LESSON 13

SAMPLE QUIZ & HOMEWORK QUESTIONS

Sample Quiz: Lesson 13

Students answer quiz questions online where they are automatically graded. The quizzes are designed to help the student test their own knowledge of the material. They should use the weekly comprehension quizzes as an opportunity to see where there are weaknesses in understanding so they can go back and study these areas.

There are four quarterly exams. These will be longer and more comprehensive tests, but the course contains study guides to help students remember all the important material. The exam grades are final —grades cannot be reset.

As a parent, you can log in to your own parent dashboard and click on "Student Management" to see the grades for each quiz.

For this quiz, students will need to know how to apply the equations learned in this lesson and some previous lessons. These equations will be provided to students on the Physics Equation Guide which they can use on quiz and homework questions throughout the course.

1) Which of the following can not be a vector?
    a) Distance
    b) Time
    c) Velocity
    d) Acceleration

2) When considering the velocity of a high jumper, jumping over a horizontal bar, the horizontal movement of the jumper will slow down the vertical movement of the jumper.
    a) True
    b) False

3) A person who launches upwards with a vertical velocity of 5 m/s can rise to a height of 1.25 m. If that person were instead running sideways at 3 m/s and then launched with that same vertical velocity, how high could they rise?
    a) More than 1.25 m
    b) Less than 1.25 m
    c) Exactly 1.25 m
    d) It depends on how far they move sideways.

4) A car is driving north through an intersection at 45 mph when another car collides with it coming from the east, giving it an additional 25 mph of speed westward. What is the total speed of the car after the collision?
   a) 35 mph
   b) 41 mph
   c) 45 mph
   d) 51 mph

5) In the action movie *Speed*, a bus driving at 55 mph (24 m/s) tries to jump over a large gap without any ramp, driving straight off the edge! If the gap is 10 m wide, how far should the bus have fallen by the time it reached the other side?
   a) 2.4 m
   b) 24 m
   c) 0.8 m
   d) 10 m

6) A pitcher throws a baseball perfectly horizontally, at a speed of 42 m/s. Because he is standing on a mound and throwing it from over his head, it begins 3.07 m off the ground. When it reaches home plate, it has traveled 18.4 m horizontally. How high will it be off the ground at this time? Remember to find how far it falls and *subtract* from where it started.
   a) 2.11 m
   b) 3.07 m
   c) 1.84 m
   d) 2.72 m

7) Consider an action movie where our hero has to jump a gap from one building to the next. If he can leap vertically at a speed of 6 m/s, how much sideways speed does he need from his running start in order to get to the next building if it is 12 m away?
   a) 12 m/s
   b) 10 m/s
   c) 18 m/s
   d) 6 m/s

8) A stuntman on a motorcycle is trying to jump over a 40 m gap. If his horizontal speed at takeoff is 30 m/s, how much vertical speed does he need in order to clear the gap?
   a) 40 m/s
   b) 30 m/s
   c) 10 m/s
   d) 6.7 m/s

Sample Homework Questions: Lesson 13

Students will typically be assigned homework questions to answer each week. These questions are designed to help them apply the lecture material by practicing equations or reinforcing difficult lecture topics. Your students can use their notes, textbook, or other resources available to them to answer these questions. We also provide homework help videos in case students get stuck on any tricky math equations.

The parent is responsible for grading these assignments. You can download an answer key in your parent dashboard that will help you with grading. For each question, we recommend assigning a grade between 0-3. Give your student 3 points if the answer looks accurate, 2 points if the work lacks important details, 1 point if it looks largely inaccurate, and 0 points if the work was incomplete or was hastily completed.

Below is an example of what homework questions for lesson 13 look like along with the parent answers included in red.

1) hy can't you simply add the distances of two perpendicular motions to find the overall distance? How must you add them instead?
   Since they are perpendicular, they are not on the same number line so addition doesn't work in the normal way, you must use Pythagorean addition instead: square the two numbers, then add them, then take the square root of the result.

2) A pigeon hitches a ride on a taxi cab that drives 8 blocks north, then turns east and drives 6 more blocks. How far would the pigeon have to fly to go straight back to where it started?
   a = 8 b = 6 c = ?
   $c = \sqrt{a^2 + b^2}$
   c = $\sqrt{8^2 + 6^2} = \sqrt{64 + 36} = \sqrt{100}$
   c = 10 blocks

3) A plane flies south at 150 mph, and a cross wind adds 50 mph of westward speed. What is the total speed of the plane?
   a = 150 b = 50 c = ?
   $c = \sqrt{a^2 + b^2}$
   $c = \sqrt{150^2 + 50^2} = \sqrt{22,500 + 2,500} = \sqrt{25,000}$
   c = 158 mph

4) A hurdler can jump over a hurdle using a vertical velocity of 4 m/s. If her running speed is 7.5 m/s, how far before the hurdle should she take off so she is at the peak of her jump when she is right over the hurdle? In other words, how far sideways will she move by the time she stops rising?

Time to stop rising:

v_{yi} = 4 m/s $\quad$ v_{yf} = 0 m/s $\quad$ v_x = 7.5 m/s $\quad$ a_y = -10 m/s^2 $\quad$ t = ?

$v_{yf} = a_y t + v_{yi}$ $\quad$ $t = (v_{yf} - v_{yi})/a_y$

(0 m/s - 4 m/s)/(-10 m/s^2) = 0.4 s

Distance before she should jump:

$v_x = x/t$ $\quad$ $x = v_x t$

x = (7.5m/s)(0.4s) = 3 m

5) A helicopter flying at 30.0 m/s is 100.0 m above the ground. It carries a load of water to put out a forest fire. How far sideways can the water move by the time it hits the ground, if dropped from this helicopter? This is how the pilot will decide how far ahead of the fire to release the water.

Time to reach the ground:

v_x = 30.0 m/s $\quad$ v_{yi} = 0 m/s $\quad$ y_f = -100.0 m $\quad$ a_y = -10 m/s^2 $\quad$ t = ? $\quad$ y_i = 0 m

$$y_f = v_{yi}t + \frac{1}{2}a_y t^2 + y_i \qquad y_f = (0)t + \frac{1}{2}a_y t^2 + 0$$

$$y_f = \frac{1}{2}a_y t^2 \qquad \sqrt{\frac{2y}{a}} = t$$

$$t = \sqrt{\frac{2(-100\ m)}{-10\ m/s^2}} = \sqrt{20\ s^2}$$

t = 4.47 s

How far sideways the water moves:

$v_x = x/t$ $\quad$ $x = v_x t$

x = (30 m/s)(4.47 s) $\quad$ x = 134 m

6) A baseball launches from the bat with 15 m/s of vertical velocity. If there is a home run fence 100 m away that is the same height as where the ball launched from, what horizontal velocity must the ball have in order to clear the fence?

The time to fall back to the same height (and therefore the same speed):

v_{yi} = 15 m/s $\quad$ v_{yf} = -15 m/s $\quad$ x = 100 m $\quad$ a_y = -10 m/s^2 $\quad$ t = ?

$v_{yf} = a_y t + v_{yi}$

$t = (v_{yf} - v_{yi})/a_y$

t = (-15m/s - 15m/s)/(-10m/s^2) $\quad$ t= 3s

Horizontal velocity of the ball:

$v_x = x/t$ $\quad$ $v_x = x/t$

$v_x = (100\ m)/(3\ s)$ $v_x = 33.3\ m/s$

7) If you run at a 4 m-wide puddle going 6 m/s and you want to jump clear across it, how much vertical velocity will you need to launch with?

$x = 4\ m$ $v_x = 6\ m/s$ $a_y = -10\ m/s^2$

Time to cross the puddle:

$v_x = x/t$ $t = x/v_x$

$t = (4\ m)/(6\ m/s)$ $t = 0.67s$

Velocity needed to cross the puddle:

$v_{yf} = a_y t + v_{yi}$ $v_{yf} - v_{yi} = a_y t$ $-v_{yi} - v_{yi} = a_y t$

$-2v_{yi} = a_y t$ $v_{yi} = a_y t/-2$

$v_{yi} = (-10m/s^2)(0.67s)/-2$ $v_{yi} = 3.35\ m/s$