Motion Unit Test

Name Key

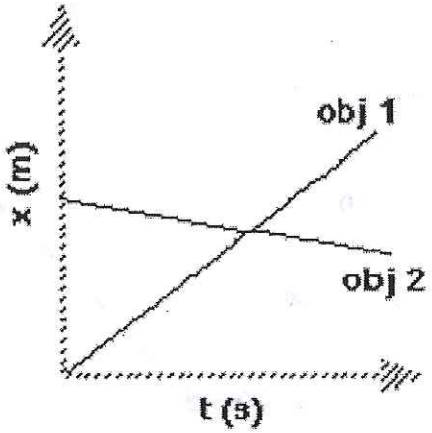
For each of the following graphs in questions 1 and 2:

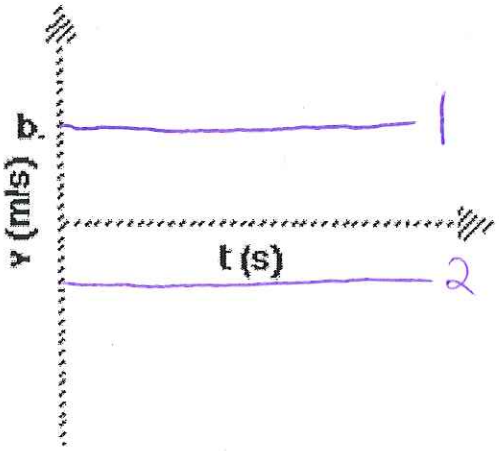
a. Describe, using a clear, complete sentence, how the motion (not the graph shape) of object 2 differs from the motion of object 1.

b. Sketch the graph of velocity vs time for object 1 and object 2. (label clearly)

c. In the space provided, draw motion maps for object 1 and object 2.

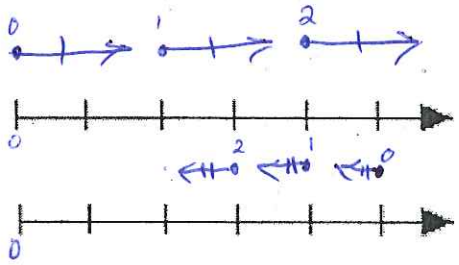
1. (5 points)



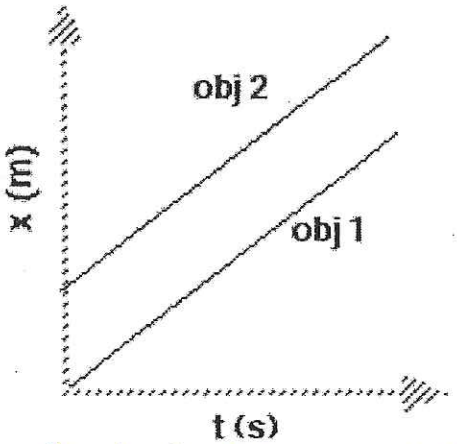


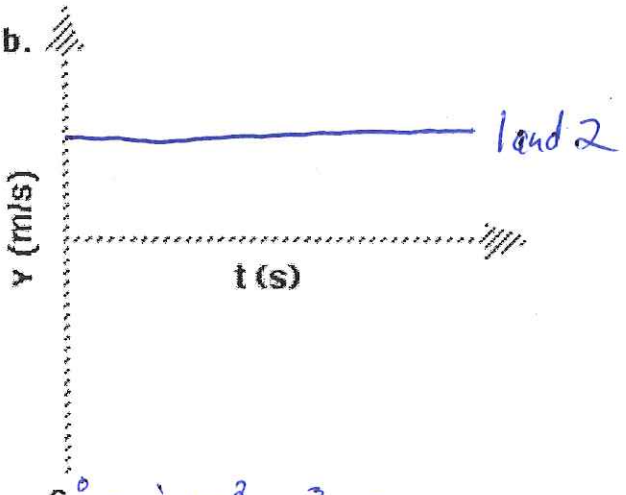
a. Object 1 starts @ 0 position, moves at constant + velocity. 2 starts in + position, moves @ slower constant − velocity.

c.



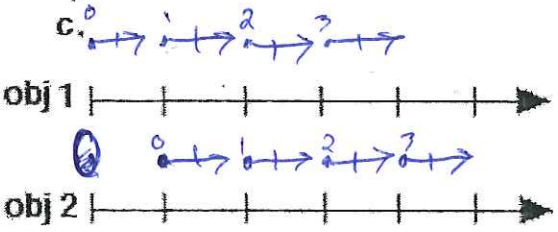
2. (5 points)



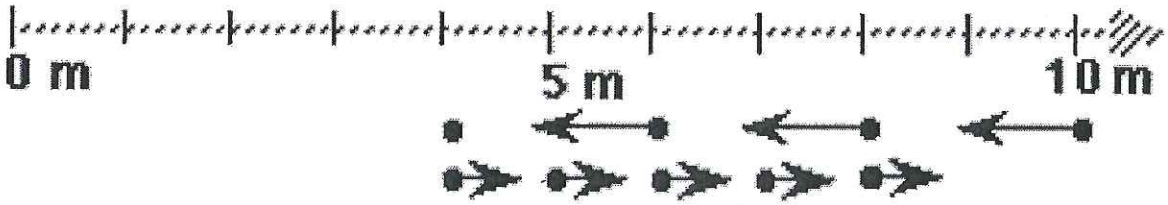


a. Objects 1 and 2 move at the same constant + velocity. Object 1 begins @ 0 position, object 2 begins at a positive position

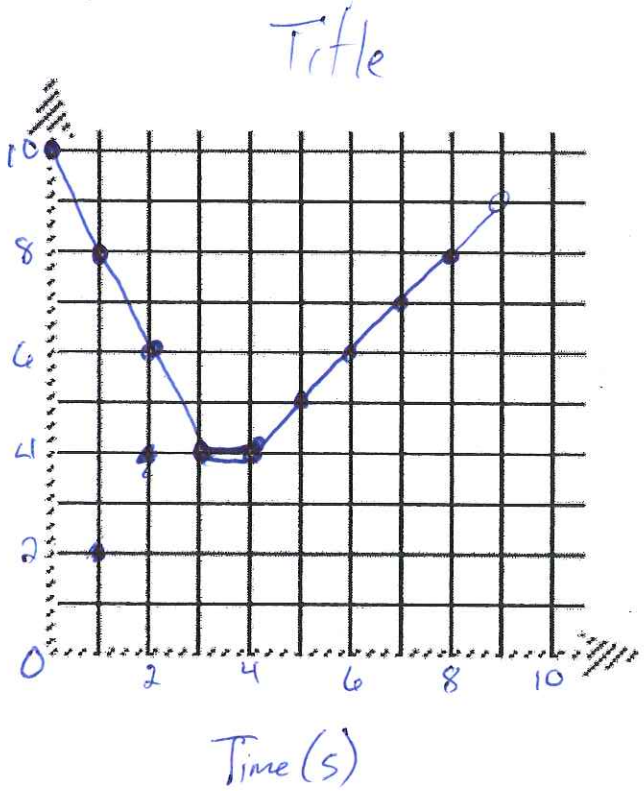
c.



3. Below is a quantitative motion map for a dog fetching a ball. The dots indicate its position each second.



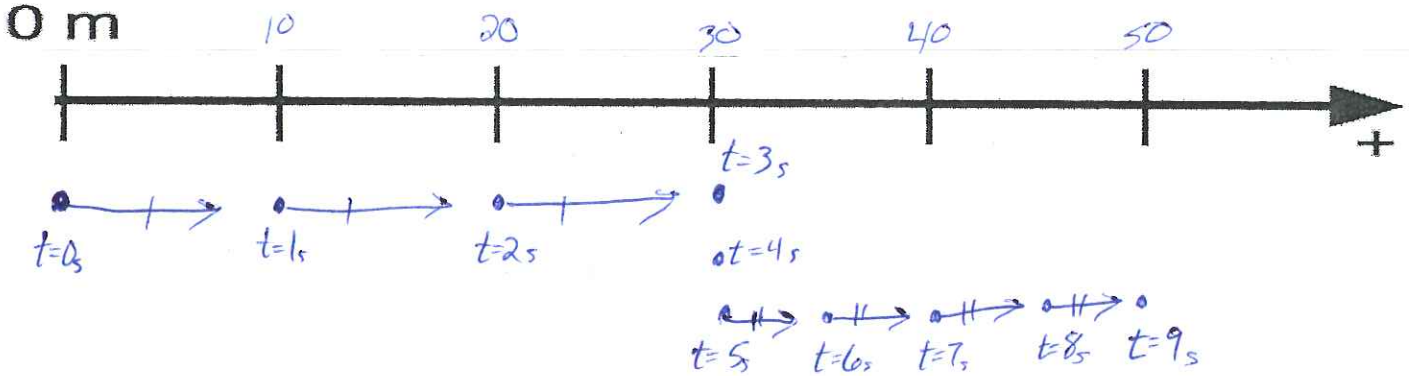
a) On the coordinate axes, carefully draw and label a quantitative position-time graph describing the dog's motion. PLEASE INCLUDE LABELS AND A TITLE. (5 points)



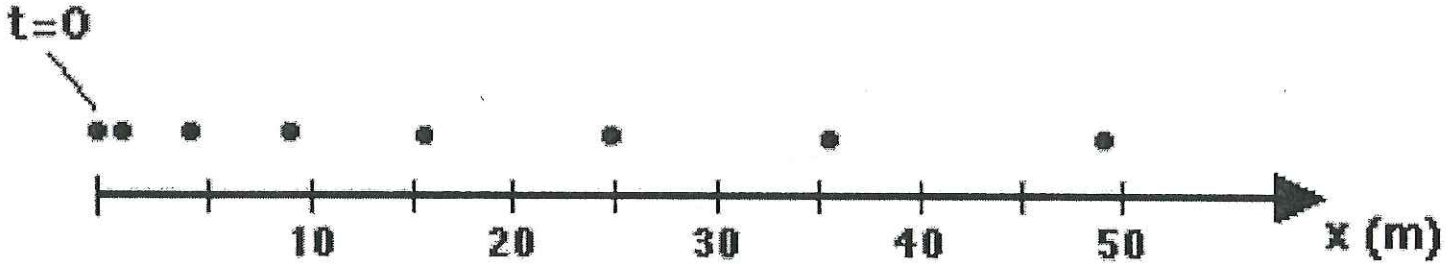
b) Describe the motion of the object in words (5 points)

The dog Begins at 10 m and runs at -2 m/s for 3 s. Then it stops for 1 second, and runs at $+1$ m/s for 4-5 seconds.

4. Create a QUANTITATIVE motion map for the following situation: A runner at the starting line runs at 10 m/s every second for 3 seconds. Then he stops for 2 seconds and then begins to jogs forward at a velocity of 5 m/s for 4 seconds. PLEASE LABEL TIMES AND DISTANCE. (6 points)

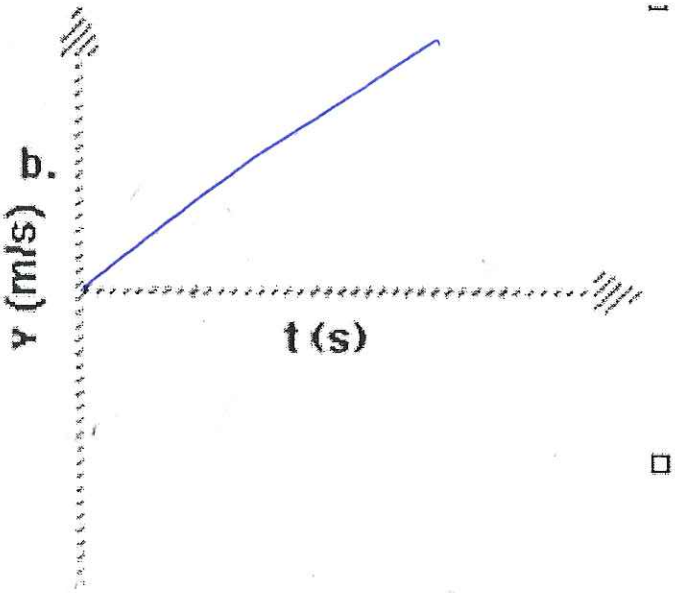


7. The following motion map shows an object moving forward.

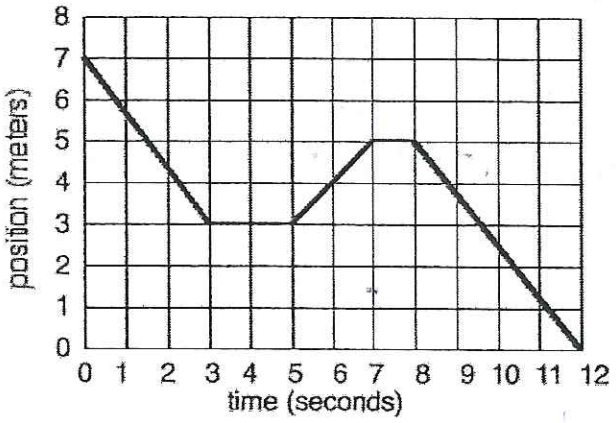


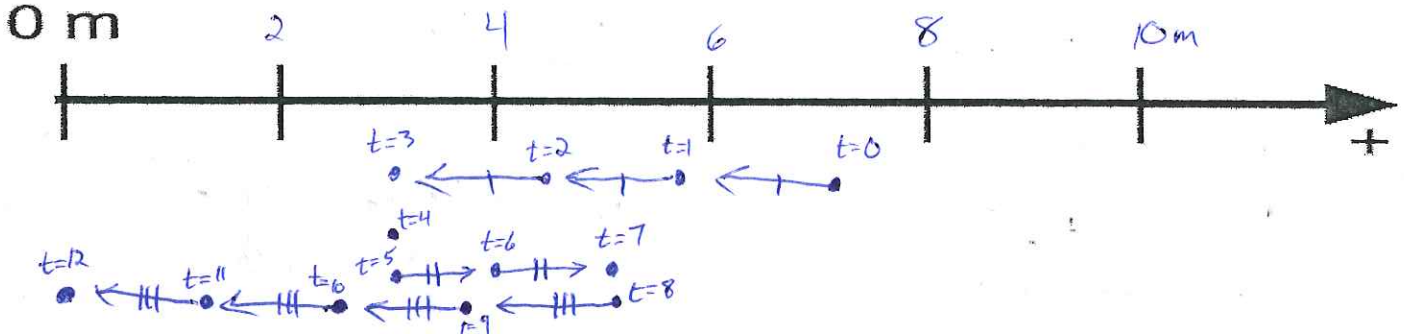
a) Describe the motion of the object in words, and then create a qualitative velocity vs. time graph for it (2 points).

The object is speeding up in the positive direction, starting from 0 position.

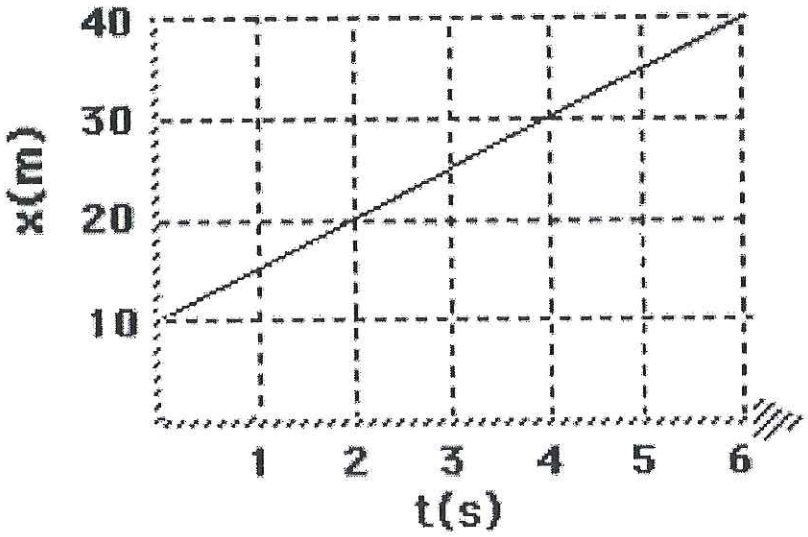


8. Create a QUANTITATIVE motion map from the graph at the right.





5. Consider the position vs time graph for Flipper below:



a) Determine Flipper's average speed. Show your work. (y1-y2)/(x1-x2) (2 points)

$\frac{30\text{ m}}{6\text{ s}} = 5\text{ m/s}$

b) Write a mathematical model for the relationship between Flipper's position and time. (5 points) y=mx+b

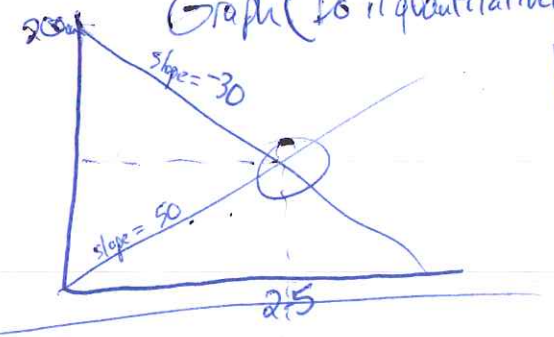
Position = 5 m/s (time) + 10 m

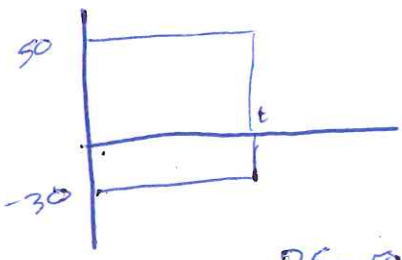
c) What will Flipper's position be at 8.0 s? Show how you got your answer. (2 points)

Position = 5 m/s (8 s) + 10 m = 50 m

6. Two cars are 200 cm away from each other. The car at 0 cm has a velocity of 50 cm/s and the car at 200 cm has a velocity of -30 cm/s. Using any method you'd like, find the site where they will crash within 10 cm. CIRCLE YOUR ANSWER. (3 points)

Graph (Do it quantitatively)





$50t = -30t + 200$

$\frac{80t}{80} = \frac{200}{80}$

$t = 2.5\text{ s}$

$2.5 \times 50 = 125\text{ cm}$

$P_1 = 50\frac{\text{cm}}{\text{s}}(t)$

$-(P_2 = -30t + 200)$

$0 = 80t - 200$

$\frac{200}{80} = \frac{80t}{80}$

$t = 2.5$

$P_{crash_1} = (50\frac{\text{cm}}{\text{s}})(2.5\text{ s}) = 125\text{ cm}$

$P_{crash_2} = (-30\frac{\text{cm}}{\text{s}})(2.5\text{ s}) + 200\text{ cm} = 125\text{ cm}$

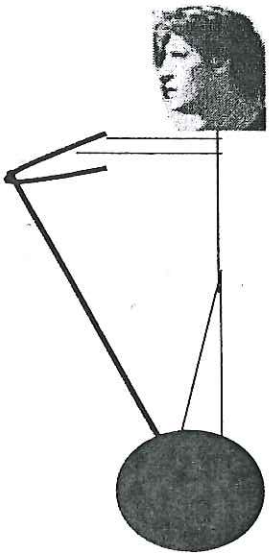
Motion Unit Test (Integrated)

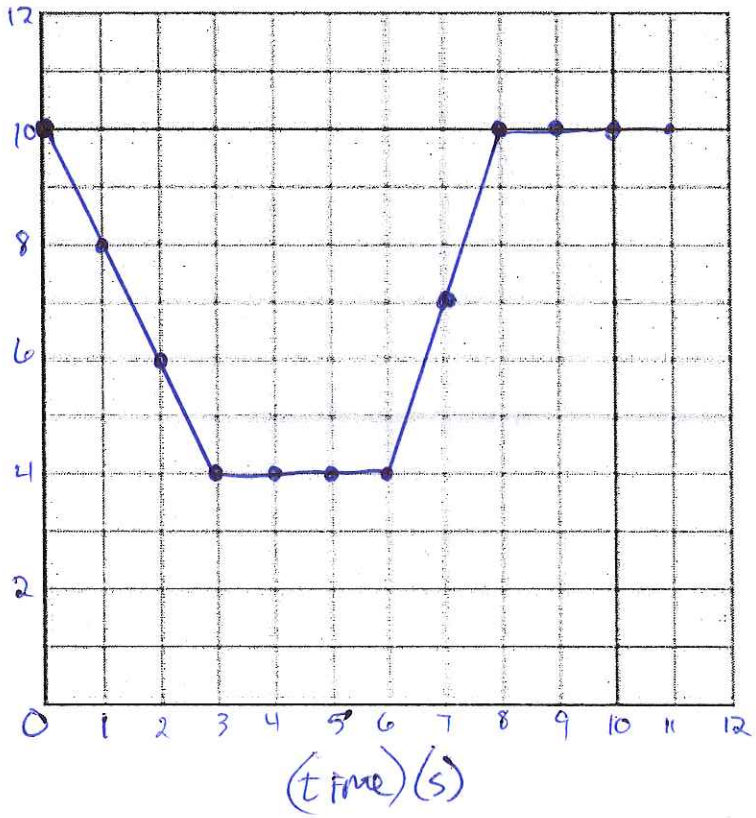
Name_____

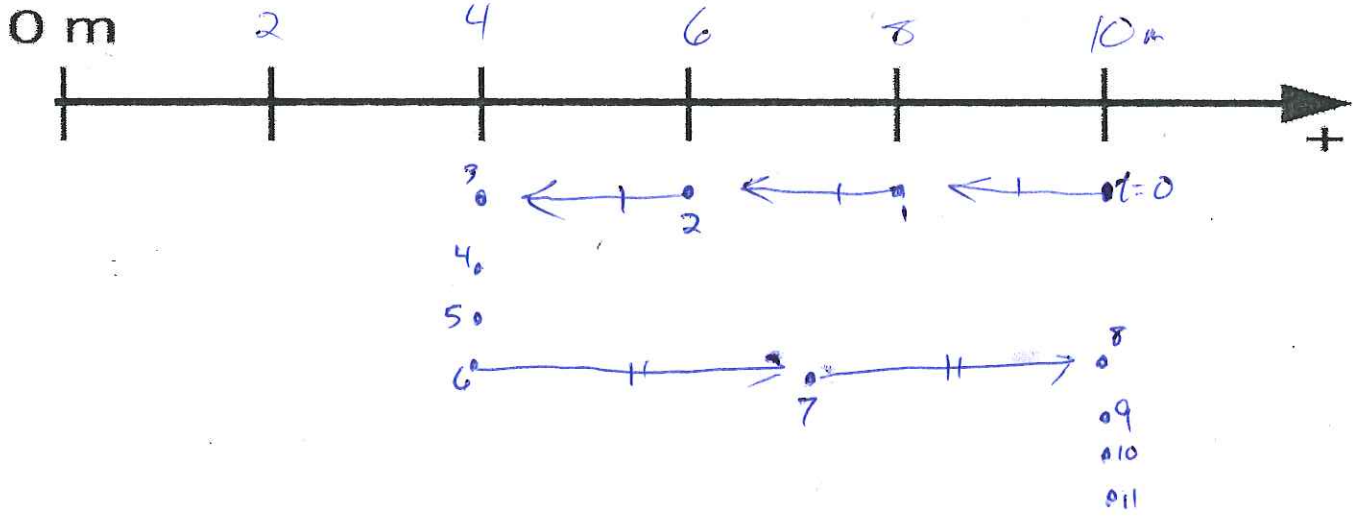
Motion of an Object

1. Using the following description, create a quantitative graph and motion map for the trip. (Graph worth 6 points, motion map worth 6)

"Mr. Starkey steals a segway from a tour guide in Florida. He starts at 10 m and goes at -2 m/s for 3 seconds, until he figures how to steady himself. Then he stands still for 3 seconds before moving at 3 m/s for 2 seconds, ending up hitting a pole. He lays motionless for 3 seconds."







Constant Velocity

2. Which graph shows two objects moving at the same constant positive velocity?

a) Figure 1 c) Figure 3
b) Figure 2 d) Figure 4

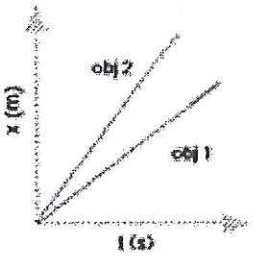


FIGURE 1

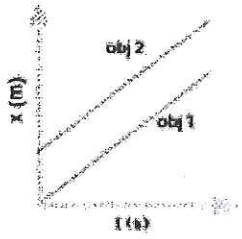


FIGURE 2

3. Which graph shows an object passing another object that is standing still?

a) Figure 1 c) Figure 3
b) Figure 2 d) Figure 4

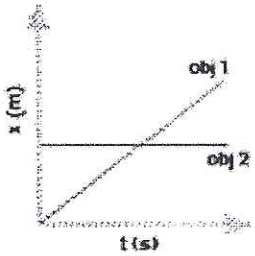


FIGURE 3

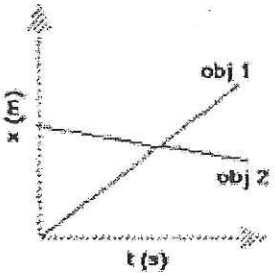


FIGURE 4

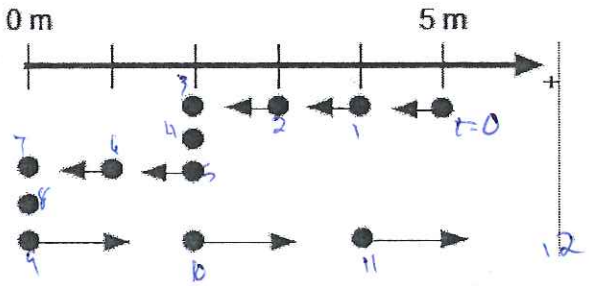
4. Which graph shows two objects moving in opposite directions?

a) Figure 1 c) Figure 3
b) Figure 2 d) Figure 4

5. Which graph shows two objects starting from the same point, and one moving at a faster velocity than the other?

a) Figure 1 b) Figure 2 c) Figure 3 d) Figure 4

Using the motion map below to answer questions 6-9.



6. What is the velocity of the object between t=0 and t=3?

a) 0 m/s b) -1 m/s c) -2 m/s d) -3 m/s e) -6 m/s

7. What is the velocity of the object between t=3 and t=5?

a) 0 m/s b) 1 m/s c) 2 m/s d) 3 m/s e) 6 m/s

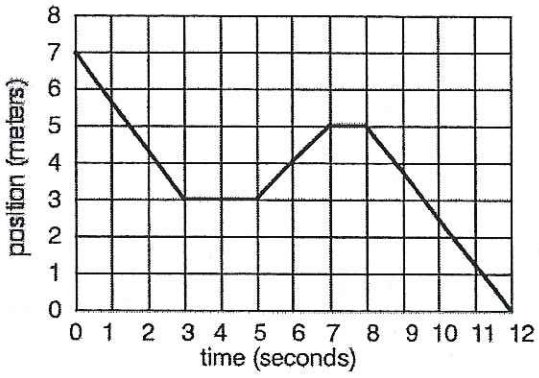
8. What is the velocity of the object between t=9 and t=11?

a) 0 m/s b) 1 m/s c) 2 m/s d) 3 m/s e) 6 m/s

9. What would the final position of the object be at t=12 seconds?

a) 4 m b) 5 m c) 6 m d) 0 m

Use the following graph to answer questions 10 -12.



10. During which part of the trip does the object have a velocity of -1.25 m/s?
    a) Between t=0 and t=3
    b) Between t=3 and t=5
    c) Between t=5 and t=7
    d) Between t=7 and t=8
    e) Between t=8 and t=12

11. When does the car have its greatest SPEED (not velocity)?
    a) Between t=0 and t=3
    b) Between t=3 and t=5
    c) Between t=5 and t=7
    d) Between t=7 and t=8
    e) Between t=8 and t=12

12. How many total seconds did the object remain still?
    a) 2 seconds b) 3 seconds c) 4 seconds d) 5 seconds

13. If an object is traveling at a constant velocity of 5 m/s for 6 seconds, how far have they travelled?
    a) 5 m b) 6 m c) 11 m d) 30 m e) none of these

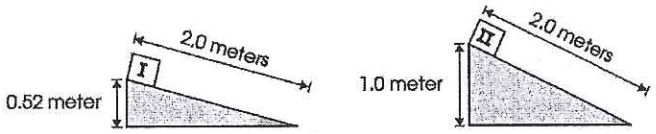
14. Which of the following tells the difference between speed and velocity?
    a) Speed and velocity are the same thing
    b) Speed has a direction while velocity is just how fast you're going
    c) Speed is how fast you're going, but velocity is just your direction
    d) Speed is how fast you're going, and velocity is your speed and direction

15. Starting from position 0 m, an object moves with a constant velocity of 3 m/s for 5 seconds. Then it stops for 3 seconds and moves at -4 m/s for 2 seconds. Where was the object's final position?

    a) 0 m b)-1 m c) 7 m d) 11 m e) 23 m

Acceleration

Use the following diagram and data tables to answer questions 16-18



Block I Results	
Time (seconds)	Total Distance Traveled (meters)
0	0.00
1	0.05
2	0.20
3	0.45
4	0.80

Block II Results	
Time (seconds)	Total Distance Traveled (meters)
0	0.00
1	0.10
2	0.40
3	0.90
4	1.60

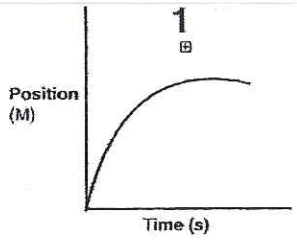
16. Which of the following correctly compares the motion of both blocks?
    a) Block 1 is accelerating while block 2 has a constant positive velocity
    b) Block 2 is accelerating while block 1 has a constant positive velocity
    c) Both blocks have a constant, positive velocity
    d) Both blocks are accelerating

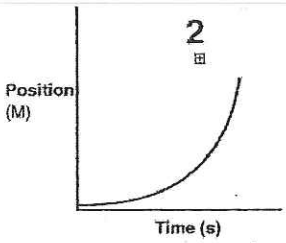
17. Which block will have the greatest velocity by the end of the ramp?
    a) Block I b) Block II c) they will have the same velocity at 2 m

18. Which block will reach the end of the ramp in the least amount of time?
    a) Block I b) Block II c) they will arrive at the same time

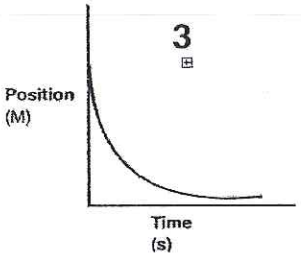
Use the following graphs to answer questions 19-22

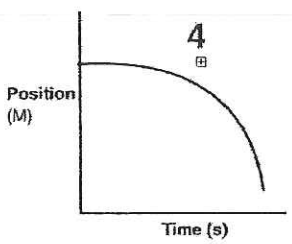
19. Which graph(s) show(s) objects moving with a positive acceleration?
    a) Graph 1
    b) Graph 2
    c) Graph 3
    d) Graph 4
    e) Graphs 1 and 4
    f) Graphs 2 and 3





20. Which graph(s) show(s) objects moving with a negative acceleration?
    a) Graph 1
    b) Graph 2
    c) Graph 3
    d) Graph 4
    e) Graphs 1 and 4
    f) Graphs 2 and 3



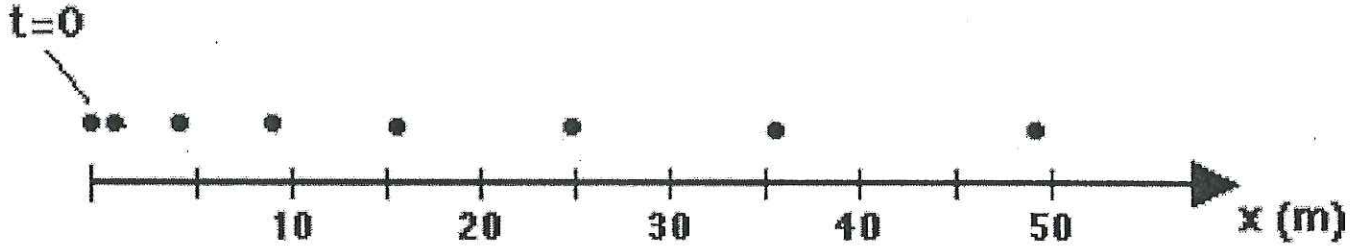


21. An object starts in a positive position with a negative velocity, and changes to a velocity of 0 m/s. Which graph best shows this motion?
    a) Graph 1 b) Graph 2 c) Graph 3 d) Graph 4

22. A car travels up a ramp starting in a positive position (down the ramp will be the positive direction). Which graph shows the motion of the car?

a) Graph 1 b) Graph 2 c) Graph 3 d) Graph 4

23. Using the following motion map, calculate the acceleration of the object. Assume that the dots each represent one second in time. (2 points)



$d = \frac{1}{2}at^2$

$49_m = \frac{1}{2}a(7_s)^2$

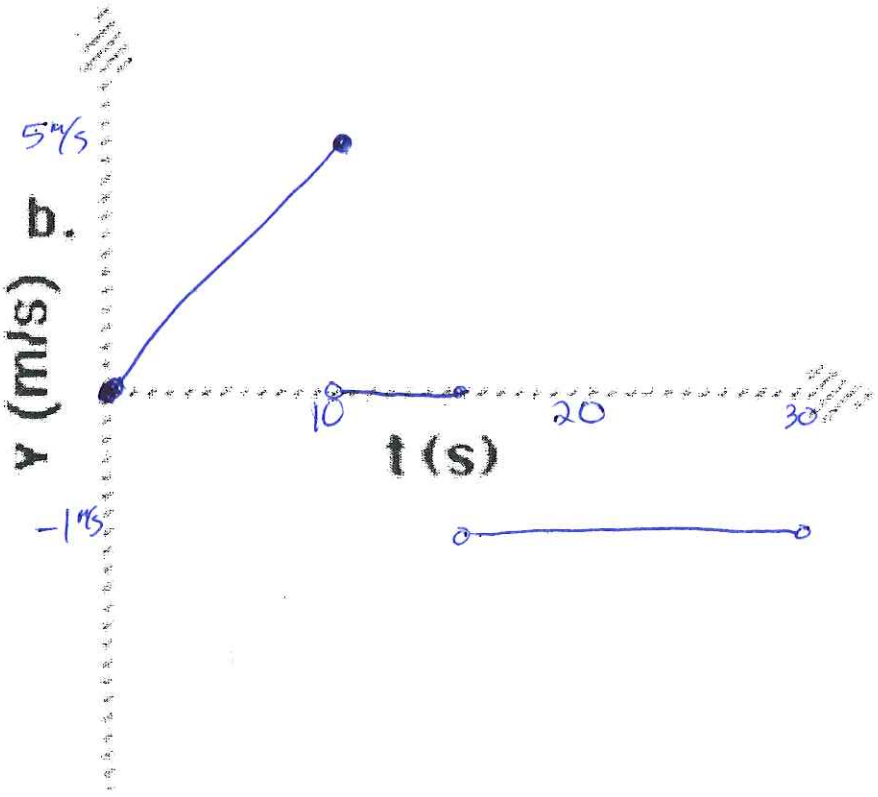
$\frac{49_m}{49_{s^2}} = \frac{\frac{1}{2}a(49_{s^2})}{49_{s^2}}$

$\frac{1\ ^m/_{s^2}}{(1/2)} = \frac{\frac{1}{2}a}{(1/2)}$

$2\ ^m/_{s^2} = a$

24. Create a ***quantitative*** velocity vs. Time graph for the following situation:

Mr. Clark starts from a standing position and runs after a student whose hair is on fire. After 10 seconds, he has reached the student with a velocity of 5 m/s. When he reaches the student, the fire is gone, so they stand for 5 seconds so that Mr. Clark can catch his breath. Then, they walk back to the clinic for ice at a steady rate of -1 m/s for 15 seconds. (6 points)
BONUS POINT: How far from his starting position did Mr. Clark end up?



BONUS: Two objects are racing. One object is accelerating at a rate of 1.5 m/s^2, and the other object has a constant velocity of 10 m/s. Which object will reach 150 m first? Use any method you would like to prove your answer. Write it on a separate sheet of paper and staple to your other short answers.