Hit the Target Lab Projectile Launcher 2.0

TeacherGeek
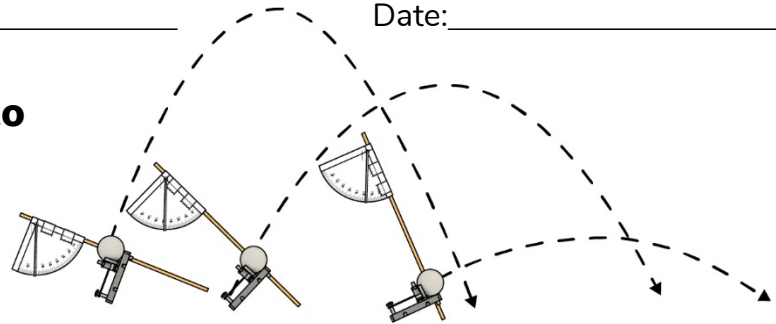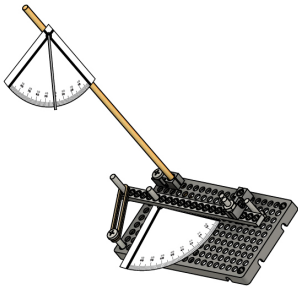
Name: _____ Date:_____

In this lab, you'll learn how to use graphs to dial in your launch distance!

Lab Supplies

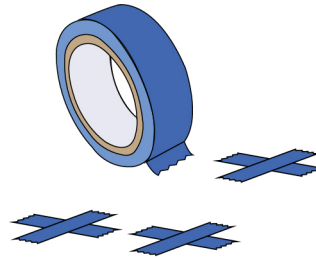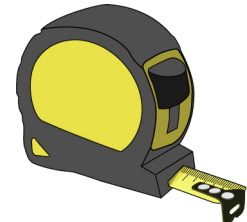**"Built" Launcher**
with protractors

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

Ping Pong Balls

Tape
to mark your shots

Measuring Tape
to measure launch distance

Plan Your Experiment

Choose one variable to change and see how it affects launch distance!

1 Which variable will you change? Which variables will you keep constant? Record your launcher's variables in the table below.

Variables:
- # of Rubber Bands
- Wind-Up Amount
- Launch Distance
- Launch Angle
- Variables specific to your unique launcher

Your control variables need measurements!
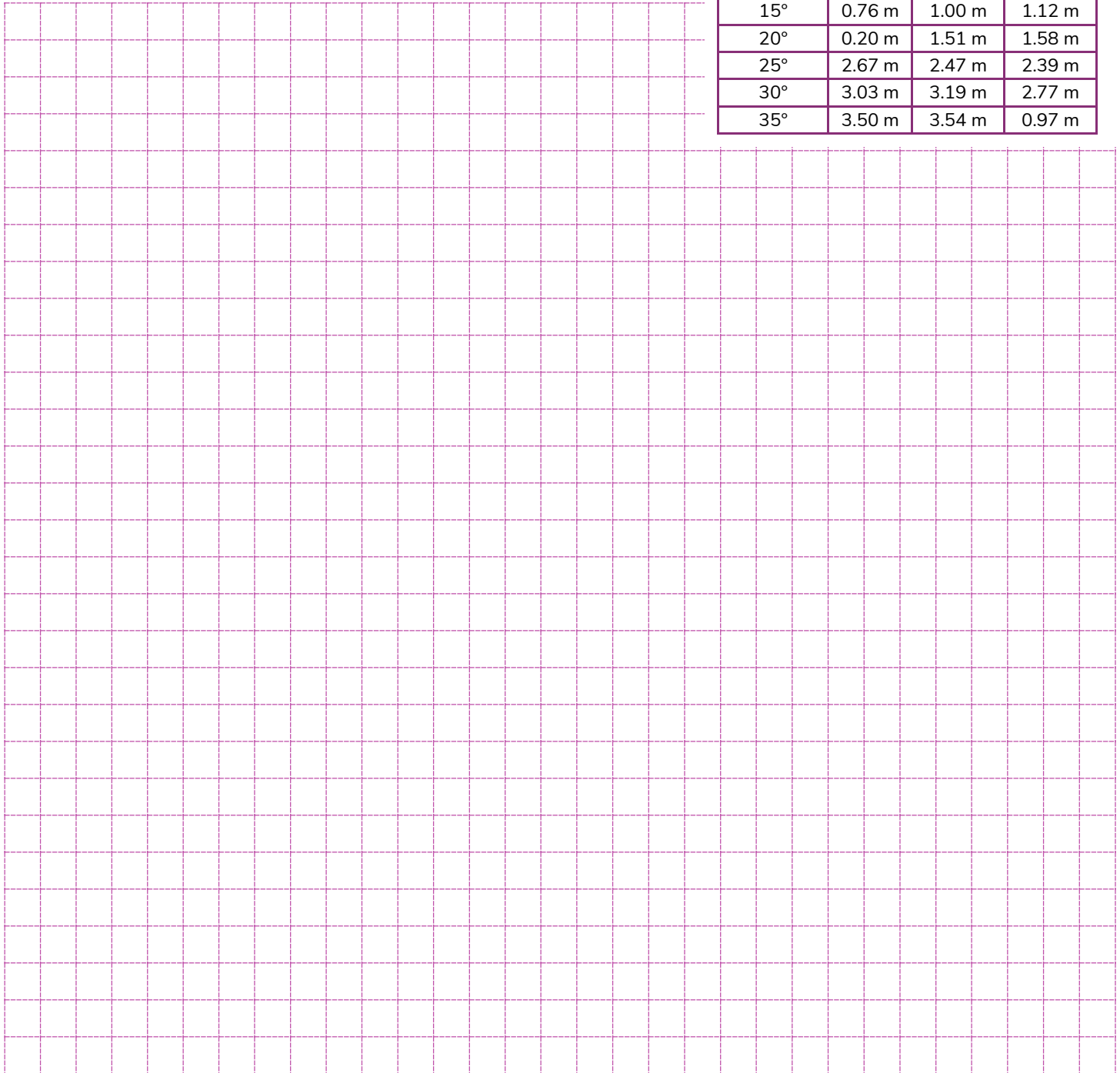E.g. don't just write your controlling the *# of rubber bands*, but write *rubber bands = 5*.

Independent Variable(s)	Dependent Variable(s)	Control Variable(s)

Collect Data

2 Do your experiment! Change the independent variable (from Step 1), and test how it affects your launch distance. Record your data on this page in lists or tables.
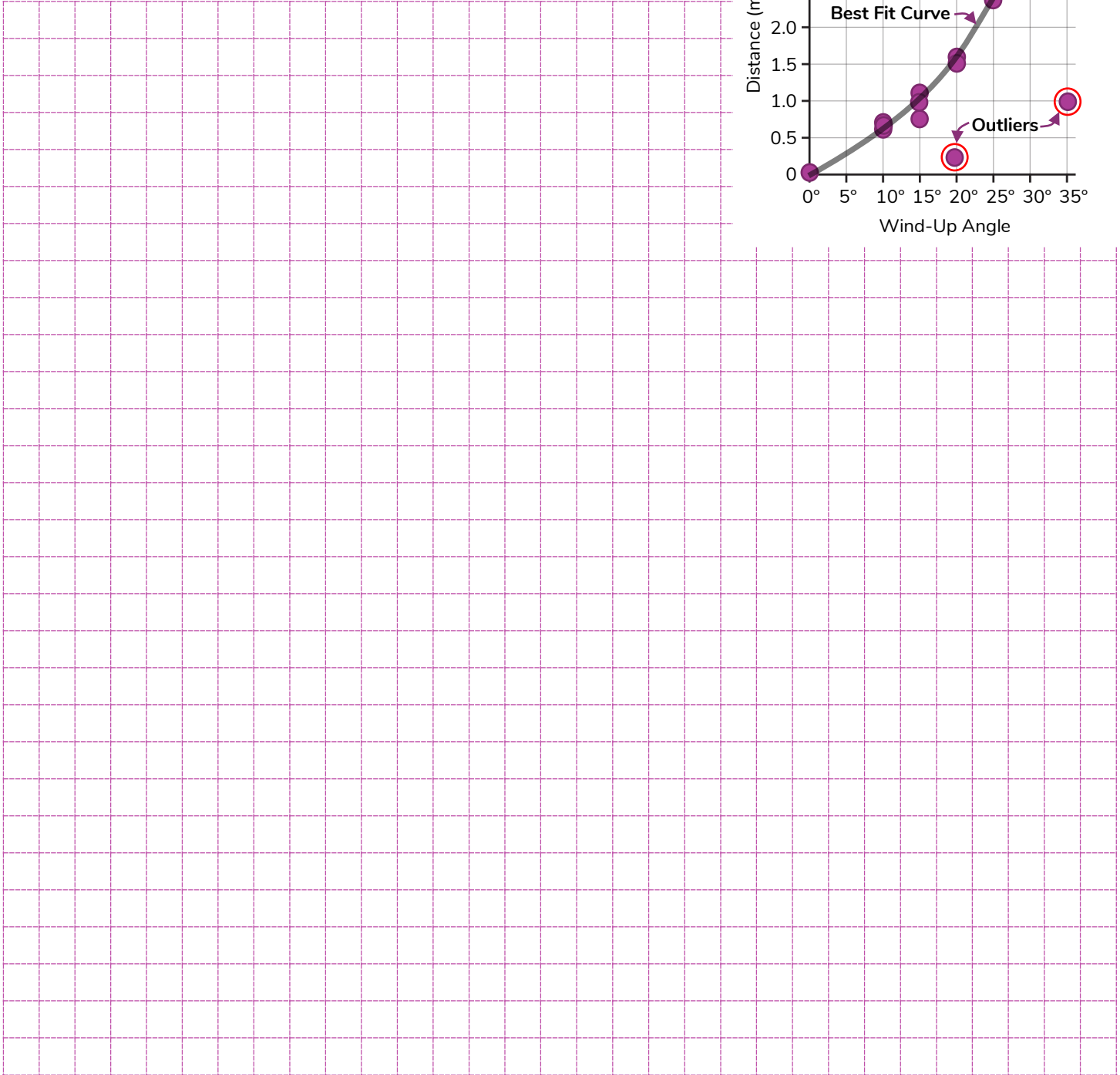
Example Data Table:

Wind-Up	Launch Distance		
	Trial 1	Trial 2	Trial 3
0°	0.00 m	0.00 m	0.00 m
10°	0.61 m	0.76 m	0.74 m
15°	0.76 m	1.00 m	1.12 m
20°	0.20 m	1.51 m	1.58 m
25°	2.67 m	2.47 m	2.39 m
30°	3.03 m	3.19 m	2.77 m
35°	3.50 m	3.54 m	0.97 m

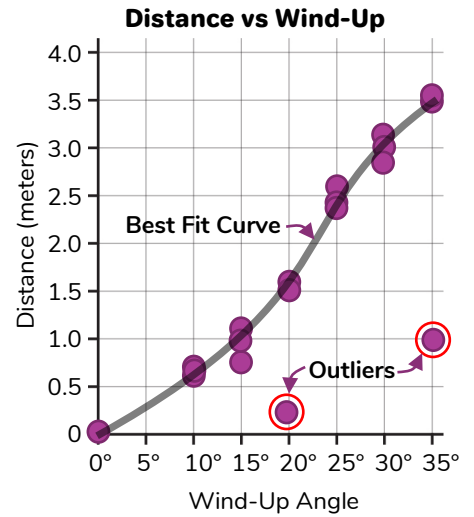# Hit the Target Lab — Projectile Launcher 2.0

Graph It!

Example Graph:

3 Graph your data below, then sketch a best-fit curve. Note: Outliers (like misfires) should be ignored when drawing your best-fit curve.

Distance vs Wind-Up

Distance (meters): 4.0, 3.5, 3.0, 2.5, 2.0, 1.5, 1.0, 0.5, 0

Best Fit Curve

Outliers

Wind-Up Angle: 0° 5° 10° 15° 20° 25° 30° 35°

Use Your Graph

4 What is the farthest distance you think your launcher can shoot (without changing the control variables)? How can you tell?

_____

_____

_____

_____

5 What control variables could you change to launch your ball even farther?

_____

_____

_____

_____

6 If you could do this experiment over, would you do anything differently? Explain.

_____

_____

_____

_____

_____

7 What happens if you change your design? Can you still use your graph? Why or why not?

_____

_____

_____

_____
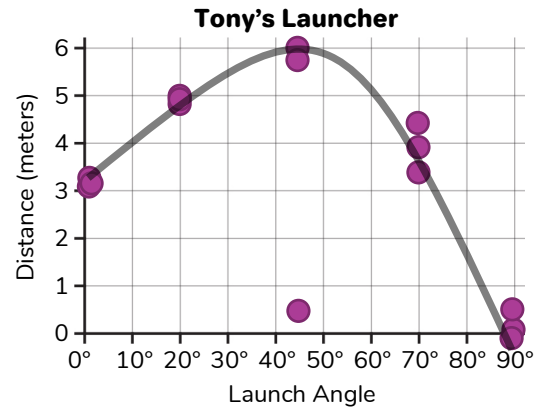
8 Tony's graph is to the right. If Tony wants to hit a target that is 4 m away, what launch angle should Tony use? Why?

Tony's Launcher

Distance (meters) vs _Launch Angle_

_____

_____

_____

_____

_____

_____

_____
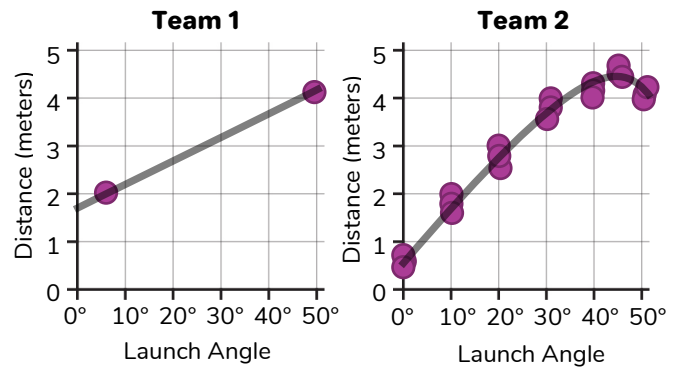
9 The two teams below are competing to hit the most bullseyes. If the target is exactly 3 m away, which team do you think will win? Explain.

Team 1

Team 2

Distance (meters) vs _Launch Angle_

_____

_____

_____

_____

_____

_____

10 What can Team 1 do to make their graph a better model for their launcher's distance?

_____

_____

_____

_____

☑ You're done with the lab! Next, you'll probably do a challenge. As you keep tinkering and improving your design, remember how to use graphs to get the most out of _your_ launcher.