

Name \_\_\_\_\_

## Freefall WS 1

$$y = \frac{1}{2} at^2 \text{ (} g = 9.8 \text{ m/s}^2 \text{ or } 10 \text{ m/s}^2 \text{)}$$

1. A baseball dropped from the roof of a tall building takes 3.1 seconds to hit the ground. How tall is the building?
2. A rock falls freely from rest a total of 32 meters near the surface of a planet where the acceleration due to gravity is  $4.0 \text{ m/s}^2$ . How many seconds does it take to reach the ground?
3. A student standing on the roof of a 50.0-meter-high building kicks a stone. How much time is required for the stone to reach the level ground below?
4. If a ball hits the ground 4.0 seconds after being released, approximately how high is the cliff?
5. A clam dropped by a sea gull takes 3.0 seconds to hit the ground. What is the sea gull's approximate height above the ground at the time the clam was dropped?

$$y = v_0 t + \frac{1}{2} at^2$$

6. A baseball thrown at  $3 \text{ m/s}$  from the roof of a tall building takes 3.1 seconds to hit the ground. How tall is the building?
7. If a ball hits the ground 4.0 seconds after being thrown with an initial speed of  $10 \text{ m/s}$ , approximately how high is the cliff?
8. A clam that is tossed downward at  $1.5 \text{ m/s}$  by a sea gull takes 3.0 seconds to hit the ground. What is the sea gull's approximate height above the ground at the time the clam was dropped?
9. A rock falls freely a total of 33 meters near the surface of a planet where the acceleration due to gravity is  $6.0 \text{ m/s}^2$ . If it is thrown initially at  $2 \text{ m/s}$ , how many seconds does it take to reach the ground?

$$y = y_0 + v_0 t + \frac{1}{2} at^2$$

10. A baseball thrown down at  $3 \text{ m/s}$  from the penthouse window, which is 10 m below the top of a tall building. How tall is the building if it takes 8.0 seconds to hit the ground?
11. A soccer play starts at the 20 meter line with the center running at  $2 \text{ m/s}$ . What meter line will she end up on if she accelerates for 4 seconds at  $1.5 \text{ m/s}^2$ ?
12. A manned spaceship has just undocked from the international space station which is traveling at  $7700 \text{ m/s}$  when the rockets accelerated it at  $12 \text{ m/s}^2$  at a tangent to the orbit. If the ISS is 350 km above Earth, how far will the spaceship be from the Earth in 1 hour?
13. A ball is thrown straight downward with a speed of 0.50 meter per second from a height of 4.0 meters. What is the speed of the ball 0.70 second after it is released? (Note: acceleration of gravity =  $9.8 \text{ m/s}^2$ )

14. Fill in the following chart for free fall on Earth ( $10 \text{ m/s}^2$ )

Time	Final Speed	Average Speed	Distance this second	Total Distance
0 second	0 m/s		0 m	0 m
1	10 m/s	5 m/s	5 m	5 m
2				
3				
4				
5				

15. Fill in the following chart for free fall on Mars ( $3.8 \text{ m/s}^2$ )

Time	Final Speed	Average Speed	Distance this second	Total Distance
0 second	0 m/s		0 m	0 m
1				
2				
3				
4				
5				

16. A rock dropped off a bridge takes 5 seconds to hit the water. Approximately what was the rock's velocity just before impact?

17. A ball dropped from rest falls freely until it hits the ground with a speed of  $20 \text{ m/s}$ . What is the time the ball is in free fall?

18. An object, initially at rest, falls freely near the Earth's surface. How long does it take the object to attain a speed of  $98 \text{ m/s}$ ?