A Component of the
Washington State Assessment System

Science, Math, & Educational Technology

Speed Racer

Practice Papers

Grades 4-5

OSPI-Developed
Assessment

Office of Superintendent of Public Instruction
June 2011

Grades 4 – 5 Speed Racer
Science, Math, and Educational Technology Assessment

Introduction
This Practice Set provides educators with student exemplars for the grades 4-5 Speed Racer Educational Technology assessment. We selected each sample to model the range of scoring for this assessment. There are two components that make up the scoring guide for educational technology— **Attributes of Educational Technology Standards (checklist)** and the **Scoring Rubric for Educational Technology**.

Attributes of Educational Technology Standards. Teachers will use the *attributes* checklist first to determine the number of **attribute points** the student work can earn. The checklist presents a list of characteristics that should be present in student work which meets the standard. The **GLE**s targeted by the assessment are listed in the left column.

Each **attribute name**, such as *Generate Questions*, is derived directly from the standards (*Build background knowledge and generate questions by viewing multimedia.*). Each attribute has one or more **descriptions** which detail what an at-standard performance looks like (*Develops original questions after viewing multimedia.*).

This is different from a typical rubric, which describes various levels of performance. With the checklist, the teacher has only to decide whether or not the work is at standard. If the teacher determines that the work is at standard, then it earns the number of points indicated in the right-hand column. The teacher totals the points.

Scoring Rubric for Educational Technology. In the final step, the teacher uses the **total number of points** earned in the *attributes* checklist to determine the overall level of performance for the assessment. Student work earning no more than five attribute points would represent a below standard (Level 1) performance. Six to seven points meets the standard (Level 2), while student work that earns eight or nine points exceeds the standard (Level 3).

Discussion
We understand that that this type of scoring may be new for many teachers; however, there are several compelling reasons why the assessment development group selected this tool over a traditional rubric.

First, many of the educational technology standards represent skills. As such, a student can demonstrate the skill or they cannot—there is no "better or worse than." It did not make sense to scale the point scoring for the attributes, and the assessment development group decided not to quantify performance in terms of the number of times a student could demonstrate the skill. This is also why there are three performance levels instead of four.

A checklist format that describes the *attributes* is an efficient tool for teachers. There is only one decision involved for each attribute—is the work at standard?—instead of several decisions about quality. The tool also allows for cleaner scoring as the teacher need only consider **one attribute at a time**. This is unlike many rubrics, which have multiple attributes within a single cell. A student's work might reach various targets within a column or row, so the teacher must synthesize the score. With the *attributes* checklist and *scoring rubric* tool we provide for the educational technology standards, teachers will be able score consistently across student work.

Review the Scoring Guide carefully (next two pages) and then the exemplars. Score each sample before using the annotations to review your choices and options for student feedback.

Grades 4 – 5 Speed Racer
Science, Math, and Educational Technology Assessment

Directions: Each of the *attribute names* below represents part of an educational technology standard. These are followed by *descriptions* of student performance which meet the standard. If the student work provides evidence of meeting the standard, it earns the *points* shown in the final column. Total the points and then compare to the *Scoring Rubric* to determine the overall level of performance.

We use the term *digital* to refer to tools and information that do not exist in a physical form. Computer software, Web sites, online databases, pod/vodcasts and pages from an eReader are just a few examples.

Attributes of Educational Technology Standards

GLE	Attribute Name	Description	Points
Research Process (separate from multimedia product)			
1.3.1	Generate Questions	Develops original questions after viewing multimedia (for example an online simulation or video clip).	1
	Plan Projects	Uses a digital tool to plan an investigation related directly to the student task.	1
1.1.2	Collect and Graph Data	Collects data related directly to the student task.	1
		Graphs data using a digital tool.	1
	Recognize Patterns	Uses an interactive resource (online simulation or graphing tool) to identify a pattern or trend. *For example,* "*The graph shows that as the weight of a ball increases, so does its speed down the ramp."*	1
Multimedia Product			
1.1.1	Produce Multimedia	Creates a digital product to communicate information.	1
		Combines audio, text, graphs, video, symbols, or pictures that are related directly to the student task into product.	1
	Organize Ideas	Uses information gathered during the investigation to explain how the rules will make the race fair.	1
		Uses features (font, color, transitions) of the digital tool to effectively communicate main ideas to the audience. *For example, different font sizes are used consistently to show headers and subjects or transitions to reveal answers.*	1
TOTAL			9

Grades 4 – 5 Speed Racer
Science, Math, and Educational Technology Assessment

Scoring Rubric for Educational Technology

Performance Description	Points
A **Level 3 response** exceeds the standards and reflects that a student can demonstrate knowledge and ability beyond the requirements for Educational Technology GLEs 1.1.1, 1.1.2, and 1.3.1.	8 - 9
A **Level 2 response** meets the standards and reflects that a student understands and is able to perform GLE 1.1.1 *Demonstrate creative thinking, construct knowledge and develop innovative products and processes using technology,* 1.1.2 *Use models and simulations to explore systems, identify trends and forecast possibilities* and GLE 1.3.1 *Identify and define authentic problems and significant questions for investigation and plan strategies to guide inquiry* BY using digital tools to explore the relationship between time, distance, weight and speed in order to develop a set of rules for a toy car race.	6 - 7
A **Level 1 response** reflects that a student is still working toward meeting GLEs 1.1.1, 1.1.2 and 1.3.1.	0 - 5

2.17.11

P1

Lab: Speed Racer

You have been asked to judge a toy car race. Last year, some cars were so much faster than others that it was believed some racers might have cheated. The organizers want the race to be fair. They would like you to write a set of at least four rules for the event to ensure no car can cheat to win. The rules must be based on evidence about how weight, time, and distance affect the speed of an object rolling down a ramp.

To develop the rules, you will need to plan and conduct an investigation, collect and interpret data, and explain how your rules will make the race fair. Use digital tools to organize your information and communicate your results to the Racing Committee.

Speed is determined by the distance traveled divided by the time traveled (for example, mph in a car).

Luger Race Observation Data: Choose earth and two other space objects. Collect data for three trials of each.

Gravity(Earth)	1/2 time	Total time
1.0 (Earth) Trial #1	37.4	55.5
Trial #2	36.6	54.8
Trial #3	36.6	54.8
Average (mean)		
	36.9	55.3
Gravity Sun, 28.05	1/2 time	Total time
Trial #1	8.1	11.5
Trial #2	8.1	11.5
Trial #3	8.1	11.5
Average (mean)	8.1	11.5
Jupiter		
Gravity 0.069	1/2 time	Total time
Trial #1	24.8	36.2
Trial #2	24.2	36.2
Trial #3	24.8	36.3
Average (mean)	74.3	108.7

What do you notice?

The less gravity the slower something goes

SPEED RACER

P1

Reseach/Purpose Question: How does the weight of a round object affect the speed of a round object?

Background information (based on the Intergalactic Luge activity and previously learned information)

What did you notice about the relationship between the weight of the luger and his/her speed down the track?

I noticed that the More weight the faster the sled goes.

Newton's First Law of Motion: Something in Motion will stay in Motion Something at rest stays at rest.

Newton's Second Law of Motion: Force changes using Mass and Speed

Hypothesis (predict the answer to your research question): I predict

I predict the bigger heavyer ball will go faster than the smaller ball

Materials: Meter stick, three Marbles, Math book, journal, timer

Procedure: What are the steps to test your research question?

(1) gather Materials (2) Make a ramp (3) send each object down the ramp (5) collect data. (6) Put data in data table (7) repeat 3-6 twice. 5 Measure distance (8) find Mean (9) compare results

Data Collection

The Distance an Object Travels in 3 Seconds

Type of Object *(Manipulated Variable: place on X axis)*	D Distance in centimeters *(Responding Variable: place on Y axis)*				
	Trial #1	Trial #2	Trial #3	Average Distance (mean)	Average Speed (distance divided by time)
Round candy (lightest/lowest weight)	116 cm	133	107	118.6	24.53
Small marble (middle weight)	197	140	209	182	60.6
Large marble (heaviest/most weight)	207	163	205	207	55.5

P1

Graph. Make a line graph of your data, using centimeter graph paper.
Online graph. Graph your information, using the graphing tool at http://nces.ed.gov/nceskids/createagraph.

Print out a copy and include it with this lab sheet. Also, save the graph in your file.

Conclusion: What does your table and graph show? How does the weight of the round object affect the speed of the round object? Answer your research question, using data from your table and graph.

The lighter the object slower you go. The graph sows the advantages. The big ball went 55.5cm. The small ball went 24.56 cm. My conclusion was correct

You have been asked to judge a toy car race. Last year, some cars were so much faster than others that it was believed some racers might have cheated. The organizers want the race to be fair. They would like you to write a set of at least four rules for the event to ensure no car can cheat to win. The rules must be based on evidence about how weight, time, and distance affect the speed of an object rolling down a ramp. To develop the rules, you will need to plan and conduct an investigation, collect and interpret data, and explain how your rules will make the race fair. Use digital tools to organize your information and communicate your results to the Racing Committee.
Speed is determined by dividing the distance traveled by the time traveled (for example, mph in a car).

Rule #1: No extra weight Reason for the rule (based on evidence collected in Speed Racer lab or online activities) cars with a lot of weight go faster	Rule #2: all slopes must be the same Reason for the rule (based on evidence collected in Speed Racer lab or online activities) all ramps the same slope or one will get there first
Rule #3: racers must be the same weight Reason for the rule (based on evidence collected in Speed Racer lab or online activities) heavier driver faster car	Rule #4: Must be home made car Reason for the rule (based on evidence collected in Speed Racer lab or online activities) Store cars have Motors

P1

Plan a project and test your solution (your rules). Create a model using the following materials.

Materials: a toy car, tape, pennies to change the weight, ramp.

Project plan. How will you test your rules, using a model?

How does a slope affect how far the car goes? Proceedures① gather materials② Make three different slopes③ send the car down④ measure the distance⑤ recorde distants in data table.⑥ recreat steps 3-5 for trials 2-3⑦ compare results

The data collected to prove my rules are fair:

	Trial 1	Trial 2	Trial 3	Mean
Slope 1	32cm	31 cm	47cm	36.6cm
Slope 2	44cm	38cm	41cm	41cm
Slope 3	26cm	25cm	29cm	26.6cm

Presentation:

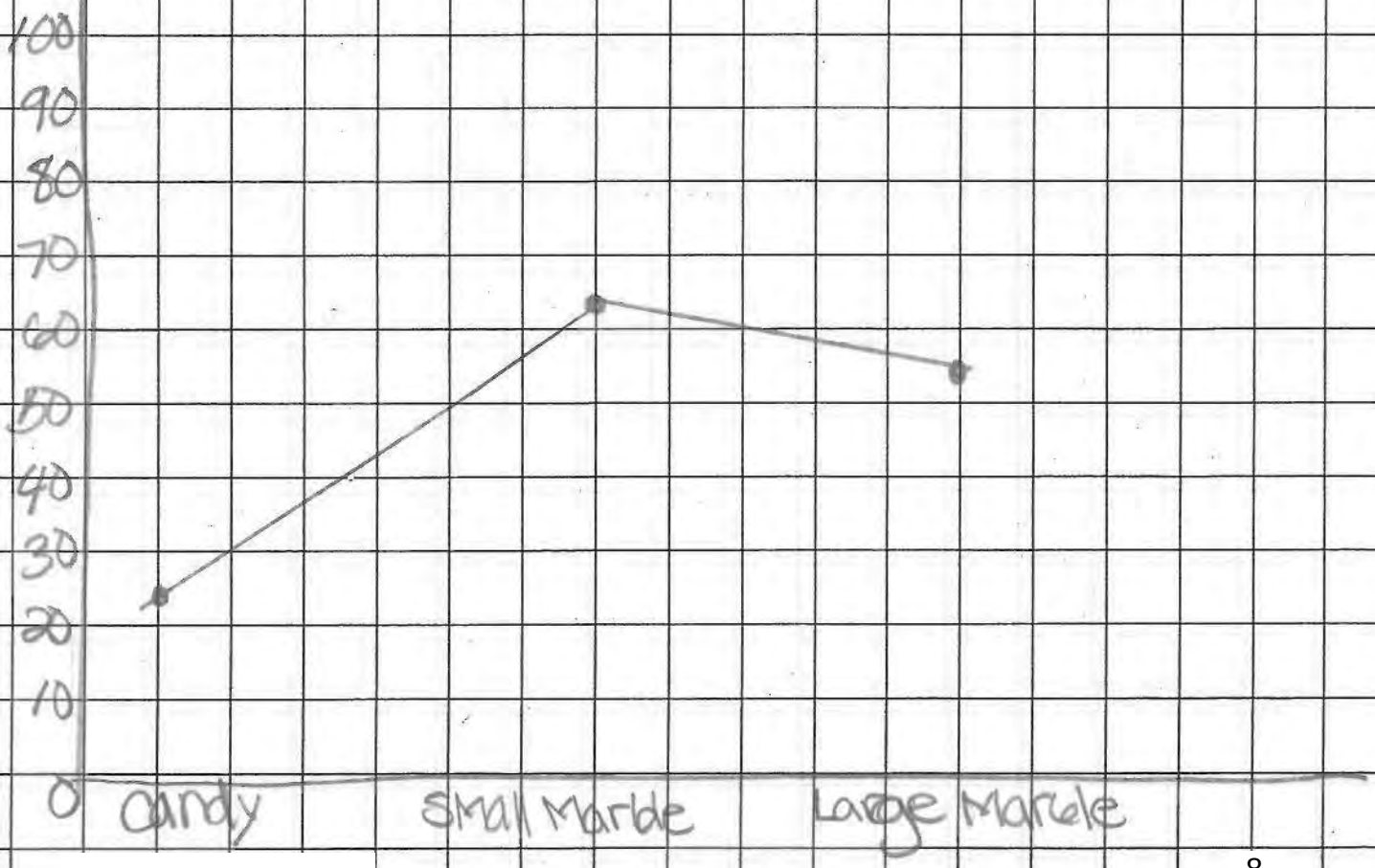
Use prezi.com to make an online presentation of your solution to the problem. Your primary title should be "SPEED RACER." Include your rules, the reason your rules are fair, the plan you made to test your rules and the graph that you made from the Speed Racer lab. Also include science concepts that connect to your plan. If you use pictures or information from online or somewhere else, be sure to include the source that your pictures or information came from.

Reference notes: (name of web site or book, URL if online, author, date used)

Conclusion This test shows my rules are Fair because the results are not the same.

Distance

P1



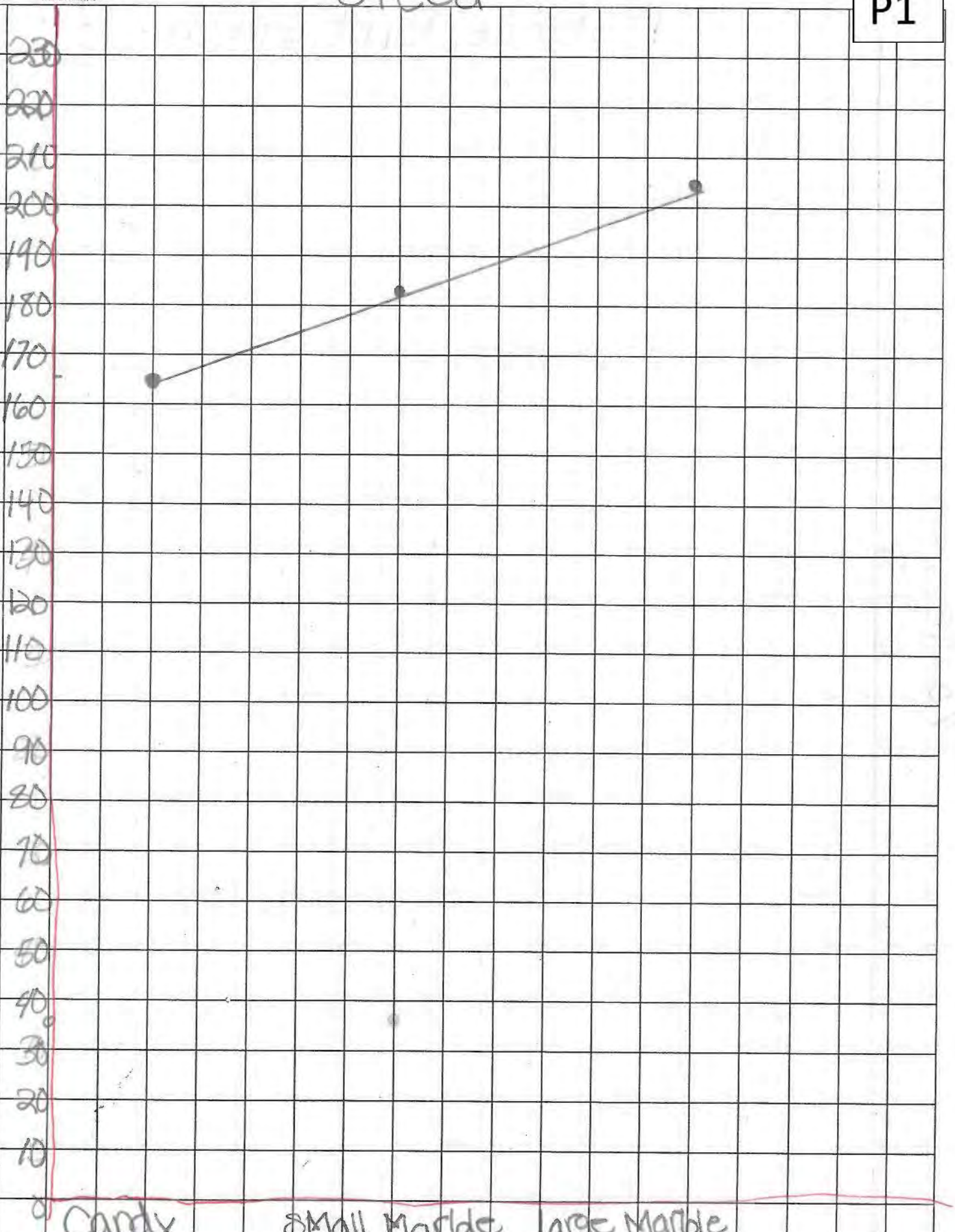
LEARNING RESOURCES
VERNON HILLS, IL

METRIC GRAPH PAPER

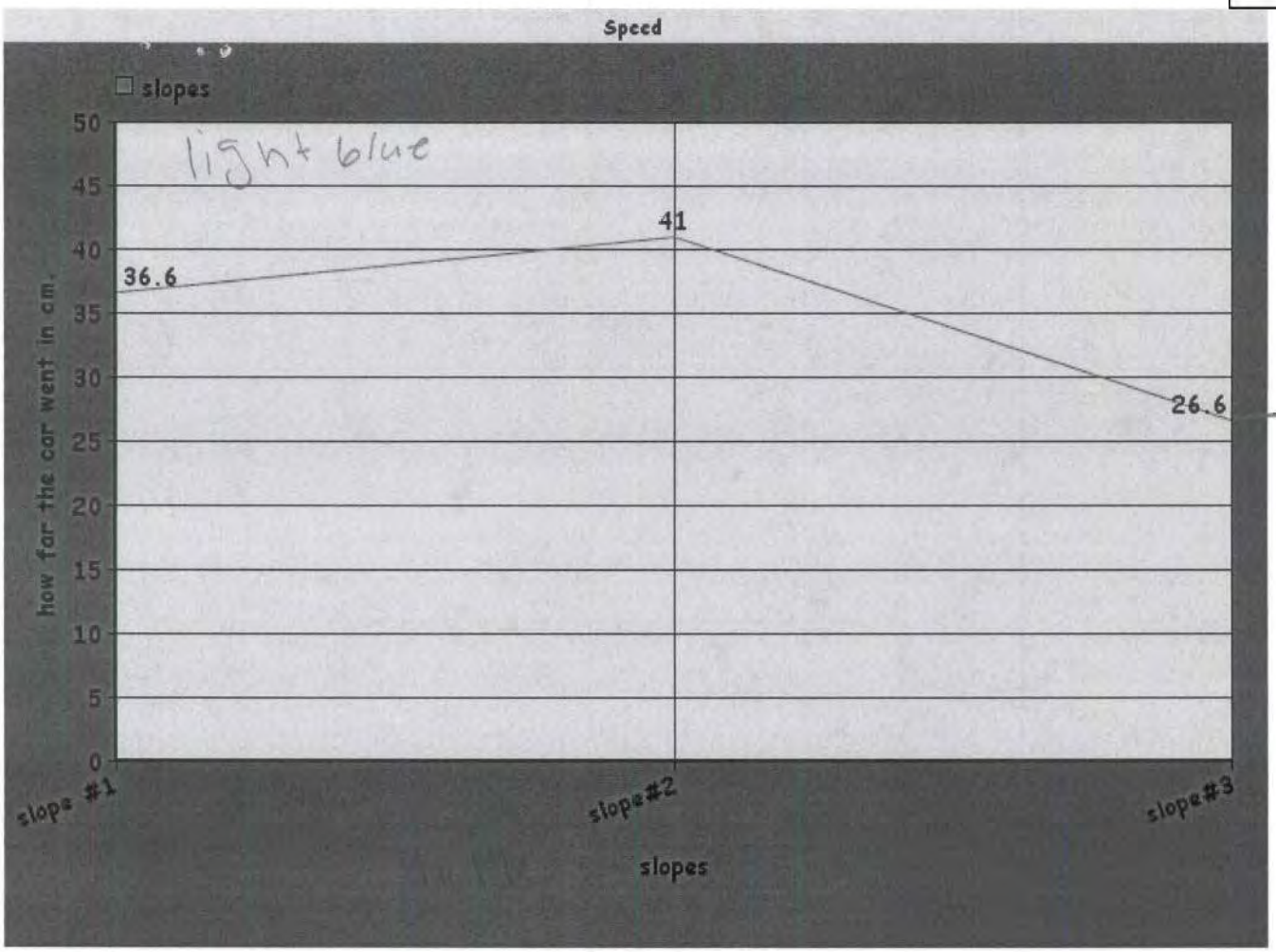
Speed

LER

P1



P1


Speed
slopes
light blue
41
36.6
26.6
red
how far the car went in cm.
50
45
40
35
30
25
20
15
10
5
0
slope #1
slope#2
slope#3
slopes

purple

P1

SPeed Racer Rules

1. [illegible]
2. NO engines because racers
3. NO Weights
4. NO electricity
5. no boosts

only our Wheels

no remote controls

1. no extra weight. cars will go faster
2. all racers must be the same weight

P1

Speed Racer Project Plan
Grades 4 – 5 Science, Math, and Educational Technology CBA

Name _____

Define the Problem
What is the problem you are trying to solve?

The cars are cheating

Criteria for Solution
How will you know if the problem has been solved? What evidence will you use?

You could weigh the drivers see if all cars are home-made

Tools and Materials
List all of the tools and materials you will need to develop a solution to the problem.

Car, ramp, timer, driver, weighing machine

Design a Model
Describe what you will do to create a model to test as a solution.

I will bring a weighing machine to weigh the drivers

Test the Solution
Describe how you will test the solution. What steps will you take?

Make a race, weigh drivers, see if all cars are home-made

Jelly Bean

P1

Speed Racer Project Plan
Grades 4 – 5 Science, Math, and Educational Technology CBA

Giggles

Mear-cat

Results

What are the results of your test? Use a combination of words, tables, graphs, or pictures to show the data and observations.

A higher ramp goes faster

See gragh

Modify the Design

What could you do to modify the design and improve the results?

Change height or material or car

Communicate the Solution

List the rules you developed for the toy car race. Be sure to include evidence that shows how weight, time, and distance affect the speed of an object rolling down a ramp.

All ramps must be the same.
No extra weight
All cars must be home made
Drivers must be same weight

P1

SPEED RACER

Rule #1
no extra weight
cars with more weight go faster

Procedures#1-8

#1 gather materials
#2 make a ramp
#3 send each car down the ramp
#4 measure distance
#5 record data in data table
#6 repeat steps #1-5
#7 find mean
#8 compare results

rule #4
all cars must be
home made
some store cars
have motors

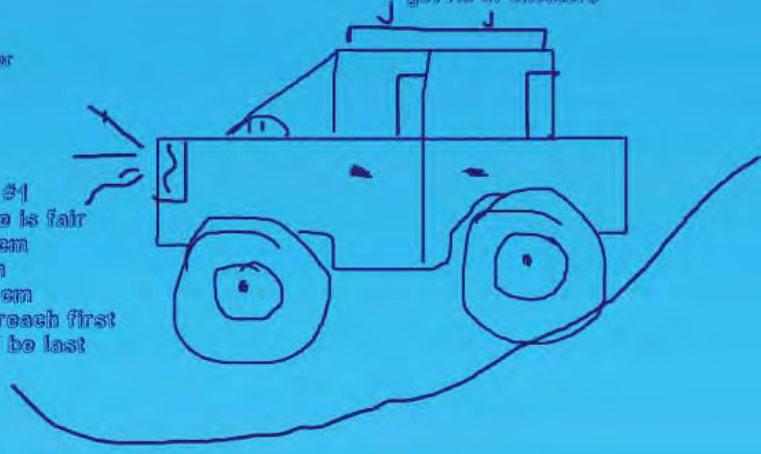
Rule #3
racers must be the same
weight heavyer driver heavyer
car

Rule #2
all slopes must be the same
if the ramps are different
one car will finish first

Last year the town had a car race
some cars went faster than others
so we need to make the race fair by
making rules

When I tested Rule #1
I found that this rule is fair
slope #1 was 38.6 cm
slope #2 was 41 cm
slope #3 was 28.6 cm
so slope #2 would reach first
and slope #3 would be last

a race is having cheaters
so we have to find rules to
get rid of cheaters



Please visit http://www.k12.wa.us/EdTech/Assessment/VideoPracticeIndex.aspx#P1 to see the multimedia product for Sample P1.

P2

Lab: Speed Racer

You have been asked to judge a toy car race. Last year, some cars were so much faster than others that it was believed some racers might have cheated. The organizers want the race to be fair. They would like you to write a set of at least four rules for the event to ensure no car can cheat to win. The rules must be based on evidence about how weight, time, and distance affect the speed of an object rolling down a ramp.

To develop the rules, you will need to plan and conduct an investigation, collect and interpret data, and explain how your rules will make the race fair. Use digital tools to organize your information and communicate your results to the Racing Committee.

Speed is determined by the distance traveled divided by the time traveled (for example, mph in a car).

Luger Race Observation Data: Choose earth and two other space objects. Collect data for three trials of each.

Gravity(Earth)	1/2 time	Total time
1.0 (Earth) Trial #1	36.8 sec	54.9 sec
Trial #2	37.1 sec	55.3 sec
Trial #3	37.7 sec	55.9
Average (mean)	37.8 sec	55.36 sec
Gravity (Jupiter) 2.529	1/2 time	Total time
Trial #1	24.9 sec	36.3 sec
Trial #2	24.9 sec	36.4 sec
Trial #3	24.8 sec	~~24.8 sec~~ 36.3 sec
Average (mean)	~~24.7 sec~~ 74.6 sec	~~36.2 sec~~ ~~109 sec~~ 36.33 sec
Gravity (Sun) 28.05	1/2 time	Total time
Trial #1	8.0 sec	11.5 sec
Trial #2	8.0 sec	11.5 sec
Trial #3	8.0 sec	11.5 sec
Average (mean)	24 sec	34.5 sec

What do you notice?

The more gravity you have the faster the sled goes

P2

Reseach/Purpose Question: How does the weight of a round object affect the speed of a round object?

Background information (based on the Intergalactic Luge activity and previously learned information)

What did you notice about the relationship between the weight of the luger and his/her speed down the track?

The more weight/gravity pull there was the faster the "round object" went down the track.

Newton's First Law of Motion: an object in motion or at rest stays there unless acted upon by another force

Newton's Second Law of Motion: force always changes with mass and the speed of acceleration

Hypothesis (predict the answer to your research question): I predict that the heavier the round object is the faster the round object will go.

Materials: 1 meterstick, 3 diff. size marbles, mathbook, timing clock

Procedure: What are the steps to test your research question?

1) Gather materials/make course
2) set round object(s) at the top of the ramp
3) release round object(s) at the same time
4) collect data and write down in data table
5) repeat steps two through four about 2 to 4 times
6) Find averages and compare

Data Collection

The Distance an Object Travels in 3 Seconds

CPS = centimeters per second

Type of Object *(Manipulated Variable: place on X axis)* horizontal	D Distance in centimeters *(Responding Variable: place on Y axis)* vertical				
	Trial #1	Trial #2	Trial #3	Average Distance (mean)	Average Speed (distance divided by time)
Round candy (lightest/lowest weight)	38cm	43cm	49cm	$43.\overline{3}$cm	$14.\overline{43}$cps
Small marble (middle weight)	51cm	53cm	60cm	$54.\overline{6}$cm	18.2cps
Large marble (heaviest/most weight)	78cm	75cm	79cm	$77.\overline{3}$cm	$25.\overline{76}$cps

point graph

Conky graph
average

P2

Graph. Make a line graph of your data, using centimeter graph paper.
Online graph. Graph your information, using the graphing tool at http://nces.ed.gov/nceskids/createagraph.
http://www.onlinecharttool.com
Print out a copy and include it with this lab sheet. Also, save the graph in your file.

Conclusion: What does your table and graph show? How does the weight of the round object affect the speed of the round object? Answer your research question, using data from your table and graph.

My prediction was correct because the average distance was 7.3 which was the most out of the largest object 4.3, 5.6, and 7.7

You have been asked to judge a toy car race. Last year, some cars were so much faster than others that it was believed some racers might have cheated. The organizers want the race to be fair. They would like you to write a set of at least four rules for the event to ensure no car can cheat to win. The rules must be based on evidence about how weight, time, and distance affect the speed of an object rolling down a ramp.
To develop the rules, you will need to plan and conduct an investigation, collect and interpret data, and explain how your rules will make the race fair. Use digital tools to organize your information and communicate your results to the Racing Committee.
Speed is determined by dividing the distance traveled by the time traveled (for example, mph in a car).

Rule #1: Same weight for each car Reason for the rule (based on evidence collected in Speed Racer lab or online activities) So gravity won't pull a single car down the track faster than the others	Rule #2: Start the car at the same distance up the track Reason for the rule (based on evidence collected in Speed Racer lab or online activities) So a specific car doesn't have less track to run
Rule #3: Cars can only be moved by gravity Reason for the rule (based on evidence collected in Speed Racer lab or online activities) If a car is pushed it definitely will go faster	Rule #4: All cars released at the same time Reason for the rule (based on evidence collected in Speed Racer lab or online activities) So one car isn't pushing while one is starting

P2

Plan a project and test your solution (your rules). Create a model using the following materials.

Materials: a toy car, tape, pennies to change the weight, ramp.

Project plan. How will you test your rules, using a model?

Research Question: How does releasing the cars at different heights up the ramp effect the speed and distance that the cars go?

Procedure: 1) Gather materials 2) set up 3) set car at different place on ramp 4) release 5) stop car where-ever it is at 4 sec. 6) record data 7) repeat steps 2-6 about 3 times on distance within 4 sec that it traveled

The data collected to prove my rules are fair:

trial	How far up the ramp (inches)	How far the car went		Average
#1	1 inch	4cm	2cm	4.3
#2	3 inches	3cm	12cm	13
#3	8 inches	10cm	8cm	7.3
Average	4 inches			

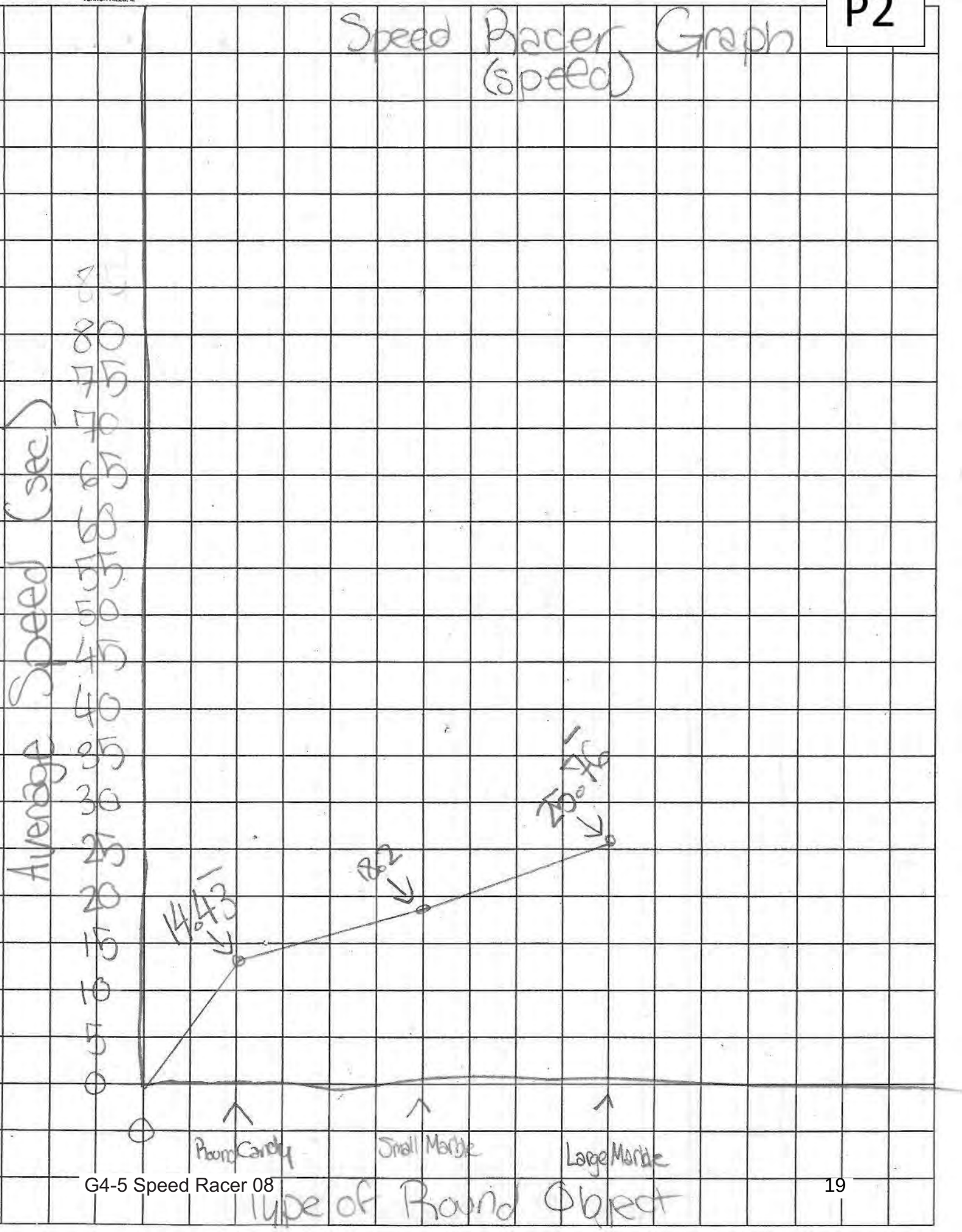
Presentation:

Use prezi.com to make an online presentation of your solution to the problem. Your primary title should be "SPEED RACER." Include your rules, the reason your rules are fair, the plan you made to test your rules and the graph that you made from the Speed Racer lab. Also include science concepts that connect to your plan. If you use pictures or information from online or somewhere else, be sure to include the source that your pictures or information came from.

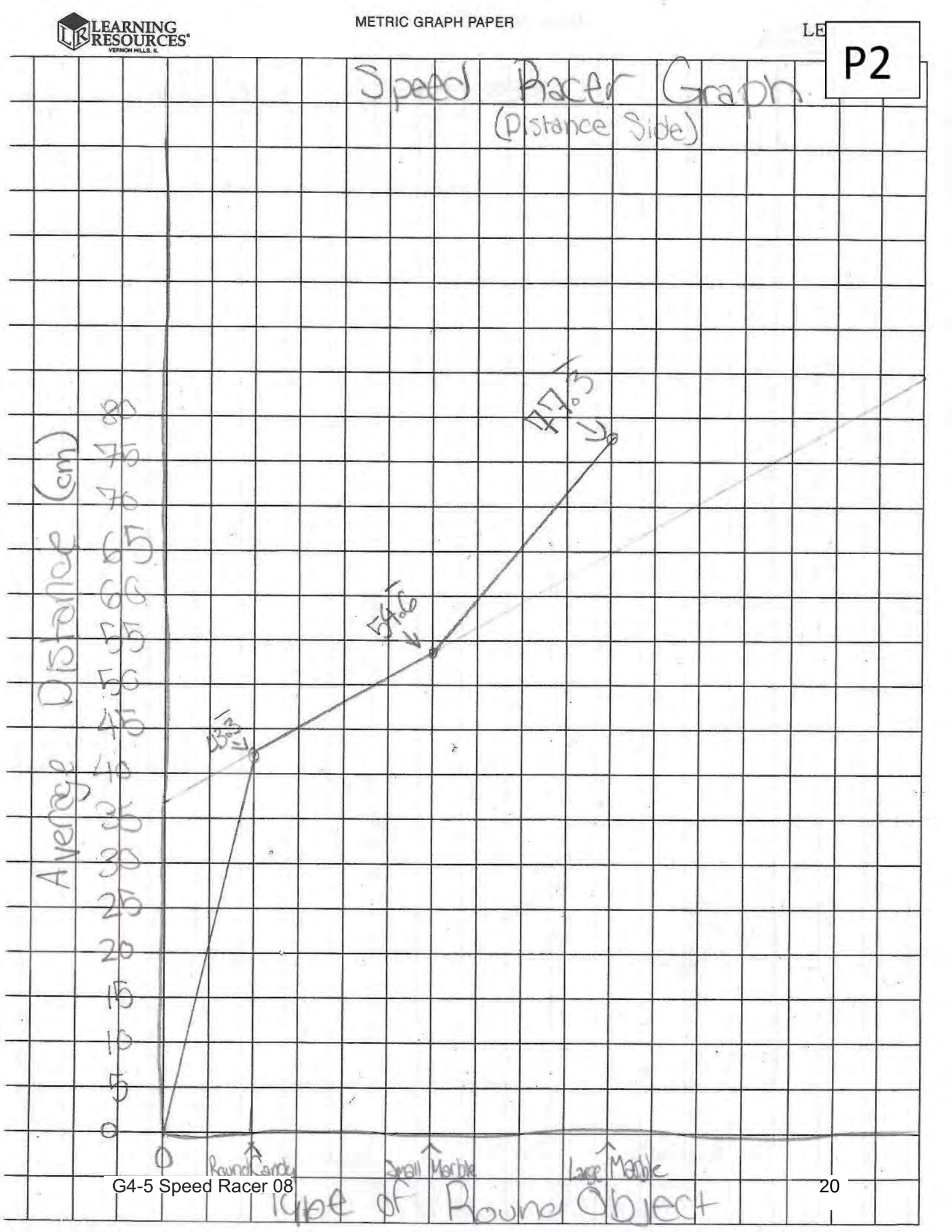
Reference notes: (name of web site or book, URL if online, author, date used)

Conclusion: This test shows my rules are fair because if one of them starts at the top and one starts in the middle the middle one will go furthest

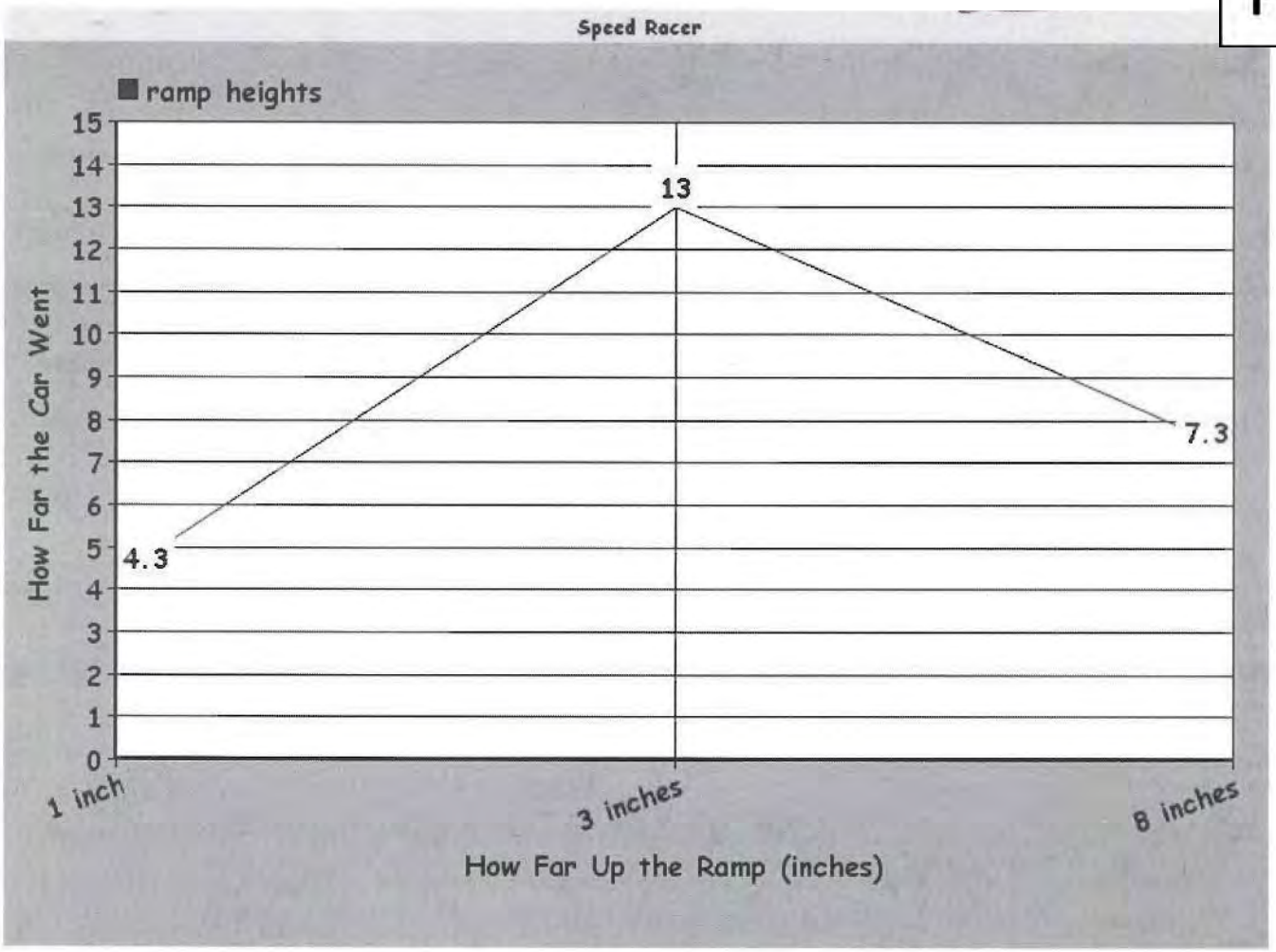
Speed Racer Graph (speed)



Speed Racer Graph
(Distance Side)



P2


Speed Racer
ramp heights
How Far the Car Went
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
13
7.3
4.3
1 inch
3 inches
8 inches
How Far Up the Ramp (inches)

P2

Speed Racer Project Plan
Grades 4 – 5 Science, Math, and Educational Technology CBA

Name _____

Define the Problem

What is the problem you are trying to solve? Cars can't cheat in this race, so I am testing how far up/down the cars should start on the track

Criteria for Solution

How will you know if the problem has been solved? What evidence will you use?
My averages of how far the cars starting point up the ramp's distance will prove that at ___ inches the car will go ___ far.

Tools and Materials

List all of the tools and materials you will need to develop a solution to the problem.
Car (1), Meter stick (1), Ramp (1), Timing Clock (1),

Design a Model

Describe what you will do to create a model to test as a solution. Start cars at different points up the ramp let the car go at the 4 sec. mark Stop the car wherever it is. Measure (with the Meter Stick in cm.) the front of the car. Be sure the meterstick's "0 mark" is at the edge of the ramp.

Test the Solution

Describe how you will test the solution. What steps will you take?
1) Gather materials
2) Set up
3) release car
4) at 4 sec. mark stop car
5) record data in data table
6) repeat steps 3-5 about 3 times
(Note: for step 3 put the car at different places on the ramp)

P2

Speed Racer Project Plan
Grades 4 – 5 Science, Math, and Educational Technology CBA

Results

What are the results of your test? Use a combination of words, tables, graphs, or pictures to show the data and observations.

See graph

Modify the Design

What could you do to modify the design and improve the results?

Test weight affects onto what I was trying to prove.

Communicate the Solution

List the rules you developed for the toy car race. Be sure to include evidence that shows how weight, time, and distance affect the speed of an object rolling down a ramp.

See rules in the speed racer packet on page number 2

P2

Rule#2: Start each car at the same distance up the track

Speed Racer

#7 :repeat steps 2-6

here are the 4 rules I came up with

Please visit http://www.k12.wa.us/EdTech/Assessment/VideoPracticeIndex.aspx#P2 to see the multimedia product for Sample P2.

Lab: Speed Racer

You have been asked to judge a toy car race. Last year, some cars were so much faster than others that it was believed some racers might have cheated. The organizers want the race to be fair. They would like you to write a set of at least four rules for the event to ensure no car can cheat to win. The rules must be based on evidence about how weight, time, and distance affect the speed of an object rolling down a ramp.

To develop the rules, you will need to plan and conduct an investigation, collect and interpret data, and explain how your rules will make the race fair. Use digital tools to organize your information and communicate your results to the Racing Committee. Speed is determined by the distance traveled divided by the time traveled (for example, mph in a car).

Luger Race Observation Data: Choose earth and two other space objects. Collect data for three trials of each.

Gravity(Earth)	1/2 time	Total time
1.0 (Earth) Trial #1	36.8	55.0
Trial #2	37.0	55.1
Trial #3	37.1	55.3
Average (mean)	36.9	55.1
Gravity Jupiter 2.529	1/2 time	Total time
Trial #1	25.0	36.5
Trial #2	24.9	36.4
Trial #3	24.9	36.4
Average (mean)	24.93	36.4
Gravity sun 28.05	1/2 time	Total time
Trial #1	8.0	11.5
Trial #2	8.0	11.5
Trial #3	8.0	11.5
Average (mean)	8	11.5

What do you notice?

I notice that the planet with the ~~smallest~~ ~~mass~~ biggest amount of gravity makes the sled go faster

P3

Reseach/Purpose Question: How does the weight of a round object affect the speed of a round object?

Background information (based on the Intergalactic Luge activity and previously learned information)

What did you notice about the relationship between the weight of the luger and his/her speed down the track?

The more weigh something has means that the speed will go faster

Newton's First Law of Motion: Things like to do whatever they are already doing

Newton's Second Law of Motion: Force changes with mass and acceleration

Hypothesis (predict the answer to your research question): I predict

I think the object with more weigh have faster speed

Materials: marble 3 different sizes meterstick journal mat paper

Procedure: What are the steps to test your research question?

The steps are to Gather materials Set the mat Test each marble three times & find the average then find average speed distance divided by time Repeat steps 2 and 3 compare results

d9
-12
87

Data Collection

The Distance an Object Travels in 3 Seconds

Type of Object *(Manipulated Variable: place on X axis)*	D Distance in centimeters *(Responding Variable: place on Y axis)*				
	Trial #1	Trial #2	Trial #3	Average Distance (mean)	Average Speed (distance divided by time)
Round candy (lightest/lowest weight)	38cm	41cm	57cm	45.3cm	15.1 cm per sec
Small marble (middle weight)	59cm	62cm	87cm	69.3cm	23.1 cm per sec
Large marble (heaviest/most weight)	98cm	150cm	140cm	84.3cm	28.1 cm per sec

(graph averages)

Graph. Make a line graph of your data, using centimeter graph paper.
Online graph. Graph your information, using the graphing tool at http://nces.ed.gov/nceskids/createagraph.

Print out a copy and include it with this lab sheet. Also, save the graph in your file.

Conclusion: What does your table and graph show? How does the weight of the round object affect the speed of the round object? Answer your research question, using data from your table and graph.

My table and graph show four rules the weight of the round object effect the speed if its going down hill it will go faster.

You have been asked to judge a toy car race. Last year, some cars were so much faster than others that it was believed some racers might have cheated. The organizers want the race to be fair. They would like you to write a set of at least four rules for the event to ensure no car can cheat to win. The rules must be based on evidence about how weight, time, and distance affect the speed of an object rolling down a ramp.
To develop the rules, you will need to plan and conduct an investigation, collect and interpret data, and explain how your rules will make the race fair. Use digital tools to organize your information and communicate your results to the Racing Committee.
Speed is determined by dividing the distance traveled by the time traveled (for example, mph in a car).

Rule #1: cars have to have a weight of two grams	Rule #2: All cars have to start on the same point on the ramp
Reason for the rule (based on evidence collected in Speed Racer lab or online activities) The reason is that a heavier car might go faster or slower than other cars.	Reason for the rule (based on evidence collected in Speed Racer lab or online activities) My reason is that different starting points on the ramp will have different outcomes
Rule #3: No pushing your car	Rule #4: All weights must by on the same place on all the cars
Reason for the rule (based on evidence collected in Speed Racer lab or online activities) My reason is that if you push your car then that will give the car more force	Reason for the rule (based on evidence collected in Speed Racer lab or online activities) My reason is so the weight has the same effect on each car.

P3

Plan a project and test your solution (your rules). Create a model using the following materials.

Materials: a toy car, tape, pennies to change the weight, ramp.

Project plan. How will you test your rules, using a model?

I will test my rules using a model by adding different weights and not pushing the car.

The data collected to prove my rules are fair:

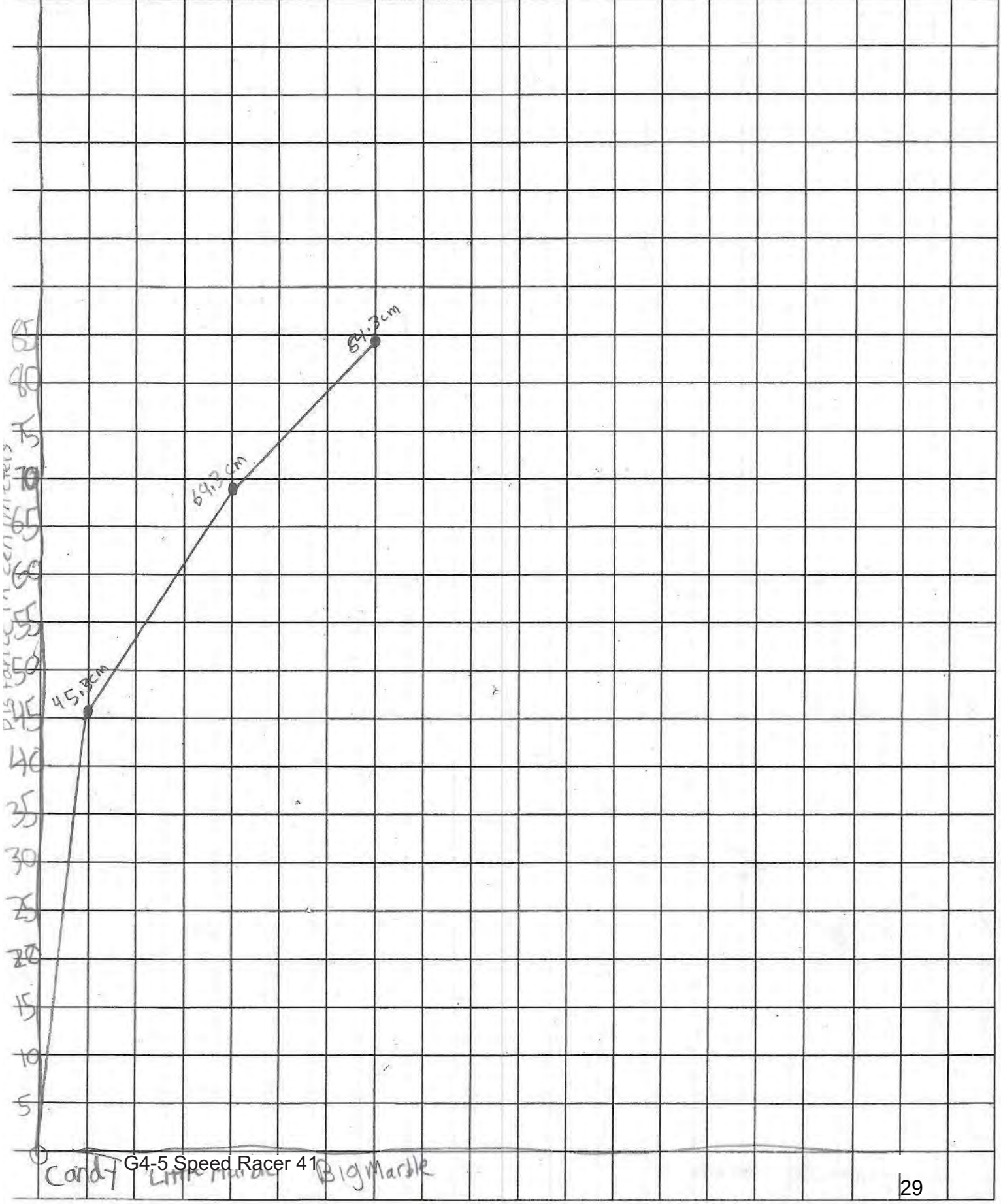
Trial	Distance traveled			
	Trial 1	Trial 2	Trial 3	Average
Trial 1 10 pennies without pushing	80cm	74cm	82	78.6
Trial 2 5 pennies without pushing				
Trial 3 0 pennies without pushing				

Presentation:

Use prezi.com to make an online presentation of your solution to the problem. Your primary title should be "SPEED RACER." Include your rules, the reason your rules are fair, the plan you made to test your rules and the graph that you made from the Speed Racer lab. Also include science concepts that connect to your plan. If you use pictures or information from online or somewhere else, be sure to include the source that your pictures or information came from.

Reference notes: (name of web site or book, URL if online, author, date used)

Average Distance

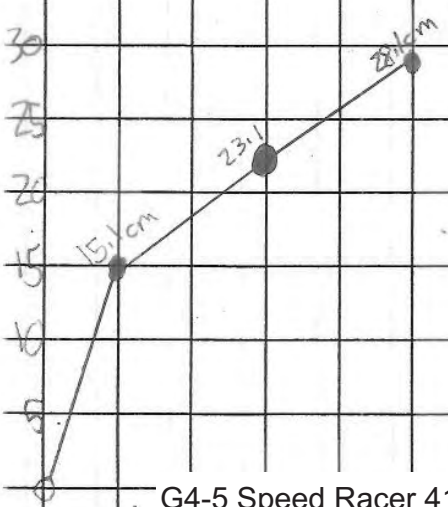


LEARNING RESOURCES VERNON HILLS, IL

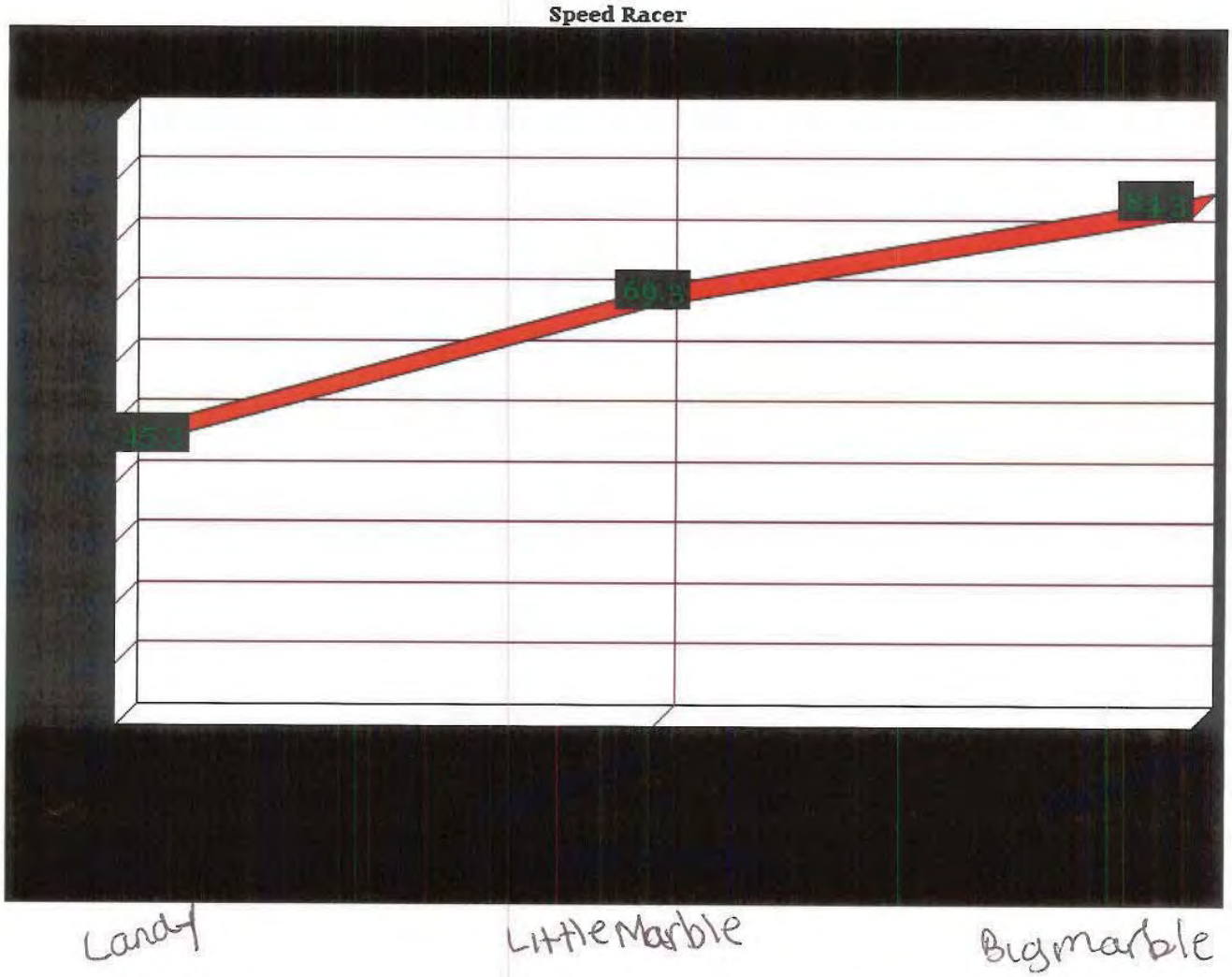
METRIC GRAPH PAPER

Average Speed

LER P3



P3



P3

Speed Racer Project Plan
Grades 4 – 5 Science, Math, and Educational Technology CBA

Name _____

Define the Problem

What is the problem you are trying to solve? The problem is how to make the race fair.

Criteria for Solution

How will you know if the problem has been solved? What evidence will you use?

Tools and Materials

List all of the tools and materials you will need to develop a solution to the problem.

Toy car, ramp, meter stick, rules

Design a Model

Describe what you will do to create a model to test as a solution.

Test the Solution

Describe how you will test the solution. What steps will you take?

P3

Speed Racer Project Plan
Grades 4 – 5 Science, Math, and Educational Technology CBA

Results

What are the results of your test? Use a combination of words, tables, graphs, or pictures to show the data and observations. The results are 80cm, 74cm, 82 cm and 78.6

Modify the Design

What could you do to modify the design and improve the results?

I could modify the design of the ramp

Communicate the Solution

List the rules you developed for the toy car race. Be sure to include evidence that shows how weight, time, and distance affect the speed of an object rolling down a ramp.

P3

First Rule

Second Rule. All the cars have to start on the same place on the ramp because if one car is closer to the finish line than the other cars it will probably win.

Third Rule. You cant push your car because if one person pushes their car then it will go faster than all the other cars.

Fourth Rule. The cars all have to weigh the same because if one car weighs hevier then it might go slower.

Please visit http://www.k12.wa.us/EdTech/Assessment/VideoPracticeIndex.aspx#P3 to see the multimedia product for Sample P3.

P4

Lab: Speed Racer

You have been asked to judge a toy car race. Last year, some cars were so much faster than others that it was believed some racers might have cheated. The organizers want the race to be fair. They would like you to write a set of at least four rules for the event to ensure no car can cheat to win. The rules must be based on evidence about how weight, time, and distance affect the speed of an object rolling down a ramp.

To develop the rules, you will need to plan and conduct an investigation, collect and interpret data, and explain how your rules will make the race fair. Use digital tools to organize your information and communicate your results to the Racing Committee.

Speed is determined by the distance traveled divided by the time traveled (for example, mph in a car).

Luger Race Observation Data: Choose earth and two other space objects. Collect data for three trials of each.

Gravity(Earth)	1/2 time	Total time
1.0 (Earth) Trial #1	36.8	55.0
Trial #2	37.0	55.1
Trial #3	37.1	55.3
Average (mean)		55.0
Gravity Sun 28.05	1/2 time	Total time
Trial #1	8.0	11.5
Trial #2	8.0	11.5
Trial #3	8.0	11.5
Average (mean)		11.5
Gravity Pluto 0.069	1/2 time	Total time
Trial #1	91.7	153.2
Trial #2	94.1	156.3
Trial #3	94.0	155.2

Average (mean) 155.1

What do you notice?

I noticed that the bigger the planet the faster the sled will go.

P4

Reseach/Purpose Question: How does the weight of a round object affect the speed of a round object?

Background information (based on the Intergalactic Luge activity and previously learned information)

What did you notice about the relationship between the weight of the luger and his/her speed down the track?

I noticed that if the planet has more gravity it makes the luger more heavy and that increases his/her speed and the opposite the only for smaller planets Pluto.

Newton's First Law of Motion: Things like to keep doing whatever they already doing at that time

Newton's Second Law of Motion: force gets smaller or bigger depending on mass and acceleration.

Hypothesis (predict the answer to your research question): I predict

I predict that the bigger the round object the faster the smaller one will go and the opposite of that for small round objects.

Materials: meter stick, 3 different size marbles, math book clock

Procedure: What are the steps to test your research question?

The steps are 1. gather material 2. setup your things 3. Make a table 4. do tests trials 5. Compare speeds on all three marbles 6. Find averages or the mean. Extra 7. drop marble on meter stick record how far it went 8. record this data/mean too.

Data Collection

The Distance an Object Travels in 3 Seconds

Type of Object *(Manipulated Variable: place on X axis)*	D Distance in centimeters *(Responding Variable: place on Y axis)*				
	Trial #1	Trial #2	Trial #3	Average Distance (mean)	Average Speed (distance divided by time)
Round candy (lightest/lowest weight)	33cm	39cm	41cm	37.6	12.53 cmps
Small marble (middle weight)	54cm	62cm	52cm	56	18.6 cmps
Large marble (heaviest/most weight)	79cm	99cm	101cm	93	31 cmps

P4

Graph. Make a line graph of your data, using centimeter graph paper.
Online graph. Graph your information, using the graphing tool at http://nces.ed.gov/nceskids/createagraph. (only graphaverages)

Print out a copy and include it with this lab sheet. Also, save the graph in your file.

Conclusion: What does your table and graph show? How does the weight of the round object affect the speed of the round object? Answer your research question, using data from your table and graph.

My hypothesis was right the bigger/heavier an object is the faster it goes and opposite that principal for small objects.

You have been asked to judge a toy car race. Last year, some cars were so much faster than others that it was believed some racers might have cheated. The organizers want the race to be fair. They would like you to write a set of at least four rules for the event to ensure no car can cheat to win. The rules must be based on evidence about how weight, time, and distance affect the speed of an object rolling down a ramp.
To develop the rules, you will need to plan and conduct an investigation, collect and interpret data, and explain how your rules will make the race fair. Use digital tools to organize your information and communicate your results to the Racing Committee.
Speed is determined by dividing the distance traveled by the time traveled (for example, mph in a car).

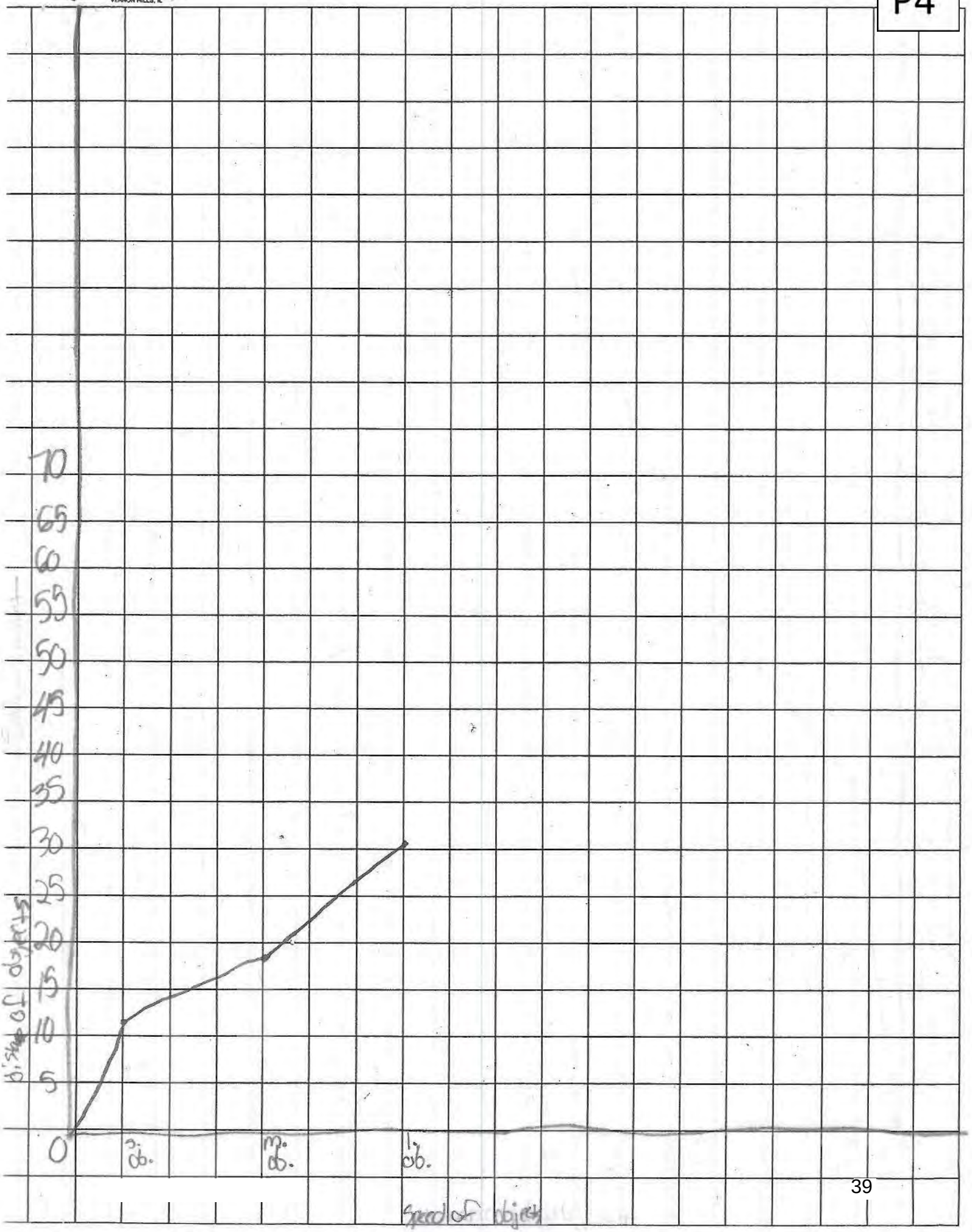
Rule #1: No motor powered cars. Reason for the rule (based on evidence collected in Speed Racer lab or online activities)	Rule #2: Car must not be powered by anything but gravity. Reason for the rule (based on evidence collected in Speed Racer lab or online activities)
Rule #3: Anyone caught cheating will be disqualified. Reason for the rule (based on evidence collected in Speed Racer lab or online activities)	Rule #4: No [illegible] anyone else's cars. Reason for the rule (based on evidence collected in Speed Racer lab or online activities) That way we all have a fair chance to win.

P4

Plan a project and test your solution (your rules). Create a model using the following materials.
Materials: a toy car, tape, pennies to change the weight, ramp.
Project plan. How will you test your rules, using a model?

The data collected to prove my rules are fair:

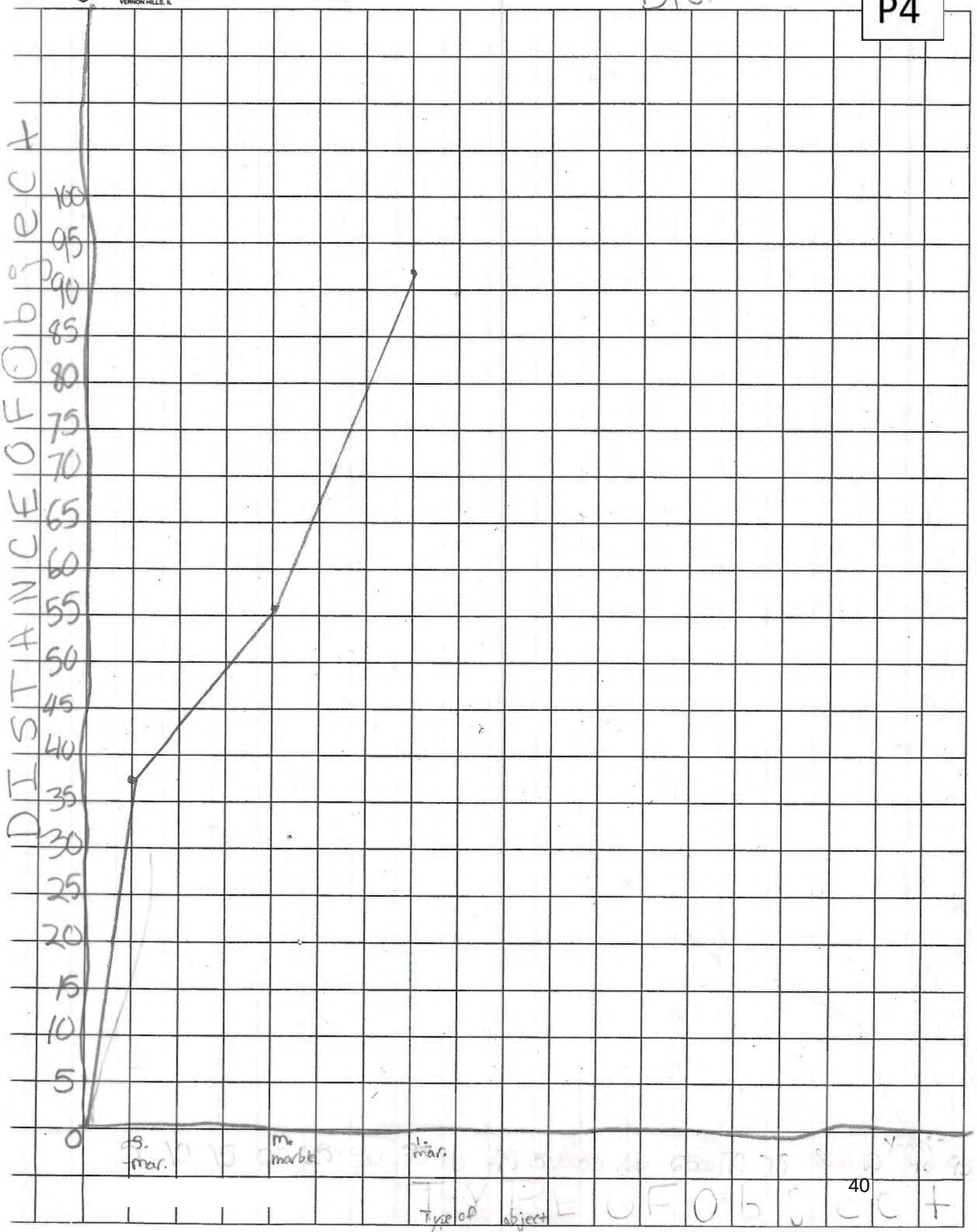
Presentation:
Use prezi.com to make an online presentation of your solution to the problem. Your primary title should be "SPEED RACER." Include your rules, the reason your rules are fair, the plan you made to test your rules and the graph that you made from the Speed Racer lab. Also include science concepts that connect to your plan. If you use pictures or information from online or somewhere else, be sure to include the source that your pictures or information came from.
Reference notes: (name of web site or book, URL if online, author, date used)


70
65
60
55
50
45
40
35
30
25
20
15
10
5
0
Speed of objects

LEARNING RESOURCES
VERNON HILLS, IL

METRIC GRAPH PAPER

Marble Averages Distance



P4

rule#1: no motor powered cars

rule#2: car must not be powered by anything

rule#3: anyone caught cheating will be disqualified

rule#4: no ruining anyone else's cars

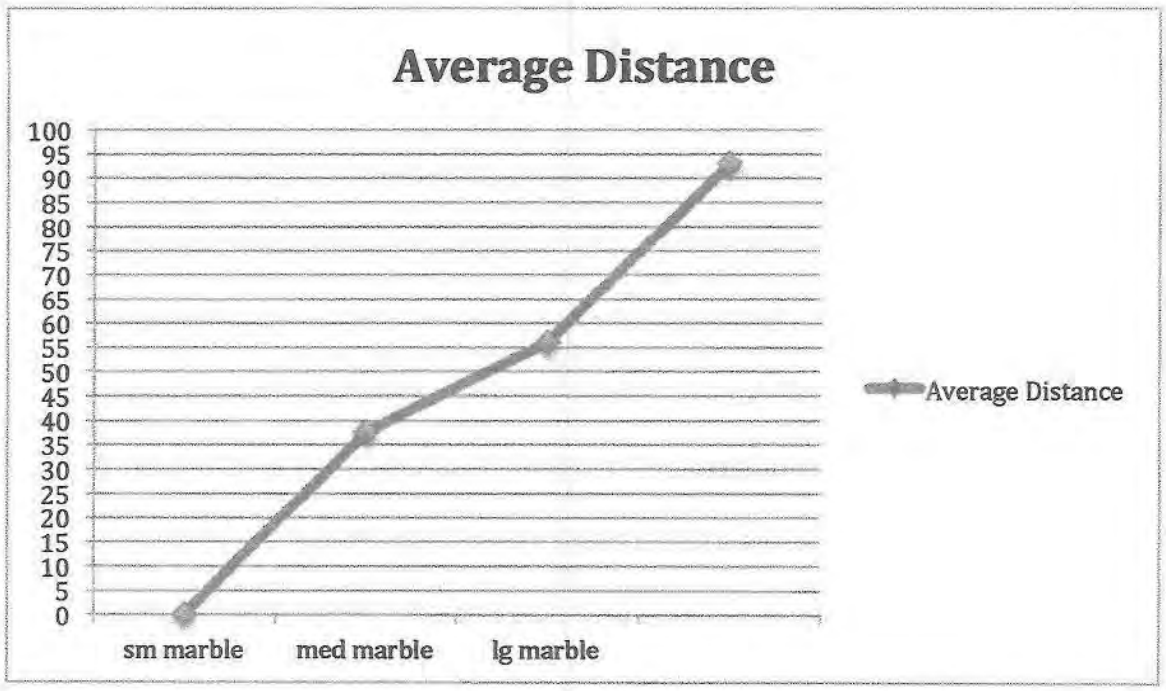
reason#1: That way no one is always the winner.

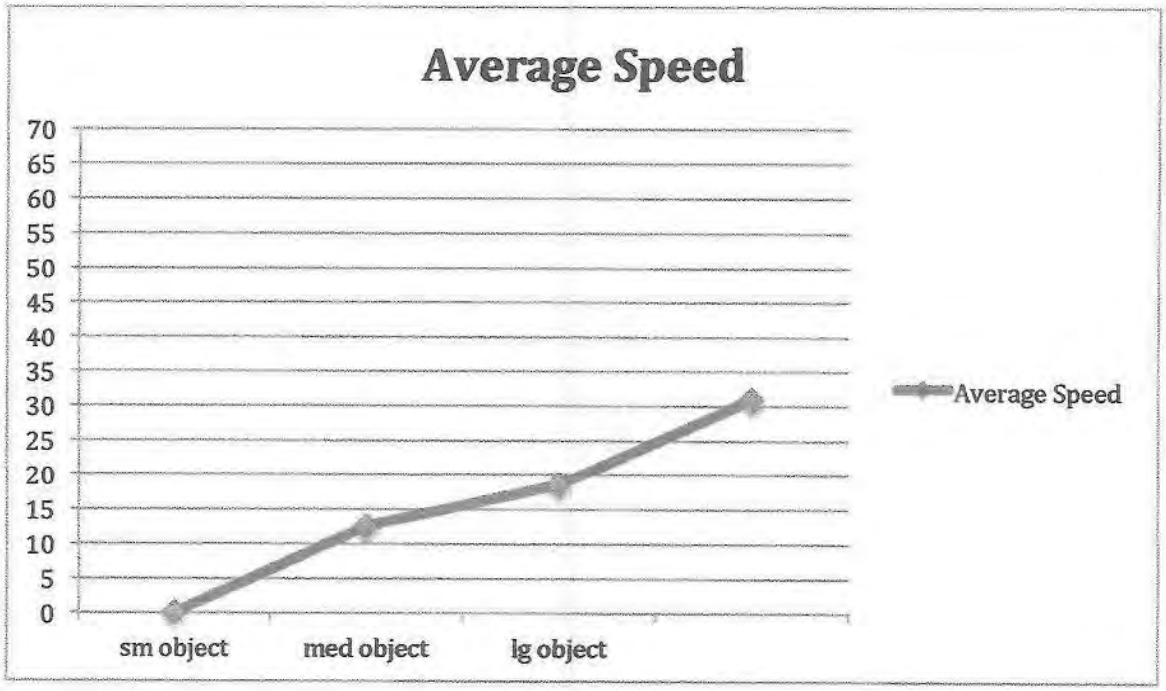
reason#2: So no one is the absolute fastest

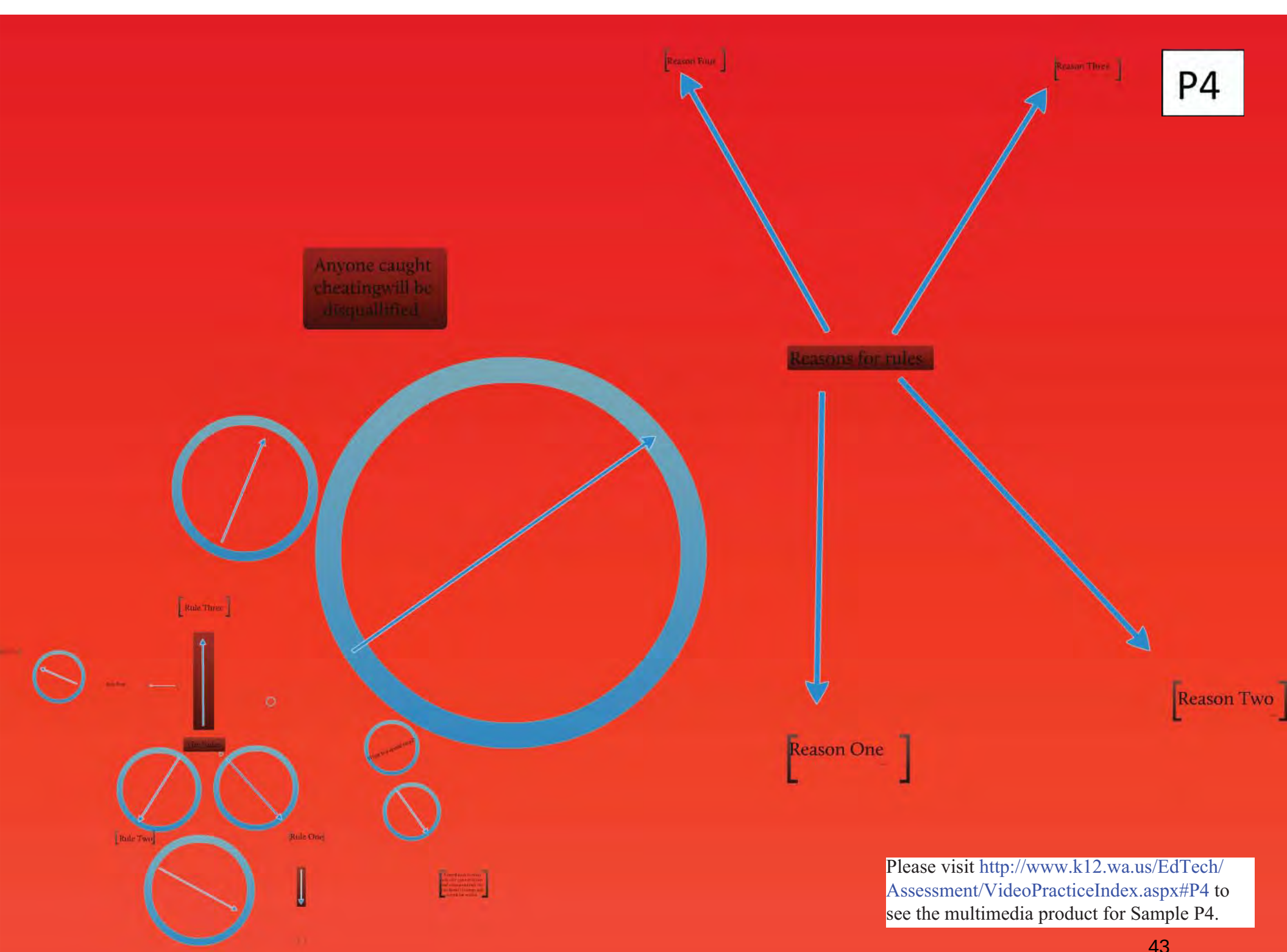
reason #3: That way there will be no cheaters.

reason #4: That way we all have a fair chance to win.

P4


Average Distance
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
15
10
5
0
sm marble
med marble
lg marble
Average Distance


Average Speed
70
65
60
55
50
45
40
35
30
25
20
15
10
5
0
sm object
med object
lg object
Average Speed



Please visit http://www.k12.wa.us/EdTech/Assessment/VideoPracticeIndex.aspx#P4 to see the multimedia product for Sample P4.

P5

Lab: Speed Racer

You have been asked to judge a toy car race. Last year, some cars were so much faster than others that it was believed some racers might have cheated. The organizers want the race to be fair. They would like you to write a set of at least four rules for the event to ensure no car can cheat to win. The rules must be based on evidence about how weight, time, and distance affect the speed of an object rolling down a ramp.

To develop the rules, you will need to plan and conduct an investigation, collect and interpret data, and explain how your rules will make the race fair. Use digital tools to organize your information and communicate your results to the Racing Committee. Speed is determined by the distance traveled divided by the time traveled (for example, mph in a car).

Luger Race Observation Data: Choose earth and two other space objects. Collect data for three trials of each.

Gravity(Earth)	1/2 time	Total time
1.0 (Earth) Trial #1		55.5
Trial #2	36.6	54.8
Trial #3	36.6	54.8
Average (mean)	36.9	55.1
Gravity (Sun) 28.05	1/2 time	Total time
Trial #1	8.1	11.5
Trial #2	8.1	11.5
Trial #3	8.1	11.5
Average (mean)	8.1	12
Gravity (Pluto) 0.64	1/2 time	Total time
Trial #1	87.5	147.8
Trial #2	91.8	153.3
Trial #3	88	148.8
Average (mean)	89	150

What do you notice?

When theres more gravity the faster the sled goes. faster

P5

Reseach/Purpose Question: How does the weight of a round object affect the speed of a round object?

Background information (based on the Intergalactic Luge activity and previously learned information)

What did you notice about the relationship between the weight of the luger and his/her speed down the track?

The heavier luger is the faster they go.

Newton's First Law of Motion: Anything in motion stays in motion until acted upon by a force.

Newton's Second Law of Motion: Force varies with mass and acceleration

Hypothesis (predict the answer to your research question): I predict that

Materials: Meter sticks, 3 marbles, Mathbook, journal, timer,

Procedure: What are the steps to test your research question?

1. Gather materials - make ramp
2. Start timer, do each trial and record data
3. Repeat step 2 until done with all your data
4. find average and share results

Data Collection

The Distance an Object Travels in 3 Seconds

Type of Object *(Manipulated Variable: place on X axis)*	D Distance in centimeters *(Responding Variable: place on Y axis)*				
	Trial #1	Trial #2	Trial #3	Average Distance (mean)	Average Speed (distance divided by time)
Round candy (lightest/lowest weight)	51cm	43cm	48cm	47.3	15.8
Small marble (middle weight)	70cm	63cm	66	66.3	22.1
Large marble (heaviest/most weight)	87cm	84cm	79cm	83.3	27.8

P5

Graph. Make a line graph of your data, using centimeter graph paper.
Online graph. Graph your information, using the graphing tool at http://nces.ed.gov/nceskids/createagraph.

Print out a copy and include it with this lab sheet. Also, save the graph in your file.

Conclusion: What does your table and graph show? How does the weight of the round object affect the speed of the round object? Answer your research question, using data from your table and graph.

The weight of the speed does affect it because if its heavier it will go faster because the small candy got an average speed 15.8 small marbles average 22.1 and large marble average of 27.8. so based on my info. my hypothesis was correct.

You have been asked to judge a toy car race. Last year, some cars were so much faster than others that it was believed some racers might have cheated. The organizers want the race to be fair. They would like you to write a set of at least four rules for the event to ensure no car can cheat to win. The rules must be based on evidence about how weight, time, and distance affect the speed of an object rolling down a ramp.
To develop the rules, you will need to plan and conduct an investigation, collect and interpret data, and explain how your rules will make the race fair. Use digital tools to organize your information and communicate your results to the Racing Committee.
Speed is determined by dividing the distance traveled by the time traveled (for example, mph in a car).

Rule #1: Each car has to weigh the same Reason for the rule (based on evidence collected in Speed Racer lab or online activities) Because if one is heavier it can go faster and have an unfair advantage	Rule #2: You can not modify your car Reason for the rule (based on evidence collected in Speed Racer lab or online activities) Because you can add like a remote control car part to make it faster
Rule #3: Has to be a home-made with wood glue etc. and no store bought Reason for the rule (based on evidence collected in Speed Racer lab or online activities) Because you can't just go to the store and buy it because it can't be a remote control car so it goes a lot slower	Rule #4: The judge has to inspect your car Reason for the rule (based on evidence collected in Speed Racer lab or online activities) Because so you can't do rule #1 make it heavier rule #2 no modifications rule #3 it may be store bought.

P5

Plan a project and test your solution (your rules). Create a model using the following materials.

Materials: a toy car, tape, pennies to change the weight, ramp.

Project plan. How will you test your rules, using a model?

Research Question: How does the more weight affect speed and distance if one car is heavier than another, and car

Procedure: ① Gather materials ② Set up ramp ③ release and collect data ④ Repeat step 3 until data is complete ⑤ Share results

of Speed & distance

The data collected to prove my rules are fair:

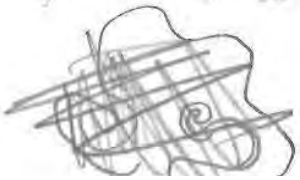
Type	trial #1	trial #2	trial #3	Average distance	Average speed (speed distance)
No Pennies	100 cm	76 cm	127 cm	101	33.7
W/ Pennies	102 cm	107 cm	127 cm	112	37.3

Presentation:

Use prezi.com to make an online presentation of your solution to the problem. Your primary title should be "SPEED RACER." Include your rules, the reason your rules are fair, the plan you made to test your rules and the graph that you made from the Speed Racer lab. Also include science concepts that connect to your plan. If you use pictures or information from online or somewhere else, be sure to include the source that your pictures or information came from.

Reference notes: (name of web site or book, URL if online, author, date used)

This fact shows that my rules are right because the average for a regular car without pennies the distance average is 101 cm and speed 33.7 cm but for with pennies the average is distance average 112 cm and speed 37.3 cm and that shows my rules were correct

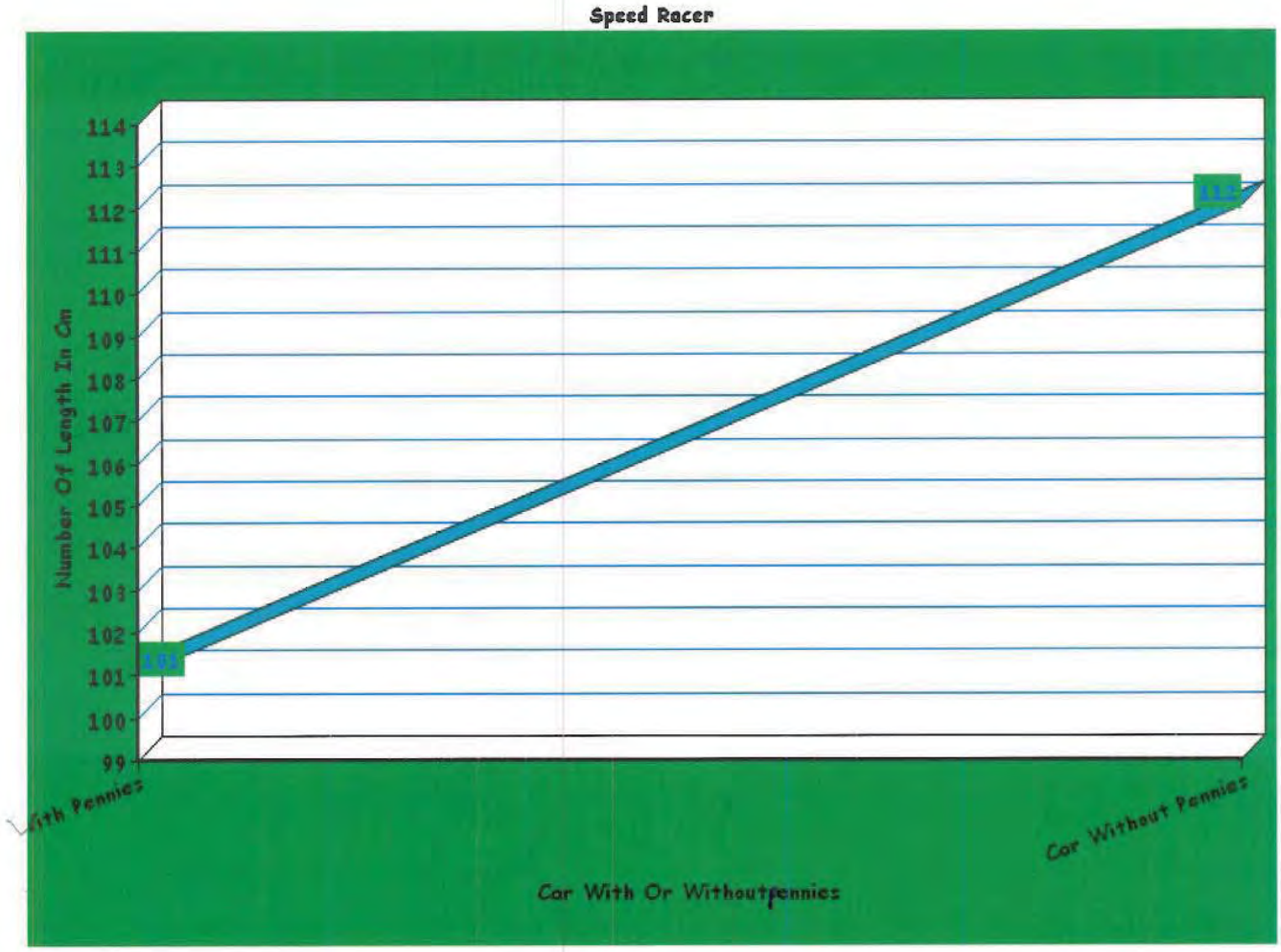


P5

Speed Racer Rules

1. Each car has to weigh the same
2. You can not modify your'e car
3. Has to be a home-made car
4. You have to let the car be checked by the judges before you begin the race

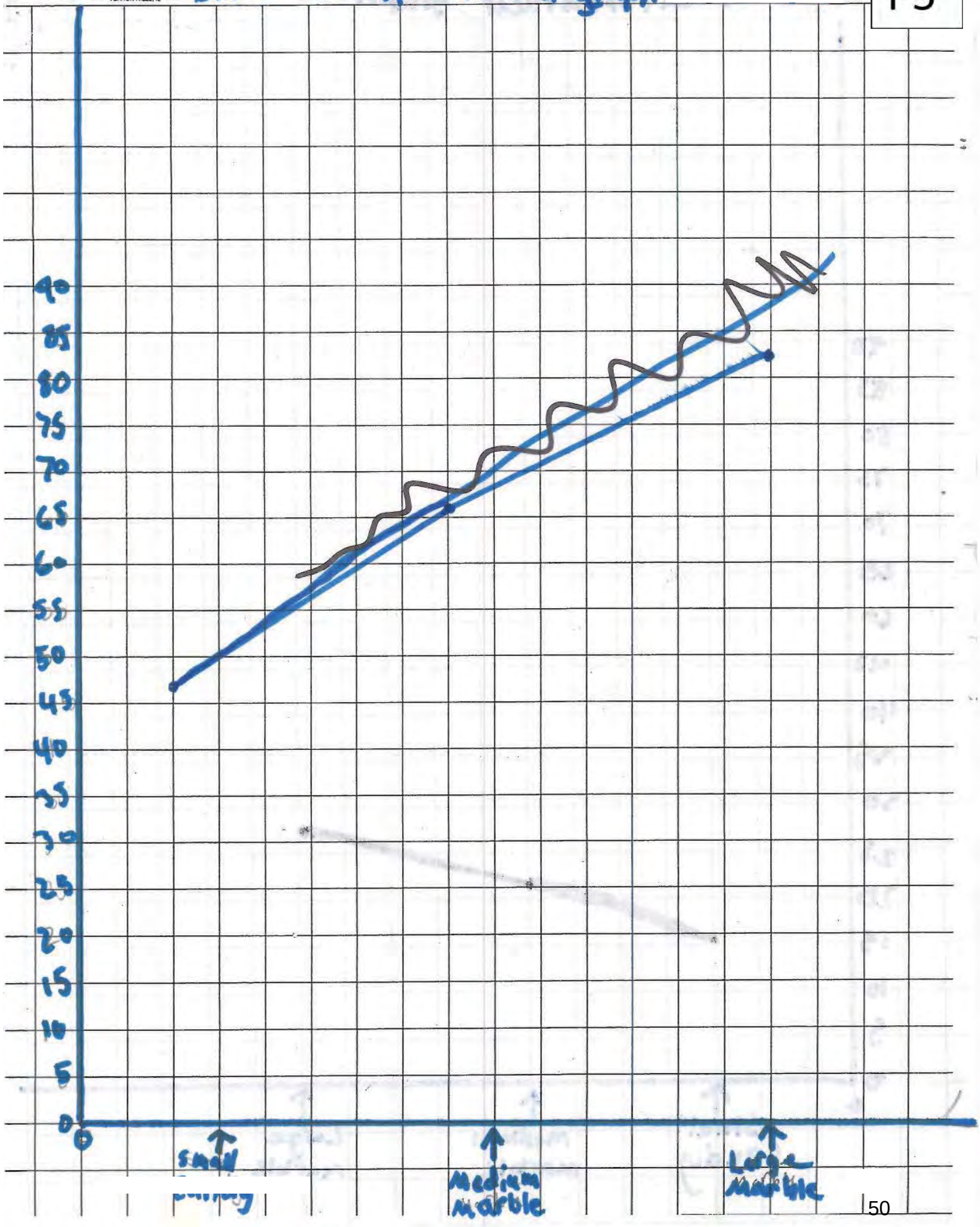
P5


Speed Racer
114
113
112
111
110
109
108
107
106
105
104
103
102
101
100
99
Number Of Length In Cm
ith Pennies
Car Without Pennies
Car With Or Withoutpennies

LEARNING RESOURCES VERNON HILLS, IL

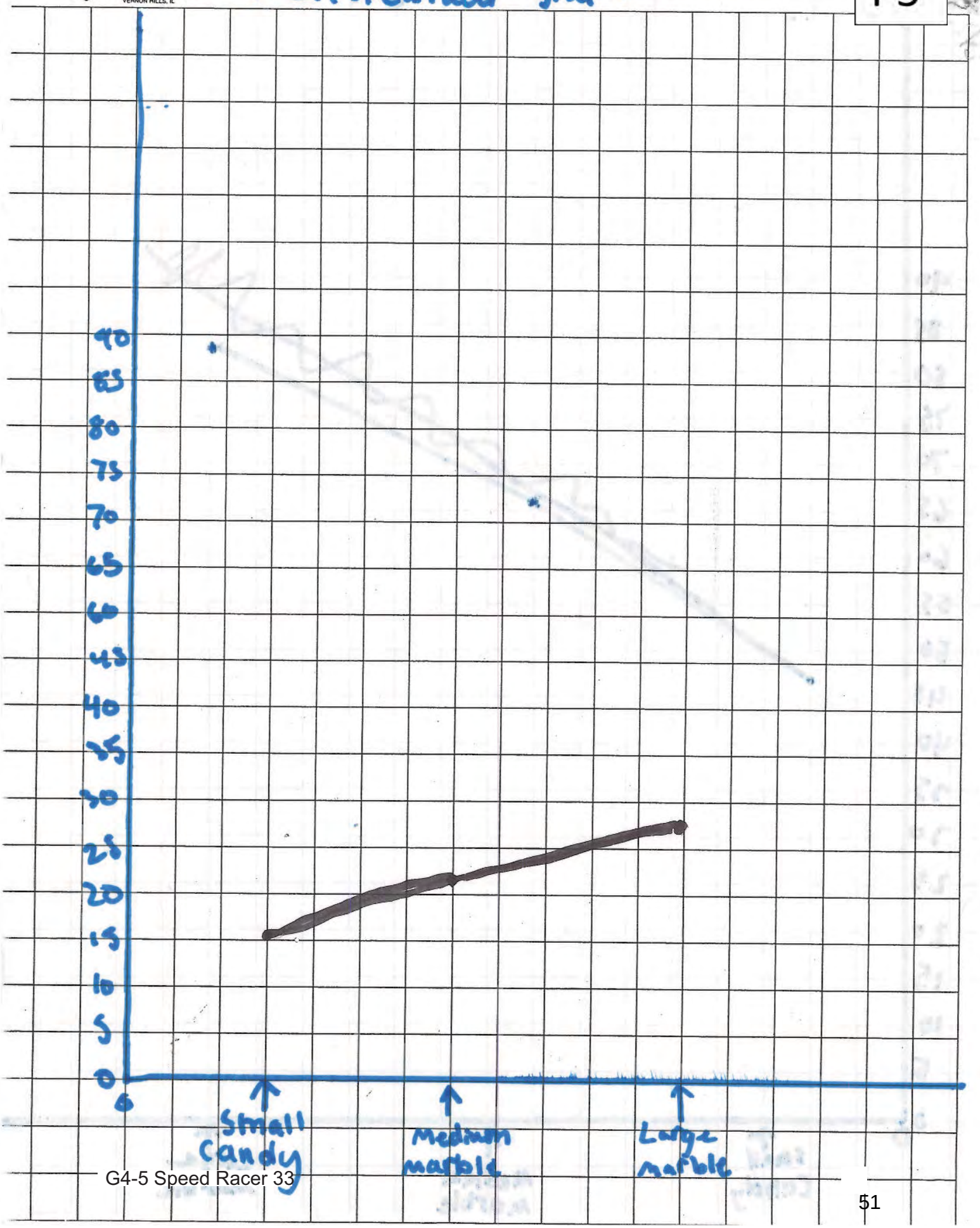
METRIC GRAPH PAPER

Distance speed racer graph



speed; Speedracer graph

P5



P5

Speed Racer Project Plan
Grades 4 – 5 Science, Math, and Educational Technology CBA

Name _____

Define the Problem

What is the problem you are trying to solve?

Last year people thought others were cheating

Criteria for Solution

How will you know if the problem has been solved? What evidence will you use?

That it looks fair

Tools and Materials

List all of the tools and materials you will need to develop a solution to the problem.

You can get a weighor so you can weigh the cars to see if there cheating because its too heavy.

Design a Model

Describe what you will do to create a model to test as a solution.

I added pennies and the car went faster when it was heavier.

Test the Solution

Describe how you will test the solution. What steps will you take?

I will see if you add pennies and paperclips if it will go faster then a car without anything.

P5

Speed Racer Project Plan
Grades 4 – 5 Science, Math, and Educational Technology CBA

Results

What are the results of your test? Use a combination of words, tables, graphs, or pictures to show the data and observations. The one with pennies went faster than the one without.

Modify the Design

What could you do to modify the design and improve the results? add more Pennies. (?)

Communicate the Solution

List the rules you developed for the toy car race. Be sure to include evidence that shows how weight, time, and distance affect the speed of an object rolling down a ramp.

1# All cars have to weigh 1 Lb; so if you add more weight it will go faster

2# No modifications: no remote control parts or something like that so it will go faster.

3# Can't be storebought! has to be made of wood, glue, tape, & nails etc.

4# Judges have to check your car; so you don't do any of rules 1#, 2#, 3#.

P5

Speed Racer

Procedures

#1. Gather materials
#2. Make ramp
#3. Start and record data for each
#4. Repeat steps #3 until data is complete
#5. Find averages and share results

My Rules!!!

1. Each Car Has To Weigh The Same

2. You can not modify or upgrade your car.

3. has to be a home-made car with the materials of wood, glue, nails, screws, and 2 3" metal sticks.

Because you cant just go to the store and buy a toy car because it may weigh more and thats unfair.

4. The judge has to inspect your car.

My rules are fair because if there wasn't my rules people could cheat.

Please visit http://www.k12.wa.us/EdTech/Assessment/VideoPracticeIndex.aspx#P5 to see the multimedia product for Sample P5.