Walking to Win
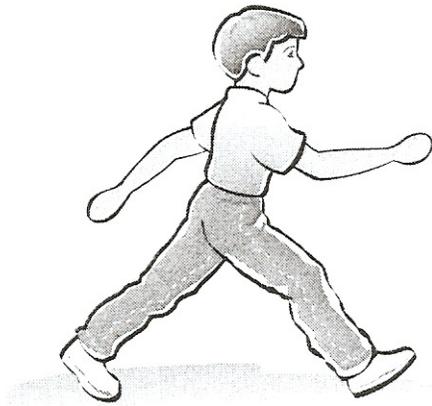
CMST Summer Institute 2006
Final Project

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Final Project - Team I
Walking to Win
Using Stella and Geometer Sketchpad

NYS Standards: Mathematics - 7th Grade

7.R.1: Use physical objects, drawing, charts, tables, graphs, symbols, equations or objects
    created using technology as representations.
7.A.8 Create algebraic patterns using charts/ tables, graphs, equations and expressions.
7.PS.16 Justify solution methods through logical arguments.

Materials:
    Connected Math Books: Moving Straight Ahead
    Computers and programs: Stella, GSP
    Classwork sheets and homework
Essential Question: How can you fix a race?

Objectives:

1. Students will be able to use the Stella Model and Geometer Sketchpad to create a
    graph and a table for the situation purposed by the teacher.
2. Students will demonstrate ability to work in a group; communicating and
    being respectful of others.
3. Students will identify the distance required for a close race given specific conditions
    and provide evidence to support their answer.
4. Students will make observations about the features of the graphs and their
     meaning
5. Students will use the table and graph to answer questions
6. Students will identify how results vary by using the Stella model to manipulate the
    conditions of the race.

Procedures:

1. Show students the PowerPoint to introduce them to the problem they will need
    to solve.
2. Introduce Geometer Sketchpad and the simple Stella Model.
3. Discuss the variables in the problem and what strategies students might use to
    solve the problem.
4. Break students up into groups
5. Pass out worksheet
6. Work time -Students will work with their group to find a solution to the
    problem and the follow up questions.
7. Student volunteers will share solutions and the evidence to support conclusions
8. When finished, students will complete an evaluation of their group members
    and turn into teacher.
9. Homework – Students will be assigned a problem similar to the classwork to
    reinforce their graph interpretation skills.

Summary: Student volunteers will share their solutions and explain why their solution makes sense. We will discuss the features of the graphs, by asking questions about what affects the steepness of the line and what the point of intersection means as well as the what does the point on the y-axis represent.

Goals:

Students will learn how to interpret a graph and or a table to find a solution to a problem. In addition, students will begin to develop an understanding of the concept of slope and the y-intercepts and their effects on the appearance on the graph and tables using the modeling tools Geometer Sketchpad and Stella.

Name_____   Date_____
Moving Straight Ahead Problem 2.4   Classwork

   In Mr. Goldberg's gym class, Emile finds out that his walking rate is 2.5 meters per second. When he gets home from school, he times his little brother Henri, as Henri walks 100 meters. He figures out the Henri's walking rate is 1 meter per second.

   Henri challenges Emile to a walking race, Because Emile's walking rate is faster, Emile gives Henri a **45-meter head start**.

Problem 2.4
Emile knows his brother would enjoy winning the race, but he does not want to make the race so short that it is obvious his brother will win. What would be a good distance to make the race so that Henri will win in a close race? Describe your strategy, and give evidence to support your answer.

Distance for the race_____

 Explanation:

Problem 2.4 Follow Up
What would be a good distance to choose if Emile wants to beat his brother but wants the race to be close? Explain.

Problem 2.5

1. Write an equation for each brother showing the relationship between the time and distance from the starting line.

2. How far from the starting line will Emile overtake Henri? Explain how you can use the table and the graph to answer this question?

3. After how many seconds will Emile overtake Henri? Explain how you can use the table and the graph to answer this question.

4. After 3 seconds, who will be ahead? By how much?

5. How far will Henri be from the starting line when Emile has walked 10 meters?

6. Which graph is steeper? How can you determine which of two lines will be steeper from their tables? From their equations?

7. Explain how you can use the table, the graph, and the equations to determine how far from the starting line each brother will be after 5 minutes.

8. At what points do Emile's and Henri's graphs cross the y-axis? What do these points mean in terms of the race? How can you predict where a graph will cross the y-axis from a table? From an equation?

Graphing using Geometers Sketchpad

To make sure your points will be labeled (optional):
- Under EDIT select PREFERENCES
- Click TEXT Tab
- Under SHOW LABELS AUTOMATICALLY click box next to FOR ALL NEW POINTS

Plot points:
- Under GRAPH, select DEFINE COORDINATE SYSTEM
- Under GRAPH, select GRID FORM then RECTANGULAR GRID
- Choose appropriate scale for x and y axis:

  - Click on the Arrow selection tool
  - Place arrow on the unit point on the axis
  - Click and Drag toward origin until the desire scale is reached
- Under GRAPH, select PLOT POINTS
- Enter the x and y value and then click OK
- Click DONE when all points have been entered

To create the line:

- Click on the Arrow selection tool
- Click on beginning point and end point in order to highlight it.
- Under CONSTRUCT select segment

To change color

- Click on the Arrow selection tool
- Click on object to high light it
- Under DISPLAY select color

Name_____   Date_____
Moving Straight Ahead Problem 2.4   Homework

Emile's friend Yvette joins the race. Yvette has a head start of 20 meters and walks at 2 meters per second.

   A)   Copy and complete the table below to show Yvette's distance from
        the starting line for 0 to 7 seconds.

Time (seconds)	Distance (meters)
0	20
1	
2	
3	
4	
5	
6	
7	

   B)   Which of the following equations gives the relationship between
        Yvette's distance from the starting line, d, and the time t?
        a. d = 20 + 2t
        b. d = 2 + 20
        c. d = 20t + 2
        d. d = 20 + t
        e. none of the above

12. Ingrid stops at Tara's house on her way to school. Tara's mother says that Tara left 4 minutes ago. Ingrid leaves Tara's house, running to catch up with Tara. The graph below shows the distance each girl is from Tara's house, starting from the time Ingrid leaves Tara's house.
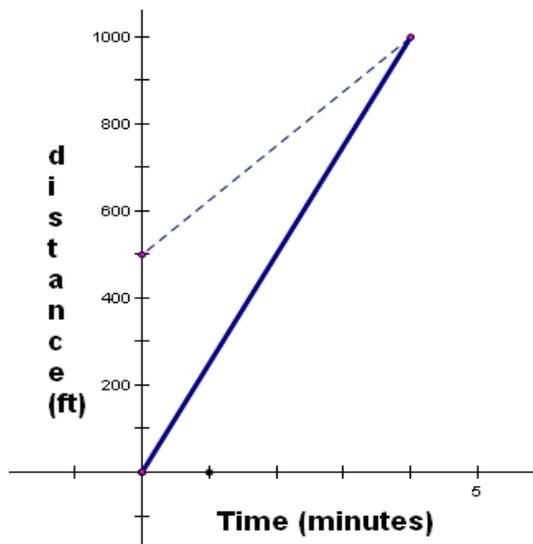
a. In what way is this situation like the race between Henri and Emile? In what way is it different?

b. After how many minutes does Ingrid catch up with Tara? Explain.

c. How far from Tara's house does Ingrid catch up with Tara? Explain.

d. Each graph intersects the distance axis (the y-axis). What information do the points of intersection give about the problem?

e. Which line is steeper? How can you tell from the graph? How is the steepness of each line related to the rate at which the person travels?

f. What do you think the graphs would look like if we extended them to show distance and time after the girls meet?

Rubric:

Peer Evaluation 0 = 0 1 = 5 2 – 10 3 = 15 4 = 20 (out of 20)	Student has not participated and has been removed from the group. 0 pts.	Student does not participate in group work and has been disruptive or talkative and off task. Student was unable to show an understanding of the graph created in GSP 1 pt.	Student has participated little in group work, but was off task frequently. Student was unable to show an understanding of the graph created in GSP 2 pts.	Student has participated in group work and has cooperated; however, he/she was off task once or twice. Student was able to show an understanding of the graph created in GSP 3 pts.	Student participated in group work and stayed on task until the activity was completed and showed good effort. Student was able to show an understanding of the graph created in GSP 4 pts.	
Points for problems on Class Work Assignment 10 questions @ 2 pts. per question, including example (out of 20)	Did not make any attempt to complete class work assignment 0 pts.	Student completed 1- 5 questions on classwork assignment. Answers were correct or a correct strategy was clear. 10 pts.	Student completed six or seven questions on classwork assignment. Answers were correct or a correct strategy was clear. 14 pts.	Student completed eight questions on classwork assignment. Answers were correct or a correct strategy was clear. 16 pts.	Student completed nine questions on classwork assignment. Answers were correct or a correct strategy was clear. 18 pts.	Student completed ten questions on classwork assignment. Answers were correct or a correct strategy was clear. 2018 pts.

PEER EVALUATION FORM

Name:_____

Date:_____

Home Base:_____

The members of my group today were:

1.   Rate: 0 1 2 3 4

2.   Rate: 0 1 2 3 4

3.   Rate: 0 1 2 3 4
4.   Rate: 0 1 2 3 4

Rate each member under for cooperation and participation from 0 – 4 and circle the number next to his/her name above. (4 is the highest rate; 0 is the lowest.)

Did all members of your group contribute evenly? If not, please make a comment below:

_____

_____

_____

_____

One thing I learned from today's lesson was:

_____

_____

_____

_____