

Projectile Launcher Precision & Accuracy Lab



Name: _____ Set: _____ Date: _____

Lab Materials

Make sure you have built an example **Projectile Launcher** before starting this lab. Find the Build Guide at teachergeek.com/learn



What is Scientific Measurement?



1 In science, we measure **data** to collect, compare and analyze. So many tools help us measure – rulers, scales, even our eyes! List other “stuff” we can use to measure:

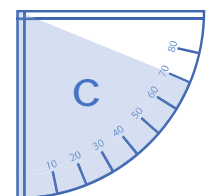
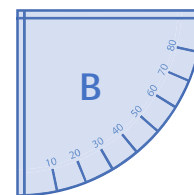
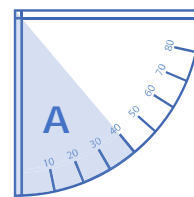


2 **Protractors** measure **angles**. Your flat semi-circle measures up to 90°. Use your TeacherGeek protractor to answer the questions below.

A How many degrees° is the *widest angle* the TeacherGeek protractor can measure? _____

- < An **acute** angle is *less than* $\leq 90^\circ$.
- L An **obtuse** angle is *greater than* $\geq 90^\circ$.
- \ A **right** angle is *exactly* $= 90^\circ$.

B Angle **A** is a(n) _____
 Angle **B** is a(n) _____
 Angle **C** is a(n) _____



TeacherGeek Protractors

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Precision v. Accuracy



Shots that land in the **same** place each time.



Precision is a characteristic of scientific measurement. Precise data is reliable and **consistent** (repeatable).

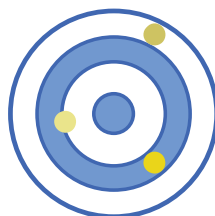
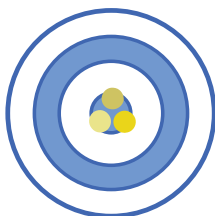
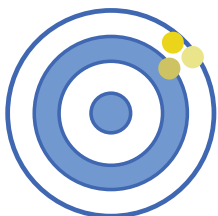


Accuracy is another feature of scientific measurement. Accurate data is close to the **actual** (or predetermined) result.

Shots that land in the **center** of a target.

3

Circle whether the targets below are **accurate**, **precise**, or **neither**.



Accurate

Accurate

Accurate

Precise

Precise

Precise

Neither

Neither

Neither



Precision

Weighing a textbook & getting the same result each day, for a week.



Accuracy

Tossing darts at a target & hitting the bull's-eye (also a great way to win).

A Describe how a **precise**, yet **inaccurate**, target would look:

B Describe how an **accurate**, yet **imprecise**, target would look:

C Describe how an **inaccurate**, **imprecise** target would look:

4

If your launcher's **projectile** (ball) went the farthest in the class each shot, but never hit the floor target, would your launcher be precise or accurate?

Why? _____



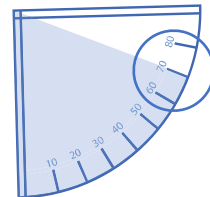
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Launch Range: High & Low



Using your example launcher, adjust the **angle** of the legs to **70°**. Take three shots, measuring the **distance** each landed.



5 Were the shots **precise** (landing in the same place?)

6 Find the **mean** (average) of the **70°** launch angle by adding each shot's distance together and dividing by three.

$$\underline{\quad} + \underline{\quad} + \underline{\quad} = \underline{\quad} \div 3 = \underline{\quad} \text{ Mean}$$

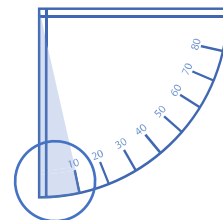
Sample Average:

$$2 + 2.2 + 2 = 6.2 \text{ meters}$$

$$6.2 \div 3 = 2 \text{ meters}$$



Now, adjust the **angle** of the legs to **10°**. Take three shots, measuring the **distance** each landed.



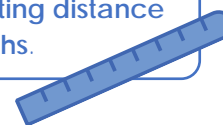
7 Find the **mean** (average) of the **10°** launch angle.

$$\underline{\quad} + \underline{\quad} + \underline{\quad} = \underline{\quad} \div 3 = \underline{\quad} \text{ Mean}$$

8 Subtract the **10°** mean from the **70°** mean - this is the **range** of your launches.

$$\underline{\quad} - \underline{\quad} = \underline{\quad} \text{ Range}$$

The **range** (difference between the lowest and highest values) is useful for **estimating distance** and **labeling graphs**.



9 **Estimate** (guess) where a launch from **40°** would land, based on the mean(s) and range above.

Hint: the distance would be between the 10° and 70° mean.

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Meaningful Data

You need a partner (or two) to complete these questions.

Test if your launcher is precise and accurate through **repeatability** and **reproducibility**.



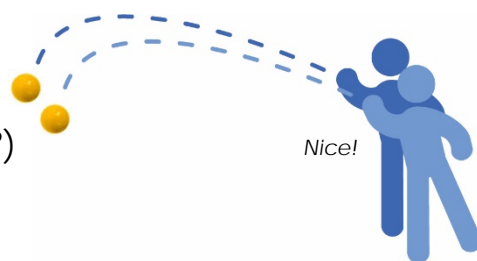
- 10 Adjust the **angle** of your launcher's legs to **45°**. Take three shots, measuring the distance each landed.

Were the shots **precise** (landing in the same place?)

If your shots are **precise**, then the data has **repeatability**.

- 11 Have another person take three more shots, with the same **angle** and from the same **starting point**.

Were the shots **precise** (landing in the same place?)



Did the shots land in the same place as **Question 10**?

If their shots are **precise**, and match your data from before, then the data has **reproducibility**.

► Nice Shot!

Repeatable, reproducible data helps to better re-design your launcher – accurate shots are a **HUGE** advantage in competition!



If you are going to do the optional *Launcher Challenges*, now's the time!

Documents at [teachergeek.com/learn](https://www.teachergeek.com/learn)

