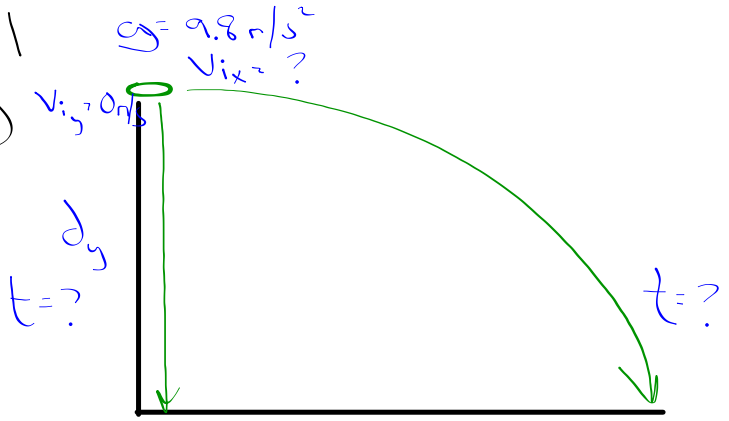
Lab Exam Practice

TASK 1

A.)



B.) Vertically

Bullet drop

d_y = vertical distance (m)

v_{iy} = 0 m/s

g = 9.8 m/s²

t = time to drop to ground (s)

- Assume no friction

$$d_y = v_i t + \frac{1}{2} g t^2$$

Horizontally

Curved path

→ Vertical component involved

→ Horizontal component

d_x = horizontal distance (m)

v_{ix} = ? (m/s) → Constant

Assume no friction

t = time to reach ground (s)

$$v_x = \frac{d_x}{t}$$

Task 2

A.) To prove time bullet falls vertically = time bullet travels in curved path assuming same starting height

B.) We would expect both objects to land at same time → assuming no friction.

C.) Linear → straight line → down

D.) Curvilinear → Non linear (dk)
→ Parabolic → Curved

E.) Linear → Horizontally

TASK 3 & compare golf

Purpose: To test n times of balls dropped both vertically & horizontally

Material: Complete?

Procedure: Complete? Make sense? Reproducible?

Data Collection

Trial	Vertical Height (m)	Vertical Time (s)	Horizontal Distance	Horizontal Time (s)
1	1.00	0.36	1.25	0.41
2	1.00	0.42	0.98	0.39
3	1.00	0.51	1.52	0.46

$\partial_{x_{avg}} = 0.79_4 m$

Calculation

Average time: $\frac{0.36+0.42+0.51}{3}$

$t_y = 0.43s$

$t_x = 0.42s$

Discussion:

- Distance values were collected for vertical & horizontal scenarios
- Times were taken from each trial & average time calculated
- t_x appeared very close to t_y

Theoretically

$\partial_y = \frac{1}{2}gt^2$

$t_y = \sqrt{\frac{2\partial}{g}}$

$t_y = \sqrt{\frac{2(1)}{9.8}}$

$t_y = 0.45s$

$\%\text{ Error} = \left|\frac{\text{Actual} - \text{Theoretical}}{\text{Theoretical}}\right| \times 100\%$

$= \left|\frac{0.43 - 0.45}{0.45}\right| \times 100\%$

% Error = 4.4% error

If object had any $\partial_x = 0.794 m$

$V_x = \frac{\partial_x}{t} = \frac{0.794 m}{0.42s}$

$V_x = 1.89 m/s$

If we used this value with t_y

$V_x = \frac{\partial_x}{t}$

$(1.89)(0.45) = \partial_x$

$\partial_x = 0.8505 m$

∴ Given a certain degree of error $t_x \cong t_y$

Sources of Error:

- Starting & stopping watch compared to moment ball leaves hand/ledge
- Negligible friction
- Degree of measurement in ruler (limit was 0.5mm)
- Ruler length correct?
- Moment of landing in correct position
- Not level surface?

Improvements?

- Level surface
- Use a ramp? - Same starting point
- Actual firing device?
- Measuring tape?

Conclusion

In this experiment we found the time it took to drop an object vertically was very similar to time to fall

relatively small margin of error consistently with a