

Pumpkin Chunk-Off Lab: $F = m \times a$



Name _____

Class _____ Date _____

TEKS 8.7A · Every launch pauses at the start of the swing. Write down the sling pull, the friction and the pumpkin's mass, then do the math here. Round each acceleration to a tenth, and always write the unit.

Net force = sling pull – friction (they point in opposite directions) **Acceleration** = net force ÷ mass $F = m \times a$ · N = kg × m/s²

PART 1. LAUNCH LOG

Practice launches

The first row is the tutorial. Add a row for each practice launch you use.

Throw	Pumpkin	Mass (kg)	Counterweight (kg)	Angle	Sling pull (N)	Friction (N)	Net force (N)	Acceleration (m/s ²)	Distance (m)
Tutorial	Sugar Pie	3.06	5,000	35°					
Practice 1									
Practice 2									
Practice 3									
Practice 4									
Practice 5									
Practice 6									
Practice 7									
Practice 8									
Practice 9									
Practice 10									
Practice 11									
Practice 12									

Official throws

Your three official throws. The best one also goes in the box at the end of the worksheet.

Throw	Pumpkin	Mass (kg)	Counterweight (kg)	Angle	Sling pull (N)	Friction (N)	Net force (N)	Acceleration (m/s ²)	Distance (m)
Official 1									
Official 2									
Official 3									

PART 2. SOLVE IT

1. A sling pulls a 4.08 kg pumpkin 64 N toward the back. Friction pushes it 14 N toward the front. The up and down forces are balanced. What is the pumpkin's acceleration?

- A. 15.7 m/s² B. 12.3 m/s² C. 19.1 m/s² D. 3.4 m/s²

2. A 4.49 kg pumpkin has an acceleration of 12 m/s². What net force acts on it?

3. A net force of 45 N gives a pumpkin an acceleration of 15 m/s². What is its mass?

4. Find each pumpkin's acceleration, then rank them from greatest to least acceleration.

Pumpkin	Net force	Mass	Acceleration (m/s ²)
Sugar Pie	45 N	3.06 kg	
La Estrella	45 N	4.49 kg	
Cinderella	57 N	4.08 kg	
Knucklehead	72 N	5.44 kg	

Greatest to least: _____

5. A sling pulls a 4.49 kg pumpkin 68 N toward the back. Friction pushes it 17 N toward the front. The up and down forces are balanced. Find the net force and the acceleration. Show your work and write the units.

PART 3. ANALYZE IT

Use practice launches for questions 6 and 7. If a pumpkin bursts, you still get its numbers under This launch.

6. Test it in the lab. Launch **Sugar Pie at 5,500 kg with a 50° release angle** and **La Estrella at 3,500 kg**. Fill in the table.

Pumpkin	Mass (kg)	Sling pull (N)	Friction (N)	Net force (N)	Acceleration (m/s ²)
Sugar Pie, 5,500 kg	3.06				
La Estrella, 3,500 kg	4.49				

Both pumpkins have the same net force. Which one speeds up more, and why? Use $F = m \times a$ in your answer.

7. Your friend says, "A heavier pumpkin always speeds up less." Launch **Sugar Pie at 3,000 kg** and **La Estrella at 5,000 kg**, and fill in the table.

Pumpkin	Mass (kg)	Sling pull (N)	Friction (N)	Net force (N)	Acceleration (m/s ²)
Sugar Pie, 3,000 kg	3.06				
La Estrella, 5,000 kg	4.49				

Do you agree or disagree with your friend? Use numbers from the table.

8. You want a pumpkin to speed up more at the start of the swing. Name two ways to do it, and use net force or mass in each.

My best official throw. Pumpkin _____ Counterweight _____ kg Angle _____° Distance _____ m

At the start of its swing: net force = _____ N, acceleration = _____ m/s². Show the math.
