Name______________________________

Date__________Pd____

Model for Projectile Motion

We have discovered that projectiles have a constant downward acceleration (neglecting friction) and their vertical velocity changes by -10 m/s each second.

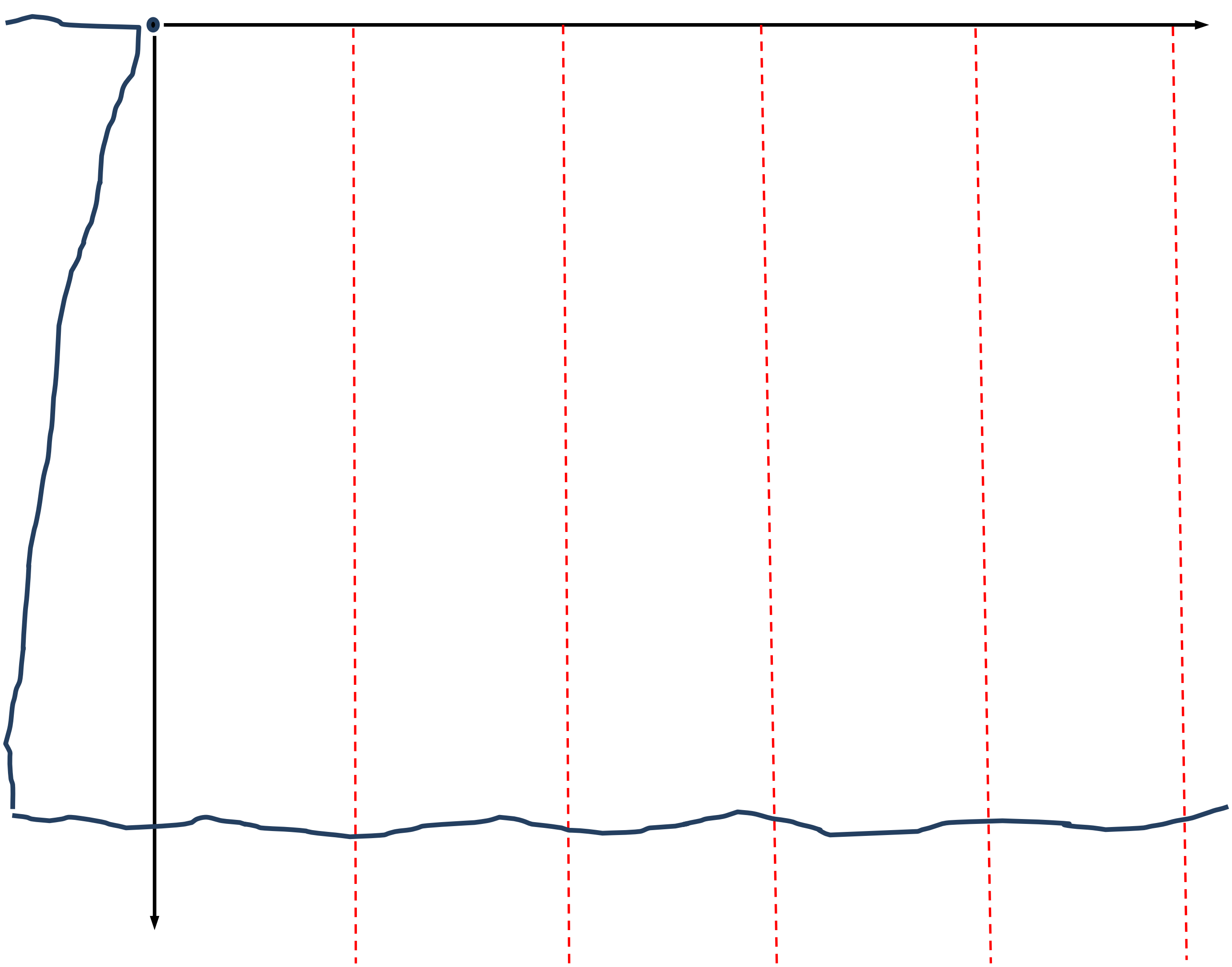
time (s)	velocity (m/s	y-position (m)
0	0	0
1		
2		
3		
4		
5		

A stone was dropped from the top of a cliff. Fill in the values for the velocity for the first 5 seconds. Use the relationship $\Delta y=1/2at^2$ to determine the y-position at these times.

Mark these positions on the y-axis below.

Use a scale of 1.0 cm = 10 m for your drawing.

Suppose that you could **"turn off"** gravity. When you throw the ball horizontally from the cliff at 30 m/s it would travel 30 m each second in a straight line. Mark these positions on the x-axis below.

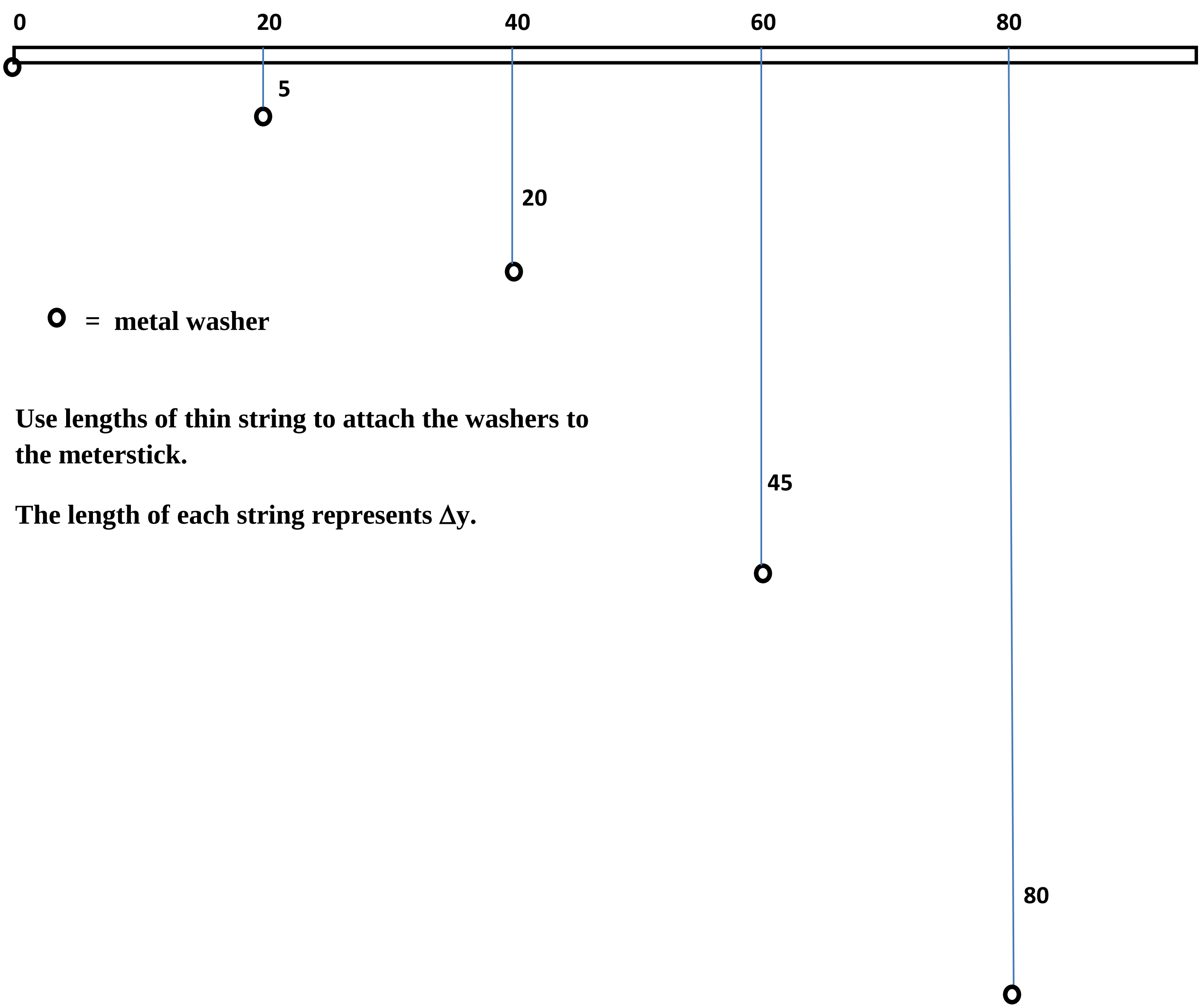


The motion of the thrown ball has both horizontal and vertical components. At each second, draw a vertical line down from the horizontal position, then draw a horizontal line from the dropped ball position to determine the actual position of the stone. Sketch a smooth curve to describe the path of the projectile.

Determine the vertical distance the stone would fall ______m. Use your drawing to estimate the following:

Time in the air: ______ s Horizontal distance: ________ m

You will now build a physical model that can be used to show the <u>projectile path for any angle.</u> Suppose that you use the scale (1.0 cm = 1.0 m). Speed of throw is 20m/s.



Use lengths of thin string to attach the washers to the meterstick.

The length of each string represents Δy.

Place a WB on the table and lift it up so that is vertical. Now put the meterstick directly next to the WB to represent a projectile thrown at different angles. Carefully mark the positions of the centers of the washers that show the x and y values of the projectile each second. Record the values into the data tables below. Finally, draw a smooth curve on the WB to show the path of the projectile in each situation.

1. Angle is 90 degrees from horizontal (straight up) at 20 m/s.

Maximum height is ______ m

Time to reach max height is: ______ s

Total time in air is ______ **s**

time (s)	x (m)	y (m)
0		
1		
2		
3		
4		

2. Angle is 30 degrees above horizontal at 20 m/s.

Maximum height is ______ m

Time to reach max height is ______ s

Total time in air is ______ s

Horizontal (x) distance ______ m

time (s)	x (m)	y (m)
0		
1		
2		
3		
4		

3. Angle is 45 degrees above the horizontal at 20 m/s.

Maximum height is ______ m

Time to reach max height is ______ s

Total time in air is ______ s

Horizontal (x) distance ______ **m**

time (s)	x (m)	y (m)
0		
1		
2		
3		
4		

4. Angle is 60 degrees above the horizontal at 20 m/s.

Maximum height is ______ m

Time to reach max height is ______ s

Total time in air is ______ s

Horizontal (x) distance ______ m

time (s)	x (m)	y (m)
0		
1		
2		
3		
4		