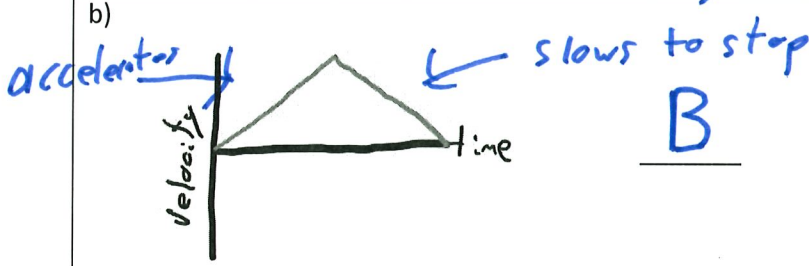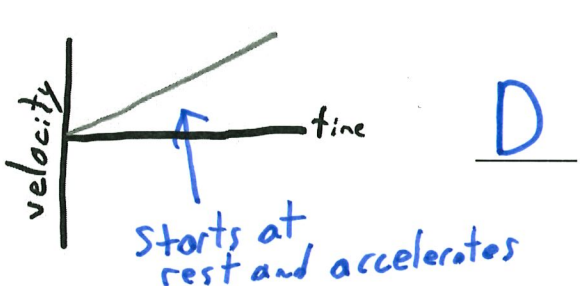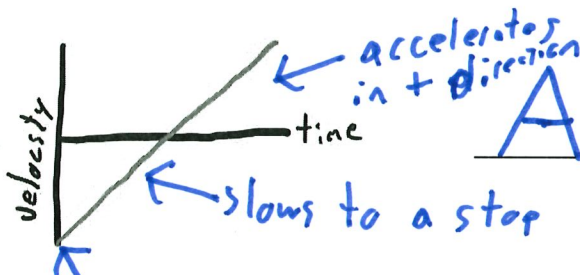
Name:_____

1. Match the following velocity time graphs with descriptions of the motion.

| Graph	Description
a) velocity ← constant positive velocity time **C** ← constant negative velocity	**A:** Starts moving in the negative direction, slows to a stop and accelerates in the positive direction.
b) accelerates velocity ← slows to stop time **B**	**B:** Starts at rest, accelerates in the positive direction, and then slows to a stop.
c) velocity time **D** starts at rest and accelerates	**C:** Starts moving with a constant velocity in the positive direction, immediately turns around the starts moving with the same speed in the negative direction
d) velocity ← accelerates in + direction time **A** ← slows to a stop starts with negative velocity	**D:** Starts at rest and accelerates in the positive direction

Velocity Time Graph Practice

Name:_____

2. Sketch a velocity time graph, with values labelled for each of the following situations:
   a. An object moves with a constant velocity of 5.0 m/s for 15 seconds.
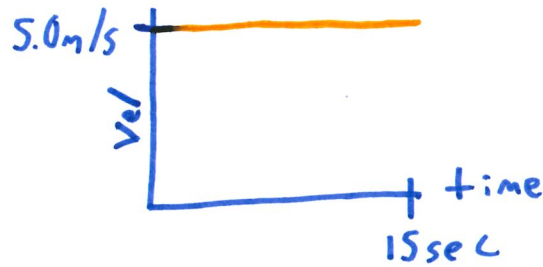
   b. An object starts at rest and accelerates at a constant rate to a velocity of 15.0 m/s after 15 seconds.
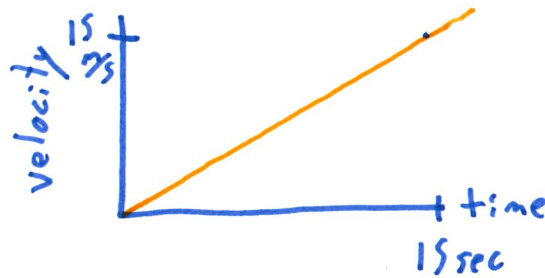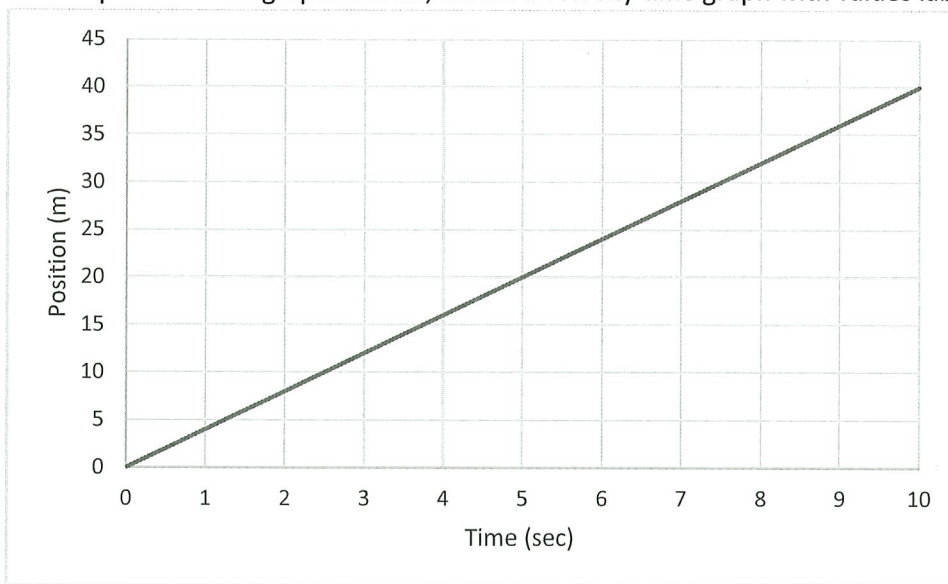

   c. An object moves in the negative direction for 5 seconds at -5.0 m/s, then instantaneously stops and remains at rest for 5 seconds, then moves in the positive direction at 5.0 m/s for 5 seconds.
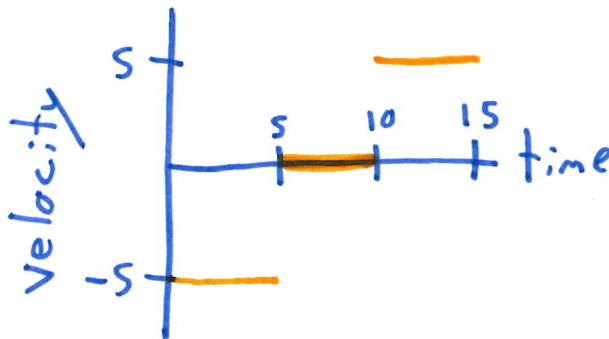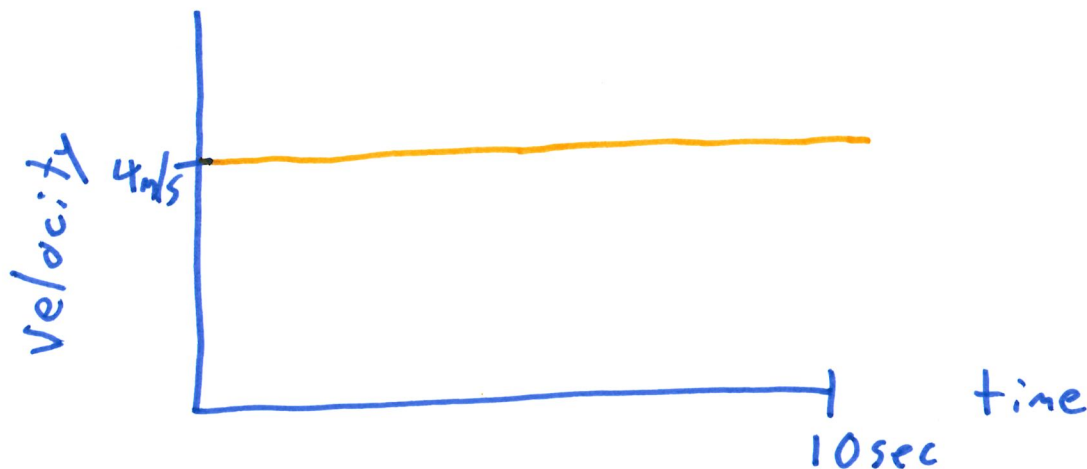
Velocity Time Graph Practice

Name:_____

3. For each of the position time graphs shown, sketch a velocity time graph with values labelled.

a.

Constant velocity of $\frac{40m}{10sec}$ = 4m/s

Velocity Time Graph Practice

Name:_____

40
30
20
10
0
-10
-20
-30
-40

Position (m)

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

Time (sec)

−60 m
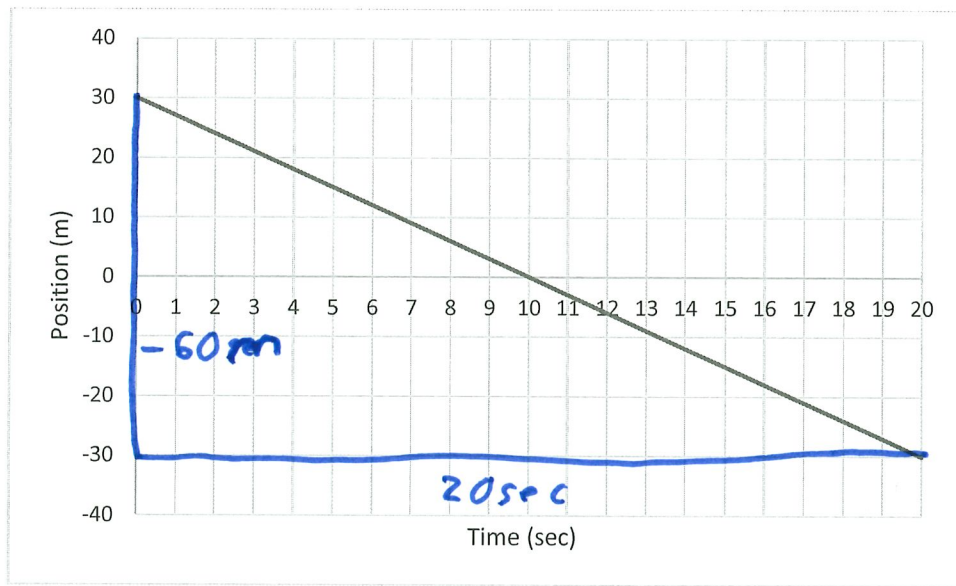
20 sec

b.

constant velocity of $\dfrac{-60m}{20s} = -3m/s$

Velocity (m/s)

time (s)

20sec

-3 m/s

Velocity Time Graph Practice
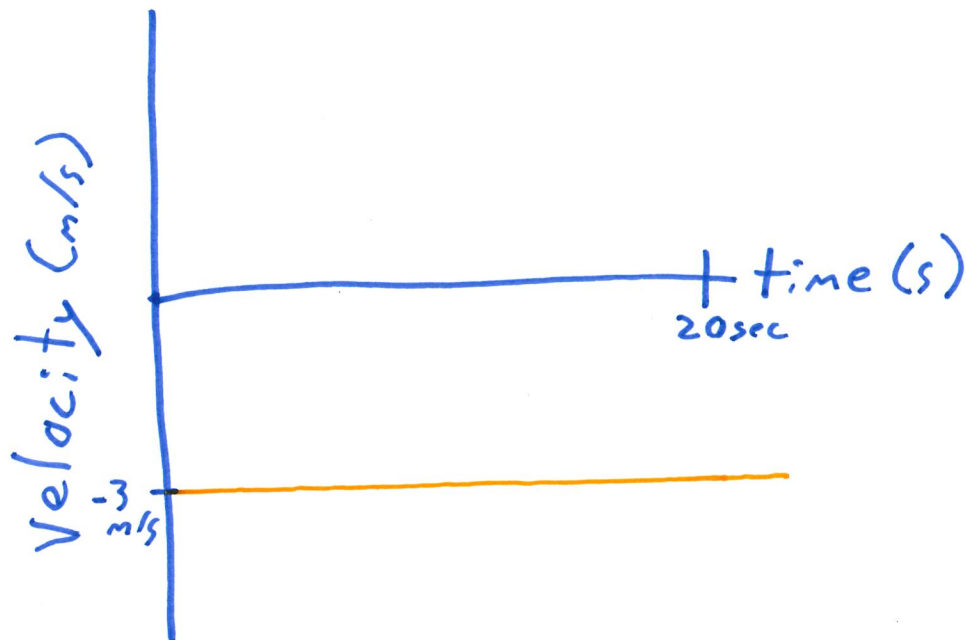
Name:_____

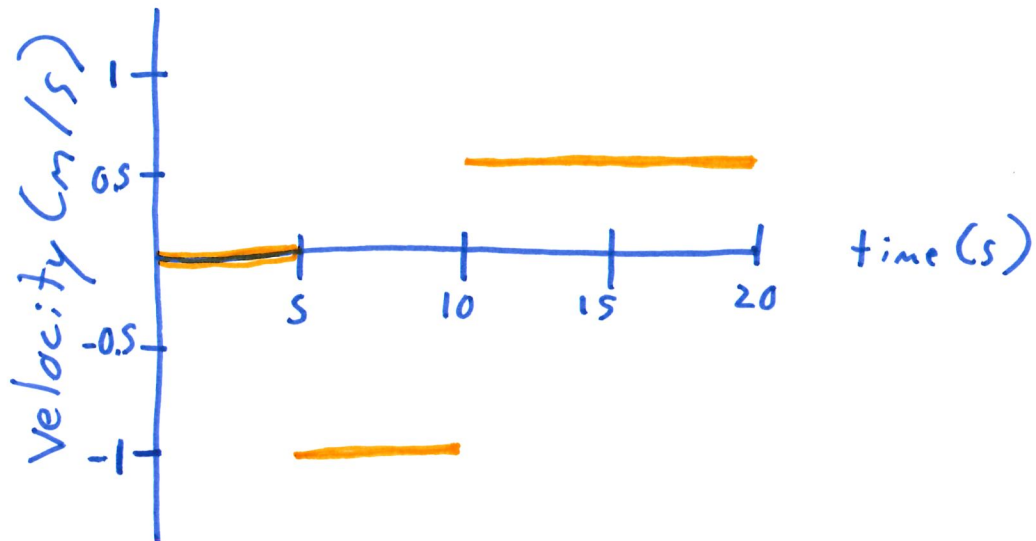**-5m**   **S sec**   **5m**
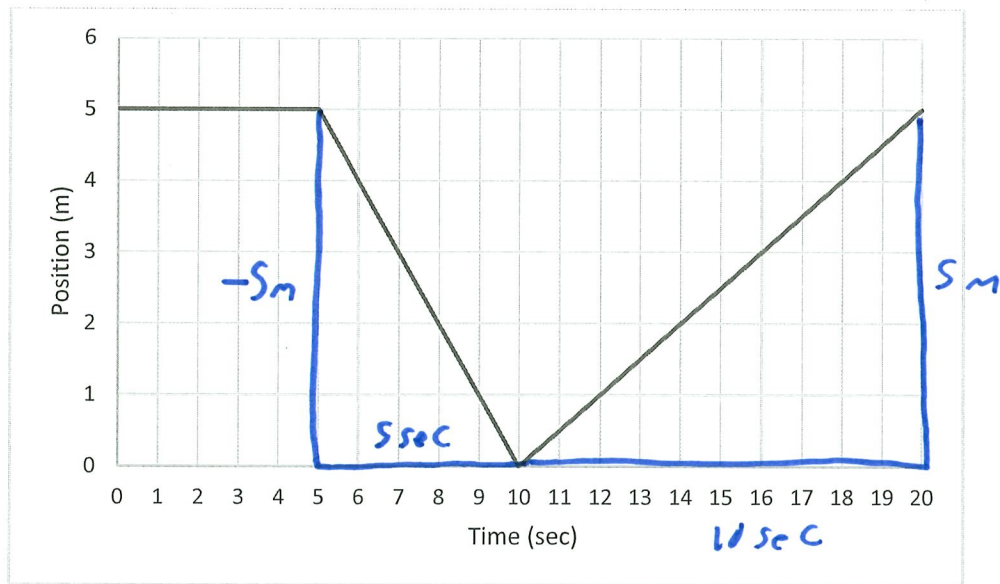
10 sec

c.

First 5 sec velocity is Zer

5-10 sec velocity is $\dfrac{-5m}{5 sec} = -1 m/s$

10-20 sec velocity is $\dfrac{5m}{10 sec} = 0.5 m/s$

Velocity Time Graph Practice

Name:_____

4. Match the following velocity time graphs with corresponding position time graphs.

a)

constant positive velocity

slows to stop

velocity | time

__B__

A:

position | time

b)

accelerates from rest

constant velocity

velocity | time

__C__

B:

position | time

c)

velocity | time

slows to stop

accelerating in negative direction

__A__

C:

position | time

d)

constant positive velocity

velocity | time

constant negative velocity

__E__

D:

position | time

e)

starts with positive velocity

slows to stop

velocity | time

accelerates in negative direction

__D__

E:

position | time

Velocity Time Graph Practice

Name:_____

5. Consider the velocity time graph shown.

8 sec

-13 m/s

8 m/s

4 sec

3 m/s

4 sec
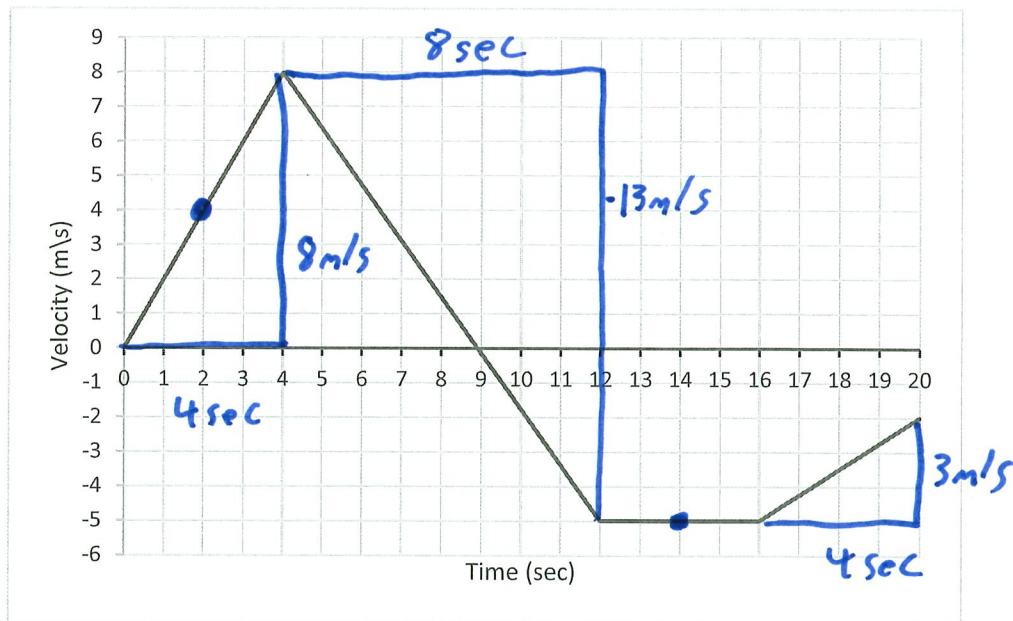
Velocity (m\s)

Time (sec)

a. What is the velocity of the object at t=2?

$$4 m/s$$

these can be read directly from the graph

b. What is the velocity of the object at t=14?

$$-5 m/s$$

c. What is the acceleration of the object between times t=0 and t=4?

$$a = \frac{\Delta v}{\Delta t} = \frac{8 m/s}{4 sec} = 2 m/s^2$$

d. What is the acceleration of the object between t=4 and t=12?

$$a = \frac{\Delta v}{\Delta t} = \frac{-5 m/s - 8 m/s}{12 sec - 4 sec} = \frac{-13 m/s}{8 sec} = -1.625 m/s^2 \approx -1.6 m/s^2$$

e. What is the acceleration of the object between t=12 and t=16?

$$a = \frac{\Delta v}{\Delta t} = \frac{0}{4} = 0 m/s^2$$

Don't worry too much about sig figs on these

f. What is the acceleration of the object between t=16 and t=20?

$$a = \frac{\Delta V}{\Delta t} = \frac{3 m/s}{4 sec} = 0.75 m/s^2$$

Velocity Time Graph Practice

Name:_____

6. Consider the velocity time graph shown.
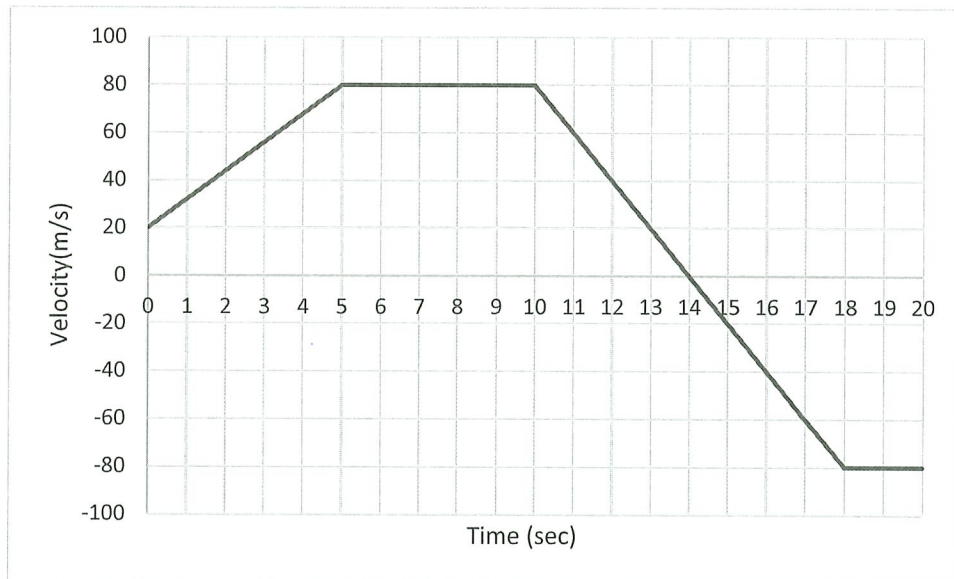
a. A student claims the object is stationary between t=t and t=10. What mistake do you think they made?

They probably were thinking it was a position time graph

b. When is the object not moving?

At t=14 (v=0 then)

c. During what time periods is the object moving with constant velocity?

Between t=5 - t=10 and t=18 - t=20

this is when v-t graph is horizontal line

d. During which time periods is the object moving in the positive direction?

Any time velocity is positive, t=0 — t=14

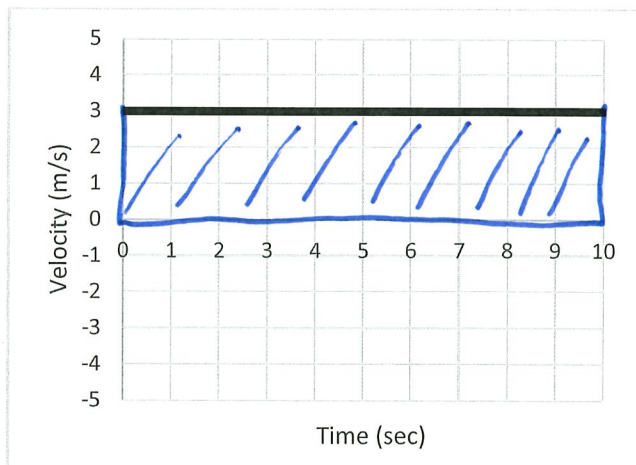e. During which time periods is the object **accelerating** in the positive direction?

Any time slope of the graph is positive t=0-5

Velocity Time Graph Practice

Name:_____

7. Consider the velocity time graph shown.
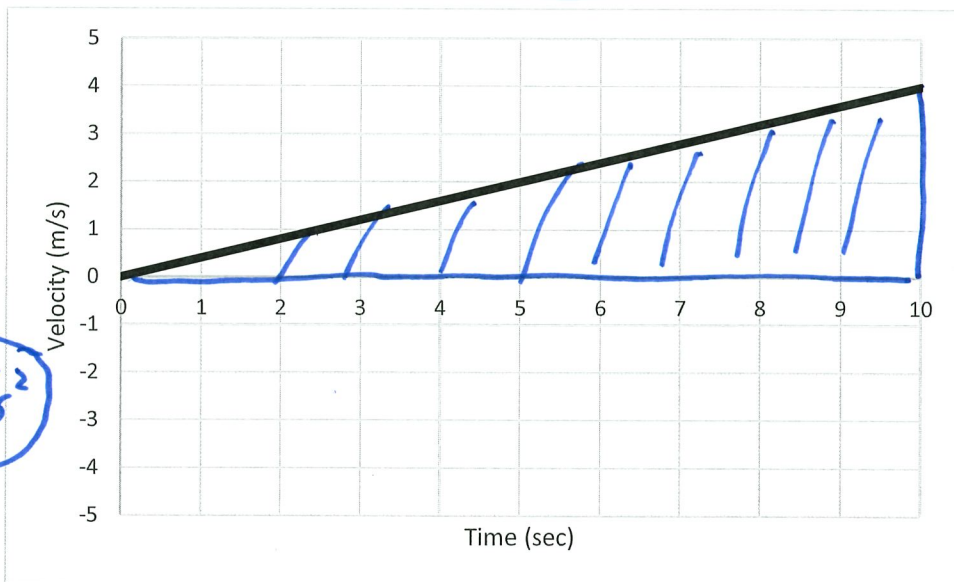   a. What is the velocity of the object throughout this graph?

$3 m/s$

b. What is the total displacement of the object during the time shown on the graph?

Displacement = Area between x-axis and line

$= (3m/s)(10s) = \boxed{30m}$

8. Consider the velocity time graph shown.

   a. What is the **acceleration** of the object throughout the graph?

$a = \dfrac{\Delta v}{\Delta t} = \dfrac{4}{10} = \boxed{0.4 m/s^2}$

b. What is the total displacement of the object during the time shown on the graph?

Displacement = Area between x-axis and line

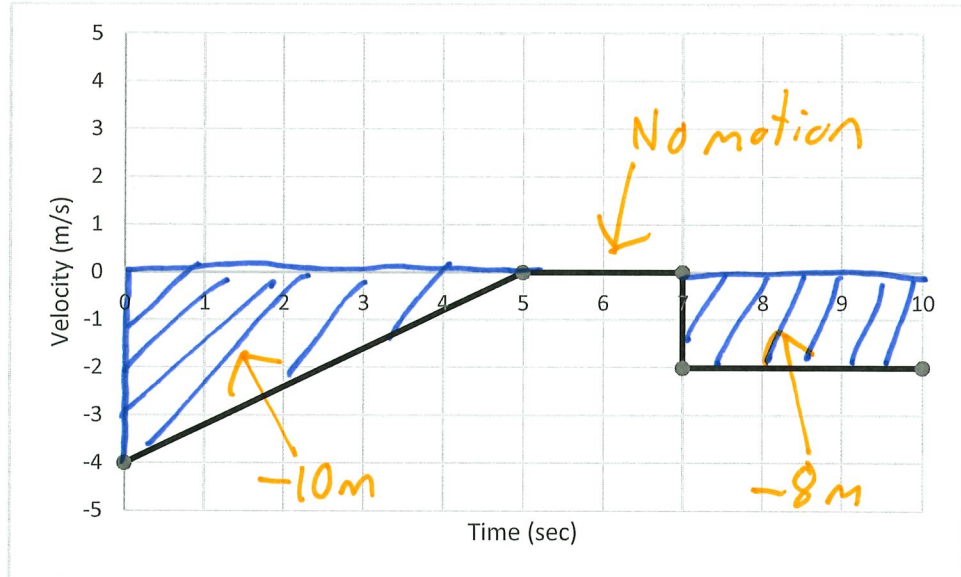Area of triangle $= \dfrac{base \times height}{2}$

$= \dfrac{10 sec \times 4m/s}{2} = \dfrac{40m}{2} = \boxed{20m}$

Velocity Time Graph Practice

Name:_____

9. Consider the velocity time graph shown.

Velocity (m/s) vs **Time (sec)** graph with annotations: "No motion", "−10m", "−8m"

a. What is the acceleration of the object between t=0 and t=5?

$$a = \frac{\Delta v}{\Delta t} = \frac{4 \, m/s}{5 \, sec} = \boxed{0.8 m/s^2}$$

b. Describe the motion of the object between t=5 and t=7.

At rest, velocity is zero

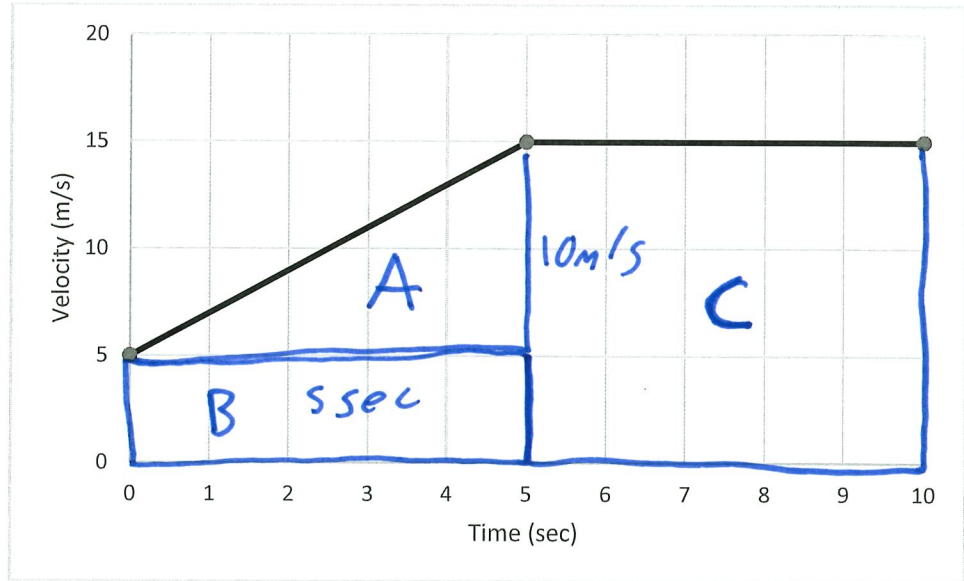c. Describe the motion of the object between t=7 and t=10.

Constant velocity of −2m/s

d. What is the total displacement of the object?

Section 1 = triangle

$$A = \frac{bh}{2} = \frac{5 sec \times -4m/s}{2}$$

$$= \boxed{-10m}$$

Section 2 no motion
Displacement = 0

Section 3 rectangle
$A = l \times w$
$= 4 sec \times -2m/s$

$= \boxed{-8m}$

Total
−10m + 0m
+ −8m

$\boxed{-18m}$

Velocity Time Graph Practice

Name:_____

10.

$a = \dfrac{10m/s}{5 sec}$

$= 2m/s^2$

a. Fill in the blanks:

The object starts with a velocity of __5__ m/s. It accelerates at __2__ m/s² for
__5__ seconds until it has a velocity of __15__ m/s. It continues at that velocity
for the rest of the time.

b. Determine the total displacement of the object.

$A = $ triange

$\dfrac{b \times h}{2} = \dfrac{5 sec \times 10 m/s}{2}$

$= \boxed{25m}$

$B = $ rectongle

$\ell \times w = 5 sec \times 5 m/s$

$= \boxed{25m}$

$C = $ rectongle

$= \ell \times w = \dfrac{5 sec \times 15 m}{sec}$

$= 75m$

Total $= 25m + 25m + 75m$

$= \boxed{125m}$

Velocity Time Graph Practice

Name:_____

11.

Graph: Velocity (km/hr) vs Time (sec)

Annotations on graph:
$\frac{30 \times 5}{2} = 75$

400

$5 \times 50 = 250$

$10 \times 50 = 500$
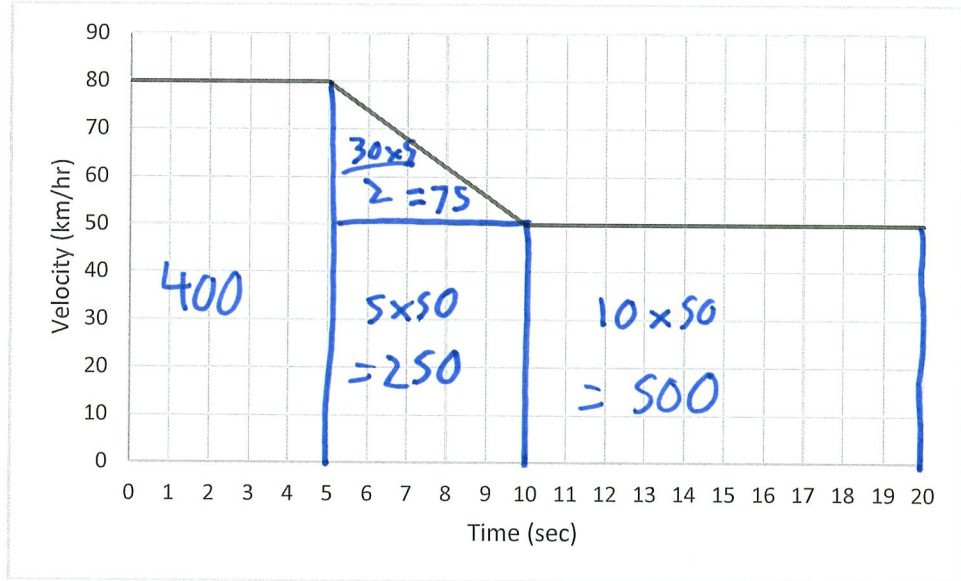
a. A student claims that during the first 5 seconds the object will have a displacement of $5 \times 80 = 400$ m. Why is that incorrect?

Velocity is not in m/s

b. What are the units that the calculation should be in?

$5 \, sec \times \dfrac{80 \, km}{hr} = 400 \dfrac{sec \cdot km}{hr}$

c. Determine the actual displacement in metres during the first 5 seconds.

$400 \dfrac{sec \cdot km}{hr} \times \dfrac{1 \, hr}{3600 \, sec} \times \dfrac{1000 m}{1 \, km} = \boxed{111 \, m}$

d. What is the total displacement during the whole graph?

$400 + 75 + 250 + 500 = 1225 \dfrac{sec \cdot km}{hr}$

$1225 \dfrac{sec \, km}{hr} \times \dfrac{1 \, hr}{3600 \, sec} \times \dfrac{1000 m}{1 \, km} = \boxed{340 m}$