**Question 2- Medium**

**Mission: Operation Silent Guardian**

In the dead of night, a small squad of soldiers is stationed a top a remote, abandoned building on the outskirts of a besieged town. This squad is the last line of defense, tasked with protecting frontline forces engaged in a fierce battle against enemy armor advancing through the area. The squad has a single mortar gun on the rooftop, which is their only means of assisting their comrades below. (A mortar is a portable, short-barreled, muzzle-loading artillery weapon that fires explosive projectiles at high arcs and short ranges)

You, the leader of the squad, have received intelligence reports indicating that enemy tanks and armored vehicles are closing in on allied positions, concealed under the cover of night. Time is critical, and every second counts. You must calculate the mortar's trajectory, as one misfire could expose your location to the enemy—or worse, endanger your own allies. Use your physics knowledge you gained from military academy.

A group of people in military uniforms

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**The Challenge**

To deliver effective support, you need to determine:

1. **The flight time** of the mortar shell to anticipate when it will hit.
2. **The horizontal range** of the shell to ensure it reaches enemy positions but not beyond, where allied forces are stationed.
3. **The maximum height** the shell will reach, which is important to ensure it clears any potential obstacles on the battlefield.

Your team only has a few moments to respond. Using the **initial speed** of the shell, **height of the building**, and the **angle** at which you’ll fire, you must quickly make these calculations before relaying the firing instructions to your squad. Precision is key, and there’s no room for error.

**Example Scenario**

Imagine you’re given the following data:

* **Initial speed** of the mortar shell as it leaves the gun: 90 m/s
* **Height of the building** where you’re stationed: 45 meters
* **Launch angle** of the mortar gun: 55 degrees

With this information, calculate:

1. **Flight time** – how long the shell will remain in the air.
2. **Horizontal range** – how far it will travel horizontally.
3. **Maximum height** – the highest point it will reach, above the ground.

This will enable your team to adjust the angle or timing of the next shot if the shell doesn’t land precisely where intended.

A diagram of a triangle

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\*Hint – use above inclined projectile diagram to derive required equations from standard motion equations.

\* Assume g = 9.81

Standard motion equations:  
  
A white background with red text

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**Input Format**

* : height of the building(meters)
* : the initial speed of the shell (meters per second)
* : angle that you fire (degrees)  
    
  Inputs will be provided in 3 lines. All inputs are integers.

**Constraints:**

* **1 <= <= 2000**
* **100 <= <= 500**
* **0 <= <= 90**

**Output Format:**

Print **Flight time, Horizontal range** and **Maximum height** in three lines respectively.

Roundoff your answers for **five decimal points**.

**Test Case 1:**

Input:

100

100

45

Output:

15.71348

354.842

1111.11111

**Test Case 2:**

Input:

50

150

45

Output:

22.08561

623.3945

2342.53306

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**Hidden Test Cases**

**Test Case 3:**

Input:

500

500

30

Output:

52.89553

3685.52497

22904.43806

**Test Case 4:**

Input:

2000

200

60

Output:

44.47911

3529.05199

4447.91057

**Test Case 5:**

Input:

300

100

0

Output:

7.82062

300.0

782.06189

**Test Case 6:**

Input:

100

300

90

Output:

61.49362

4687.15596

0.0

**Test Case 7:**

Input:

1

400

20

Output:

27.89886

954.94722

10486.5406

**Test Case 8:**

Input:

2000

500

5

Output:

25.11778

2096.79056

12511.10159

**Test Case 9:**

Input:

1000

100

10

Output:

16.15785

1015.36885

1591.23743

**Test Case 10:**

Input:

700

300

89

Output:

63.40361

5285.75878

331.96365

**Test Case 11:**

Input:

1200

250

50

Output:

44.53718

3069.34279

7156.98755