NAME: _____ **DATE:** _____

STUDENT #: _____ **TEACHER:** _____

Simulation Data, Section 1

Complete the tables with data obtained from the simulation.

Sim Investigation #1: How does height affect maximum speed?
Sim Investigation #2: How does height effect percentage of damage?

LOWEST ----------> HIGHEST

	Position A	Position B	Position C	Position D	Position E
Sim #1 Skater's Max Speed (m/s)					
Sim #2 Percent of Damage (%)					

Answer after Sim #1

1. What trend do you see when you compared height to maximum speed?

_____

_____

_____

_____

_____

_____

_____

(over→)

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Answer 2-4 ONLY after Sim #2

2. What trend do you see when you compared height to pumpkin damage?

3. What, in your opinion, is causing these trends? Why do you think we see these changes in speed and pumpkin damage as height increases?

4. Thinking about helmets, what thoughts have these two investigations provided? What impact do the results suggest about skaters worrying about speed?

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Simulation Data, Section 3

Complete the tables with data obtained from the simulation.

Sim Investigation #3: How does height affect kinetic energy?
Sim Investigation #4: How do helmets affect the transfer of kinetic energy?

LOWEST ----------> HIGHEST

	Position A	**Position B**	**Position C**	**Position D**	**Position E**
Sim #3 Skater's Max Kinetic Energy (Joules)					
Sim #4 Kinetic Energy Transfer with Helmet (Joules)					

Answer after Sim #3

1. What trend do you see when you compared height to kinetic energy?

_____

_____

_____

_____

_____

(over→)

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Answer 2-4 ONLY after Sim #4

2. What trend do you see when you add a helmet to the pumpkin?

3. How do the pumpkin-with-helmet results compare to the pumpkin-with-NO-helmet results?

4. What, in your opinion, is causing the trend you see in Question 3?

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Speed & Kinetic Energy Analysis

Use the data from the *Simulated Data, Section 1* and *Simulated Data, Section 3* sheets. Calculate how much the max speed and kinetic energy changes when the skater moves from one position up to the next position. For example, we can calculate the change in max speed when moving from Position A to Position B. We simply subtract Position A speed data from Position B speed data:

Position B – Position A = (1.8 m/s) – (0.9 m/s) = **0.9**

So, a skater increases their max speed by +0.9 m/s when they move from Position A to Position B.

Complete the table below for both max speed and kinetic energy using the data from your *Simulation Data, Section 1* and *Simulated Data, Section 3* sheets.

LOWEST ----------> HIGHEST

Change in Position	**From A to B**	**From B to C**	**From C to D**	**From D to E**
Change in Speed (m/s)	**+ 0.9**			
Change in Kinetic Energy, No Helmet (Joules)				

(over→)

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1. From the Section 1 table, we see that each time the skater moves up to the next position, their max speed increases. According to your calculations here, is the increase in speed a consistent, uniform increase? Why or why not?

_____

_____

_____

2. From the Section 3 table, we see that each time the skater moves up to the next position, their max kinetic energy increases. According to your calculations here, is the increase in kinetic energy a consistent, uniform increase? Why or why not?

_____

_____

_____

3. Early in the **Introduction,** we read that...

> *"Some skaters think that they are skilled enough that they do not need a helmet. They think if they fall, they would be able to avoid serious injury* ***because they believe that they are not going very fast****. These skaters only worry when they are going very fast from the highest heights."*

Do you think this perception by skaters is a fair and true point? Support your answer with evidence.

Amount of Energy	Effects on the Brain
Less than 3 Joules	No effect, possible headache
3 to 7 Joules	Headache, possible confusion or mild concussion
More than 7 Joules	Concussion, possible brain injury

_____

_____

_____

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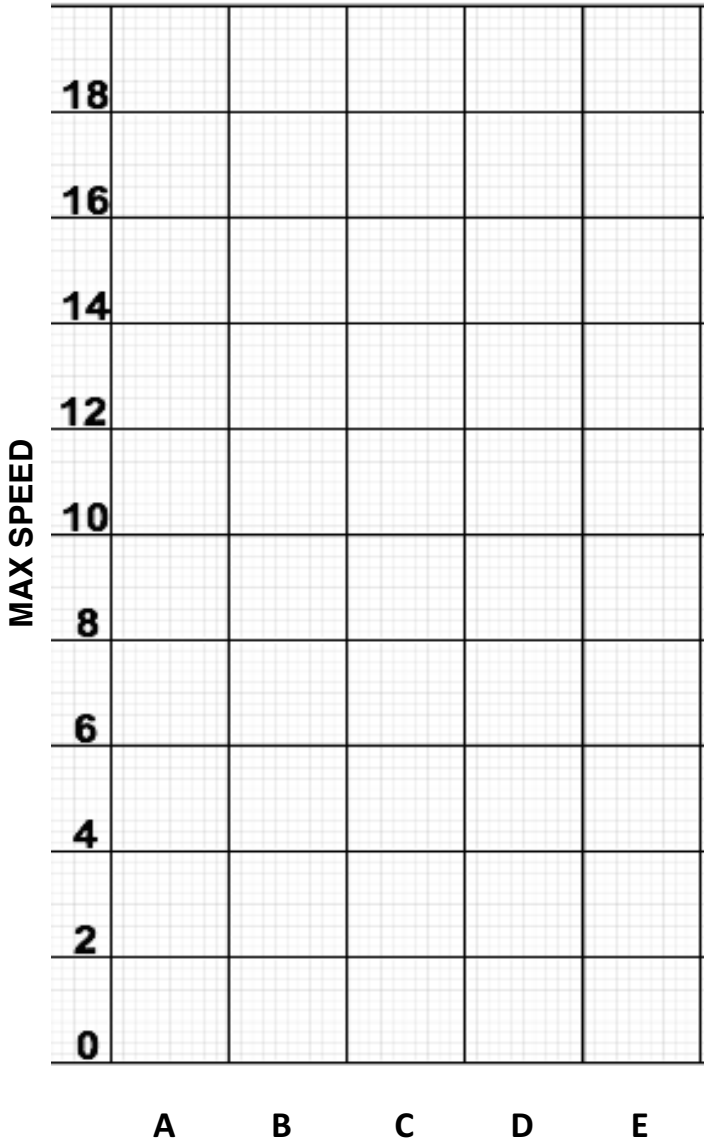
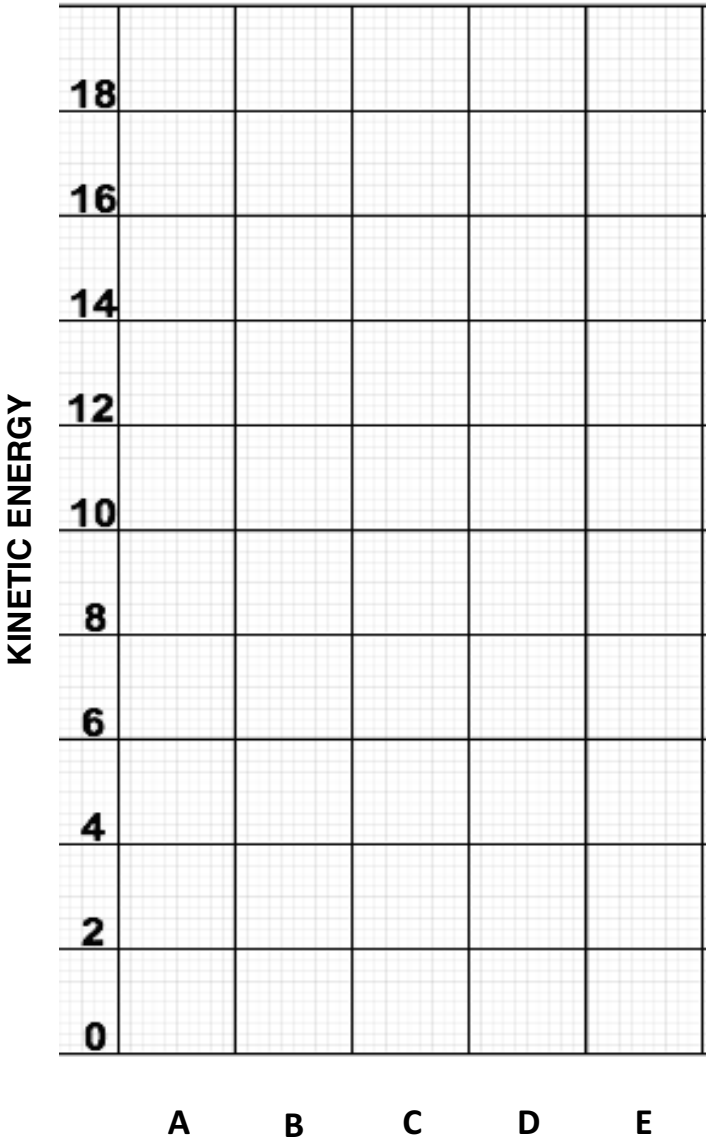
NAME:		DATE:		DATA VISUALIZATION
STUDENT #:		TEACHER:		SECTION 4

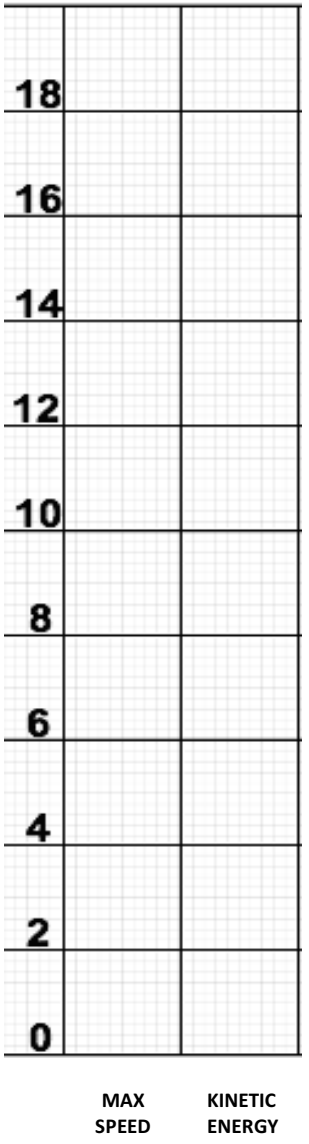
Starting Position vs. Max Speed



Starting Position vs. Kinetic Energy



SUMMARY



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