1.4 Explore

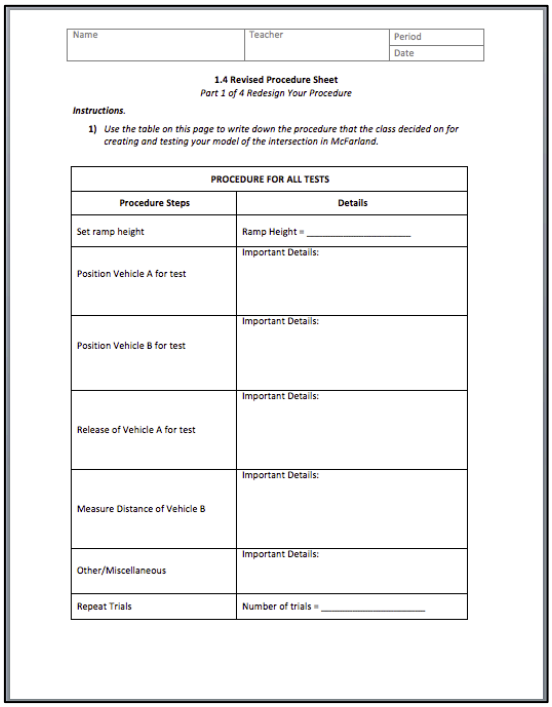
A Revised Procedure

1.4: Part 1 of 4 – Redesign Your Procedure

As a class, discuss changes that could make your procedure more consistent. Your teacher will make a list of procedural differences you noticed during your first investigation. As a class, decide on the procedural details that all groups will use. This should ensure that all groups have a more consistent procedure. After the class has decided on the procedure, record these details on the Procedure Sheet. The new procedure sheet will communicate the important details of how the investigation will be carried out. If all groups follow the same procedure consistently it should eliminate some outlying data, which resulted from earlier procedural differences.

CLASS

Record the details of your updated procedure on the *Revised Procedure Sheet*.



Name	Teacher	Period
		Date

1.4 Revised Procedure Sheet
Part 1 of 4 Redesign Your Procedure

Instructions.

1) *Use the table on this page to write down the procedure that the class decided on for creating and testing your model of the intersection in McFarland.*

PROCEDURE FOR ALL TESTS	
Procedure Steps	**Details**
Set ramp height	Ramp Height = _____
Position Vehicle A for test	Important Details:
Position Vehicle B for test	Important Details:
Release of Vehicle A for test	Important Details:
Measure Distance of Vehicle B	Important Details:
Other/Miscellaneous	Important Details:
Repeat Trials	Number of trials = _____

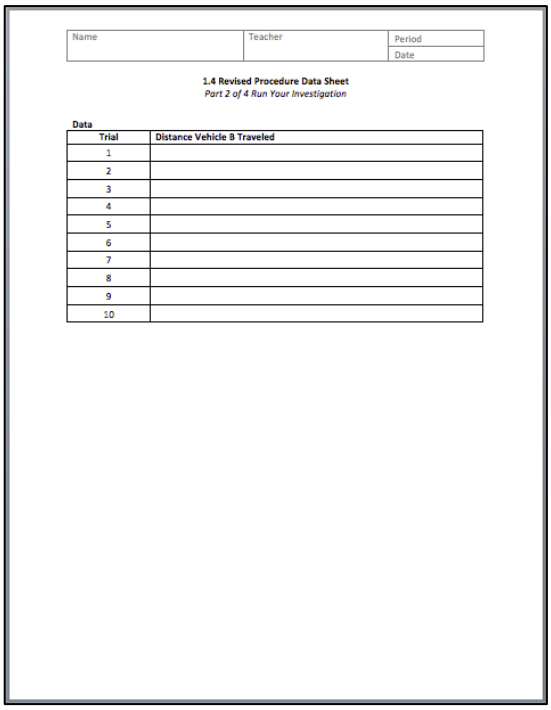
1.4: Part 2 of 4 – Run Your Investigation

Follow your updated procedure to collect data from 10 trials. You will have 10 minutes to collect and record your data. Your group will share your data like last time to create a class data set. Be sure to follow your new procedure carefully.

1.4 Explore

GROUP

Complete your new procedure and record the results on your *Revised Procedure Data Sheet.*



Name	Teacher	Period
		Date

1.4 Revised Procedure Data Sheet
Part 2 of 4 Run Your Investigation

Data

Trial	Distance Vehicle B Traveled
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	

1.4: Part 3 of 4 – Share

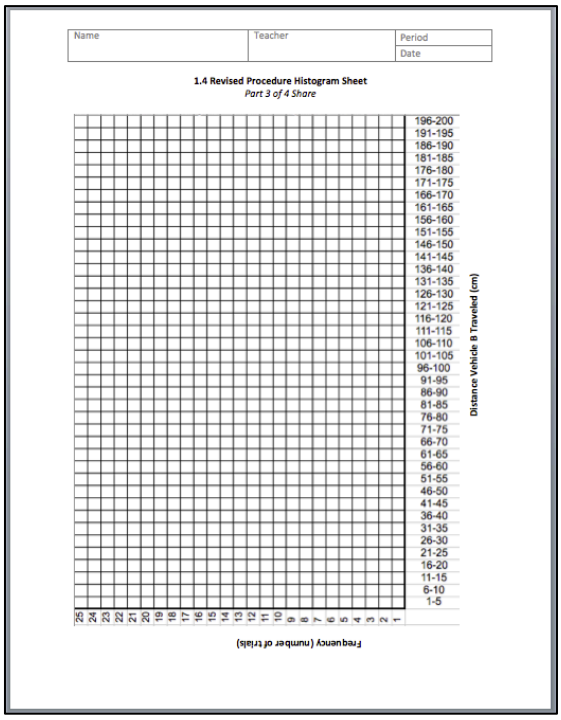
Now that your group has collected data, your teacher will ask each group to share their data with the class. As before, record data from every group on one histogram sheet.

STUDENT

Record your class data on the *Revised Procedure Histogram Sheet* and analyze the histogram.

After all groups report their data your teacher will have the class compare the new data (from the revised procedure) to the old data (from the original procedure). What differences do you notice?

1.4 Explore


Name | Teacher | Period | Date

1.4 Revised Procedure Histogram Sheet
Part 3 of 4 Share

Distance Vehicle B Traveled (cm)
196-200
191-195
186-190
181-185
176-180
171-175
166-170
161-165
156-160
151-155
146-150
141-145
136-140
131-135
126-130
121-125
116-120
111-115
106-110
101-105
96-100
91-95
86-90
81-85
76-80
71-75
66-70
61-65
56-60
51-55
46-50
41-45
36-40
31-35
26-30
21-25
16-20
11-15
6-10
1-5

Frequency (number of trials)
25 24 23 22 21 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1

1.4: Part 4 of 4 – Add to Your Understanding: Experimental Design

Science and engineering requires using well-designed, consistent procedures for measuring and collecting data. To do this, scientists and engineers carefully record their procedure so that they and others can repeat the procedure and verify measurements.

Specifying and carefully following these procedures is important to make sure that data is consistently collected. If consistent procedures are not used, then changes in the procedures might cause differences in data collected. When these procedural differences are unintentional then we say that they add *error* to the data. Scientists try to remove as much error from their data as possible.

For example, in the first investigation (Section 1.3) many groups let the height of the ramp change between trials. These different ramp heights meant the procedure was not consistent and therefore the distance data had error due to differences in ramp height. Ramp height is an example of a *variable*. A variable is any part of the procedure that could change.

1.4 Explore

An *independent variable* is a variable that the investigator systematically changes during the experiment. For instance, an experimenter might vary the amount of water that a plant gets, in order to see how different amounts of water affect the height of plants.

A *dependent variable*, on the other hand, is a variable that the experimenter measures during the experiment. Often, the independent variable is predicted to affect the dependent variable. For instance, an experimenter might think that the amount of water (independent variable) will affect plant height (dependent variable). The dependent variable (plant height) depends on the amount of the independent variable (water).

In the second investigation (Section 1.4), every group should have used the same ramp height. Because each group consistently used the same height for all trials, ramp height became a *controlled variable*. A controlled variable is a variable that is "controlled" so that it stays the same each time the procedure is run. Controlling a variable usually reduces error. In this case, each group controlled the ramp height variable, which should have reduced error. The data should have been more accurate, and thus more clustered together on the histogram.

1.5 Explore

DEFINITIONS

Error – The difference between the observed value of a quantity and the true value of that quantity: *Because he estimated the height of the opening, there was error in his measurement for a new door.*

Variable – Any feature of the procedure that can vary (change). *In their experiment, the amount of water given to the plant was a variable because they could give the plant different amounts of water.*

Independent Variable – A variable that is systematically changed during the experiment. *In their experiment, the amount of water given to the plant varied to see how different amounts of water affect plant height.*

Dependent Variable – The variable that is measured during the experiment. *In their experiment, plant height is measured to see how it depends on the amount of water provided.*

Controlled Variable – A variable that is "controlled" so that it stays the same each time the procedure is run. *In their experiment, the amount of water given to the plant was a controlled variable because they always used 500 milliliters.*