Name:_____

Kinematics Exam Review 2023

1. A boat sails 35 km [North] in 2.2 hours and then 18 km [East] in 1.8 hours.
a) Determine the average speed.
b) Determine the average velocity (hint: use Pythagoras theorem)

2. Suppose you take a trip that covers 180 km in 3 hours. What is your average speed?

3. A bicyclist accelerates from rest to 18 m/s along a 150 m segment of a straight road. Determine the acceleration of the bicyclist.

4. Jacob decided to drive to school. She drove 18.0 km [E], then 9.0 km [W], then 3.0 km [E]. Where is the school relative to his house?

5. An SUV travels for 13 km [E], then 22 km [W] and finally 9 km [E]. What is its overall displacement?

6. Assume that the ironman marathon record is 4h 20min 15s. Determine the average speed of this 100 km race. Express your answer in m/s.

7. A rat in a maze travels 252 cm total from where it is released before finding the exit. The time it takes the rat to finish is 4 minutes. Calculate the average speed of the electrons in m/s.

8. A roller coaster travels at 8.0 m above the ground speeding along at 19 m/s. It rises to a peak height of 17 m high and then plunges down to a height of 3.0 m (the lowest point of the ride). Determine the speed at the lowest point of the ride.

9. At the snail racing championship in England, the winner moved at an average velocity of 3.8 mm/s [fwd] for 137 s. Determine the winning snail's displacement (in mm) during this time interval.

10. An object is thrown vertically upward at 35 m/s (on Earth). Calculate its velocity after 5 s.

11. A car accelerates uniformly from 18.5 m/s to 46.1 m/s in 2.47 s. Determine the distance traveled.

12. The women's record for the top windsurfing speed is 25.8 m/s. Assuming that this speed remains constant, how long would it take the record holder to move 128 m [fwd]?

13. A projectile is fired with an initial speed of 65.2 m/s at an angle of 34.5º above the horizontal on a long flat firing range. Determine the total time in the air and the total horizontal distance covered

14. A soccer player starting from rest and undergoing uniform acceleration reaches a velocity of 7.0 m/s [fwd] in 6.2 s. Find the average acceleration of the soccer player.

15. A ball is thrown upwards at 22m/s[up] at t = 0s. Find
a) Its velocity at t = 1.5s
b) the time it requires to reach maximum height
c) the maximum height reached
d) its displacement during the first 1.8s of its flight.

16. A car travelling along a highway must uniformly reduce its velocity to 15 m/s [N] in 3.5 s. If the displacement travelled during that time interval is 70 m [N], what is the car's average acceleration? What is its initial velocity?

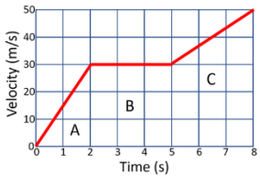
17. A boy launches a toy rocket from his backyard. The rocket's upward velocity increased from 10m/s to 100m/s, with an average acceleration of magnitude 4.1 m/s^2. How long did the acceleration last?

18. Two rugby players are running towards each other. They are 37 m apart. If one is accelerating from rest at 0.5 m/s^2 and the other was already moving at 3.1 m/s and maintains her speed,
a) How long before they meet together?
b) How fast was the accelerating player going?
c) How far has each player run?

19. A sports car starts from rest and has a uniform acceleration of 1.2 m/s [N]. What is its velocity after 30 s? How far does it go in that time?

20. A football is kicked at ground level with a speed of 18.0 m/s at an angle of 35.0º to the horizontal. How much later does it hit the ground?

21. Below is a velocity-time graph of a moving car. Answer the following questions using the graph.
a) How far did the car go in 2 seconds?
b) What is the car's acceleration at 6 seconds?



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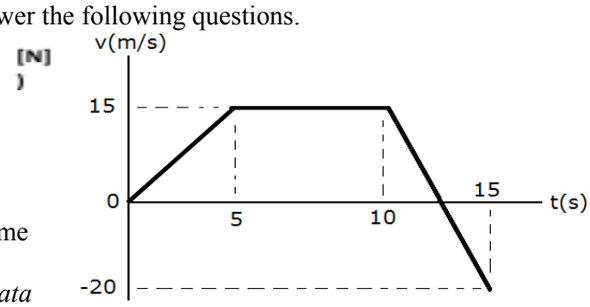
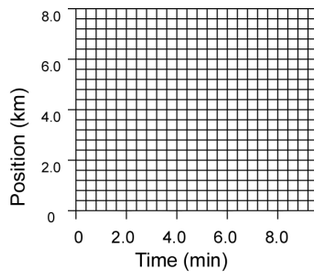
22. Use the v-t graph shown on the right for a 3.5 kg mass to answer the following questions.
a) its acceleration at t=13 s
b) the displacement of the body from t=0 s to t=10 s
c) the kinetic energy of the body at 9.5 s
d) the net force on the body at t= 6 s
e) the work done on the body from t=0 s to t=5 s



23. Sketch a position-time graph for the following scenario: assume that Mr. Termai, the fastest teacher at TDSS, runs 11 m straight South each second for 12.0s. *Hint, it may be helpful to create a data table for the x values (time) and y values (displacement) in your graph*.
a. Calculate the slope of the graph. What does this value represent?

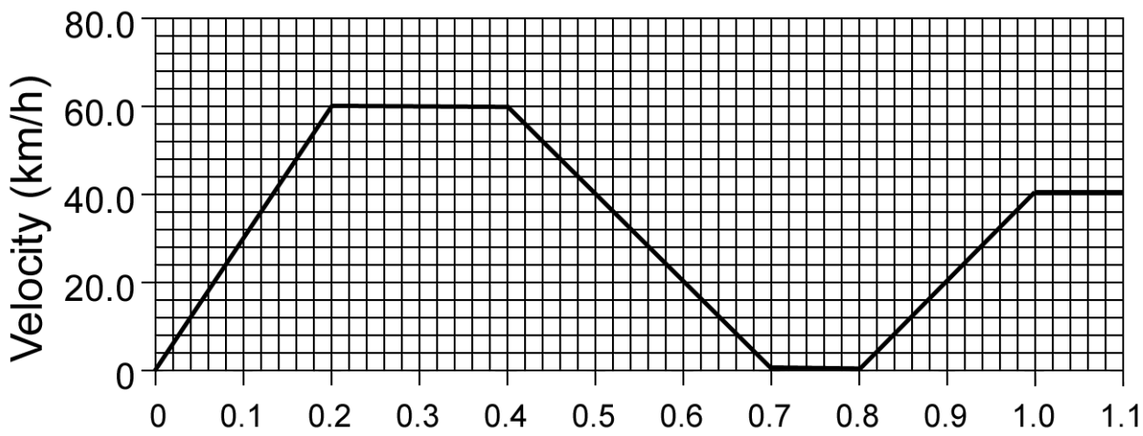
24. The following table shows the positions of two cars at the times indicated. Graph the data for each car on one set of axis and compute the velocity of each car. One another section of the graph paper, sketch a velocity-time graph for the same scenario
a. Calculate the slope of this graph:

TIME (min)	Position CAR A (km)	CAR B (km)
0	0	2
2	2	3.5
4	4	5
6	6	6.5
8	8	8



25. A ball is thrown horizontally from the roof of a building 45.0 m tall and lands 24.0 m from the base. What was the ball's initial speed?

26. Below is a velocity-time graph of a moving car. Answer the following questions using the graph.



a) How far did the car go in 0.2 hours?
b) What is the car's acceleration at 0.9 hr?

27. Consider an object that starts from rest, and then accelerates West with an average acceleration of 5.0 m/s^2. Draw the velocity-time graph on another sheet of graph paper.
a. Calculate the area between the line and the x-axis of this graph. What does this value represent?

28. Calculate the displacement for the entire trip from given velocity-time graph.