HUMAN

Accelerator

Thomas Jefferson National Accelerator Facility - Office of Science Education
http://education.jlab.org/

Human Accelerator

HOW EASY IS IT TO WORK TOGETHER AS A TEAM?

1. Stand side by side, shoulder to shoulder with your class. Your class is now a linear accelerator that will help deliver the electron beam to its target.

2. The first person in the line will act as the injector. Every other person in the line is a cavity. The last person in line will hit the target with the electrons.

3. Cup your hand that is closest to the injector in the upward direction and the other hand downward.

4. As the electrons that make up the beam are injected you will transfer them along the accelerator by bringing your hands together and then moving them back to their original position as a leader calls “in...out...in...out...” in constant rhythm. When your hands come together, or in, you will transfer the electrons from one hand to the other. When your hands go out you will transfer them to the next cavity in line.

5. You must continue to do your job **even if you don’t have any electrons** so that the accelerator may continue operating.

6. Do not pick up any lost electrons.

7. After the beam has been delivered to its target, use the **Human Accelerator Data Chart** on the next page to record your data.

Human Accelerator Data Chart

Beam Type	Number of balls **Injected**	Number of balls **Delivered**	Fraction Delivered	Percent Delivered
Pulsed Beam (average cadence)				
Continuous Beam (slow cadence)				
Continuous Beam (fast cadence)				
Eyes Shut				
Other				

How do I convert a fraction Into a percent?

Write the fraction as a division problem.

$$\frac{7}{12} = 12\overline{)7}$$

12 doesn't go into 7, so make the 7 look larger by adding a decimal point and some zeros.

$$12\overline{)7.000}$$

Bring the decimal point up and divide like you usually do.

$$\begin{array}{r} .583 \\ 12\overline{)7.000} \\ -\,6\,0 \\ \hline 1\,00 \\ -\,96 \\ \hline 40 \\ -\,36 \\ \hline 4 \end{array}$$

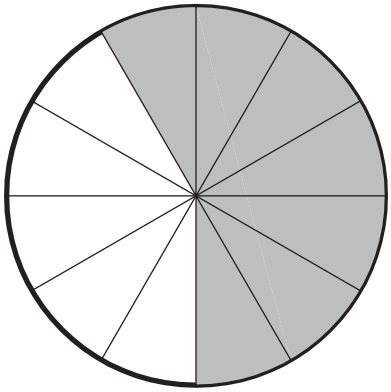
This problem will go on forever. Stop dividing when you have went out three decimal places.

Convert your decimal answer to a percent by multiplying by 100.

$$\begin{array}{r} .583 \\ \times\ 100 \\ \hline 58.3\% \end{array}$$

Let's make some graphs!

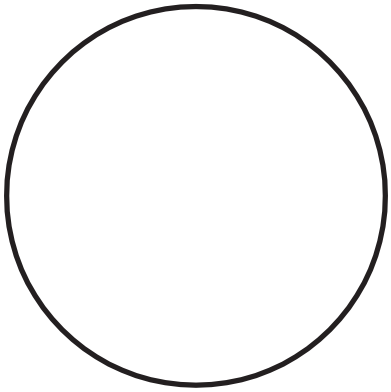
Example



Fraction Delivered = $\frac{7}{12}$

Percent Delivered = 58%

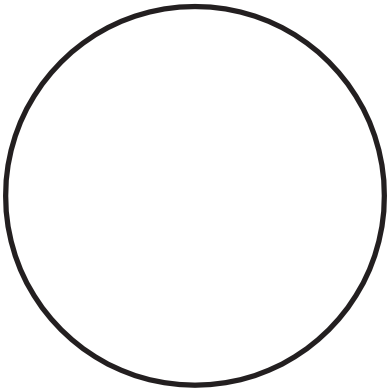
Pulsed Beam
(average cadence)



Fraction Delivered = ____

Percent Delivered = ____

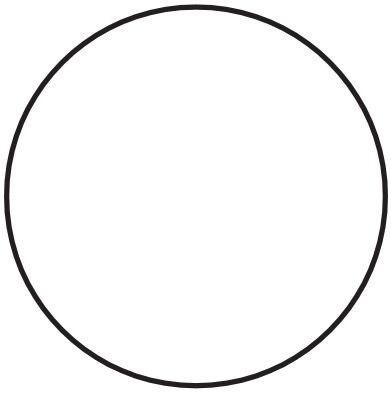
Continuous Beam
(slow cadence)



Fraction Delivered = ____

Percent Delivered = ____

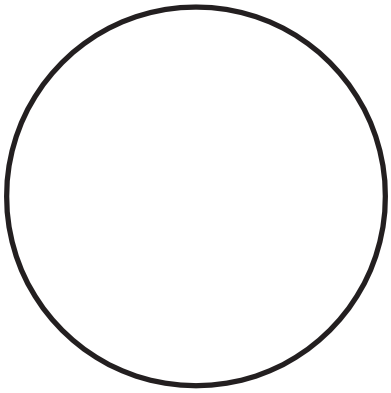
Continuous Beam
(fast cadence)



Fraction Delivered = ____

Percent Delivered = ____

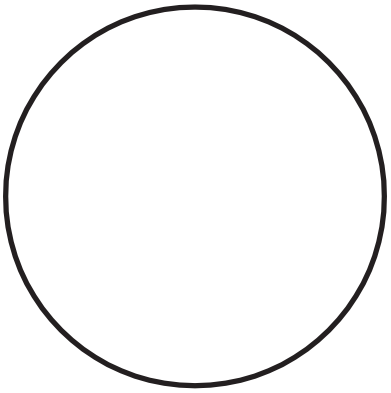
Eyes Shut



Fraction Delivered = ____

Percent Delivered = ____

Other



Fraction Delivered = ____

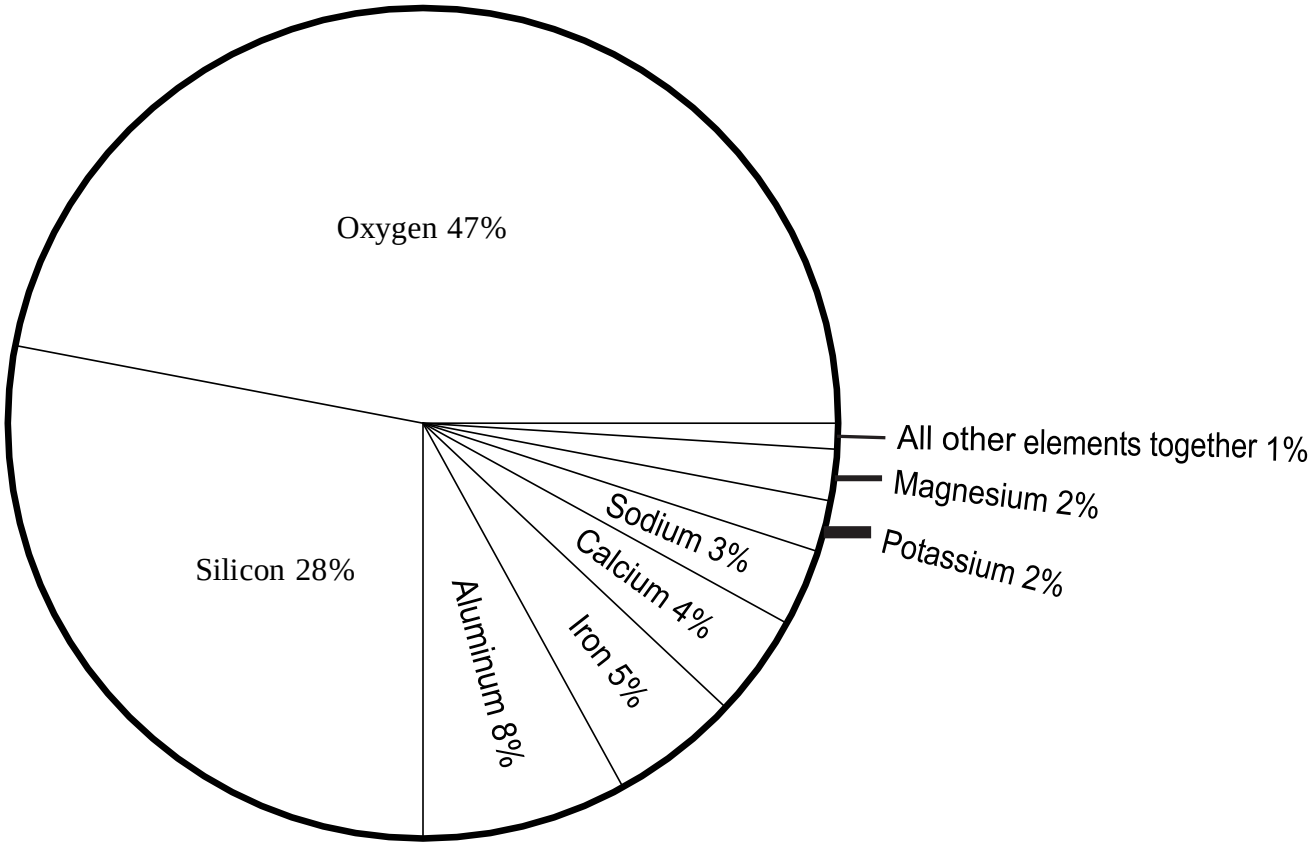
Percent Delivered = ____

Reading About Materials in the Earth's Crust

In the Human Accelerator activity you did at the lab, you used pie graphs to see the percentage of tennis balls that arrived at the target. Use the pie graph below to help you understand the following passage.

Directions: Read the following passage. Fill in the blanks with words that make sense. Remember to use context clues that come before and after the blanks.

The __1__ chart below shows the elements that make up most minerals. The graph shows that __2__ makes up 47% of the materials found in the minerals of the crust. Both potassium and magnesium make up __3__ of the crust. The graph also gives us information about other elements, such as carbon. Carbon makes up __4__ 1% of the crust.



Directions: Use the context of the passage and the graph to select the best word for each blank.

1.	a. line	b. bar	c. percentage	d. pie
2.	a. silicon	b. aluminum	c. oxygen	d. iron
3.	a. 4%	b. 3%	c. over 8%	d. 2%
4.	a. more than	b. less than	c. equal to	d. unknown