

Linear Motion Worksheet (p. 1)

Honors Physical Science

Show "K-U-E-S" on your own paper where necessary. Otherwise answer completely on your own paper.

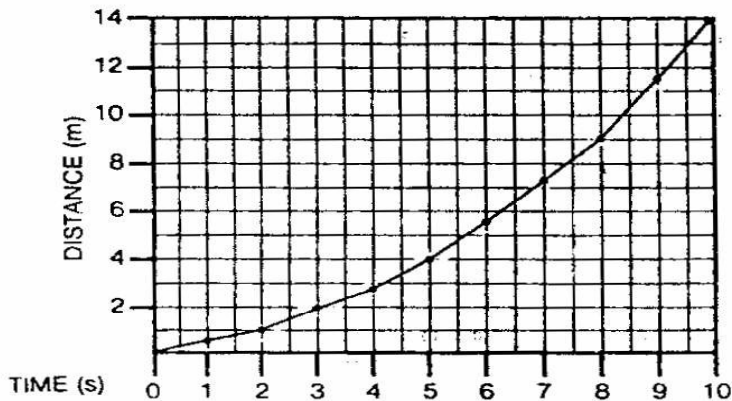
1. A driver travels the Pennsylvania Turnpike (576 km) in 6.67 hours. What is her average speed in (a) km/h? (b) m/s? (c) mi/h?
86.3 km/h 24.0 m/s 53.5 mi/h
2. Light from the sun reaches the earth in 498 s. If the sun is 1.494×10^{11} m from the earth, how fast (m/s) does light travel in space?
 3.00×10^8 m/s
3. A bullet is fired at 660 m/s and strikes a target 200.0 meters away. What is the duration of the bullet's flight?
0.30 s
4. What is the average speed (km/h and mi/h) of a runner who completes a 5.00 km race in 20.50 min?
14.6 km/h 9.05 mi/h
5. How far would an object move in 20.0 seconds if it were traveling at a constant speed of 63.00 meters per second?
1260 m
6. A football travels 25 meters in 2.6 seconds. What is the speed of the football?
9.6 m/s
7. A bus going 55 km/h travels nonstop from the northern end of town to the southern end of town in 15 minutes. How far does the bus travel, in kilometers and miles?
14 km 8.7 mi
8. An amusement park carousel travels at a speed of 8.0 m/s. If the circular track of the carousel has a radius of 10.3 m, how many seconds will it take for the carousel to make one complete revolution?
8.1 s
9. A motorist travels 406 kilometers during a 7.0 hour period. What was the average speed in km/h?
58 km/h
10. During a canoe race, a camper paddles 406 meters in 70.0 seconds. What is the average speed?
5.8 km/h
11. A bullet shot from a rifle with a speed of 720.0 m/s. How far will the bullet travel in 2.3 seconds?
1660 m
12. A rocket launched into outer space travels 2.40×10^5 kilometers during the first 6.2 hours after the launch. What is the average speed of the rocket?
 3.87×10^4 km/h
13. An electron travels through a vacuum tube 2.00 centimeters long in 0.000016 seconds. What is the average speed of the electron?
 1.3×10^5 cm/s
14. The distance from home plate to the pitcher's mound is 60.5 feet. If John Smoltz throws his 95 mi/h fastball, how many seconds does the batter have to swing at the ball after it is released?
0.43 s

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The graph below shows the motion of a toy car. Use the graph to answer #15-16. When reading the graph, distances should be recorded to the nearest 0.1 meter and time to the nearest 0.1 second.



15. What was the car's average speed during (a) the first second? (b) the fifth second? (c) the tenth second?

0.5 m/s 1.1 m/s 2.4 m/s

16. Based on your calculations and the shape of the graph, what can you conclude about the car's speed over the entire 10 second interval?

increases

17. What is the velocity of a car traveling north on I-75 if it takes 2 hours to reach Chattanooga (120 miles)?

60 mi/h N

18. The controls on a motorboat are marked at the position where it travels at 25.0 km/h in still water. What will be the velocity of the boat, as measured by an observer on shore, if it is directed upstream on a river which flows at the rate of 4.0 km/h?

21.0 km/h

19. What is the velocity of a student that takes 5.00 minutes to walk to Walton from home? The student lives 0.50 mile north of Walton.

0.10 mi/min S

20. During a 400 meter run at a track meet the runner in lane 1 will start and finish at the same point. If it takes 58.00 seconds for her to run the race what is her velocity?

No velocity

21. (a) What is the displacement of a cyclist during a 0.50 hour ride if his average velocity was 1.00 km/h west? (b) Did the cyclist actually travel more, less, or the same total distance as his displacement. Explain your answer

0.50 km W more or same

22. Your total displacement during the school day was 25.38 meters towards your homeroom. Your average velocity was 3.583 m/h towards your homeroom. How long is your school day?

7.084 h

23. Andruw Jones throws a baseball from the outfield to home plate and nails a runner trying to score. If Andruw was 106.7 meters from home plate and the throw takes 2.75 seconds to get there, what was the velocity of Andruw's throw in miles per hour?

86.6 mi/h toward home

Linear Motion Worksheet (p. 3)

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25. How much time does a car with an acceleration of 2 m/s^2 take to go from 10 m/s to 30 m/s ?

10 s

27. A car starts from rest and reaches a velocity of 22.0 m/s in 20.0 seconds. What is its acceleration?

1.10 m/s^2

28. How long would the same car, from #27, take to go from 22.0 m/s to 30.0 m/s with the same acceleration?

7.3 s

29. What is the acceleration of a racing car if its velocity is decreased uniformly from 66 m/s to 44 m/s during an 11 second period?

-2.0 m/s^2

30. A spacecraft traveling at 1200 m/s is uniformly accelerated at the rate of 150 m/s^2 by burning its second stage rocket. If the rocket burns for 18 s , what is the final velocity of the craft?

3900 m/s

26. An airplane requires 20 seconds and 400 meter runway to become airborne, starting from rest. What is the velocity at which it leaves the ground?

40 m/s

More thought than K-U-E-S

31. Can an automobile with a velocity toward the north have an acceleration toward the south? Explain.

32. Can an object reverse its direction of travel while maintaining a constant acceleration? If so, give an example. If not, explain why.

33. You are driving north on a highway. Then without changing speed, you round a curve and drive east.
(a) Does your velocity change? (b) Do you accelerate? Explain.

34. Starting from rest, one car accelerates to a speed of 50 km/h , and another car accelerates to a speed of 60 km/h . Can you say which car underwent the greater acceleration? Why or why not?

35. Cite an example of something that undergoes acceleration while moving at a constant speed. Can you also give an example of something that accelerates while travelling at constant velocity? Explain

36. (a) Can an object be moving when its acceleration is zero? If so, give an example. (b) Can an object be accelerating when its speed is zero? If so give an example.

37. What is the acceleration of a car that moves at a steady velocity of 100 km/h for 100 seconds? Explain your answer.

38. On which of these hills does the ball roll down with increasing speed and decreasing acceleration along the path?



Linear Motion Worksheet (p. 4)

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Freefall - More thought than K-U-E-S

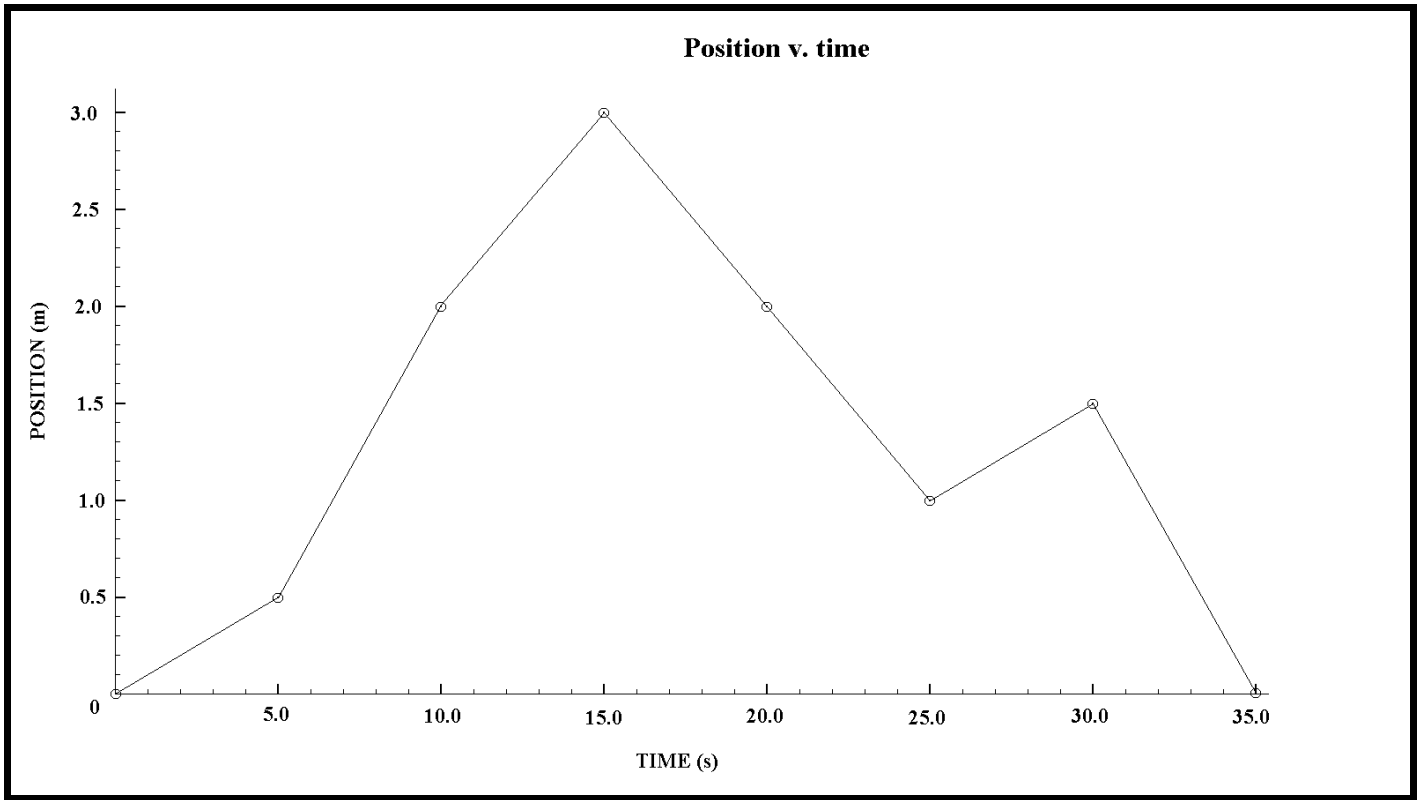
39. What are the conditions for a freely falling object?
40. What is the gain in velocity per second for a freely falling object? *9.8 m/s*
41. The acceleration of free fall is about 10 m/s^2 . Why does the seconds unit appear twice?
42. What is the velocity acquired by a freely falling object 5.0 seconds after being dropped from a rest position? What is it after 6.0 seconds?
49 m/s *57.8 m/s*
43. What is the displacement of a freely falling object 5.00 seconds after being dropped from a rest position? What is it after 6.00 seconds?
123 m *176 m*
44. If a friend claims that in a standing jump he can remain off the ground for 1.0 second then how high can he jump? For 2.0 seconds? Are either of these claims likely to be true?
1.2 m *4.9 m*
45. Suppose that a freely falling object were somehow equipped with a speedometer. By how much would its speed reading increase with each second of fall?
9.8 m/s
46. Suppose that the same freely falling object were also equipped with an odometer. Would the readings of distance fallen indicate equal or different falling distances for successive seconds?
47. For a freely falling object dropped from rest, what is the acceleration at the end of the 5th second of fall? The 10th second? Defend your answer.
48. When a ball player throws a ball straight up, by how much does the velocity of the ball decrease each second while ascending? By how much does it increase while descending? How much time is required for rising as compared to falling?
49. Someone standing at the edge of a cliff throws a ball nearly straight up at a certain speed and another ball nearly straight down with the same initial speed. If air resistance is negligible, how will the speed of each ball compare just before striking the ground below?

Linear Motion Worksheet (p. 5)

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Graph #1



Graph #2

