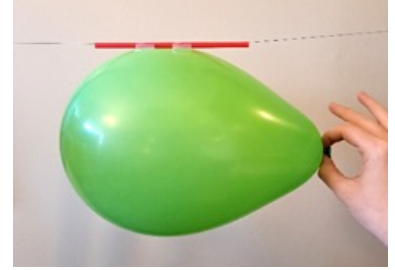


BALLOON ROCKET CHALLENGE 1

1. Thread your straw onto your long piece of string.
2. Tape one end of your string to the wall and hold the other end (or have two partners hold the string ends), so it is level and tight.
3. Blow your balloon up to a medium size (not too big!). Hold onto the end carefully so that the air does not come out.
4. Tape your balloon to the straw so that the balloon end is lined up with the string (see picture).
5. Answer questions below.



Box 1: Newton's First Law

Hold the balloon end closed. Watch the “balloon rocket”.

- Where is it moving? Why?

Now, let go of the balloon end.

- Where did the rocket move? Why?

6. Blow your balloon up again and reset your balloon rocket, same as above.
7. Answer questions below.

Box 2: Newton's Third Law

Release your balloon rocket to fly again.

- Which way did the air in the balloon go?
- Which way did the balloon go?

Draw or write your answer:

TEST 1

1. Blow up your balloon again. Find the widest part of your balloon.
2. Use your short string or measuring tape to measure how big the balloon is around its middle. This is called the balloon's *circumference*.
3. Write the balloon's circumference in the line for “Test 1” in the chart on the next page.
4. Place one team member in charge of the timer.
5. Start the timer. Another team member should let the balloon rocket go when the timer starts. Stop timing when the balloon rocket reaches the end of the string.
6. Write the “Flight Time” in the line for “Test 1” in the chart on the next page.



<i>Data Chart: Balloon Rocket Challenge 1</i>		
TEST #	BALLOON CIRCUMFERENCE (in cm)	FLIGHT TIME (in seconds)
<i>Example</i>	<i>42 cm</i>	<i>3.3 seconds</i>
Test 1		
Test 2		
Test 3		

TEST 2

1. Blow up the balloon again. This time, make it larger than before.
2. Measure the balloon's new circumference and write it in the line for "Test 2" in the chart above.
3. Test the balloon rocket at its new larger size. Write the new flight time in the line for "Test 2" in the chart above.

TEST 3

1. Blow up the balloon one more time. This time, make it smaller than the other two tests.
2. Measure the balloon's new circumference and write it in the line for "Test 3" in the chart above.
3. Test the balloon rocket at its new smaller size. Write the new flight time in the line for "Test 3" in the chart above.
4. Answer questions below.

Box 3: Newton's Second Law

Look at your data in *Data Chart: Balloon Rocket Challenge 1*.

- Which balloon size was the quickest?
- Which balloon size was the slowest?
- Why do you think this is?

BALLOON ROCKET CHALLENGE 2

1. Prepare your balloon just like *Balloon Rocket Challenge 1*. Blow it up to a medium size.
2. Measure the circumference of your balloon and record this under “Test 1” in the chart below.

<i>Data Chart: Balloon Rocket Challenge 2</i>			
TEST #	BALLOON CIRCUMFERENCE (in cm)	WEIGHT	FLIGHT TIME (in seconds)
<i>Example</i>	<i>42 cm</i>	<i>+8 coins</i>	<i>3.9 seconds</i>
Test 1		<i>just the balloon</i>	
Test 2			
Test 3			

TEST 1

1. Notice that the weight section for “Test 1” is already filled in.
2. Time how fast your balloon rocket flies across the string. Write this under “Flight Time” in the line for “Test 1.”

TEST 2

1. Now, we’re going to play with the balloon rocket’s weight. Blow your balloon up again, trying to make the circumference the same as before. Record the circumference in the chart in the line for “Test 2.”
2. Use tape to attach some weights to your balloon. Record the weight in the chart for “Test 2.”
3. Time your new, heavier balloon rocket’s flight. Write this flight time in the chart for “Test 2.”

TEST 3

1. Blow your balloon up for a third and final test. Again, try to make the circumference match the other test. Record this circumference in the chart for “Test 3.”
2. Use tape to attach a different number of weights to your balloon. Record the weight in the chart for “Test 3.”
3. Test this new balloon rocket’s flight and record its flight time in the chart for “Test 3.”
4. Answer the questions below.

Box 4: Newton’s Second Law

Look at your data in *Data Chart: Balloon Rocket Challenge 2*.

- What stayed the same in every test?
- Which balloon weight was the quickest? The slowest?
- Why do you think this is?