

THE BEST THROW

Teaching Guidelines

Subject: Mathematics

Topics: Angles, Measurement, Statistics (charts and graphs)

Grades: 4 - 8

Concepts:

- Degree
- Angle

Knowledge and Skills:

- Can measure lengths
- Can apply the strategy "use a chart or table"
- Can do a scatterplot of data

Subject: Science

Topics: Scientific Inquiry

Grades: 4 - 8

Knowledge and Skills:

- Can create a chart for the collection of experimental results
- Can graphically analyze the relationship between variables in an investigation

Materials (for each team):

- One ruler
- Two identical rubber bands
- One protractor
- One 20 foot measuring tape (if measuring tapes are not available, you can have students make 20-foot "measuring strings" on which 6 inch intervals are indicated with labeled strips of tape).

Procedure:

This activity is best done with students working in teams of two or three.

Prior to the lesson, you should do a test to determine how far back the rubber bands should be pulled so that they do not fly too far. For the purpose of this test, set the ruler at approximately 45° from the ground. Determine the proper length of pull so that the rubber band travels 8 to 12 feet.

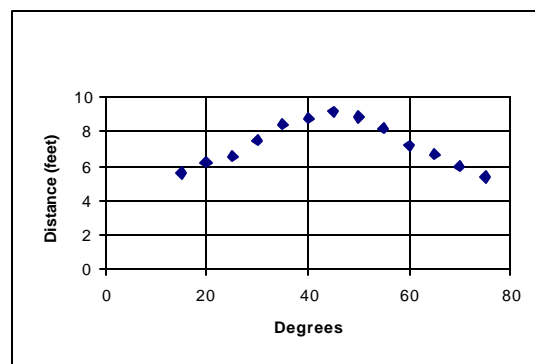
This activity should be done in a large room with a high ceiling, such as a gymnasium or cafeteria.

Distribute the handout and discuss the first three paragraphs to ensure that students understand that the distance a ball will travel depends on the angle at which it is thrown. Then review the instructions for the activity and ensure they are understood. Tell the teams they will need to have some way of recording the data of the experiment and have them create charts for doing so.

Go to the location where the activity will take place. Emphasize the need for safe behavior with the rubber bands. Place each team in its location (at least 25 feet from other teams) and distribute the rubber bands, rulers and measuring tapes. Have the teams do steps 1 and 2 and check each team to make sure that they have the correct set-up.

Once you have approved all set-ups, have the teams continue the activity. Circulate and observe as they work, ensuring that angles are correctly measured and data is properly recorded.

When all teams have completed the experiment, return to the classroom and have each team make a scatterplot graph to show its data. The graphs should look something like this:



The teams should compare their results and, as a class, determine the best angle for throwing. *(The answer should be somewhere near 45° .)*

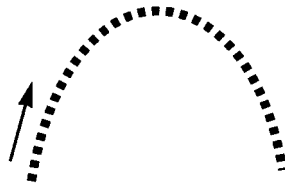
The Best Throw

If you want to throw a baseball or softball as far as you can, at what angle should you throw it?

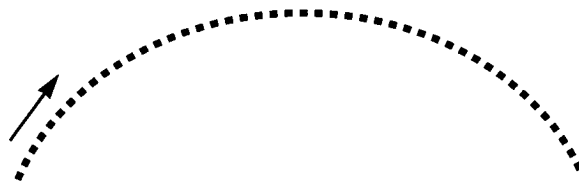
If you throw too low, it will fall to the ground quickly:



If you throw too high, it won't fall very far away from you:

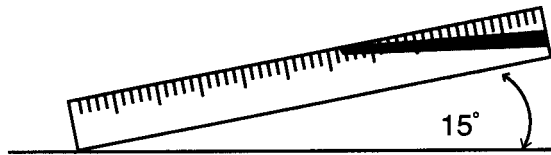


The best angle is somewhere in between:



Do this experiment to find the best angle:

1. Stretch a rubber band from the end of a ruler to one of the marks on the ruler (your teacher will tell you how far to stretch it).



2. Set the ruler at an angle 15° off the ground, pointing the end with the rubber band into the air.
3. Let the rubber band go and measure how far it travels.
4. Do steps 1 – 3 for at least 10 more angles in the range of 15° to 75° . Record the data in a chart.
5. Make a graph showing your data.

What angle seems best?