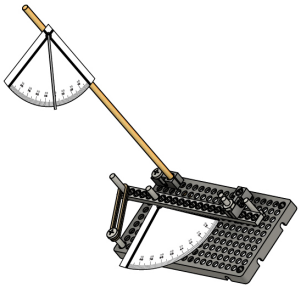
Precision & Accuracy Lab

Projectile Launcher 2.0

Name: _____ Set: _____ Date: _____

In this lab, you'll use math to analyze the accuracy of your launcher.

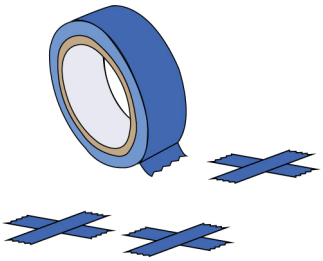
Lab Supplies



"Built" Launcher
with protractors

Build your launcher using the Go Guide – download it from teachergeek.com/launcher2.0

Ping Pong Balls

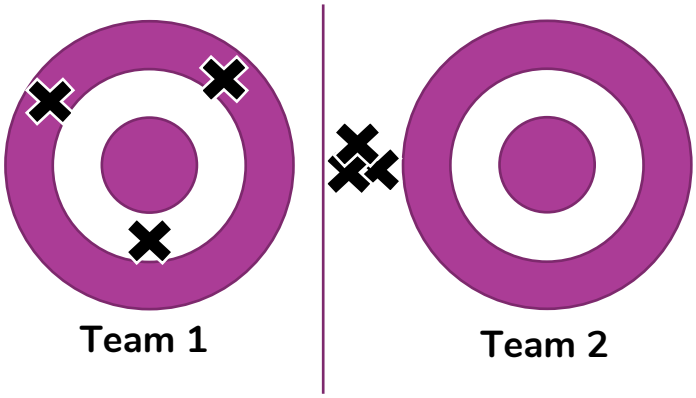


Tape
to mark your shots/targets

Measuring Tape
to measure launch distance

Target Practice

1 Team 1 and Team 2 are competing for the most bullseyes. They both aimed directly at the bullseye for every shot.



Team 1 **Team 2**

A Which team won the practice round?

_____

B If both teams aimed directly at the bullseye in the competition, who would win?

_____

C If each team could aim anywhere they wanted, who do you think would win the competition? Why?

_____

_____

_____

Precision, Trueness, & Accuracy

Teachers – the ISO Standards redefined accuracy and precision, so these definitions may be new to you.

Only accurate launchers can hit the bullseye every time. Accurate launchers are both precise and true.

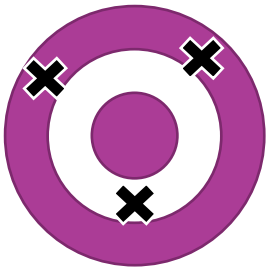
Precision is repeatability – getting the same result every time. It doesn't have to be the result you want, but it's always the same.

Trueness is when your results average where you want them – they can be spread out, but they are centered in the right place.

Accuracy is both precision and trueness – your launcher must hit the target consistently to be considered accurate.

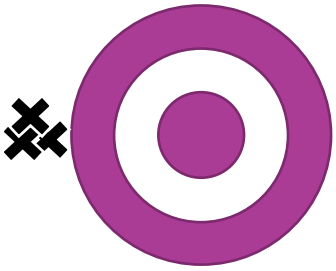
2 Circle the option that best describes each launcher.

Launcher 1



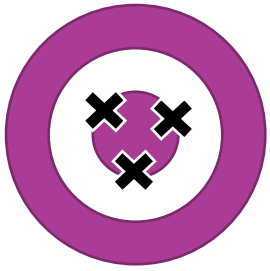
Accurate Precise
True None

Launcher 2



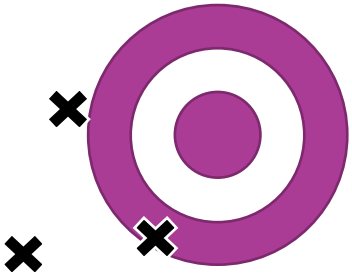
Accurate Precise
True None

Launcher 3



Accurate Precise
True None

Launcher 4



Accurate Precise
True None

3 Which launcher do you think is the best? Why?

Launch Stuff!

Now that you know what precision and accuracy are, you're going to measure the precision of your launcher!

4. Using your example launcher, adjust the launch angle to 60°. Then fire your launcher three times, recording the distance in the table below.

5. Repeat Step 4 for launch angles of 45° and 30°.

6. Find the **mean** (average) distance for each angle you tested. Show your work below, and record your answers in the table.

Work:

Example Mean:

Add your data, then divide by how many there

Launch 1	Launch 2	Launch 3	Mean
2.4 m	2.2 m	2.0 m	2.2 m

$$\frac{2.4\ m + 2.2\ m + 2.0\ m}{3} = 2.2\ m$$

Example Range:

Subtract the least value from the greatest

Launch 1	Launch 2	Launch 3	Range
2.4 m	2.2 m	2.0 m	0.4 m

$2.4\ m - 2.0\ m = 0.4\ m$
Greatest Least

7. Complete the table by finding the **range** for each angle.

Angle	Launch 1	Launch 2	Launch 3	Mean	Range
60°					
45°					
30°					

Conclusion

8. Which launch angle went the furthest average (mean) distance?

9. Which launch angle had the greatest precision? How can you tell?

10. Sabrina says that the smaller the range, the more precision the launcher has. Do you agree or disagree? Why?

11. Mateo's needs to hit the bullseye to win the competition it's exactly 4 m away. Based on his data, what launch angle should he use? Why?

Mateo's Data:

Angle	Mean	Range
60°	4.02 m	0.5 m
45°	6.00 m	0.4 m
30°	3.98 m	0.2 m

12. Is it more important to design your launcher for precision or trueness? Why?