Projectile Motion Practice Name:_____

**Reflection and Self-Assessment**

**Part 1:** Circle the statement that best describes how you completed the practice:

- I answered all questions without using the online solutions. I checked my answers against the key at the back of the practice and was able to determine my mistakes and correct them without referring to the online solutions.

- I answered most questions correctly without using the online solutions. I used the online solutions to help me with some questions and was able, with help from the online solutions, to understand every question and answer them correctly.

- I used the online solutions to help me with most of the questions. I was able, with help from the online solutions, to understand each question and answer them correctly.

- Even using the online solutions, I was not able to fully understand the solution to some problems. The questions I had trouble with were:

  _____

- I did not attempt all the questions on the practice.

**Part 2:** Circle the statement that best describes your confidence in answering questions of this type in the future.

- I am confident I can answer nearly any question of this type correctly without using notes or other assistance.

- I am confident I can answer **MOST** questions of this type correctly without using notes or other assistance.

- I am **NOT** confident I can answer most questions of this type correctly without using notes or other assistance.

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**Horizontal launch problems**

1. A ball is launched horizontally at 24.5 m/s from a height of 45m.
    a. What is the initial horizontal velocity of the ball?

    b. What is the initial vertical velocity of the ball?

    c. Does the horizontal velocity of the ball change while the ball is in the air?

    d. Does the vertical velocity of the ball change while the ball is in the air?

    e. What is the vertical acceleration of the ball?

    f. What will be the vertical displacement of the ball when it hits the ground?

    g. Use the formula $d = v_0 t + \frac{1}{2} a t^2$ to determine how long it will take until the ball hits the ground.

    h. Use the formula $d = \bar{v} t$ to determine the horizontal displacement when the ball hits the ground.

    i. Use the formula $v_f^2 = v_0^2 + 2ad$ to determine the final vertical velocity the ball hits the ground with.

    j. Determine the final velocity (combined vertical and horizontal) the ball hits the ground with. Include both magnitude and direction.

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2. A ball is launched horizontally at 56m/s from a tower and hits a wall 250m horizontally away.

   a. Fill in the chart with the data given:

| **Horizontal** | **Vertical** |
|---|---|
| $v_x =$ | $v_{oy} =$ |
| $d_x =$ | $a_y =$ |

   b. Use the formula $d = v_x t$ to determine how long it will take until the ball hits the wall.

   c. Use the formula $d = v_o t + \frac{1}{2} a t^2$ to determine the vertical displacement of the ball.

   d. Use the formula $v_f = v_o + at$ to determine the vertical velocity of the ball when it hits the wall.

   e. Determine the velocity (combined horizontal and vertical) of the ball when it hits the wall. Include both magnitude and direction.

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3. A gun is pointed horizontally, and a bullet is fired from it at 325 m/s. It is aimed at the centre of a target 100.0 m away. How far below the centre of the target will the bullet hit?

4. A ball is launched horizontally at a velocity of 19.4 m/s from a height of 4.3 m. How far horizontally from where it is launched will the ball land?

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5. A ball is launched horizontally from a height of 5.9 m, and hits the ground 2.35 metres horizontally from where it was launched. What was the initial horizontal velocity of the ball?

6. A ball is launched horizontally from a tower and hits the ground 25 metres horizontally from where it was launched, 4.3 seconds after it was launched. What is the velocity the ball hit the ground with (magnitude and direction)?

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**Angled launch**

7. A ball is launched at 15m/s, from a height of 23m, at an angle of 19° above the horizontal.
    a. Determine the vertical and horizontal components of the initial velocity.

    b. What is the vertical acceleration?

    c. What will be the vertical displacement when the ball hits the ground?

    d. Use the formula $v_f^2 = v_o^2 + 2ad$ to determine the final vertical velocity of the ball.

    e. Use the formula $v_f = v_o + at$ to determine how long the ball was in the air.

    f. Use the formula $d = \bar{v}t$ to determine how far horizontally the ball travels in that time.

    g. What will the vertical velocity of the ball be when it is at its highest point?

    h. Use the formula $v_f^2 = v_0^2 + 2ad$ to determine the vertical displacement of the ball at its highest point.

    i. How high above the ground will the ball be at its highest point?

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8. A ball is kicked from the ground at an angle 34 degrees above the horizontal with speed of 12 m/s. How far down the field will the ball land?

9. A cannon at ground level shoots a cannonball at an angle of 76 degrees above the horizontal with speed of 56 m/s. What is the maximum height the cannonball will reach?

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10. A rock is thrown at an angle of 25 degrees above the horizontal at 13m/s from a 22 metre tall cliff. What will the final velocity of the rock (magnitude and direction) be?

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11. A ship fires its cannon so that the cannonball lands at the top of a 150.0 m cliff. How far horizontally from the ship will the cannonball land if it is fired at 75 m/s at an angle of 58 degrees above the horizontal.