

Chapter 2.8 Check Your Understanding

Exercises 1–10 True or False. Give reasons.

1. A ball dropped from a height of 256 feet takes 4 seconds to hit the ground.

Answer:

True; $s = 256 - 16t^2$; when $s = 0$, $256 - 16t^2 = 0$, $t^2 = 16$, $t = 4$.

2. It takes twice as long for a ball to fall to the ground from a height of 64 feet than from a height of 32 feet.

Answer:

False; for $s_1 = 64 - 16t_1^2$; $s_1 = 0$, $t_1 = 2$. For $s_2 = 32 - 16t_2^2$; $s_2 = 0$, then $t_2 = \sqrt{2}$.

3. If a ball is dropped from a height of 256 feet and at the same instant a second ball is thrown upward from ground level at a speed of 128 feet per second, the two balls will meet at a point 192 feet above the ground.

Answer:

True; $s_1 = 256 - 16t_1^2$; when $s_1 = 192$, $192 = 256 - 16t_1^2$, $t_1 = 2$. It takes 2 seconds for the first ball to reach the height of 192 feet. $s_2 = 128t_2 - 16t_2^2$; when $s_2 = 192$, $192 = 128t_2 - 16t_2^2$, solve for t_2 , $t_2 = 2$ (or $t_2 = 6$, ball is going down) Thus, at the end of 2 seconds both balls are 192 feet from the ground.

4. In Exercise 3, the two balls will meet in 2 seconds.

Answer:

True; see solution to Exercise 3.

5. A ball rolls down a long inclined plane. It takes longer to roll down the first 10 feet than it does to roll down the next 10 feet.

Answer:

True; for the first 10 feet the ball starts from rest, and for the final 10 feet the ball has an initial velocity greater than 0.

6. It takes the same amount of time to travel 240 miles at 55 mph as it takes to travel the first 120 miles at 50 mph and the final 120 miles at 60 mph.

Answer:

False; use $d = vt$, or $t = d/v$. For 240 miles at 55 mph, $t_1 = \frac{240}{55} = 4.36$. For 120 miles at 50 mph and 120 miles at 60 mph, $t_2 = \frac{120}{50} + \frac{120}{60} = 4.4$. Thus it takes less time to travel 240 miles at 55 mph.

7. If a square and an equilateral triangle are inscribed in the same circle, then the square has greater area than the triangle.

Answer:

True; draw diagram and show that $A_t = \frac{3\sqrt{3}}{4} r^2 \approx 1.3 r^2$, and $A_s = 2r^2$.

8. For any rectangle with a perimeter of 16, the length of one side must be at least 4.

Answer:

True; $2l + 2w = 16$, $l + w = 8$. If both l and w are less than 4, then $l + w$ will be less than 8

9. No triangle can have sides of lengths 3, 4, and 8.

Answer:

True; for a triangle, the sum of the lengths of the two shorter sides ($3 + 4$) must be greater than the length of the third side, which is 8.

10. If a sphere has diameter d , then its volume V is given by $\frac{\pi d^3}{12}$.

Answer:

False; $V = \frac{4\pi r^3}{3}$. Replace r by $\frac{d}{2}$ to get $V = \frac{4\pi}{3} \left(\frac{d}{2}\right)^3 = \frac{\pi d^3}{6}$.