

**PHYSICS 2204
UNIT 1 KINEMATICS
WORKSHEET #5: UNIFORM MOTION**



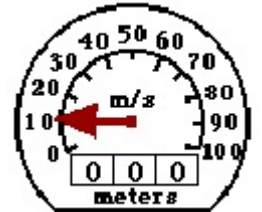
STUDENT NAME: _____

Kinematics is the study of how objects move. It makes up a large part of introductory physics.

Speed:

- always be a distance unit / a time unit

Ex.	Cars:	km/h
	Snails:	cm/s
	Falling objects	m/s

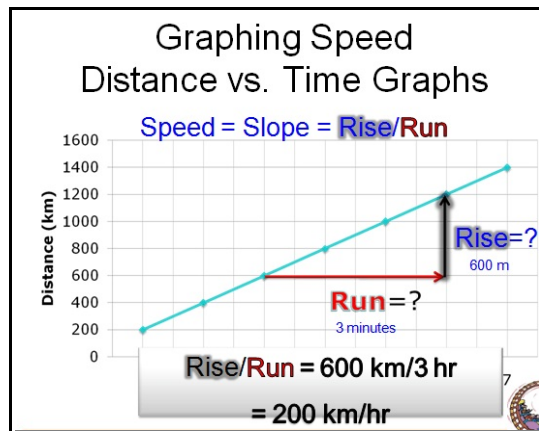


Instantaneous speed the speed at which an object is moving at a particular moment in time

Constant Speed: A moving object that doesn't change its speed travels at constant speed. Constant speed means equal distances are covered in an equal amount of time

Uniform motion : refers to motion at a constant speed in a straight line.

Example: A car with the cruise control set at 100 km/hr



A distance-time graph displays the distance of an object over time. Speed is the relationship between distance and time, $v = d/t$. The slope of a line on distance-time graph is speed. If a line rises steadily on a distance versus time graph indicates that is constant. The faster an object moves, the slope of the line would be steeper.

$$Slope = \frac{rise}{run}$$

$$speed = \frac{distance}{time}$$

$$v = \frac{d}{t}$$

Example 1:

Suppose that during your trip to school, you traveled a distance of 1002 m and the trip lasted 300 seconds. The average speed of your car could be determined as

Example 2:

A bicyclist travels 60.0 kilometers in 3.5 hours. What is the cyclist's speed?

Example 3:

If you drive at 100 km/hr for 6.0 hours, how far will you go?

Example 4:

If you run at 12 m/s for 15 minutes, how far will you go?

Example 5:

A bullet travels at 850 m/s. How long will it take a bullet to go 1.0 km?

Average speed refers to the total distance per total time ratio.

Formula :

$$V_{\text{ave}} = \frac{\Delta d}{\Delta t}$$

Δ means change

Δd → total change in distance (m, km)

Δt → total change in time (s, hr)

V_{ave} → Average Speed (m/s, km/hr)

Example 1:

You go out for some exercise in which you run 12.0 km in 2.0 hours, and then bicycle another 20.0 km in 1.0 hour. What was your average speed for the entire marathon?

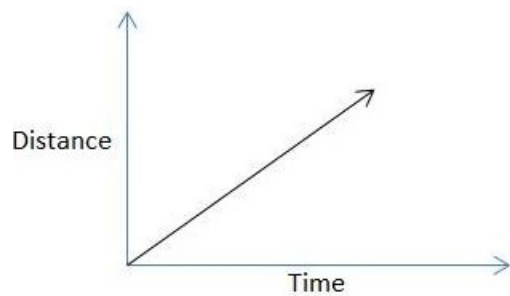
Example 2

A traveler journeys by plane at 400.0 km/hr for 5.0 hours, then drives by car for 180 km in 2.0 hours and finally takes a 45 minute ferry ride the last 12 km to his home. What is her average speed for the entire trip?

PART A: MULTIPLE CHOICE

Instructions: Shade the letter of the correct answer on the computer scorable answer sheet provided

1. What is the SI unit for speed?
(A) m
(B) m/s
(C) s
(D) s/m
2. What is 1.0 km/hr equal to?
(A) 0.28 m/s
(B) 1.0 m/s
(C) 3.6 m/s
(D) 10 m/s
3. Which of the following best describes the speed of an object?
(A) Average magnitude of its velocity during the trip
(B) Distance it travels in a small interval of time divided by the time interval.
(C) Distance it travels divided by the time it takes.
(D) Greatest magnitude of its velocity during the trip.
4. Which terms describes speed at a particular moment in time?
(A) Average Speed
(B) Constant Speed
(C) Instantaneous Speed
(D) Uniform Speed
5. What is the name of the instrument used to measure instantaneous speed of a vehicle?
(A) Accelerator
(B) Ammeter
(C) Multimeter
(D) Speedometer
6. What kind of motion is shown in the graph to the right?
(A) Accelerating
(B) Non uniform
(C) Speeding up
(D) Uniform motion

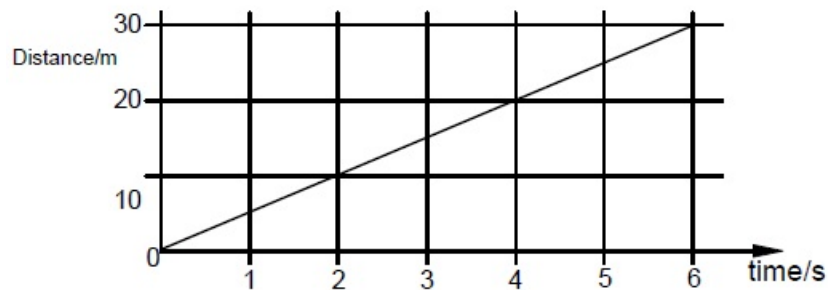


7. Which of the following describes uniform motion?

	SPEED	DIRECTION
(A)	Constant	Constant
(B)	Constant	Changing
(C)	Changing	Constant
(D)	Changing	Changing

8. What quantity do you get from the slope of a d-t graph?
- (A) Acceleration
 (B) Distance
 (C) Speed
 (D) Time
9. Which of the following would represent uniform motion on a distance - time graph?
- (A) Curved line
 (B) Parabola
 (C) Rectangle
 (D) Straight line

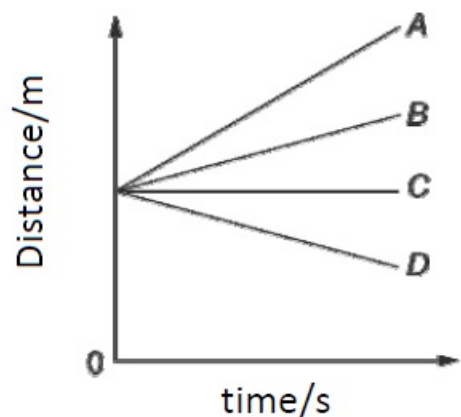
Use the graph below to answer questions 10 to 12:



10. How far did object show in graph travel in 4 seconds?
- (A) 0.0 m
 (B) 6.0m
 (C) 20. m
 (D) 30. m
11. What does the slope of this graph represent?
- (A) Acceleration
 (B) Distance
 (C) Speed
 (D) Time
12. How fast was this object moving?
- (A) 0.0 m/s
 (B) 5.0 m/s
 (C) 20.m/s
 (D) 30.0 m/s

13. Graph below shows the distance - time graph of four objects. Which object is moving at the greatest speed?

- (A) A
 (B) B
 (C) C
 (D) D



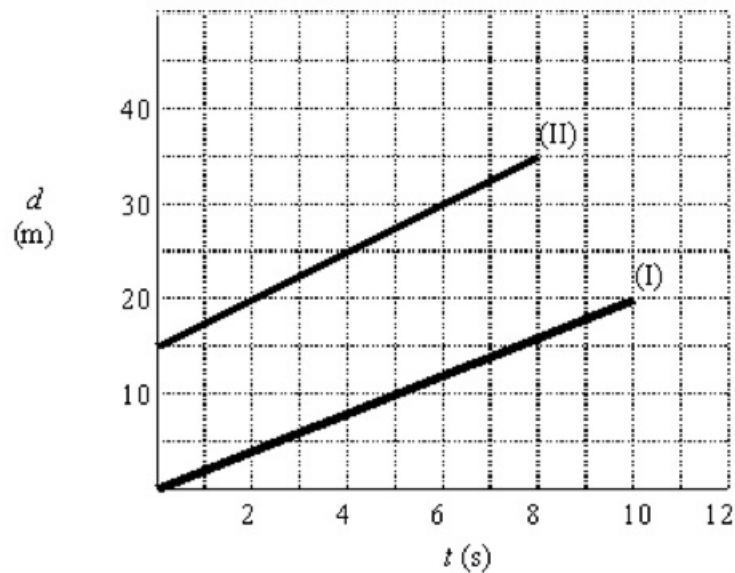
14. In the equation $v = \frac{d}{t}$, what does the t stand for?
- (A) Speed
 - (B) Time
 - (C) Total distance
 - (D) Total acceleration
15. What is the distance covered by a car in 5 h if it is moving with a speed of 35 km/h?
- (A) 7 km
 - (B) 150 km
 - (C) 175 km
 - (D) 1750 km
16. A car travels 90 km/h. How long does it take for it to travel 400 km?
- (A) 4.1 h
 - (B) 4.2 h
 - (C) 4.3 h
 - (D) 4.4 h
17. What is the speed of a bird that flies 6.0 m in 2.0 s?
- (A) 0.33 m/s
 - (B) 3.0 m/s
 - (C) 6.0 m/s
 - (D) 12. m/s
18. What is the average speed of a car that travels a distance of 10 km in 30 min?
- (A) 10 km/h
 - (B) 20 km/h
 - (C) 30 km/h
 - (D) 40 km/h
19. A runner takes 2.5 min to complete one lap around a circular track with a diameter of 100.0 m. What was the average speed of the runner?
- (A) 0 m/s
 - (B) 2.1 m/s
 - (C) 5.0 m/s
 - (D) 40.0 m/s
20. A soccer ball takes 20 s to roll 10 m. What is the average speed of the soccer ball?
- (A) 200 m/s
 - (B) 5 m/s
 - (C) 2 m/s
 - (D) 0.5 m/s
21. When an object is at rest, what is its speed?
- (A) 3.0 m/s
 - (B) 2.0 m/s
 - (C) 1.0 m/s
 - (D) 0.0 m/s
22. When is the average speed of an object equal to the instantaneous speed?
- (A) Always
 - (B) Never
 - (C) Only when the speed is constant
 - (D) Only when the speed is increasing at a constant rate

23. A person travelled by train for 1.0 hr at a speed of 50.0 km/h. He then travelled by a taxi for 30 minutes at a speed of 32.0 km/h to complete his journey. What is the average speed at which he travelled during the journey?
- (A) 44 km/h
 (B) 42 km/h
 (C) 41 km/h
 (D) 33 km/h
24. A car travels 30 km at an average speed of 60 km/hr and then 30 km at an average speed of 30 km/hr. What is the average speed the car over the 60 km?
- (A) 35 km/hr
 (B) 40 km/hr
 (C) 45 km/hr
 (D) 10 km/hr
25. A truck traveled 400 meters north in 80 seconds, and then it traveled 300 meters east in 70 seconds. What is the average speed of the truck?
- (A) 1.2 m/s
 (B) 3.3 m/s
 (C) 4.7 m/s
 (D) 6.6 m/s
26. Molly runs two laps of a 400 m running track. The first lap takes 150 seconds and the second lap takes 80 seconds. What is her average speed over the two laps?
- (A) 0.58 m/s
 (B) 1.7 m/s
 (C) 3.5 m/s
 (D) 3.8 m/s

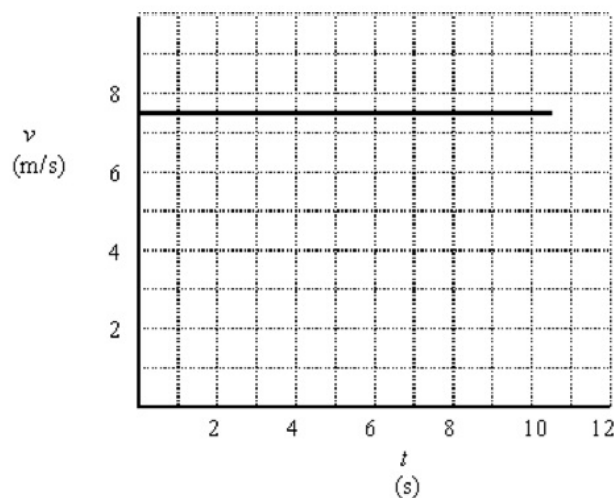
PART B: WRITTEN RESPONSE

- A car travels 32 m in 12 seconds. How fast is the car moving?
- At a party, Kermit was standing 26 m away from Miss Piggy. If she ran toward him at a steady 2 m/s, find the time before she can grab his gorgeous green body.
- Kim skateboards down the street in front of the school, travelling at 24 km/h. How much time would it take her to travel 6.0 km?
- How far could a rabbit run if it ran 36 km/h for 5 minutes?
- If you ran 15 km/h for 20 min, how much distance would you cover?
- How much time would it take Roy to walk 1 km if he walked at a rate of 4.5km/h?
- If I travel on my Skidoo at a speed of 40 km/h how long will it take me to get to Ocean Pond which is 18 km away?
- If I can travel to Port Aux Basque (466 km away) by boat in 18 hours, then how fast am I going?
- What will the speed of a Caribou be if it travels 32 km in 25 minutes while being chased by a wolf?

11. Calculate the following:
 - a) A snowmobile rider travels 10.2 km in 48 minutes. What is the average speed, in km/hr, of the rider?
 - b) The BEAST moving at 90.0 m/s travels the length of a pond in 1.3 minutes. How long is the pond?
 - c) How long does it take you to run around a circular track, with radius 50 m, if you run at 3.9 m/s?
12. How far will a man travel in 15 min driving his car down a highway at an average speed of 24m/s?
13. When training for the Crescent Triathlon you regularly ride your bike from Heart's Delight to Blaketown, a distance of 100 km. The fastest time in which you did this was 1.5 hours. What was your average speed on that day?
14. A plane flying non stop travels at a speed of 750 km/hr for 2 hrs and then at 500 km/hr for the remaining 5 hrs of the trip. Calculate the average speed.
15. The d-t graph shows the distance vs. time relationship for two objects.

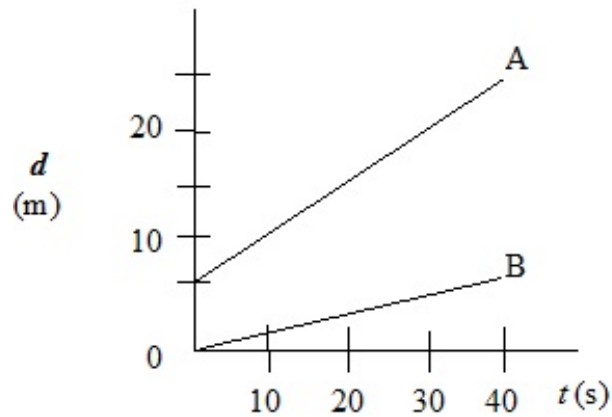


- a) Calculate the speed for each of each object.
 - b) State the y-intercept for object (II) and explain what it means.
 - c) Use the information in the graph to construct a graph of speed vs. time for the object denoted by graph(II).
16. The velocity vs. time graph was constructed for an object undergoing uniform motion.



- a) What was the average speed for the motion?
- b) What was the total distance traveled after 10 seconds?
- c) What was the distance traveled from $t = 3.0$ s and $t = 8.5$ s?

17. During what type of motion is the instantaneous speed of an object always the same as its average speed?
18. The graph shown at the right describes the motion of Al and Bette as they travel along a road in a 40 s trip.



- a) At what distance was Al from Bette when she began moving?

- b) Calculate the speed of both Al and Bette in the space below.

Al's Average Speed = _____

Bette's Average Speed = _____

- c) Would you consider the motion of Al during the trip to be "Uniform Motion"? Why/why not?

19. Graph the following data on the grid and draw a line of best fit.

[4]

Time (hr)	0	2	4	6	8	10
Distance (km)	0	5	13	17	25	29

- a) Calculate the slope of your line of best fit. Show all of your calculations.
- b) Convert your answer to m/s.
- c) What does your slope represent?