Name_____ Block _____

Physics Ib Mid-Year Exam Review

Topic 01 – Basic Skills Topic 02 – Constant Velocity Motion

Topic 03 – Accelerated Motion Topic 04 – Forces (Sections 4.1-4.3 only)

Topic 01: Basic Skills

1.2 – Measuring and Units

1) Convert 12 inches to meters using "versions of one" notation.

2) Convert $\frac{65\,\text{miles}}{1\,\text{hour}}$ to meters/second using "versions of one" notation.

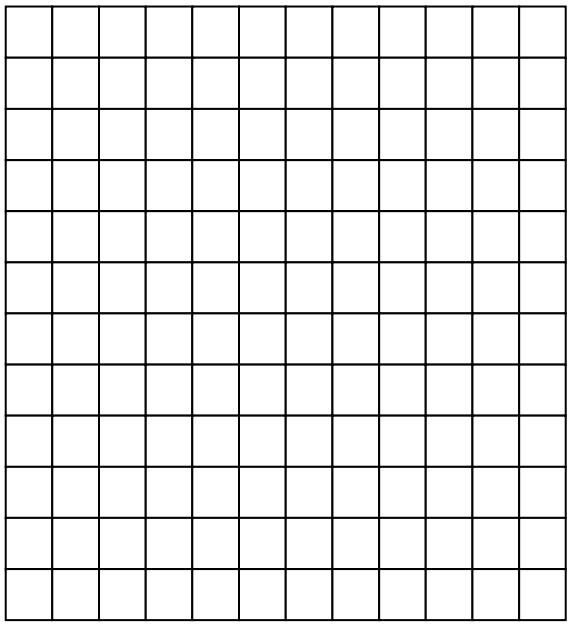
1.3 – Scientific Models

3) You predict that your ball will take 2.5 seconds to finish a race. It actually takes 2.75 seconds. Calculate the percent error in your prediction.

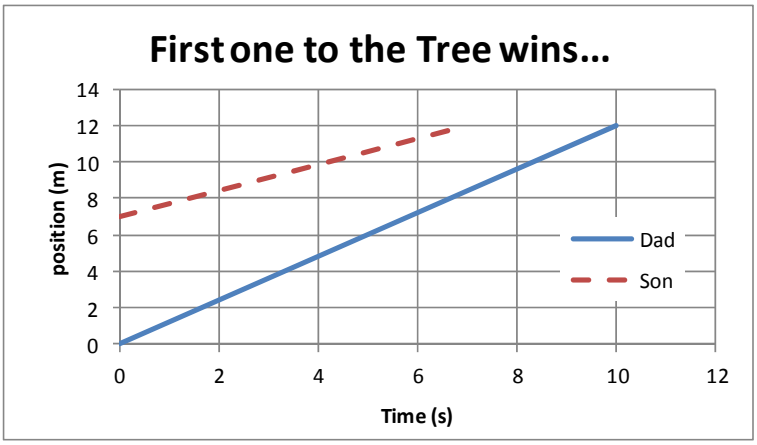
1.4 – Graphing Review

4) Data were collected for a rocket launched by the science Olympiad team. Graph the following data on the grid provided. Fully label the graph as appropriate.

Time (s)	Velocity (m/s)
0.5	3
1.5	10
2.0	12
3.5	20
4.0	24
5.0	32

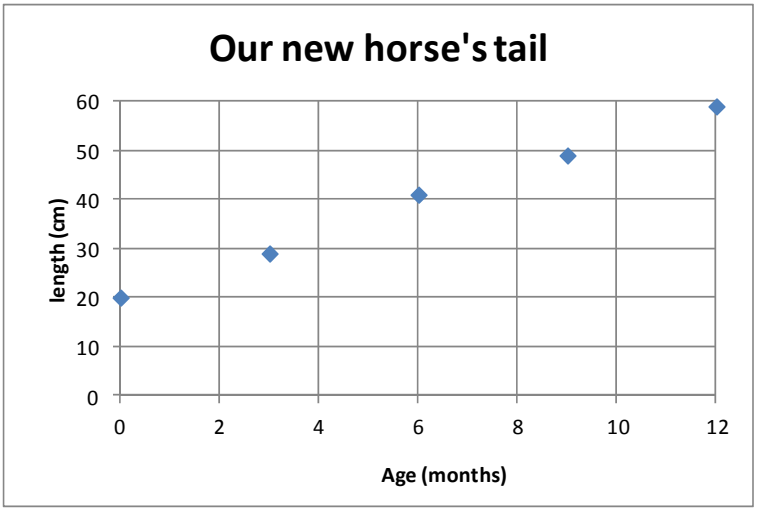


5) Describe the situation shown by this graph:



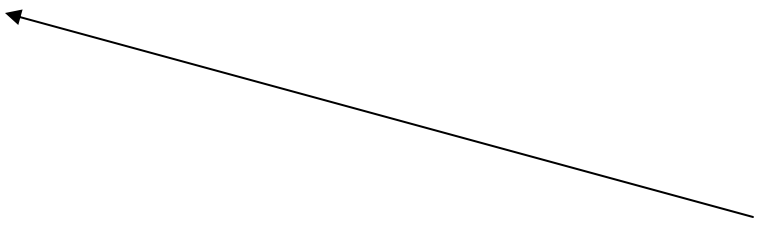
6) Find the slope and y-intercept for the son on the previous graph. Write a mathematical model for the son's position over time.

7) Write a mathematical model for the graph shown. How long is the horse's tail when it is born? How many centimeter's does the horse's tail grow each month, on average?

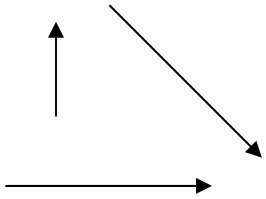


1.5 – Vectors & Scalars

8) Using a ruler and protractor, find the magnitude and direction of the vector below. Also, draw the x- and y-components of the vector and give the magnitude of each component. Use a scale of 1 cm = 10 meters.



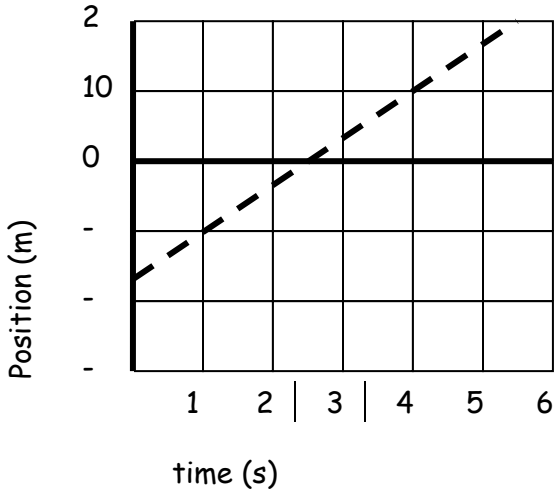
9) As accurately as possible, draw a picture showing addition of the following vectors. Draw the resultant. Using a ruler and protractor, measure the magnitude and direction of the resultant.



Topic 02: Constant Velocity

2.1 – Model of Constant Velocity

10) Write an equation that models the motion shown in the graph. Remember to keep your x- and y-variables as variables, so that your model describes every point on the graph!



11) A swimmer swims 50 m down the pool, then 50 m back, then 50 m down the pool again. The entire swim takes her 105 seconds. Calculate each of the following (check your notes!)

Δs

$\Delta \vec{s}$

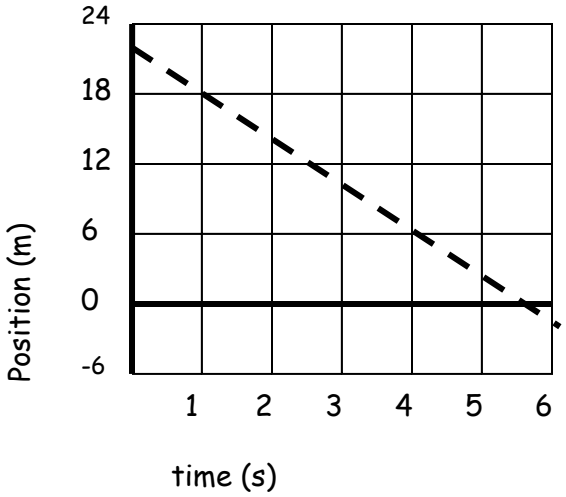
$\bar{v}$

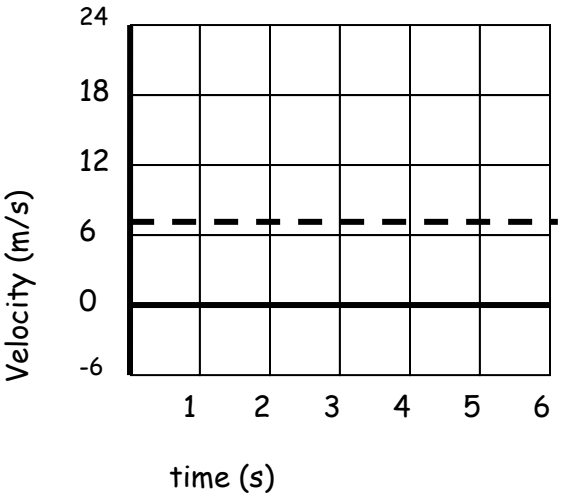
$\bar{\vec{v}}$

12) A leatherneck turtle starts at the shoreline and crawls up the beach. She starts crawling at 11:17 PM and stops crawling at 11:42 PM, 32 m from the shore. How fast was she crawling? Show your work.

2.2 – Graphs of constant velocity motion

13) What is the starting position of the runner whose motion is shown on the graph (right)? What is the runner's velocity?

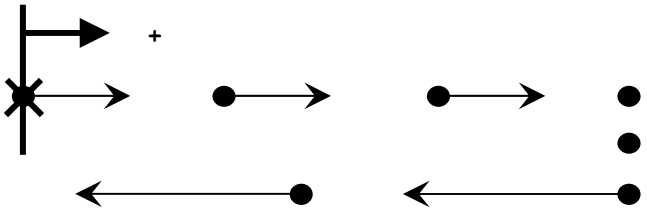


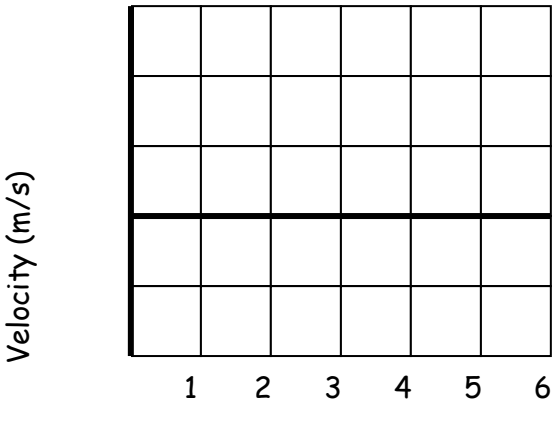


14) What is the runner's velocity in the graph at the left? How far did the runner travel in five seconds?

2.3 – Motion Maps

15) Draw a velocity vs. time graph for the motion map shown below.





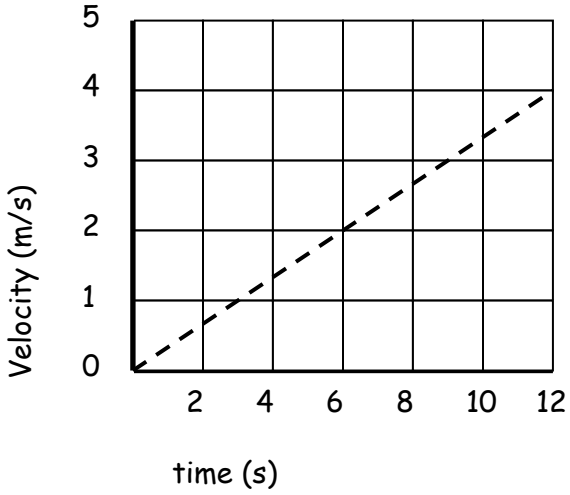
Topic 03: Constant Acceleration

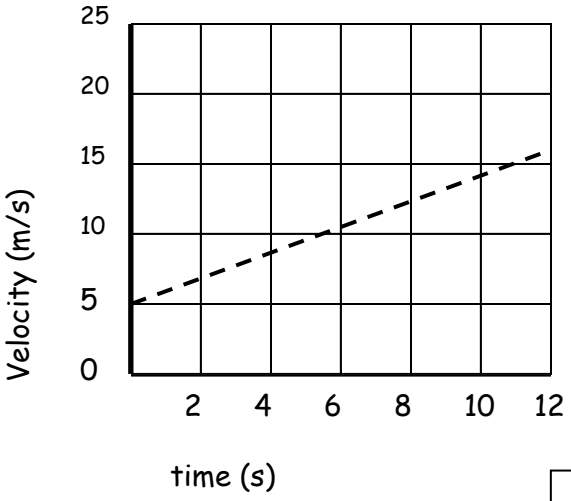
3.1 – Model of Constant Acceleration

16) What do you know about an object if it is accelerating at 6 m/s^2? (HINT: the word change must appear in your answer)

3.2 – Graphs of Constant Acceleration

17) What is the acceleration of the object shown in the graph? How far does the object move in 10 seconds?



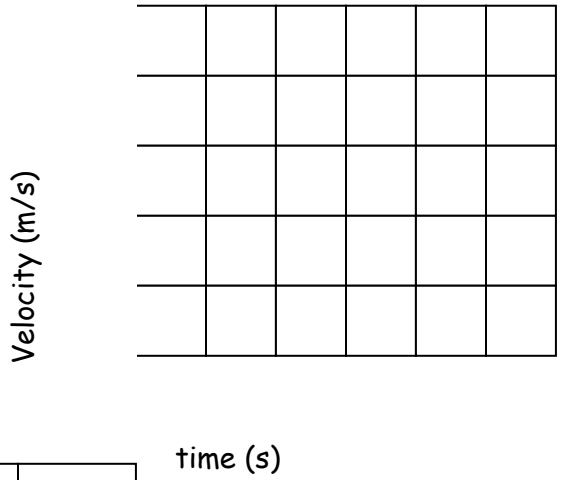


18) The graph to the left shows the motion of a car. Use information from the graph and motion equations to complete the motion chart.

v_i	v_f	$\bar{v}$	Δv	a	Δt	Δs

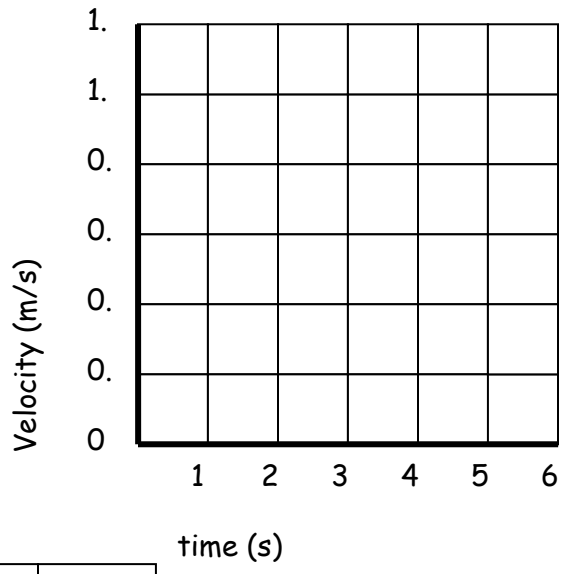
3.3 – Motion Parallel to the Ground

19) A jet airplane typically lands at a speed of 150 miles per hour. Convert this to meters per second. Then, complete the graph and chart for a plane stopping along a 400 m long runway.



v_i	v_f	$\bar{v}$	Δv	a	Δt	Δs

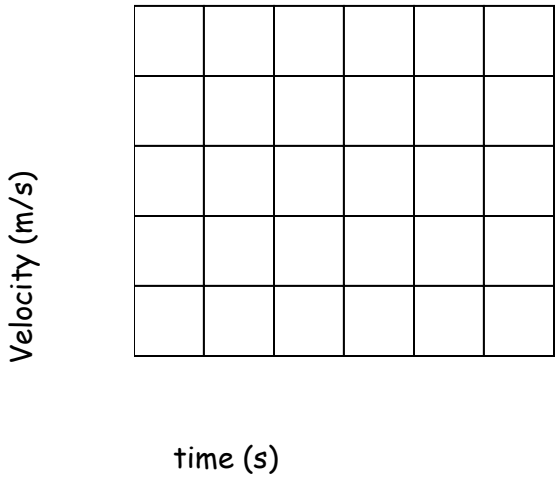
20) A ball rolls down a ramp then across the floor. It rolls down the 1.2 m long ramp in 1.8 seconds, then rolls 4.0 meters across the floor. Analyze its motion on a graph and in a chart.



	v_i	v_f	$\bar{v}$	Δv	a	Δt	Δs
on							
on							

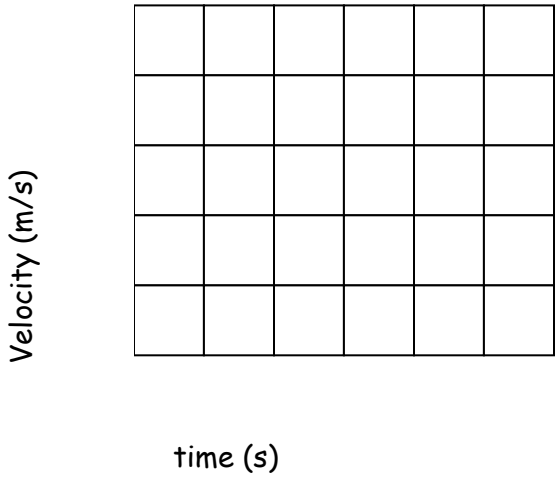
3.4 – Vertical Motion

21) A water balloon is dropped from a hotel balcony, 18 meters above the parking lot. Find the time that it takes the balloon to hit the ground and the speed just before it hits the ground.



v_i	v_f	$\bar{v}$	Δv	a	Δt	Δs

22) Repeat the analysis for the previous question, assuming that the hotel is on Mars.



v_i	v_f	$\bar{v}$	Δv	a	Δt	Δs

3.5 – Projectile Motion

23) A softball pitcher throws a pitch horizontally at 30 m/s off the top of a cliff. The ball lands 1.6 seconds later. Where does it land, and how high is the cliff?

	v_i	v_f	$\bar{v}$	Δv	a	Δt	Δs
X							
Y							

24) A marble rolls off table with a speed of 4 m/s. The marble lands 80 cm away from the base of the table. How tall is the table?

	v_i	v_f	$\bar{v}$	Δv	a	Δt	Δs
X							
Y							

Topic 04: Forces

4.1 – Basic Principles of Force

25)What is the total force on…

a) a 240 kg bull lying in a creek bed?

b) a 240 kg bull running across the field at 4 m/s?

c) a 240 kg bull racing down a hill at 1.5 m/s^2?

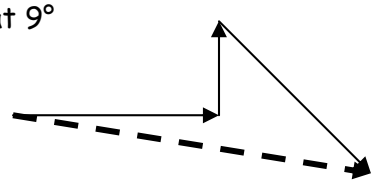
4.2 – Force Vectors

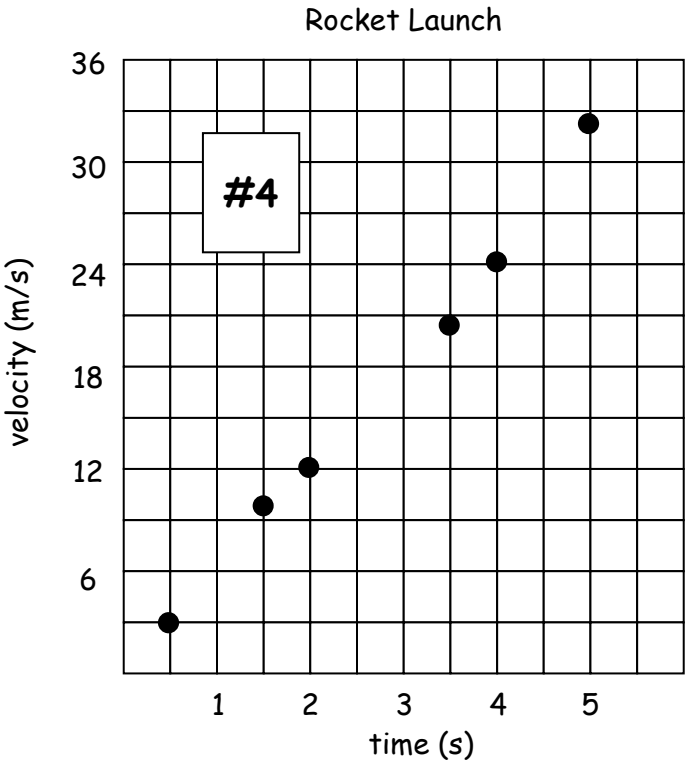
26)You push on a boulder with a force of 450 N west. Your friend pushes on the same boulder with a force of 600 N north. What is the magnitude and approximate direction of the total force?

27)Draw a free-body diagram for a book being pushed up against the ceiling.

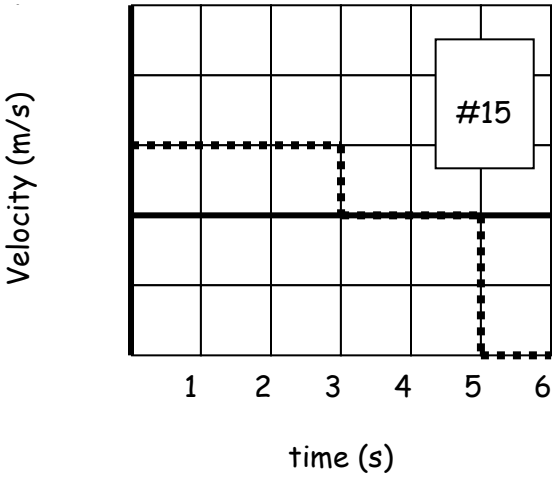
ANSWERS:

1) 0.305 meters
2) 29.05 m/s
3) 9.1%
4) see graph
5) Son gets head start, reaches finish line (12 meters) first.
6) slope = 0.75 m/s; y-intercept = 7 m; position = (0.75 m/s)Δt + 7 m
7) tail length = (3.25 cm/month)age + 20 cm; at birth, length = 20 cm; grows 3.25 cm each month.
8) Magnitude and direction: 103 meters at 15°; x = 100 meters, y = 26 meters
9) 4.4 cm at 9°





10) position = (6.67 m/s)time – 17 meters
11) Δs = 150 meters, $\Delta \vec{s}$ = 50 m, $\bar{v}$ = 1.43 m/s, $\vec{\bar{v}}$ =
12) $\bar{v}$ = 1.28 meters/minutes (NOTE UNITS!)
13) s_i = 22 meters; $\bar{v}$ = -4 m/s
14) $\bar{v}$ = 7 m/s; Δs = 35 meters



15) See Graph (variations possible)
16) Velocity is changing by 6 m/s every second
17) a = slope = 0.33 m/s^2; $\Delta \vec{s}$ = area = 17 meters

18)

v_i	v_f	$\bar{v}$	Δv	a	Δt	Δs
5 m/s	16 m/s	10.5 m/s	16 m/s	0.92 m/s^2	12 sec	126 m

19) v_i = 150 mi/hr = 67 m/s

v_i	v_f	$\bar{v}$	Δv	a	Δt	Δs
67 m/s	0 m/s	33.5 m/s	-67 m/s	-5.6 m/s^2	11.95 sec	400 m

20)

	v_i	v_f	$\bar{v}$	Δv	a	Δt	Δs
on ramp	0 m/s	3 m/s	1.5 m/s	3 m/s	.83m/s^2	1.8 sec	1.2 m
on floor	3 m/s	3 m/s	3m/s	0 m/s	0 m/s^2	1.3$\bar{}$ sec	4 m

21)

v_i	v_f	$\bar{v}$	Δv	a	Δt	Δs
0 m/s	-19 m/s	-9.5 m/s	-19 m/s	-10 m/s^2	1.9 sec	-18 m

22)

v_i	v_f	$\bar{v}$	Δv	a	Δt	Δs
0 m/s	-11.5 m/s	-5.8 m/s	-11.5 m/s	-3.7 m/s^2	3.1 sec	-18 m

23)

	v_i	v_f	$\bar{v}$	Δv	a	Δt	Δs
X	30 m/s	30 m/s	30 m/s	0	0	1.6 sec	48 m
Y	0	16 m/s	8 m/s	16 m/s	10 m/s^2	1.6 sec	12.8 m

24)

	v_i	v_f	$\bar{v}$	Δv	a	Δt	Δs
X	4 m/s	4 m/s	4 m/s	0	0	0.2 sec	0.80 m
Y	0	2 m/s	1 m/s	2 m/s	10 m/s^2	0.2 sec	0.20 m

25)a. $\Sigma F = 0$ b. $\Sigma F = 0$ c. $\Sigma F = 360$ N

26)$\Sigma F = 360$ N northwest

27)