21st Century Math Tasks

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Name _____

Per ____

Neuron Facts Assessment

Your Brain is …

Crowded and Eager

You have approximately 100 billion neurons. (That's the same as the number of stars in our Milky Way Galaxy.) The rate of neuron growth during fetal development in utero is 250,000 neurons/minute. How many months will it take to grow the 100 billion brain cells?

Complex

How long would it take to count all 1,000 trillion (1 quadrillion) synapses in your brain, if you counted one per second without stopping?

Fast

A neuron can transmit a signal up to 250 mph. The typical brain is 6 inches long. How many seconds does it take for a signal to travel from the back of your brain to the front?

Big

You brain stores up to 1,000 terabytes of information. How many 256 GB flash drives will it take to store the 1,000 terabytes of information in your brain?

Terms for Storage Capacities

1 bit = 0 or 1 (b)
8 bits = 1 byte (B)
1 thousand bytes = kilobyte (KB)
1 million bytes = megabyte (MB)
1 billion bytes = gigabyte (GB)
1 trillion = terabyte (TB)

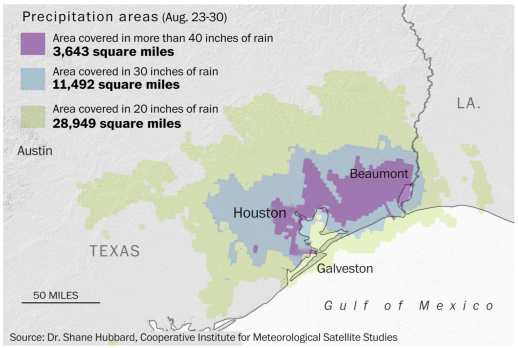
Industrious

Your brain makes up 2% of your body mass, but uses 20% of your oxygen. Given that the typical human weighs about 140 lbs, approximately how much does the typical brain weigh?

Unit Conversions for a Monster Storm

Capital Weather Gang

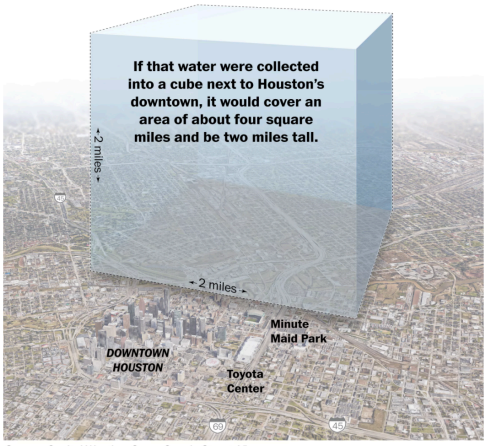
Harvey is a 1,000-year flood event unprecedented in scale



(The Washington Post)

What would 9 trillion gallons of water look like?

As of noon on Aug. 27, about 9 trillion gallons of rain had already fallen across the greater Houston area and Southeast Texas.



Source: Capital Weather Gang; Google Street View

THE WASHINGTON POST

1. a) How fast in mph did the rain fall in Beaumont, TX?

b) How fast in mph did it fall in Galveston?

2. Given that there are 231 cubic inches in a gallon, and there are 4,014,489,600 cubic inches of water per square mile for every inch of rainfall, and that eventually 33 trillion gallons of rain was dumped on Texas, how many gallons per second fell from the sky?

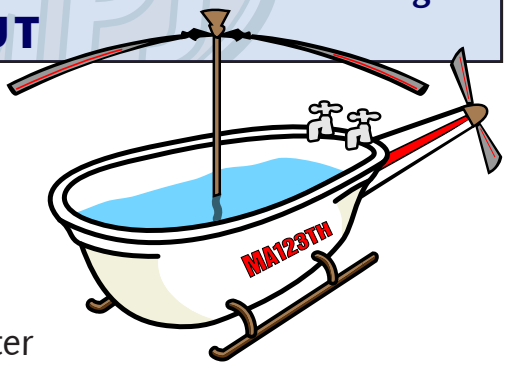
3. a) Verify that 252 km/h equals 70 m/s.

b) Given that 1 knot = 1.15 miles per hour, verify that 157 mph equals 137 knots.

Saffir–Simpson scale

Category	Wind speeds
Five	≥70 m/s, ≥137 knots ≥157 mph, ≥252 km/h
Four	58–70 m/s, 113–136 knots 130–156 mph, 209–251 km/h
Three	50–58 m/s, 96–112 knots 111–129 mph, 178–208 km/h
Two	43–49 m/s, 83–95 knots 96–110 mph, 154–177 km/h
One	33–42 m/s, 64–82 knots 74–95 mph, 119–153 km/h

TUBICOPTERS & MORE

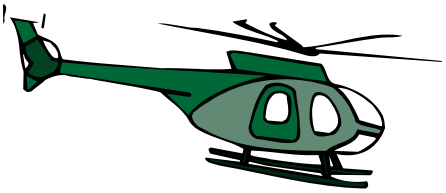


HELICOPTER

1) Why does the graph plot horizontally when the helicopter stays stationary?

2) Why does the graph plot horizontally when the helicopter goes up?

3) Why does the graph plot oblique lines (diagonally) when the helicopter goes forward?



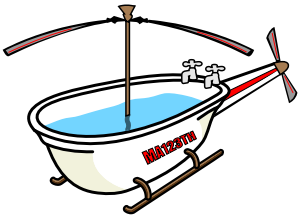
4) Why does the graph plot downward when the helicopter goes backwards? Is there a way to get the graph to "plot backwards?"

5) What determines the steepness of the graph?

6) If a horizontal line implies being in the same place at all times, what would a vertical line imply?

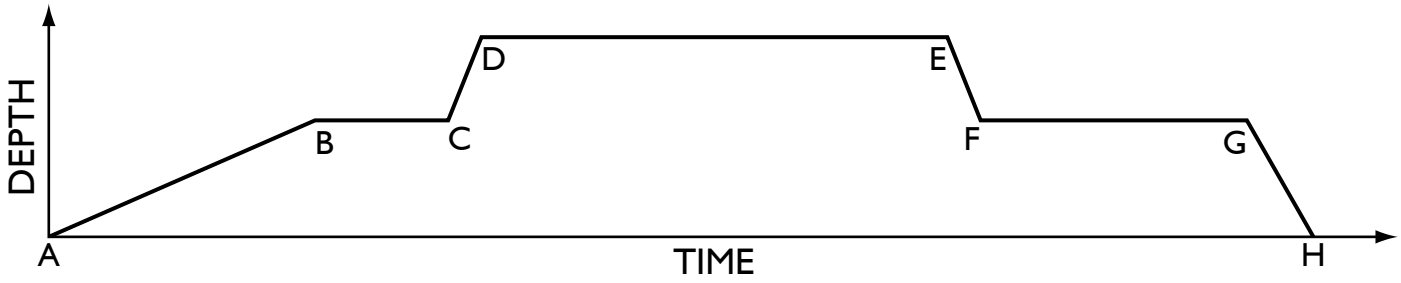
7) Sketch a graph of the time and distance for a helicopter that goes fast to the halfway point, hovers for awhile, then goes backwards fast until it is just shy of the starting point, then goes forward again slowly.

TUBICOPTERS (continued)



BATH TUB

The graph below represents the water level of a bath tub over time. It shows the tub filling, the water turned off, someone sitting in the tub, bathing, then getting out, drying off and finally the tub draining.

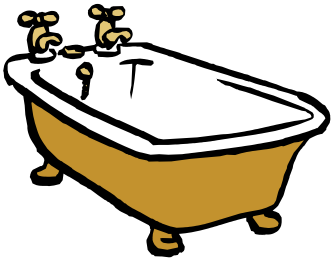


8) Mark the graph for each of these: fill, wait, sit, bath, out, dry, drain.

9) Why is the slope of $\overline{AB}$ positive while the slope of $\overline{GH}$ is negative?

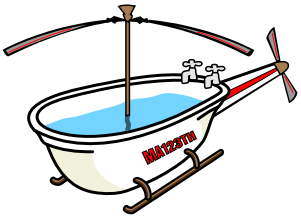
10) Why is the slope of $\overline{CD}$ greater than that of $\overline{AB}$?

11) Does the tub drain slower or faster than it fills? How can you tell?



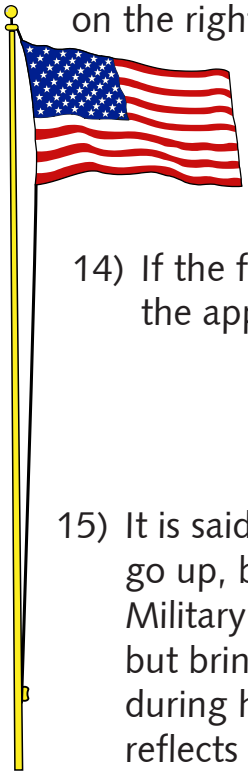
12) Why is $\overline{DE}$ higher than $\overline{BC}$? Why is $\overline{DE}$ longer than $\overline{FG}$?

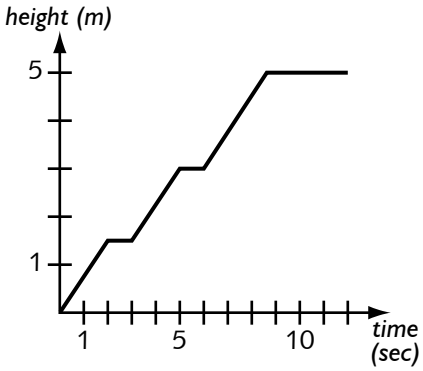
TUBICOPTERS (continued)



FLAG

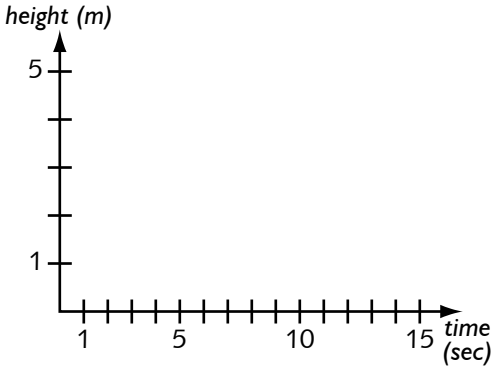
13) What was happening to the flag in the diagram on the right?





14) If the flag was raised to the top of the pole, what is the approximate height of the flagpole?

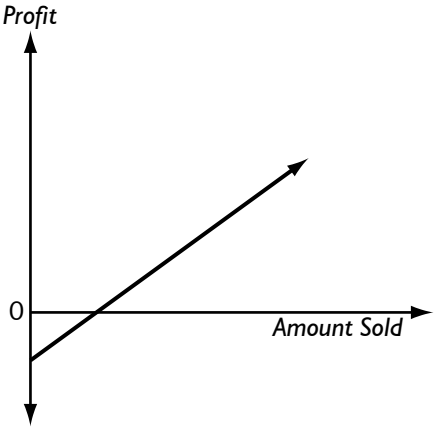
15) It is said that the American Flag is excited to go up, but sad to come down. Therefore, the Military raises the flag quickly with no pauses, but brings it down slowly, with small pauses during hand exchanges. Sketch a graph that reflects this method.



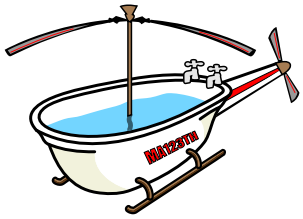
LEMONADE STAND

16) Why does the graph show profit values below zero?

17) What is the meaning of the point where the graph crosses the horizontal axis?

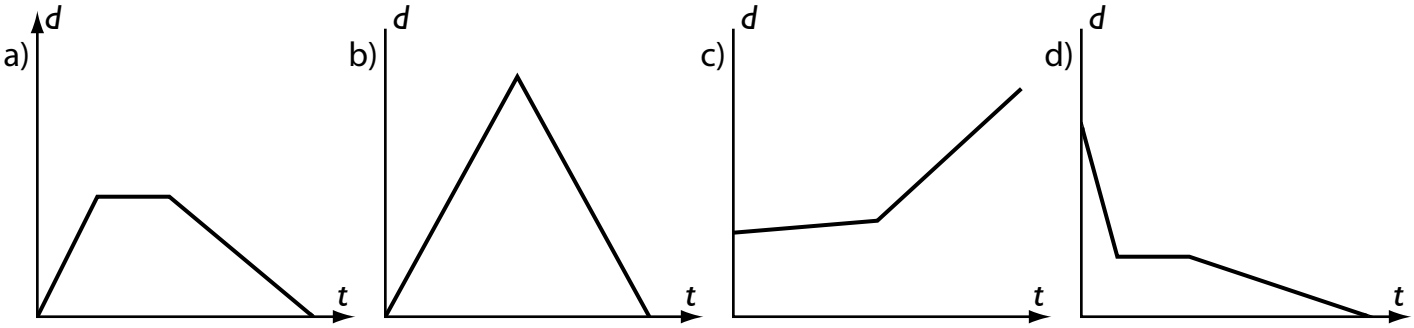


TUBICOPTERS (continued)



PRACTICE

Match each of the following scenarios with one of the graphs below.



18) Johnny runs up the street, but quickly turns and runs home at the same speed.

19) Jennifer is riding her bike home. She gets a flat tire. She can't fix it, so she walks the bike the rest of the way home.

20) Jamie is several blocks from home. She is walking to her friend's house which is even further from home. Halfway there, her friend picks her up in a car and she rides the rest of the way.

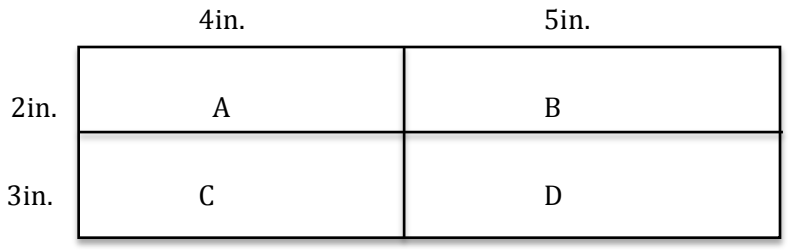
21) Jackson runs to his friend's house, hangs for a short while, and then walks home.

Algebra 1 Names: _____
TVUSD **Date:**_____ **Period:** _____

Polynomial Farm

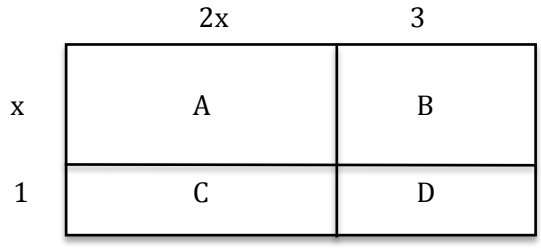
Part I (Intro & Investigate)

1. Find the perimeter and area of each small rectangle (A, B, C and D). Find the perimeter and area of the large rectangle composed of A, B, C and D.



	Perimeter	Area
A		
B		
C		
D		
Large Rectangle		

2. Find the perimeter and area of each small rectangle (A, B, C and D). Find the perimeter and area of the large rectangle composed of A, B, C and D. All measures given are in inches.



	Perimeter	Area
A		
B		
C		
D		
Large Rectangle		

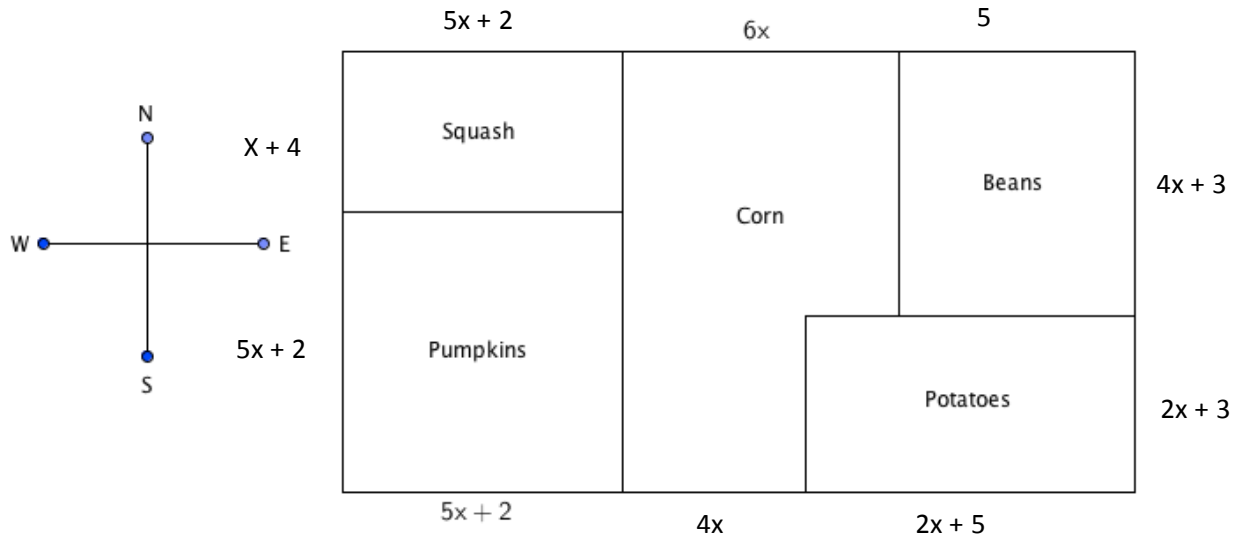
Algebra 1 Names: _____

TVUSD **Date:**_____ **Period:** _____

Polynomial Farm

Part II (Apply)

Directions: Farmer Bob is planting a field of crops this spring. He wants to plant squash, pumpkins, corn, beans, and potatoes. His plan for the field layout in feet is shown in the figure below. Use the figure and your knowledge of polynomials, perimeter, and area to solve the following:



3. Write a simplified expression that represents the length of the south fence line.

4. Find the perimeter of the pumpkin field.

5. Find the area of the squash field.

6. Find the perimeter and area of each section of the Field.

	Perimeter	Area
Squash		
Pumpkin		
Beans		
Potatoes		
Corn		
Entire Field		

Extension: a) In this field scenario, is x a variable or an unknown quantity? _____

b) If it is variable, explain. If it is an unknown quantity, use equivalent lengths to find x.

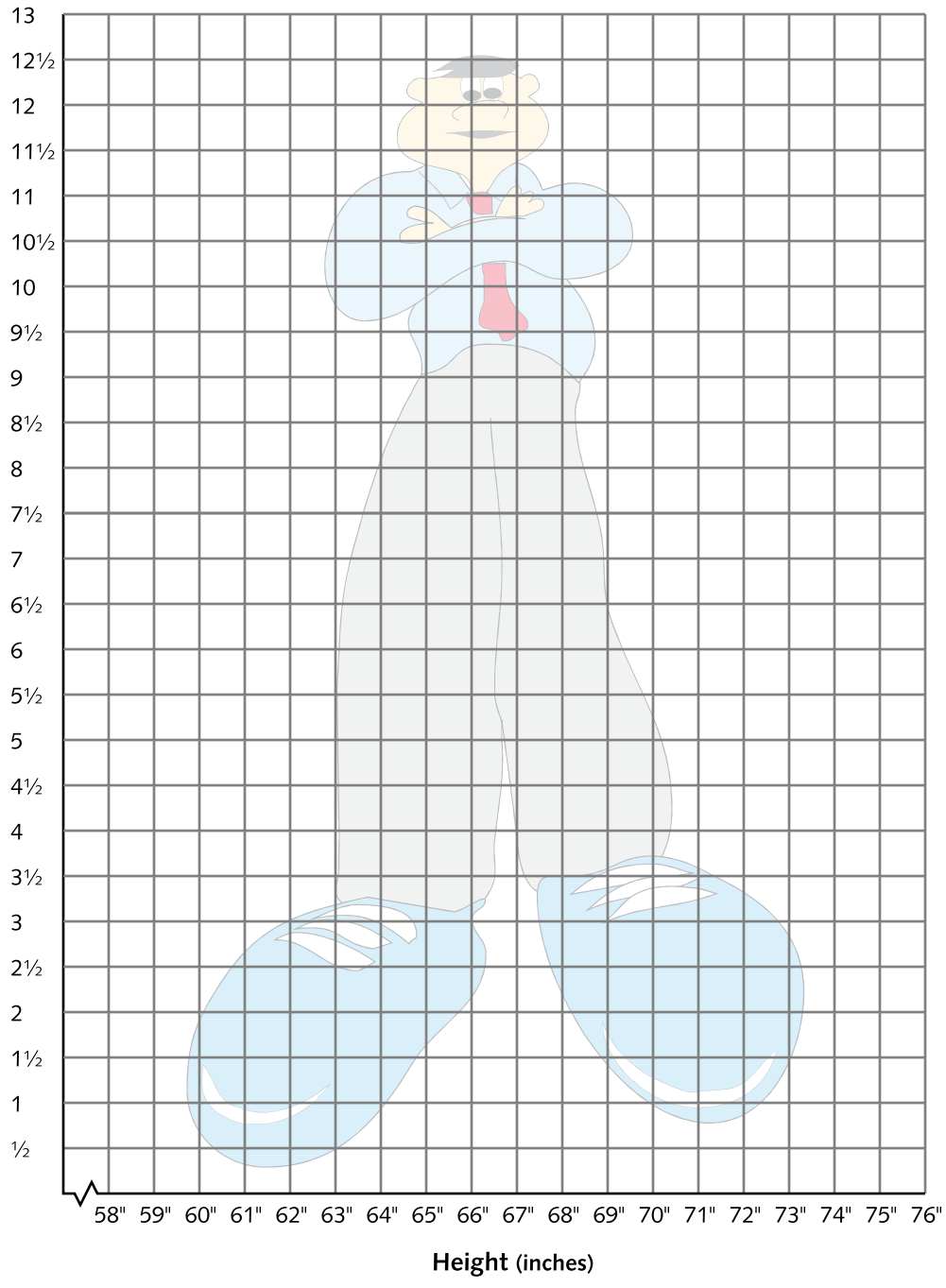
STUDENT HANDOUT

COOL SHOES: LINEAR

You own and operate NewCoolShoes.com, an online shoe store. Many people want to order shoes for friends and relatives, but do not know their shoe size. Since it is easier to estimate a person's height than shoe size, you want the customer to be able to enter a person's height and calculate the appropriate shoe size (approximate). You must have either a graph or equation in order to do this. So, your task here is to create both, using sample data from your class.

BOYS

Height (inches)	Shoe Size
75	10.5
70	12
72	13
70	10
74	14
72	11.5
70	10.5
74	12
70	10.5
76	13
68	13
76	12.5
65	7
66	8
67	8.5
75	14
69	9.5
72	9
71	10
69	10
73	11
69	12
72	10
73	11
69	10



GIRLS

Height (inches)	Shoe Size
59	5
60	7.5
61	7
66	9
63	7
66	7.5
63	6.5
37	6.5
32	7.5
32	6.5
38	11
39	10.5
72	11
68	8.5
63	8.5
68	9.5
67	8.5
66	9.5
67	7
69	9
60	7.5
66	7.5
65	7
64	8.5
68	9

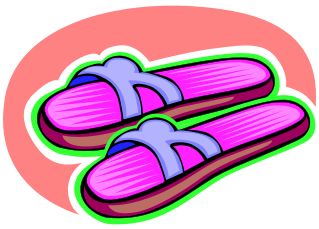
COOL SHOES: LINEAR (CONTINUED)

1. Fill the charts with data from your class. Record each person's height and shoe size.
2. Plot data points from the charts. Use one color or symbol (+) for boys and a different one for girls (*).
3. Do you notice any relationship between people's height and shoe size? What kind of correlation is it?

4. Draw an approximate line of best fit for each set of data (one for boys, one for girls).
5. For each line, calculate the rate of change (slope).

   BOYS: There is a change of _____ sizes for every _____ inches of height, or _____ sizes per every one inch.

   GIRLS: There is a change of _____ sizes for every _____ inches of height, or _____ sizes per every one inch.



6. a) Calculate the y-intercept of each line. **BOYS:** _____ **GIRLS:** _____

   b) What do these intercepts imply? Do they match your graph?

7. Write the equations of each line.

   BOYS: _____ **GIRLS:** _____

8. For each set of data, find a **height** that does NOT appear in the chart. For instance, if no girl in the class is exactly 68" tall, then choose 68 inches for the girls. Use your equation and your chosen value for height to find the corresponding shoe size at that height. Do your solutions match the graphs?

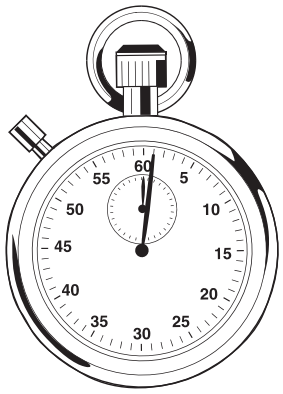
   BOYS: Height = _____ **GIRLS:** Height = _____
   Shoe Size = _____ Shoe Size = _____

9. For each set of data, find a **shoe size** that does NOT appear in the chart. For instance, if no boy in the class has a shoe size of 13.5, then choose 13.5 for the boys. Use your equation and your chosen value for shoe size to find the corresponding height. Do your solutions match the graphs?

   BOYS: Height = _____ **GIRLS:** Height = _____
   Shoe Size = _____ Shoe Size = _____

Don't Break My Stride

1. You and each member of the group are to make three trial walks. Count your steps and time for each trial.



	Time			Number of Steps		
	Trial 1	Trial 2	Trial 3	Trial 1	Trial 2	Trial 3
Walker 1						
Walker 2						
Walker 3						
Walker 4						

2. Choose ONE person from your group to walk the distance designated by the instructor. Record both the steps and times for two trials.

	Trial 1	Trial 2	Length
Time			
Steps			

Location _____

Walker _____

3. Calculate the mean, median, mode, and range of both times and steps for all members.

	Statistics for TIME				Statistics for STEPS			
	Mean	Median	Mode	Range	Mean	Median	Mode	Range
Walker 1								
Walker 2								
Walker 3								
Walker 4								

4. Use the average time to calculate the rate per second.

	Average Rate	
	ft/sec	MPH
Walker 1		
Walker 2		
Walker 3		
Walker 4		

5. Use the average number of steps to calculate the average stride length (in feet).

	Stride Length	
	Feet	Inches
Walker 1		
Walker 2		
Walker 3		
Walker 4		

6. It is _____miles to_____. The approximate time to walk there is _____.

The Clothesline

Name: _____

Date: _____

For each set, record the given values, expressions or drawings. After the discussion of their placement on the clothesline, record them on the number line.

1. _____, _____, _____

2. _____, _____, _____

3. _____, _____, _____

Reflections

Group Work and Class Discourse

How will you facilitate more tasks in your class? Commit to at least one method that you learned today regarding the facilitation of group work or class discourse.

The C-P-A Progression

How will you implement a Concept-Procedure-Application progression? Commit to at least one conceptual lesson, and one application task.

Low-Tech/High-Tech Balance

How well did the presence of both analog and digital activities enhance these lessons? Commit to at least one lesson in which you think a digital component will compliment the analog experience.