

Physics 11⁺¹² – Kinematics in 1-D Worksheet

Name: _____

Solve each of the following problems using the format and problem solving procedure outlined in problem #1.

1. A baseball pitcher threw a ball towards the catcher. The instant before it hit the catchers mitt the ball was moving at 35.0 m/s. It took a time of 0.015s from the moment it touched the catchers mitt until it stopped.
- a) What was the acceleration of the ball as it was being caught?

Given information:

$V_i =$ _____
 $V_f =$ _____
 $\Delta t =$ _____
 $a =$ _____
 $\Delta d =$ _____

Diagram:**Solution:**

- i. Equation (in symbols):

- ii. Rearrange equation (unknown variable on left)
 $a =$ _____
- iii. Plug numbers (with units) into equation
 $a =$ _____
- iv. Solve the equation
 $a =$ _____
- v. Give the solution with appropriate **UNITS**, and **SIGNIFICANT DIGITS**. Put a box around your answer, and include a sentence to explain the answer (if necessary for clarity).

$a =$ _____

The acceleration of the ball was _____ during the time that it was being caught.

- b) How far back did the catchers hand move when she was catching the ball?

2. The driver of a speeding car travelling at 38.0 m/s on the highway sees a police car and applies the brakes to slow down.
- (a) If the car slows at a rate of 5.0 m/s^2 , how far will the car have travelled by the time it reaches the speed limit of 100.0 km/h?

Given information:

$$V_i = \underline{\hspace{2cm}}$$

$$v_f = \underline{\hspace{2cm}}$$

$$\Delta t = \underline{\hspace{2cm}}$$

$$a = \underline{\hspace{2cm}}$$

$$\Delta d = \underline{\hspace{2cm}}$$

Solution:**Diagram:**

- (b) How long will it take to reach the speed of 100.0 km/h?

3. A 10.0 kg ball dropped off the edge of a cliff hits the ground 4.5 s later.
- (a) How fast was the ball going just before it hit the ground?

Given information:

$$V_i = \underline{\hspace{2cm}}$$

$$v_f = \underline{\hspace{2cm}}$$

$$\Delta t = \underline{\hspace{2cm}}$$

$$a = \underline{\hspace{2cm}}$$

$$\Delta d = \underline{\hspace{2cm}}$$

Solution:**Diagram:**

- (b) How high was the cliff?

Physics 11H - Kinematics in 1-D Worksheet

4 A javelin thrower carrying a spear while running at 6.0 m/s thrusts the spear ahead with an acceleration of 250m/s^2 for 0.10s. What is the speed with which the javelin leaves the throwers hand?

Given information:

Solution:

$$v_i =$$

$$v_f =$$

$$\Delta t =$$

$$a =$$

$$\Delta d =$$

5 (a) If an Olympic cyclist reaches 18.0 m/s from a standing start in 20.0 s, what is his average acceleration?

Given information:

Solution:

$$v_i =$$

$$v_f =$$

$$\Delta t =$$

$$a =$$

$$\Delta d =$$

(b) What distance does he travel in that time?

6 (a) If a skier accelerates steadily down a hill from 3.50 m/s to 11.40 m/s in 4.20 s, what distance does she travel?

Given information:

Solution:

$$v_i =$$

$$v_f =$$

$$\Delta t =$$

$$a =$$

$$\Delta d =$$

7 a) A frustrated physics student threw his textbook into the air with a speed of 8.0 m/s from a height of 1.0 m. How high did the book fly above the ground before falling down?

Given information:

$$v_i =$$

$$v_f =$$

$$\Delta t =$$

$$a =$$

$$\Delta d =$$

Solution:

b) How long was the book in the air before it finally hit the ground?

8 a) In a panic stop a cars brakes can produce an acceleration of -8.0 m/s^2 . If you are driving at 100.0 km/h, what is your minimum stopping distance from the instant you step on the brakes?

Given information:

$$v_i =$$

$$v_f =$$

$$\Delta t =$$

$$a =$$

$$\Delta d =$$

Solution:

COMPLETE THE REMAINING PROBLEMS ON A SEPARATE PIECE OF PAPER. USE THE SAME FORMAT AS IN THE PREVIOUS PROBLEMS.

9. A ball is thrown vertically upward off a bridge with a speed of 18.0 m/s.
- How long does it take to reach its maximum height?
 - If the ball hits the water below the bridge 8.0 s after it was thrown, how high is the bridge?
10. A car accelerates from rest to 100.0 km/h in a time of 40.0 s. How far does it travel in that time?
11. A bullet accelerates from rest at $5.75 \times 10^4 \text{ m/s}^2$ while it travels through a 0.80 m long rifle barrel.
- How long is the bullet in the barrel?
 - What is the velocity of the bullet as it leaves the rifle barrel?
12. A ball was dropped off a cliff and hit the river below with a speed of 25.0 m/s.
- How high was the bridge above the river?
 - How long did it take the ball to fall?
13. A helicopter was moving upward at a speed of 5.0 m/s when a child dropped a stone out the window. The stone hit the ground 10.0 s later. How high above the ground was the helicopter at the instant that the stone was dropped?
14. A boat accelerates from rest at a rate of 4.6 m/s^2 for 6.8 s. How fast will the boat be moving after this time?
15. Police found skid marks 78.0 m long on a highway showing where a car made an emergency stop.
- If the acceleration of the car was -8.54 m/s^2 , how fast was the car going before it tried to stop?
 - How long did it take to stop?
16. A bungee jumper steps off a bridge and falls for 50.0 m before the rope starts to slow her down.
- How long did it take for her to fall 50.0 m?
 - What was her velocity the instant before the rope started to slow her fall?
17. A ball is thrown vertically off a cliff at 12.0 m/s, and hits the ground 7.5 s later. How high is the cliff?