A Component of the
Washington State Assessment System

Science, Math, & Educational Technology

Speed Racer

Anchor 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 Anchor 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.

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

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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

A1

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 Possible	Points Earned
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	1
	Plan Projects	Uses a digital tool to plan an investigation related directly to the student task.	1	0
1.1.2	Collect and Graph Data	Collects data related directly to the student task.	1	1
		Graphs data using a digital tool.	1	0
	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	1
Multimedia Product				
1.1.1	Produce Multimedia	Creates a digital product to communicate information.	1	0
		Combines audio, text, graphs, video, symbols, or pictures that are related directly to the student task into product.	1	0
	Organize Ideas	Uses information gathered during the investigation to explain how the rules will make the race fair.	1	0
		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	0
TOTAL			9	3
A **Level 1 response** (0 – 5 points) reflects that a student is still working toward meeting GLEs 1.1.1, 1.1.2, and 1.3.1.				L1

Discussion

In Sample A1, the student develops an original question (How does the weight of a toy car affect the speed of a car as it goes down the ramp), collects data, and identifies a pattern (I noticed that the more gravity there is, the faster the luge. The less gravity, the slower the luge.). This part of the research process earns three attribute points. There is no multimedia product for this sample.

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).

pronounced luge

http://www.onlinecharttool.com

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

(all in seconds)

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
Gravity moon 0.166	1/2 time	Total time
Trial #1	71.1	113.4
Trial #2	71.1	113.4
Trial #3	73.1	115.8
Average (mean)	71.7	114.2

What do you notice? I noticed that the more Gravity there is, the faster the Luge. The less gravity, the slower the Luge.

I ♡ Candy

Hello!

A1

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 the luge weighs, the faster it will go. The less weight, the slower

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

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

Motion

Hypothesis (predict the answer to your research question): I predict that the weight of the Object will go faster.

Materials: 1 meter stick 3 different size marbles 1 math book 1 journal a time!

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

1. Gather materials 2. set up ramp. 3. roll the marbles and candy down ramp 4. measure distance 5. put data in data table! 6. repeat steps 3-6 for trials #2-3 twice

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)	35.5	22	30	29.16̄	9.72̄ cps
Small marble (middle weight)	36	53	60	49.66̄	16.55̄ cps
Large marble (heaviest/most weight)	78	74	81	77.66̄	25.88̄ cps

A1

- on Pg. 1

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 a round object makes the marble faster because the largest object to mean was 97.6 centimeters and my little marble was 49.66 and my little candy was 29.166 cm

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: You may not add extra weight to your car Reason for the rule (based on evidence collected in Speed Racer lab or online activities) because Weight would give the car more gravity which is an advantage	Rule #2: Your car must start at the same place as the others Reason for the rule (based on evidence collected in Speed Racer lab or online activities) So you dont get there first
Rule #3: your ramp must be slanted at the same level Reason for the rule (based on evidence collected in Speed Racer lab or online activities) So your car doesn't swish down a really slanted thing fast	Rule #4: Your car must be the same width as the others Reason for the rule (based on evidence collected in Speed Racer lab or online activities) So you dont push them off

A1

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 weight of a toy car affect the speed of the car as it goes down the ramp

procedure: ① gather materials ② put car down the ramp ③ measure how far the car goes ④ record distance in table ⑤ repeat steps 2-4 twice for trials 2-3 ⑥ compare results

The data collected to prove my rules are fair:

object	trial 1	trial 2	trial 3	average
car	41cm	43cm	45cm	43cm

Presentation:

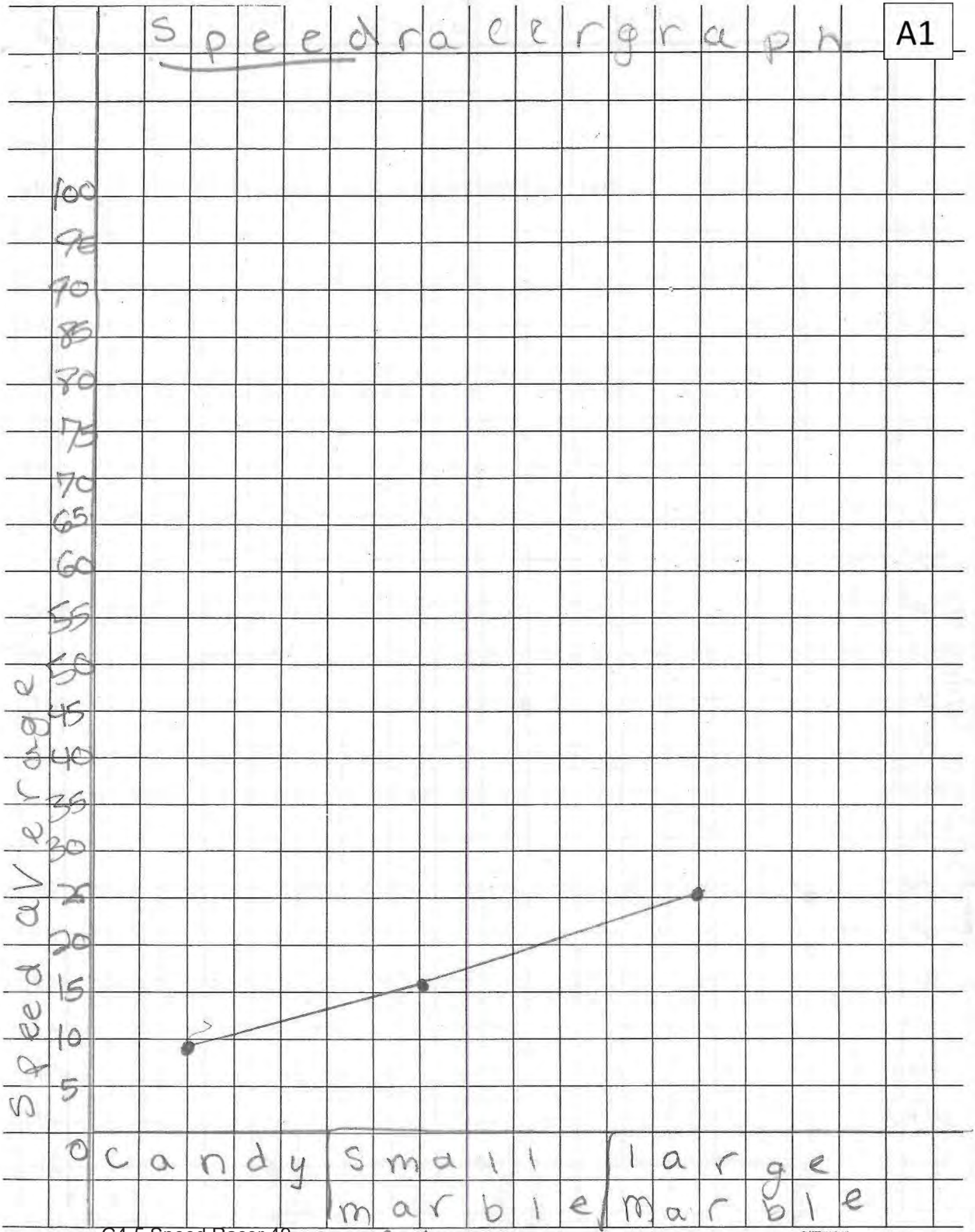
Use prezi.com to make an online presentation of your solution to the problem. Your primary title should be "SPEED RACER." Include your rules, the reason your rules are fair, the plan you made to test your rules and the graph that you made from the Speed Racer lab. Also include science concepts that connect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

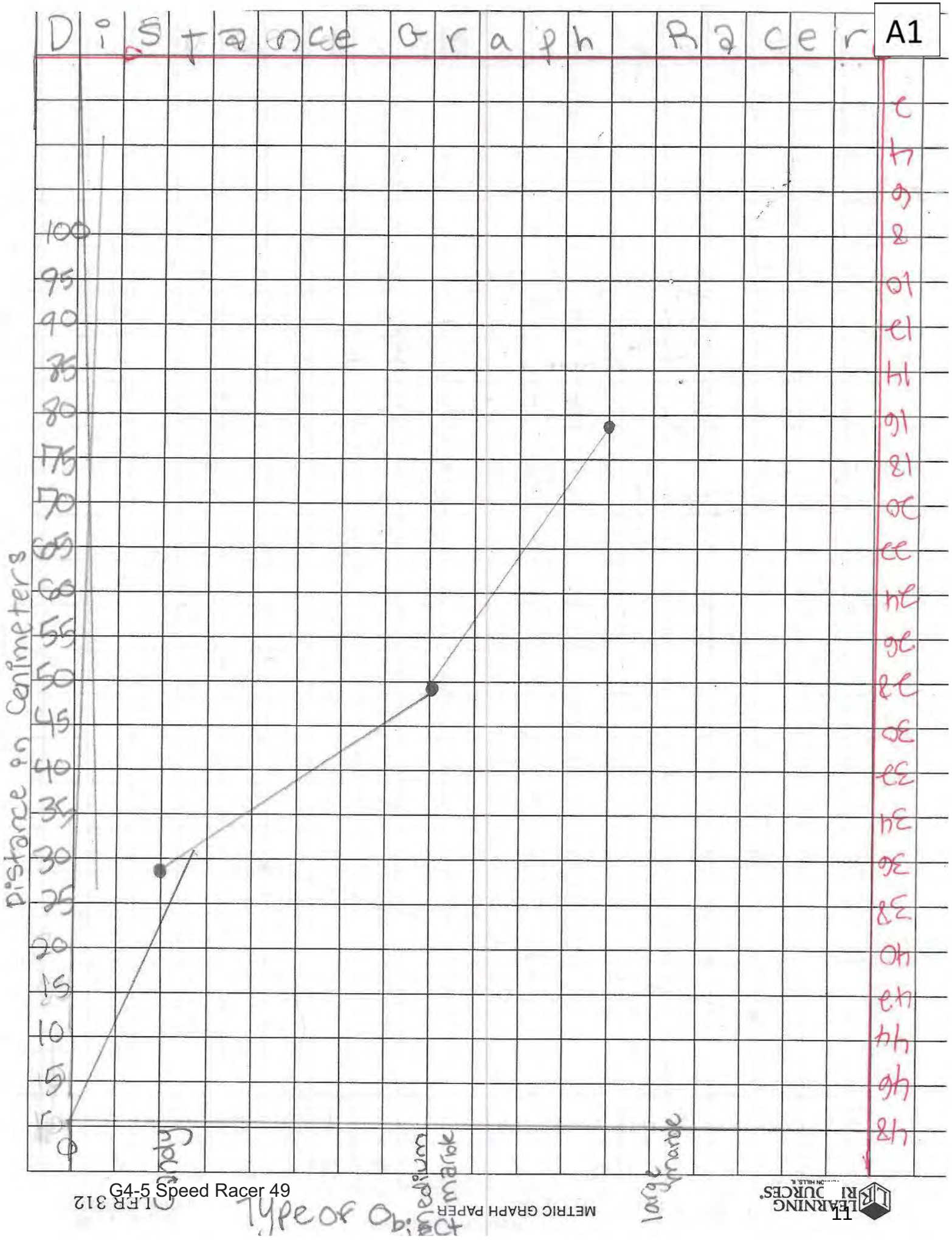
Conclusion: This test shows my results are fair because the trials were consistant. trial 1: 41cm, trial 2: 43cm, trial 3: 45cm, average: 43

A1

Speed race graph



G4-5 Speed Racer 49


Distance Graph Racer
A1
distance in centimeters
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
15
10
5
0
small marble
medium marble
large marble
Type of Object

A1

4 SPEED RACER RULES

1. You may not add extra weight to your ~~toy~~ car.
2. Your toy car does not get a head start
3. Your ~~car~~ car must ~~Make your car~~ be made along the same guidelines as the other cars
4. You can only use ~~metal~~ wood for the body of the car

A1

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?

People cheated in a car race last year so we are trying to stop them

Criteria for Solution

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

We will weigh the cars and see if they all go about as fast as each other

Tools and Materials

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

weigher
car
meterstick
Textbooks

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?

I will test with marbles

A1

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. my results are larger and smaller because of weight

Modify the Design

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

I would use a moderate weight car for all the cars

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. you may not add extra weight to your car
2. your car must start at the same place as the others
3. your ramp must be tilted the same amount as the others
4. your car must be the same width as the others

A2

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

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Attributes of Educational Technology Standards

GLE	Attribute Name	Description	Points Possible	Points Earned
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	0
	Plan Projects	Uses a digital tool to plan an investigation related directly to the student task.	1	0
1.1.2	Collect and Graph Data	Collects data related directly to the student task.	1	1
		Graphs data using a digital tool.	1	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	0
Multimedia Product				
1.1.1	Produce Multimedia	Creates a digital product to communicate information.	1	1
		Combines audio, text, graphs, video, symbols, or pictures that are related directly to the student task into product.	1	0
	Organize Ideas	Uses information gathered during the investigation to explain how the rules will make the race fair.	1	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	1
TOTAL			9	5
A **Level 1 response** (0 – 5 points) reflects that a student is still working toward meeting GLEs 1.1.1, 1.1.2, and 1.3.1.				L1

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

Discussion

Sample A2 represents work which is very close to meeting the standards for educational technology. During the research phase, the student collects data related directly to the task and then graphs it using a digital tool. This work earns two attribute points. The multimedia product earns an additional three points. There is a variety of evidence to show that the student understands how to use various features of the digital tool (Prezi) to communicate main ideas effectively. Each of the rules is enclosed in a bracket, with the circle used to designate the whole product. The student also uses different font sizes to indicate the rules and reasons. Finally, the work earns an attribute point for "Uses information gathered during the investigation to explain how the rules will make the race fair." In the product, Rule #1 states that "the cars must have the same weight" with the reason that "the heavier an object is the faster it will go." This information was directly linked to the information gathered during the research process.

Please visit http://www.k12.wa.us/EdTech/Assessment/VideoIndex.aspx#A2 to see the multimedia product for Sample A2.

A2

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	32.0	55.1
Trial #3	32.1	55.3
Average (mean)	37[illegible].0	55.1
Gravity 28.05	1/2 time	Total time
Trial #1	8.0	11.5
Trial #2	8.0	11.5
Trial #3	8.6	11.5
Average (mean)	8.0	11.5
Gravity 03.39	1/2 time	Total time
Trial #1	53.8	82.7
Trial #2	54.9	83.5
Trial #3	55.5	84.6
Average (mean)	54.7	83.7

What do you notice?

I noticed that the more gravity it goes faster, the less gravity it goes slower like the moon.

A2

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 heiver the luge is the faster it goes

Newton's First Law of Motion: things do what they were doing

Newton's Second Law of Motion: Force = Mass x Acceleration

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

The heavier the object is the [illegible] will go

Materials: 3 different size marble metre stick [illegible]

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

1. Gather materials 2. set up ramp 3. put round candy down ramp for 3 secs 4 record distance 5 repeat 3, 4, 6 times 6. find averages for Round candy, small marble and large marble

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)	59cm	59cm	59cm	59cm	19.5 cmps
Small marble (middle weight)	71cm	81cm	68cm	49.6cm	16.5 cmps
Large marble (heaviest/most weight)	100cm	96cm	98cm	98cm	32.6 cmps

A2

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 graphs show that the heavier a object is the faster it rolls

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: must have same weight Reason for the rule (based on evidence collected in Speed Racer lab or online activities) the heavier it is the more change it will win	Rule #2: Must have same ramp Reason for the rule (based on evidence collected in Speed Racer lab or online activities) if your ramp is steeper you might win
Rule #3: Must start same place and stop at the same time Reason for the rule (based on evidence collected in Speed Racer lab or online activities) because if you don't you have a [illegible]	Rule #4: must be pulled the gravity Reason for the rule (based on evidence collected in Speed Racer lab or online activities) because if you have a motor car you will win

A2

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

question: do my rules make it fair?
① I will make a ramp ② I will test all my rules ③ I will record my data

The data collected to prove my rules are fair:

toy cars	without rules		toy cars	with rules	
	trail #1	trail #2		trail #1	trail #2
orange	unfair	unfair	orange	fair	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)

This test shows that my rules are fair, because ~~all~~ I tried without my rule and it was fair, but with my rules was fair.

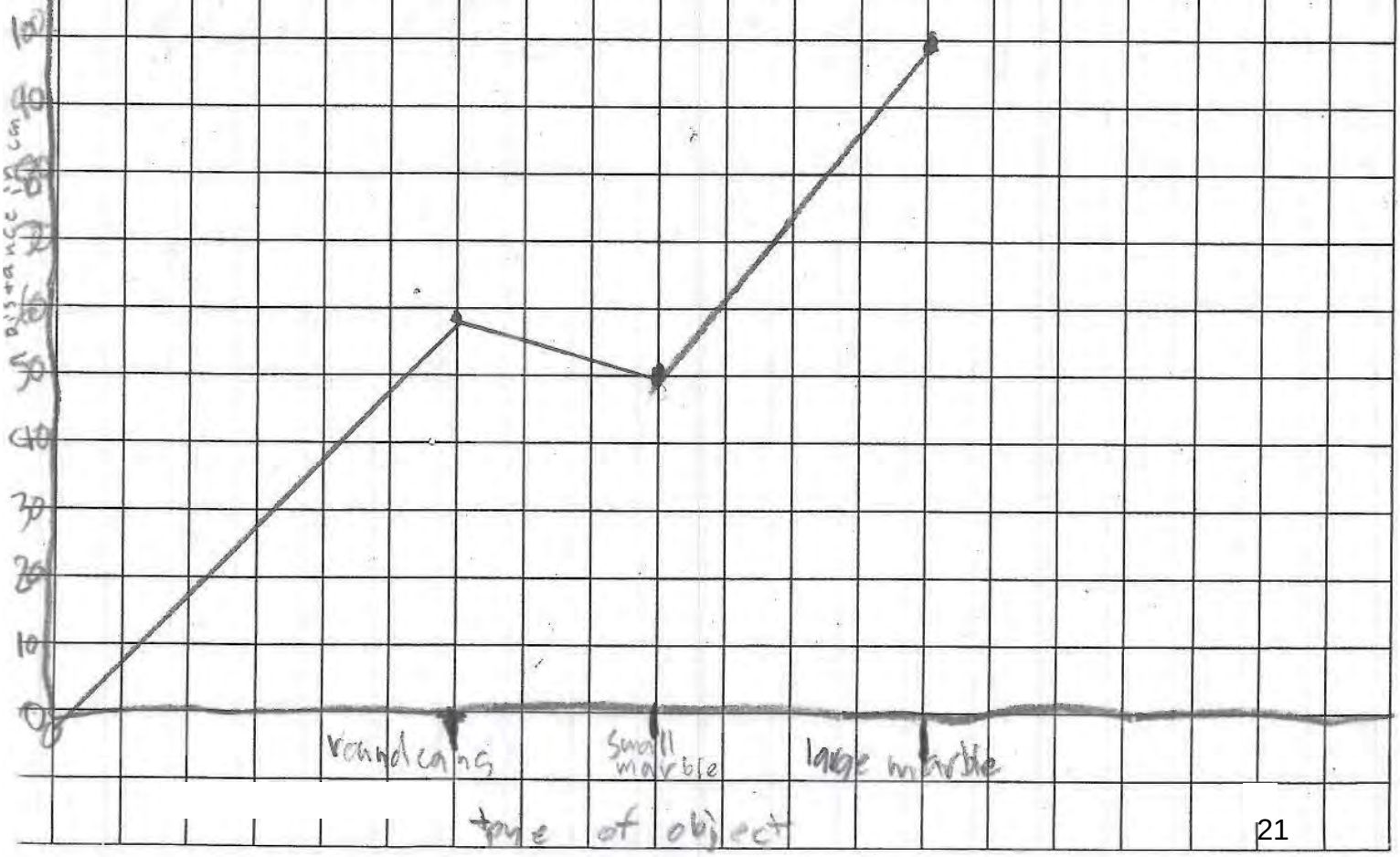
LEARNING RESOURCES VERNON HILLS, IL

METRIC GRAPH PAPER

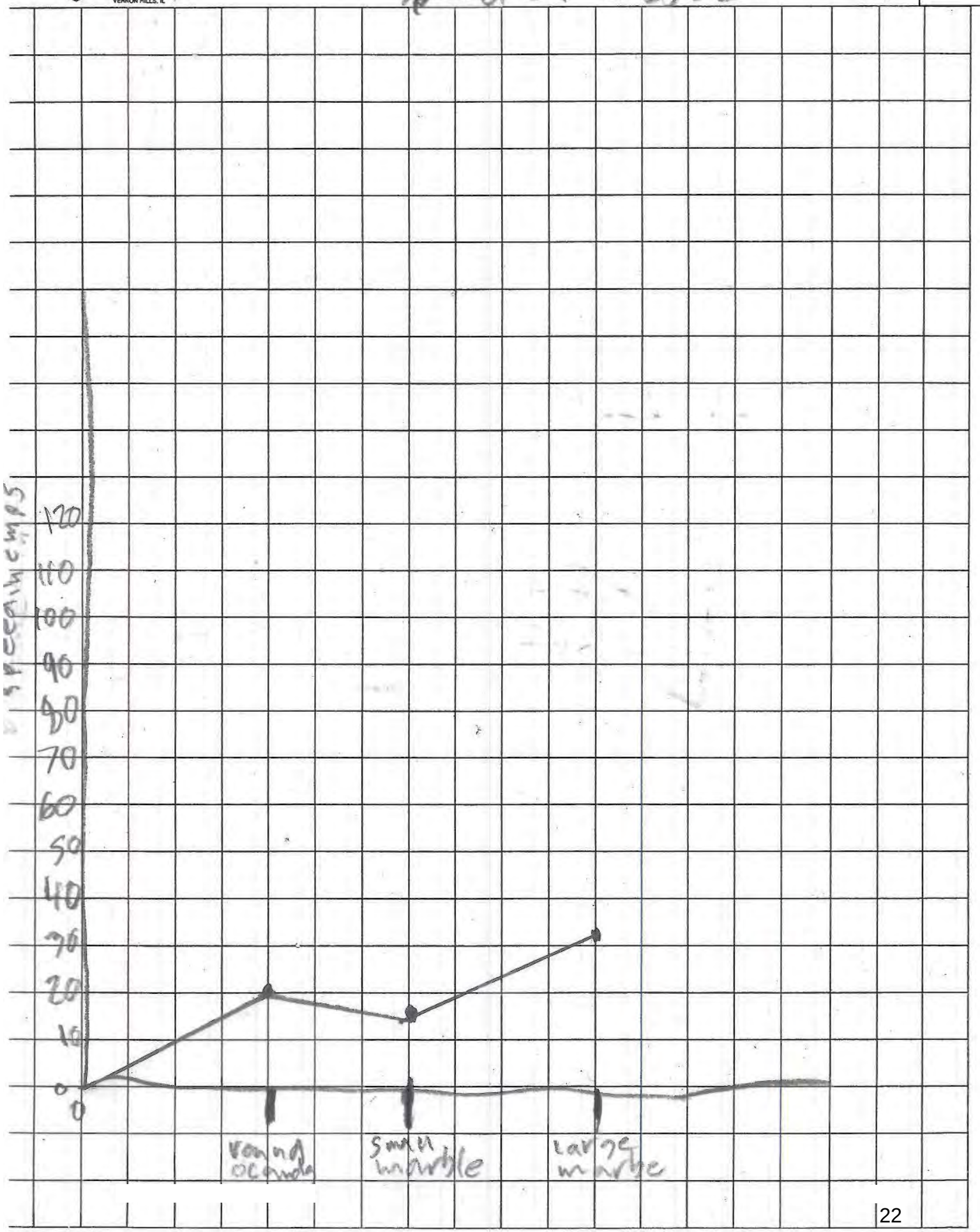
LER 312

Distance an Object travels in 3 seconds

A2



Speed of object



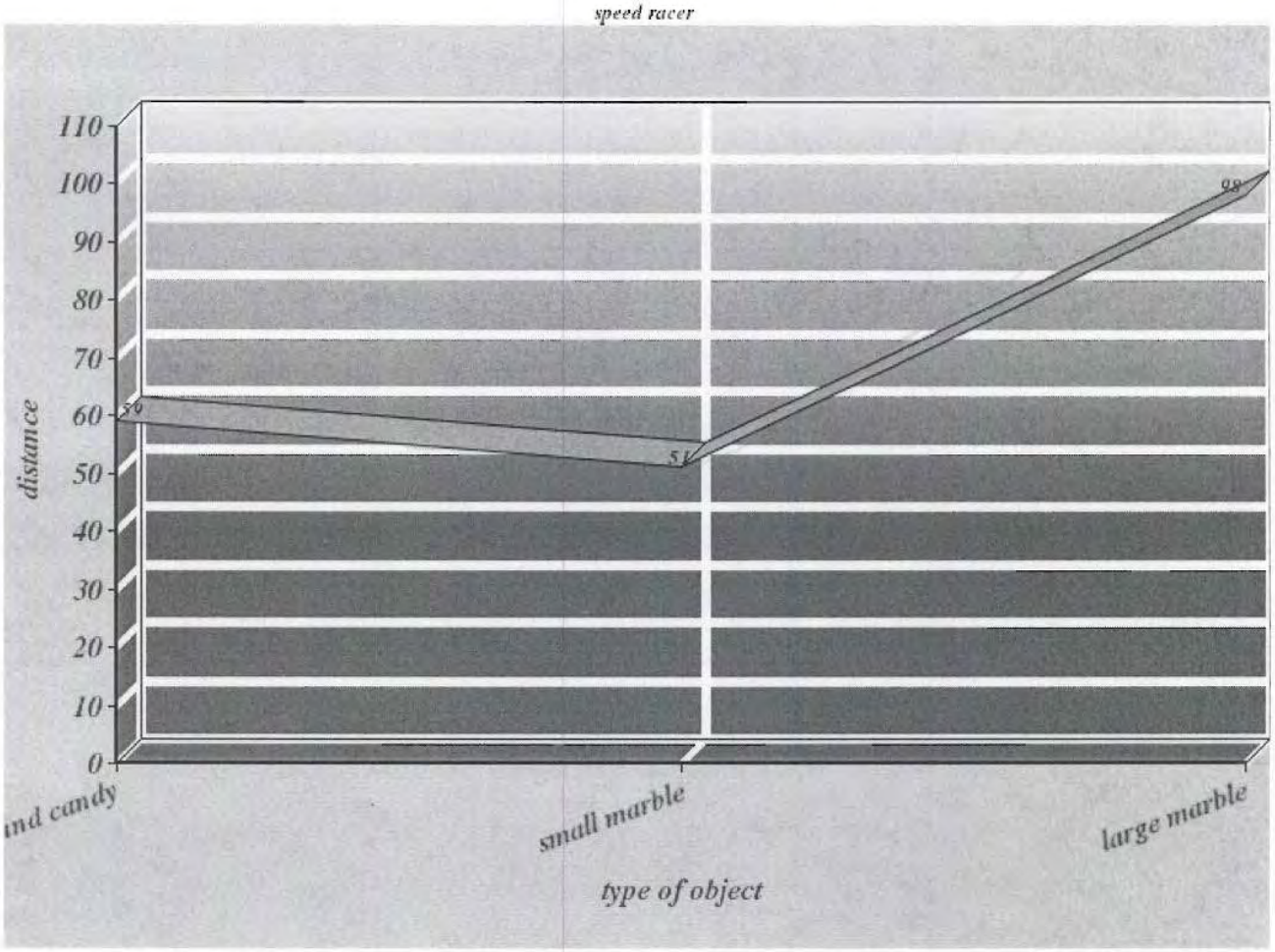
A2

1. ~~Cannt be too heavy~~ the heavy ones won a lot of times
2. ~~Cannt be too light~~ the light ones can win too
3. Must have same ramp. if you dont have the same ramp you can't win
4. Must start at same place and time

same time

Power by Gravity

A2


speed racer
110
100
90
80
70
60
50
40
30
20
10
0
distance
98
50
51
nd candy
small marble
large marble
type of object

A2

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? Haw to matke speed racer race rules
Criteria for Solution
How will you know if the problem has been solved? What evidence will you use? When nooner's cheating the problem have been solved
Tools and Materials
List all of the tools and materials you will need to develop a solution to the problem. ~~scrambles, smartboards, internet~~ cars, book, jornal, meter stick
Design a Model
Describe what you will do to create a model to test as a solution. I will race cars without my rales and with my rales
Test the Solution
Describe how you will test the solution. What steps will you take? I will test my rules to see if they are fair.

A2

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.

I have tested my rules and they were fair now no one can cheat.

Modify the Design

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

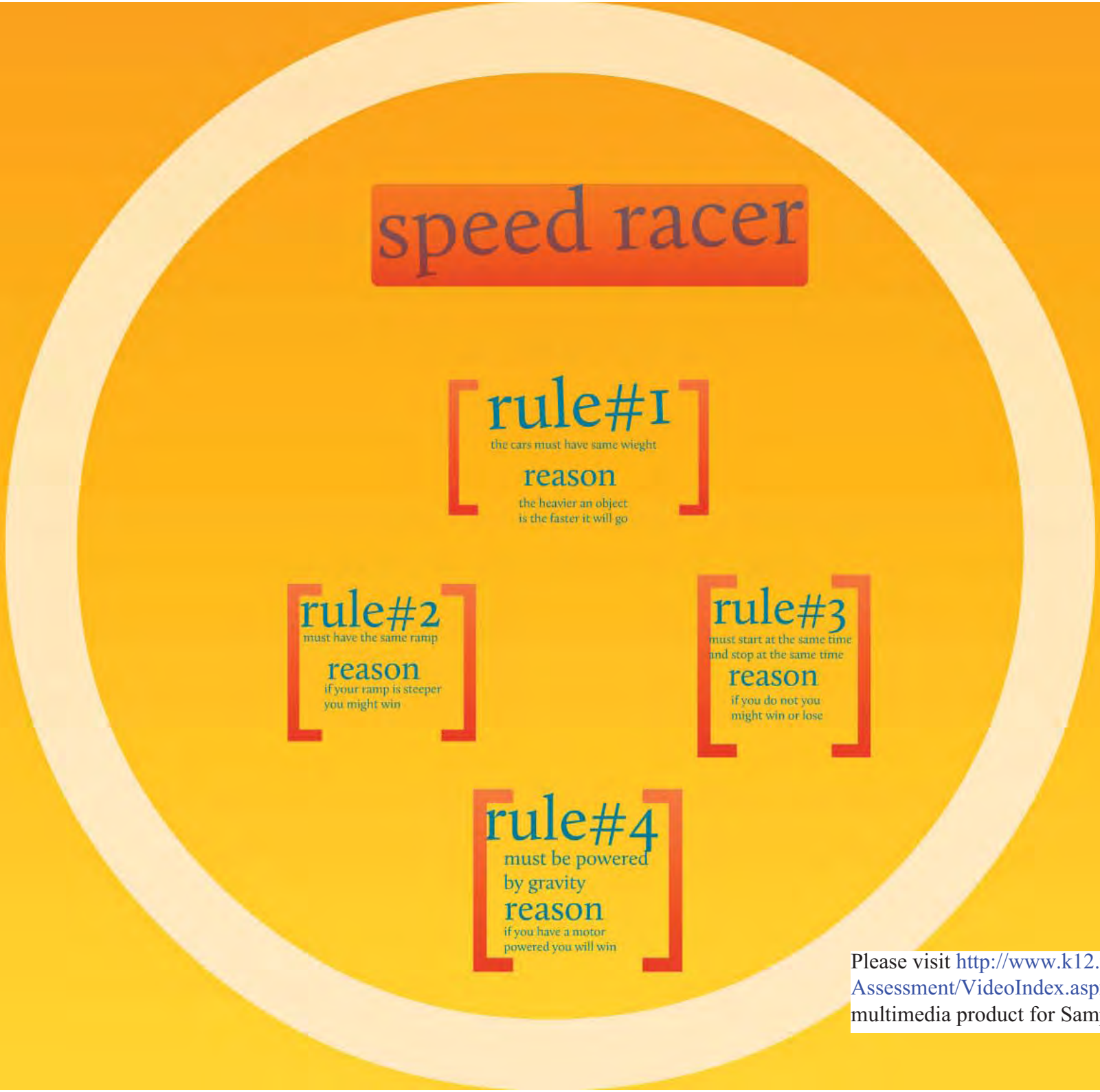
by making a better ramp

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.

Rule #1	Rule #2	Rule #3	Rule #4
must have same weight	Mast have same ramp	must start at same time and stop at same	mast be powerd by gravity
Reason	**Reason**	**Reason**	**Reason**
the heiver the car is the fast it will go	if your ramp is steeper	if you don't you will have more or less time to win	if you don't have a gravity power you will win

A2



Please visit http://www.k12.wa.us/EdTech/Assessment/VideoIndex.aspx#A2 to see the multimedia product for Sample A2.

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

A3

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 Possible	Points Earned
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	1
	Plan Projects	Uses a digital tool to plan an investigation related directly to the student task.	1	0
1.1.2	Collect and Graph Data	Collects data related directly to the student task.	1	1
		Graphs data using a digital tool.	1	0
	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	1
Multimedia Product				
1.1.1	Produce Multimedia	Creates a digital product to communicate information.	1	1
		Combines audio, text, graphs, video, symbols, or pictures that are related directly to the student task into product.	1	0
	Organize Ideas	Uses information gathered during the investigation to explain how the rules will make the race fair.	1	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	1
TOTAL			9	6
A **Level 2 response** (6 - 7 points) 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.				L2

Discussion

Sample A3 represents student work which meets the standards for educational technology. It earns 6 attribute points for a Level 2 response. During the research process, the student determines a specific question to investigate: How does the weight of an object affect the speed and distance of an object? The student also identifies a pattern or trend after using the Intergalactic Luge Simulation. S/He states, "With more gravity and the weight, it takes longer to start but once it gets going it goes the fastest of all. I noticed that from slowest to fastest it went Mars, Earth, and Sun." There is another statement: "I noticed that the weight is connected to gravity and if there is more gravity the luger will go faster down the track." The student collects data related to the question and task (weight of object vs. distance travels), but does not use a digital tool to graph this information.

Similar to Sample A2, the final product earns three attribute points for using a digital tool, applying information from the research to explain the rules, and using different features of the multimedia tool (such as font color and arrows) to communicate learning.

Please visit http://www.k12.wa.us/EdTech/Assessment/VideoIndex.aspx#A3 to see the multimedia product for Sample A3.

A3

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 seconds	55.5 seconds
Trial #2	36.6 seconds	54.8 seconds
Trial #3	36.6 seconds	54.8 seconds
Average (mean)	36.90	165.1
Mars		
Gravity 0.379	1/2 time	Total time
Trial #1	53.2 sec.	82.1 sec.
Trial #2	53.6 sec.	82.5 sec.
Trial #3	55.8 sec	85.0 sec
Average (mean)	54.2 sec	249.6 sec
Sun		
Gravity 28.05	1/2 time	Total time
Trial #1	8.1 seconds	11.5 sec.
Trial #2	8.1 sec.	11.5 sec.
Trial #3	8.1 sec.	11.5 sec.
Average (mean)	8.1	11.5

What do you notice?

With more gravity and the weight, it takes longer to start but once it gets going it goes the fastest of all. I noticed that from slowest to fastest it went Mars, Earth, and Sun

A3

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 weight is connected to gravity and if there is more gravity the luger will go faster down the track.

Newton's First Law of Motion: An object in motion stays in motion unless it is acted on by a force same with an object at rest

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

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

I predict that if the object is heavier it will go faster and further than a lighter object.

Materials: 1 meter stick, 3 different size marbles, mathbook, journal, timer

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

① Gather supplies and make a ramp ② roll the candy down the ramp (timing for 3 seconds) ③ measure the distance & put data in data table ④ do the same for the large and small marble ⑤ repeat numbers 2-4 for trials 2 & 3 ⑥ find the average distance for each object ⑦ find the average speed for each object ⑧ make graph table

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)	46cm	41cm	45cm	44 cm	14.6cm per sec.
Small marble (middle weight)	62cm	61cm	67cm	63.3cm	21.1cm per sec
Large marble (heaviest/most weight)	88 cm	83 cm	79cm	83.3cm	27.8 cm per sec

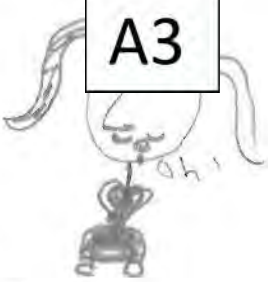
A3

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 table and graph show that the heavier object will roll faster. The weight of an object affects the speed because heavier objects roll faster. My data shows the big marble rolling at 83.3 cm and the small marble rolling at 83.3cm this shows that bigger objects roll faster because they have more weight.

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 must be made out of the same materials Reason for the rule (based on evidence collected in Speed Racer lab or online activities) Cars could be made out of materials that were heavier and the car would go faster or electric, gas, or energy powered	Rule #2: Cars must use the same track Reason for the rule (based on evidence collected in Speed Racer lab or online activities) If one track is smaller the car will finish quicker
Rule #3: Cars must start at the same place Reason for the rule (based on evidence collected in Speed Racer lab or online activities) Some	Rule #4: Cars must go at the same time Reason for the rule (based on evidence collected in Speed Racer lab or online activities)



A3

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, ruler, math book, folder

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

How does the weight of an object affect the speed and distance of the object

procedure ① gather materials ② Build a ramp ③ roll the car down the ramp with no extra weight ④ do that again with one penny on top of the car ⑤ do that again with 2 pennies on the car ⑥ record speed and distance for each ⑦ put data in data table ⑧ share results

The data collected to prove my rules are fair:

Amount of weight/ objects	Distance in centemeters traveled in 5 seconds			average
	Trial #1	Trial #2	Trial #3	
no weight	82 cm	65 cm	74 cm	73.6 cm
1 penny	71 cm	69 cm	66 cm	68.6
2 pennies	73 cm	69.Cm	77cm	73

Presentation:

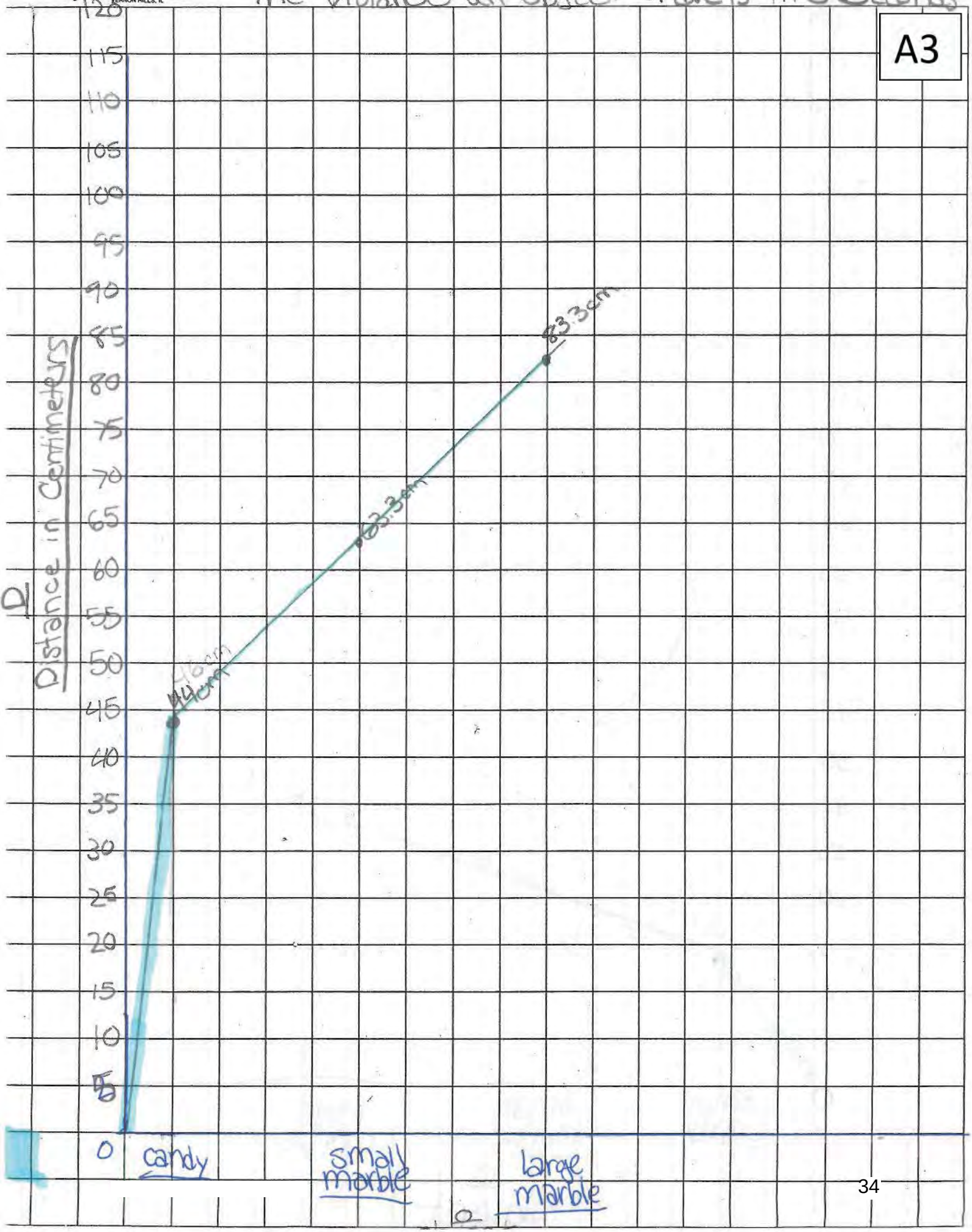
Use prezi.com to make an online presentation of your solution to the problem. Your primary title should be "SPEED RACER." Include your rules, the reason your rules are fair, the plan you made to test your rules and the graph that you made from the Speed Racer lab. Also include science concepts that connect 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 shows my rules are fair because I used my rules and none of my data was out of the ordinary. My highest average was 73.6 and that was without weight, my next highest was 73 and that was with 2 pennies. Therefor my conclusion shows that more weight doesn't alway mean the furthest.

The Distance an Object Travels in 3 Seconds

A3



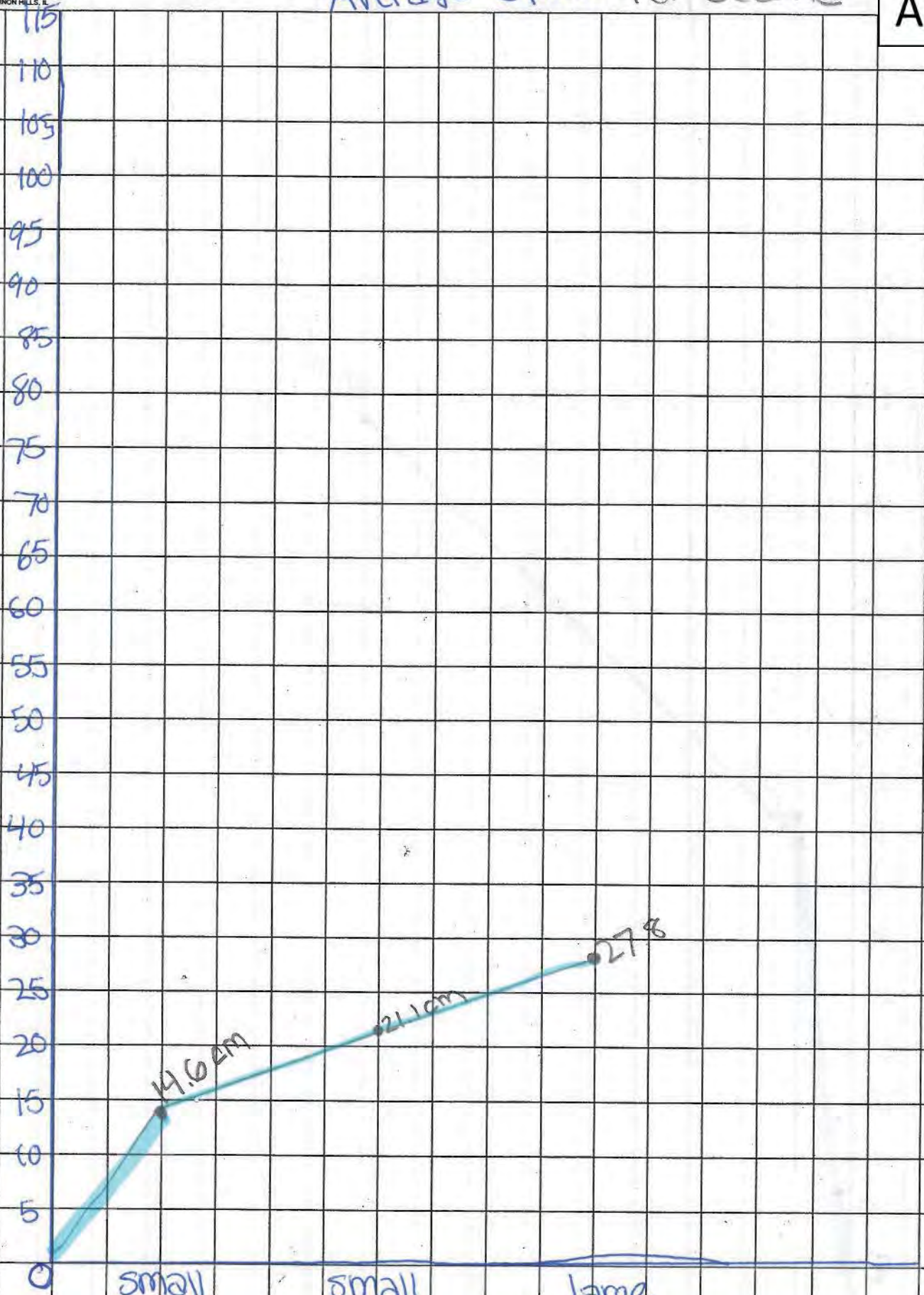
LEARNING RESOURCES VERNON HILLS, IL

METRIC GRAPH PAPER

LER

A3

Average Speed Per Second



A3

1. Cars must be make out of the same materials
2. Cars must use the same track
3. cars must start ~~the~~ at the same place
4. Cars must go at the same time

1 – Cars could be made of objects that could give an unfair advantage.

2 – A car could use a steeper track that would pick up more speed and make the race unfair.

3 – The cars must start at the same place because if one car starts someplace closer to the finish line it would not be a fair race.

4 – If one car goes before the others it will be further ahead when the other cars go.

A3

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?

Trying to make the race reasonably Fair because it is believed that some racers cheated last year

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

I will know if the problem has been solved when all of the racers go about the same speed

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

ramp, cars, timer, ruler

(Books, journal)

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

add pennies to a toy car

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

built a ramp, let 1 car without pennies roll down for 5 seconds, see where it stops, do 3 trials for each, add 1 penny to a car and do the same thing, add 2 pennies and do the same things

A3

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.

My test shows that cars without weight go the fastest, see graph

Modify the Design

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

I could do the investigation on a smoother surface or with a steeper 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.

Cars must be made out of the same materials, because cars could be made out of materials that were heavier so the cars would go faster or they could be electric, gas, or energy powered.

Cars must start at the same place, because other cars would be far ahead and some cars couldn't catch up.

Cars must use the same track so that none of the ramps are steeper than others.

Cars must go at the same time or else other cars won't be able to catch up.

A3

CONCLUSION:

This shows my rules are fair because I used my rules and none of my rules were out of the ordinary. My highest average was 73.6cm and that was with out weight, my next highest was 73 cm and that was with 2 pennies. Therefore my conclusion shows that more weight doesn't always mean the furthest.

Reasearch Question:

How does the weight of an object affect the speed of an object????

PROCEDURE:

1. gather materials 2. build a ramp 3. roll the car down the ramp for 5 seconds without any extra weight, take 3 trials 4.do that again with one penny on top of the car, take 3 trials 5. do that again with 2 pennies on top of the car, take 3 trials 6. record speed and distance for each 7. put data in data table 8. share results

1st rule
cars must be made out of the same material

because

it is possible that cars could be made out of materials that were heavier and the car would go faster, the car can not be electric, gas or energy powered.

4th rule
Cars must leave at the same time

because

if one car goes before the others it will be further ahead when the other cars start

3rd rule
Cars must start at the same place

because

if one car starts at the finish line closer to the finish line then they will not have to go as far then win the race

SPEED RACER

2nd rule
Each must use the same track

because

if one track is shorter the car will have a smaller time because the car won't have to go as far,the track could also be smoother so the car won't face as much friction and go faster

Please visit http://www.k12.wa.us/EdTech/Assessment/VideoIndex.aspx#A3 to see the multimedia product for Sample A3.

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

A4

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 Possible	Points Earned
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	1
	Plan Projects	Uses a digital tool to plan an investigation related directly to the student task.	1	0
1.1.2	Collect and Graph Data	Collects data related directly to the student task.	1	1
		Graphs data using a digital tool.	1	0
	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	1
Multimedia Product				
1.1.1	Produce Multimedia	Creates a digital product to communicate information.	1	1
		Combines audio, text, graphs, video, symbols, or pictures that are related directly to the student task into product.	1	1
	Organize Ideas	Uses information gathered during the investigation to explain how the rules will make the race fair.	1	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	1
TOTAL			9	7
A **Level 2 response** (6 - 7 points) 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.				L2

Discussion

The student work represented by Sample A4 meets the standards for educational technology and is almost a Level 3 product. It is similar to Sample A3 in that the attributes related to the research process (asks original questions, collects data, identifies patterns or trends using interactive resources). However, there is an important difference in the multimedia product. In Sample A4, the student includes pictures of a ramp and cars, and also draws a data table. The work earns the attribute point for "Combines audio, text, graphs, video, symbols, or pictures that are related directly to the student task into product" because it includes text, pictures, and the table.

Please visit http://www.k12.wa.us/EdTech/Assessment/VideoIndex.aspx#A4 to see the multimedia product for Sample A4.

A4

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)	37.	165.4
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	156.2
Average (mean)	94.	155.2
Gravity (sun) 28.06	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?

That on pluto it was slowest and had least gravity so the less gravity a space object has the slower the luge go on it.

A4

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?

If his weight is higher he will go faster depending on the planet

Newton's First Law of Motion: Objects like to stay doing what they are already going.

Newton's Second Law of Motion: Force = Mass x acceleration

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

The weight of a round object would be how big the planet is and it would cause the other round object to be faster

Materials: 1 meter stick, 3 marbles, math mat, chart, science journal

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

1. first you gather materials and set everything up.
2. when the teacher tells you to let go, let go of your small marble not big and stop it at 3 sec.
3. Record in table how far it went.
4. repeat with medium and big marbles 2-3 for trials 2 $\frac{1}{3}$
5. 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)	81	76	64	75	25 cm per second
Small marble (middle weight)	124	132.5	129	128.5	43 cm per second
Large marble (heaviest/most weight)	131	129	132.5	97.5	32 cm per second

A4

Graph. Make a line graph of your data, using centimeter graph paper.
Online graph. Graph your information, using the graphing tool at (average)
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.

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: Put different weights of cars in their one race Reason for the rule (based on evidence collected in Speed Racer lab or online activities) so a heavy one can not be in a race with a really light car	Rule #2: stop the cars at the same amount of time Reason for the rule (based on evidence collected in Speed Racer lab or online activities) so one does not have more time to get to a certain distance.
Rule #3: Keep the ramp the same steepness Reason for the rule (based on evidence collected in Speed Racer lab or online activities) so that one car does not get more of a boost using gravity	Rule #4: start at the same point Reason for the rule (based on evidence collected in Speed Racer lab or online activities) so no car can have an advantage of more time on the ramp

A4

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: will the weight of the car effect the speed when going down the ramp.

① gather materials and set up
② put cars at top of ramp
③ let go stop at 3 seconds
④ when the stop record distance ⑤ do 3 more times

The data collected to prove my rules are fair:

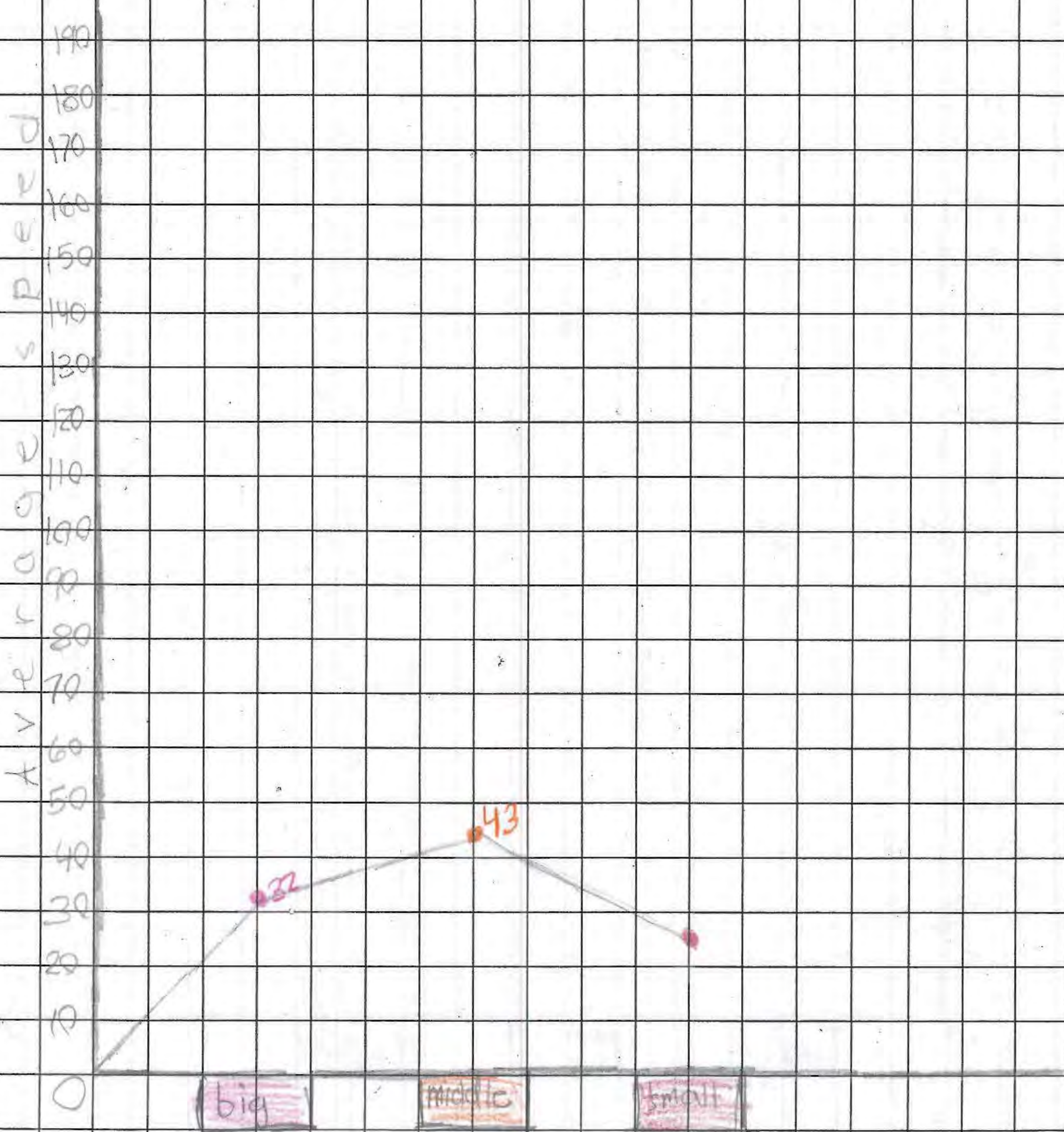
car	trials		inches	
	1	2	3	4
Car 1	11 1/2	12 1/4	1 3/4	7
Car 2	11 1/4	12	11	13

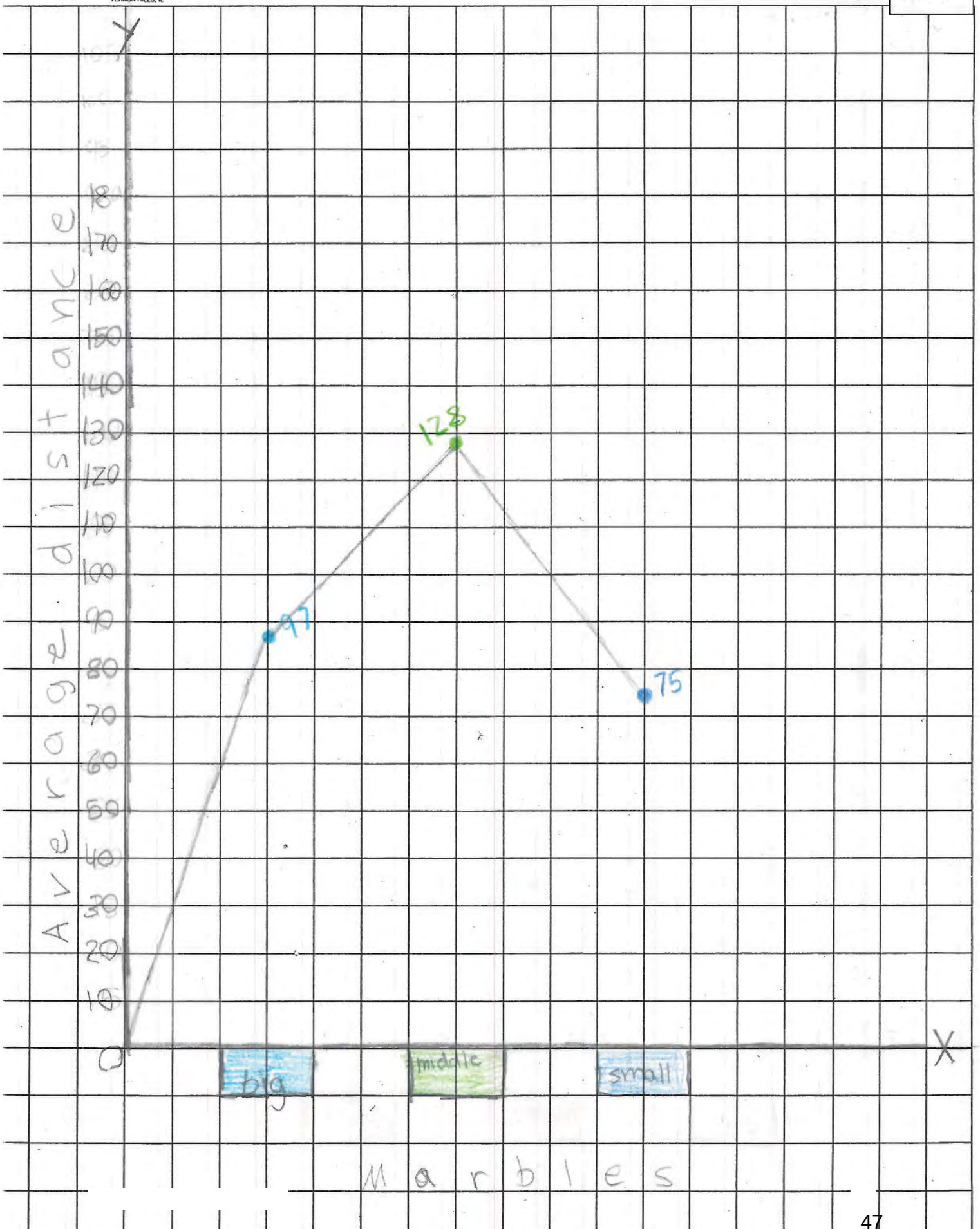
Presentation:

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 test shows my rules are fair because they all went about the same distance


Average speed
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
32
43
big
middle
small


Y
Average distance
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
128
97
75
X
big
middle
small
marbles

A4

Speed Racer

Data table

Car	In Inches		
	Trial 1	Trial 2	Trial 3
Car 1	11 1/2	12 1/4	11 3/4
Car 2	11 1/4	12	11

Rule #3

Rule #4

Rule #2

Rule #1

Plan/Procedure

1 gather and set up supplies
2 put car on top of ramp and hold till you are told to let go
3 let go and stop car at three seconds
4 record data
5 repeat steps 2-4 two more times for trial #2 and #3

Please visit http://www.k12.wa.us/EdTech/Assessment/VideoIndex.aspx#A4 to see the multimedia product for Sample A4.

A5

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.

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	Plan Projects	Uses a digital tool to plan an investigation related directly to the student task.	1	0
1.1.2	Collect and Graph Data	Collects data related directly to the student task.	1	1
		Graphs data using a digital tool.	1	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	1
Multimedia Product				
1.1.1	Produce Multimedia	Creates a digital product to communicate information.	1	1
		Combines audio, text, graphs, video, symbols, or pictures that are related directly to the student task into product.	1	1
	Organize Ideas	Uses information gathered during the investigation to explain how the rules will make the race fair.	1	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	1
TOTAL			9	8
A **Level 3 response** (8 - 9 points) 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.				L3

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

Discussion

Sample A5 represents work which exceeds the standards for educational technology. It earns eight out of nine possible attribute points and is a Level 3 product. The student identifies a question (How does the weight affect the speed and distance of the car.), collects and graphs data using a digital tool, then identifies a pattern (This test shows my rules are fair because the heavier the car the faster the car goes.)

The multimedia product earns all of the possible attribute points. The student uses different colors and symbols, as well as the overall layout, to communicate main ideas. There is an explanation of a rule based on the research conducted. And, the student uses both text and a data table in the final product.

Please visit http://www.k12.wa.us/EdTech/Assessment/VideoIndex.aspx#A5 to see the multimedia product for Sample A5.

A5

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 seconds	55.0 seconds
Trial #2	37 seconds	55.1 seconds
Trial #3	37.1 seconds	55.3 seconds
Average (mean)	36.9 seconds	55.1 seconds
Gravity (Sun) 28.05	1/2 time	Total time
Trial #1	8.0 seconds	11.5 seconds
Trial #2	8.0 seconds	11.5 seconds
Trial #3	8.0 seconds	11.5 seconds
Average (mean)	8.0 seconds	11.5 seconds
Gravity (pluto) .069	1/2 time	Total time
Trial #1	91.7 seconds	153.2 seconds
Trial #2	94.1 seconds	156.3 seconds
Trial #3	94.0 seconds	156.3 seconds
Average (mean)	93.3 seconds	155.2

What do you notice?

I notice that the less gravity (pluto) planets go slower (155.2sec) than Earth and the sun has more gravity and goes an average of 11.5 sec. which is faster than the average of Earth which is 55.1 sec

A5

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~~ sled and his/her speed down the track?

On the sun the weight of the sled was 28 x more than on the Earth and it goes faster.

Newton's First Law of Motion: Things that are in motion stay in motion until acted upon by a force and things at rest stay at rest until acted upon by a force.

Newton's Second Law of Motion: force = mass x acceleration

Hypothesis (predict the answer to your research question): I predict that the weight on the round object makes it faster if it is heavier.

Materials: 3 different sized marbels, meter stick, journal, math books, timer

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

1) Get materials 2) set up books 3) set timer for 3 sec. 4) role marble down slant 3 sec. 5) measure distance 7) record in data table 8) repeat steps 3-7 2 times for trial 2 & 3 and do for all three marbles = 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)	57cm	58cm	51cm	55.3cm	18.4 cm per sec.
Small marble (middle weight)	62.5cm	54cm	66cm	61.8cm	20.6 cm per sec.
Large marble (heaviest/most weight)	90cm.	87cm	84cm	87cm	29 cm per sec.

A5

graph tr
ave

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.

www.onlinecharttool

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 the larger marble is faster and has an average of 81cm of distance the candy is 55.3cm and the small marble is 61.8 cm

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: you're not allowed to use electricity only the force of gravity	Rule #2:
Reason for the rule (based on evidence collected in Speed Racer lab or online activities) because some people may not use electricity and the ones that do would go a lot faster	Reason for the rule (based on evidence collected in Speed Racer lab or online activities)
Rule #3:	Rule #4:
Reason for the rule (based on evidence collected in Speed Racer lab or online activities)	Reason for the rule (based on evidence collected in Speed Racer lab or online activities)

A5

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 weight affect the speed and distance of the car

procedure: 1) get materials, 2) build ramp, 3) make car, 4) test it all 5) start cars at top, 6) see who's car passed the finish line first 7) repeat steps 5-6

The data collected to prove my rules are fair:

car	Distance in mm			Average
	trial 1	trial 2	trial 3	
#1	24 mm	35 mm	41 mm	33.3
#2	14 mm	12 mm	60 mm	48.7

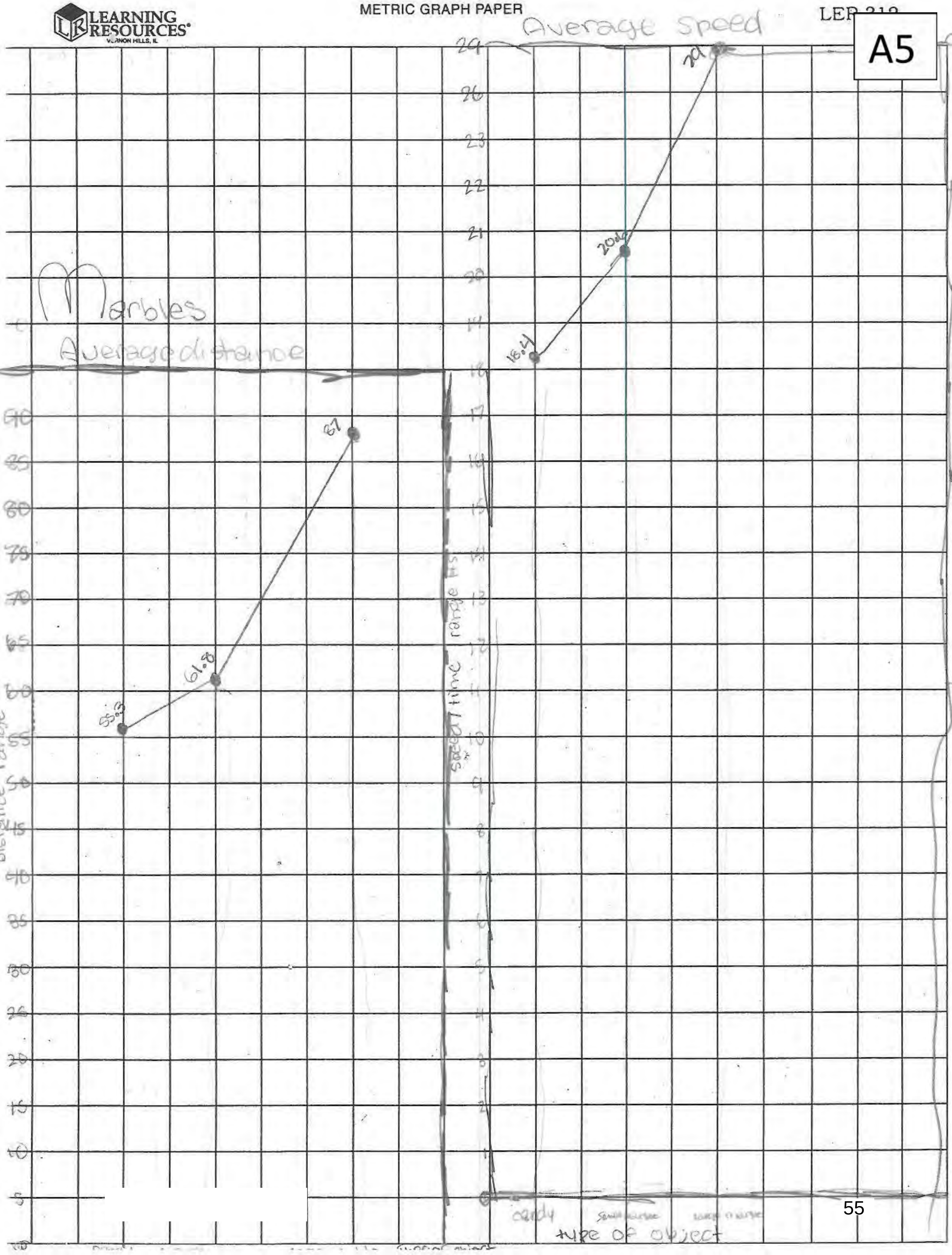
Presentation:

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.

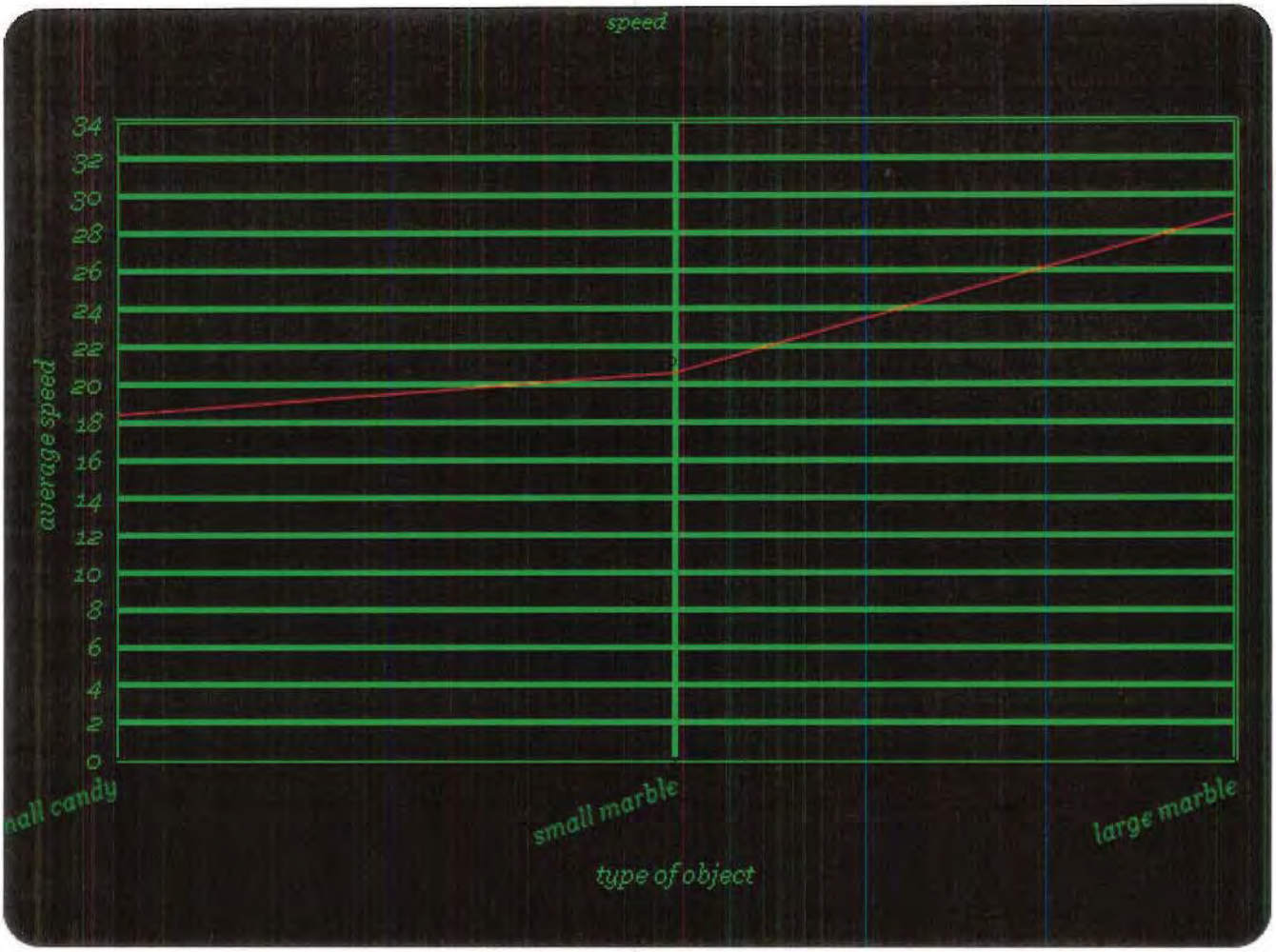
Reference notes: (name of web site or book, URL if online, author, date used)

This test shows my rules are fair because the heavier the car the further the car goes

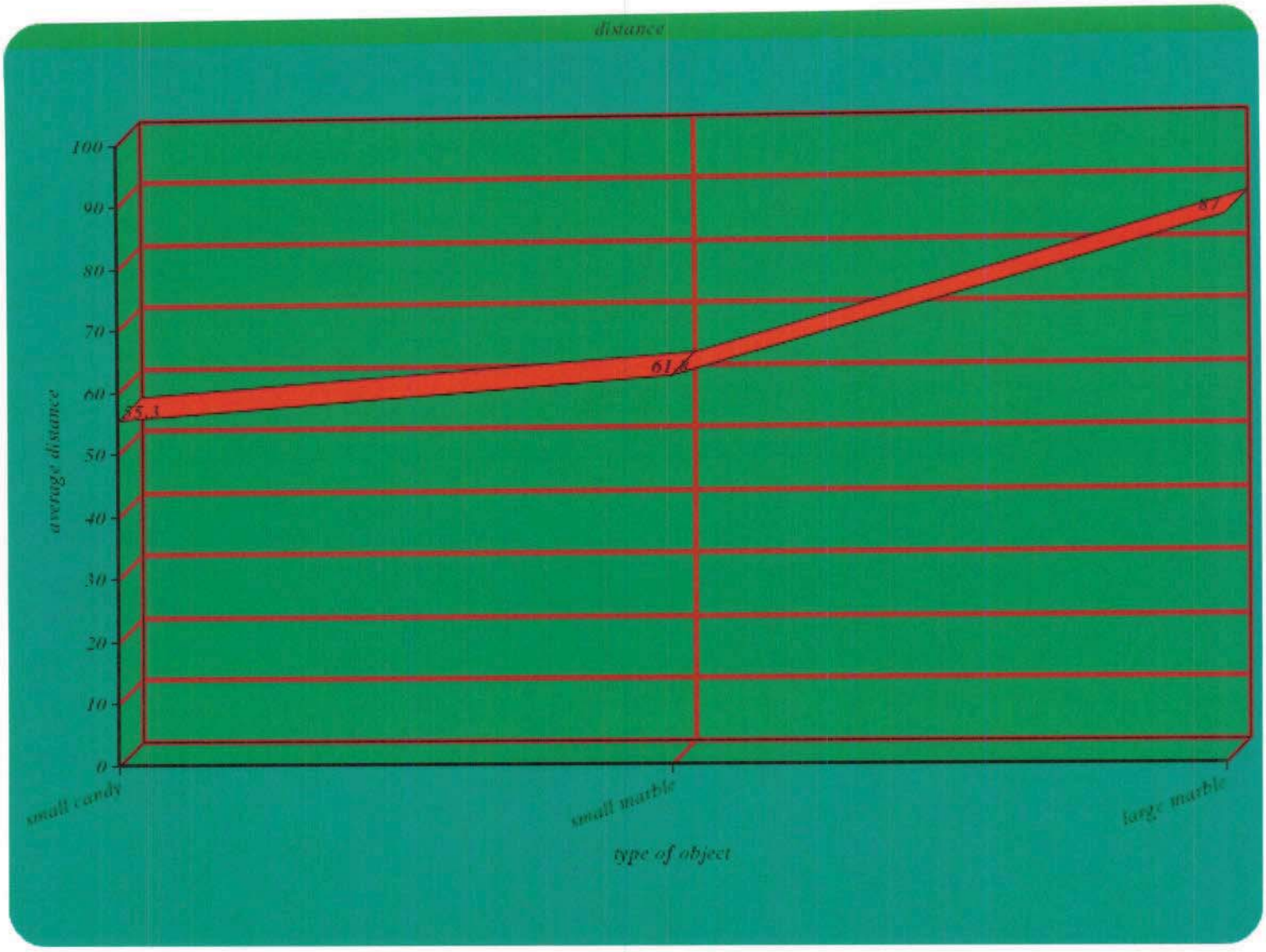
A5


Average speed
29
20.6
18.4
speed / time range
candy
small marble
large marble
type of object
Marbles
Average distance
87
61.8
55.3

A5


speed
34
32
30
28
26
24
22
20
18
16
14
12
10
8
6
4
2
0
average speed
small marble
large marble
type of object

A5


distance
100
90
80
70
60
50
40
30
20
10
0
average distance
55.1
61.6
87
small candy
small marble
large marble
type of object

A5

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?

Some people created

Criteria for Solution

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

You will make rules to make people not be as fast as others. You will know if the cars aren't so much faster than others

Tools and Materials

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

You needs to make sure you have a pencil to righ down on paper 4 rules for the racers

Design a Model

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

I will create 2 cars that are about the same and that follow the rules

Test the Solution

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

1) make and set up ramps and the ~~cars~~ start the cars at the top at the same time

A5

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 rules did help.

see graph

Modify the Design

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

I could have added a little more weight to the slower 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.

not allowed to use electricity because then the power would make car go down ramp a lot faster

can't be more than 5 lbs. because then the car will have a lot more weight and go a lot faster down ramp

can't give car a boost at beginning because then it will go way ahead and go faster down ramp

2 certain sizes of wheel size because the bigger the wheels the heavier the car and the faster the car

A5

data table

TYPE OF OBJECT	DISTANCE IN CM			
	TRIAL #1	TRIAL #2	TRIAL #3	AVERAGE DISTANCE
SMALL CANDY	57CM	58CM	51CM	55.3CM
SMALL MARBLE	62.5CM	54CM	69CM	61.8CM
LARGE MARBLE	90CM	87CM	84CM	87CM

Please visit http://www.k12.wa.us/EdTech/Assessment/VideoIndex.aspx#A5 to see the multimedia product for Sample A5.