

Harder Kinematics Problems

1. An object is dropped off a cliff. A second object is thrown down with speed 15 m/s after 1.2 seconds have elapsed. How far down the cliff do they catch each other?
2. A stone is thrown straight upward with a speed of 20 m/s. It is caught on its way down at a point 5.0 m above where it was thrown.
 - a. How fast was it going when it was caught?
 - b. How long did the trip take?
3. A baseball is thrown straight upward on the moon ($g=1.60 \text{ m/s}^2$) with an initial speed of 35 m/s.
 - a. Compute its velocity 30 s after it is thrown.
 - b. When is the ball's height 100m?
4. A car starts from rest at point A and moves in a straight line with constant acceleration. It passes two checkpoints, B and C, which are located 72 meters apart. The car is clocked at 23 m/s as it passes the second checkpoint, just 3.2 seconds after it passed the first checkpoint.
 - a. What is the car's acceleration?
 - b. What was the car's velocity as it passed the first checkpoint?
 - c. The distance between the start where the car was at rest (A) to the first checkpoint (B)?
 - d. The total time to drive from point A to C?

Answers:

1. 2.18 seconds, 56 meters down the cliff
2. B. 3.8 sec
3. a. 13 m/s downwards, $t = 3.1$ s AND 41 s
4. ...
 - a. $a = 3.2$ m/s²
 - b. $v = 8.2$ m/s
 - c. 10.5 m
 - d. 5.8 s