<table>
<thead>
<tr>
<th><strong>Item Name:</strong></th>
<th><em>Not Applicable</em></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Item Type:</strong></td>
<td>Constructed Response (Short)</td>
</tr>
<tr>
<td><strong>Subject and/or Domain:</strong></td>
<td>Mathematics/ Linear Relationships</td>
</tr>
<tr>
<td><strong>Common Core Standards:</strong></td>
<td>F-IF Interpret functions that arise in applications in terms of context.</td>
</tr>
</tbody>
</table>
| **Developer/Source:** | National Assessment of Educational Progress (NAEP)  
National Center for Statistics (NCES)  
US Department of Education  
| **Item Features:** | Administration: On demand / standardized  
Length of time for response: 25 min/section  
Method of scoring: Correct/Incorrect (Closed response)  
Opportunity for student collaboration: None  
Opportunity for teacher feedback and revision: None |

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Stanford University

2011
14. Each figure in the pattern below is made of hexagons that measure 1 centimeter on each side.

**Figure 1**
Perimeter = 6 cm

**Figure 2**
Perimeter = 10 cm

**Figure 3**
Perimeter = 14 cm

**Figure 4**
Perimeter = 18 cm

If the pattern of adding one hexagon to each figure is continued, what will be the perimeter of the 25th figure in the pattern?
Show how you found your answer.

<table>
<thead>
<tr>
<th>Item Name:</th>
<th>Not Applicable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Item Type:</td>
<td>Standardized Performance Tasks</td>
</tr>
<tr>
<td>Subject and/or Domain:</td>
<td>Mathematics/ Linear Relationships/Scatter Plots</td>
</tr>
</tbody>
</table>

**Common Core Standards:**
- F-IF Interpret functions that arise in applications in terms of context.
- F-BF Build a function that models a relationship between two quantities.
  1. Write a function that describes a relationship between two quantities.
  a. Determine an explicit expression.
- A-REI Reasoning with Equations and Inequalities
- S-ID Summarize, represent, and interpret data on two categorical and quantitative variables

**Mathematical Practices:**
- 1. Make sense problems - persevere in solving them
- 4. Model with mathematics.
- 7. Look for and make use of structure.
- 8. Look for regularity in repeated reasoning.

**Developer/Source:**
- Silicon Valley Mathematics Initiative (SVMI), Stanford Center for Assessment, Learning, and Equity (SCALE), and New York City Department of Education

**Item Features:**
- Administration: On Demand/standardized
- Length of time for response: 3-4 days
- Method of scoring: Rubric
- Opportunity for student collaboration: No
- Opportunity for teacher feedback and revision: No

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![SCALE logo](https://example.com/scale_logo.png)

Stanford Center for Assessment, Learning, & Equity
# Mathematics Performance Assessment

## Algebra 1

New York City Math Pre-test 2011-12

![Place Label Here](image)

<table>
<thead>
<tr>
<th>Task</th>
<th>Score 1</th>
<th>Score 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Party Flags</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scatter Diagrams</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Toothpick Squares</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Graphs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Two Solutions</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Party Flags

This problem gives you the chance to:
• find sizes by interpreting a diagram
• express a function by a formula

Erica is putting up lines of colored flags for a party.
The flags are all the same size and are spaced equally along the line.

1. Calculate the length of the sides of each flag, and the space between flags.
   Show all your work clearly.

   The sides of each flag measure ______________ cm.

   The space between flags measures ______________ cm.

2. How long will a line of n flags be?
   Write down a formula to show how long a line of n flags would be.

   __________________________________________
   __________________________________________
Scatter Diagram

This problem gives you the chance to:
- discuss and understand a scatter plot of real data

A group of 66 students took two tests; Test A and Test B.
In the scatter diagram, each square represents one student and shows the scores that student got in the two tests.

1. The mean score for Test A was 19 and the mean score for Test B was 16.
   Plot a point to show this on the scatter diagram.

2. Draw a line of best fit on the scatter diagram.
   How can a line of best fit be used?
3. Here are five statements about the scores shown on the scatter diagram. If a statement is true check (√) it. If it is not true, write a correct statement.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Check (√) or write correct statement</th>
</tr>
</thead>
<tbody>
<tr>
<td>The scatter diagram shows positive correlation between the scores on Test A and the scores on Test B.</td>
<td></td>
</tr>
<tr>
<td>The lowest score on Test A is lower than the lowest score for Test B.</td>
<td></td>
</tr>
<tr>
<td>The range of scores on Test B is 25.</td>
<td></td>
</tr>
<tr>
<td>The student with the highest score on Test A also has the highest score on Test B.</td>
<td></td>
</tr>
<tr>
<td>The biggest difference between a student’s scores on the two tests is 5.</td>
<td></td>
</tr>
</tbody>
</table>

***STOP: Do not proceed until instructed by your teacher***
**Toothpick Stairs**

This problem gives you the chance to:
- extend and check patterns in a geometric situation
- derive formulas connecting pairs of variables

Jake makes staircases with toothpicks arranged in squares. He counts the number of toothpicks he uses and makes a table to show his findings.

1. Complete Jake’s table.

<table>
<thead>
<tr>
<th>Staircase number</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of toothpicks on the perimeter of each staircase</td>
<td>4</td>
<td>8</td>
<td>12</td>
<td>20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of toothpicks inside each staircase</td>
<td>0</td>
<td>2</td>
<td>6</td>
<td>20</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2. How many toothpicks are there on the perimeter of Staircase 7? Explain how you figured it out.

3. How many toothpicks are there inside Staircase 8? Explain your reasoning.
4. Write down a rule or formula linking the number of toothpicks on the perimeter, $P$, with the staircase number, $S$.

5. Write down a rule or formula linking the number of toothpicks inside the staircase, $I$, with the staircase number, $S$.

Explain how you figured it out.
Graphs

This problem gives you the chance to:  
• relate given line graphs to their equations

Here is a graphical diagram:
1. Choose the correct label for each feature of the diagram from this list. Write its letter in the correct place in the diagram. (Not all the letters are needed.)

   A  The line $y = 0$
   B  The line $x = 0$
   C  The line $x = 6$
   D  The line $y = 6$
   E  The origin
   F  The line $y = \frac{1}{2} x$
   G  The line $x + y = 9$
   H  The line $y = x + 6$
   I  The line $y = x - 6$
   J  The solution of the simultaneous equations $x + y = 9$ and $y = \frac{1}{2} x$
   K  The solution of the simultaneous equations $x + y = 9$ and $y = 2x$

2. Which point is on the line $y = 6$ and on the line $x = 6$? __________________________

3. Write the equation of any straight line that goes through the point (3,6).

   __________________________
Two Solutions

This problem gives you the chance to:
• find solutions to equations and inequalities

1. For each of the following equalities and inequalities, find two values for $x$ that make the statement true.
   a. $x^2 = 121$ 
   b. $x^2 = x$
   c. $x^2 < x$
   d. $(x-1)(5x^4 - 7x^3 + x) = 0$
   e. $1776x + 1066 \geq 365$
   f. $x^2 > x^3$
   g. $|x| > x$
2. Some of the equations and inequalities on the page opposite have exactly two solutions; others have more than two solutions.

a. Write down two equations or inequalities that have exactly two solutions. Explain your answer.

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

b. Write down one equation or inequality that has more than two solutions, but not infinitely many solutions. Explain your answer.

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

c. Write down two equations or inequalities that have an infinite number of solutions.

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________
<table>
<thead>
<tr>
<th>Item Name:</th>
<th>Not Applicable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Item Type:</td>
<td>Selected Response</td>
</tr>
<tr>
<td>Subject and/or Domain:</td>
<td>Mathematics/ Linear Relationships</td>
</tr>
<tr>
<td>Developer/Source:</td>
<td>California Department of Education (CDE) Released Test Questions in Algebra I (2009)</td>
</tr>
<tr>
<td>Item Features:</td>
<td>Administration: On demand / standardized Timed session for 65 items Method of scoring: Correct/Incorrect (Closed response) Opportunity for student collaboration: None Opportunity for teacher feedback and revision: None</td>
</tr>
</tbody>
</table>

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Scale
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Stanford University

2011
Some ordered pairs for a linear function of $x$ are given in the table below.

<table>
<thead>
<tr>
<th>$x$</th>
<th>$y$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>7</td>
</tr>
<tr>
<td>5</td>
<td>13</td>
</tr>
<tr>
<td>7</td>
<td>19</td>
</tr>
</tbody>
</table>

Which of the following equations was used to generate the table above?

A. $y = 2x + 1$
B. $y = 2x - 1$
C. $y = 3x - 2$
D. $y = 4x - 3$

<table>
<thead>
<tr>
<th><strong>Item Name:</strong></th>
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</tr>
</thead>
<tbody>
<tr>
<td><strong>Item Type:</strong></td>
<td>Complex Performance Tasks</td>
</tr>
<tr>
<td><strong>Subject and/or Domain:</strong></td>
<td>Mathematics/ Linear Relationships</td>
</tr>
</tbody>
</table>

**Common Core Standards:**

- F-IF Interpret functions that arise in applications in terms of context.
- F-BF Build a function that models a relationship between two quantities.
  1. Write a function that describes a relationship between two quantities.
  a. Determine an explicit expression.

**Mathematical Practices:**

1. Make sense problems - persevere in solving them
2. Reason abstractly and quantitatively.
4. Model with mathematics.
7. Look for and make use of structure.
8. Look for regularity in repeated reasoning.

**Developer/Source:**

- Silicon Valley Mathematics Initiative (SVMI), Stanford Center for Assessment, Learning, and Equity (SCALE), and New York City Department of Education

**Item Features:**

- Administration: Curriculum-Embedded/standardized
- Length of time for response: 3-4 days
- Method of scoring: Rubric
- Opportunity for student collaboration: Yes
- Opportunity for teacher feedback and revision: Yes

---

Collection of assessment items compiled by

**SCALE**
Stanford Center for Assessment, Learning, & Equity

Stanford University, 2011
Consider the following function that generates the geometric pattern of a reverse growing fir tree.

**Stage 1**

![Stage 1](image)

2 unit squares

**Stage 2**

![Stage 2](image)

6 unit squares

**Stage 3**

![Stage 3](image)

12 unit squares

**Stage 4**

![Stage 4](image)

1. Draw and describe **Stage 5** of the pattern in terms of its shape and number of unit squares needed to construct the fir tree.
2. Describe how the pattern is growing?

3. How many unit squares are needed to build a Stage 10 Aussie Fir Tree? Show your work.

4. Given any stage number $n$, determine a closed form equation to determine the amount of unit squares needed to build the tree.

5. Your mate tells you that exactly 274 unit squares will make an Aussie Fir Tree. He is wrong. Explain to him why his statement is false.
ADMINISTRATIVE GUIDELINES FOR LONG TASKS

CLASSROOM ENVIRONMENT: The testing environment should be as close to a normal classroom environment as possible. If calculators, rulers, graph paper, or manipulatives are used routinely in class, they may also be used during the assessment task. The decision for using these materials should come from students, not be suggested by the teacher. For specific problems, manipulatives, such as cubes or isometric dot paper, may be made available to help students the problem. The teacher may mention that these resources are available, but should not suggest or demonstrate how to use the materials.

Task Administration: The teacher should spend about five minutes introducing the task and reading the task to students. While students may work in groups, the teacher should listen to student thinking and strategies to gain information about common misconceptions as assessment for further instruction. The teacher should not give explanations or hints about how to solve the problem. The purpose of the assessment task is to see how students are progressing in their ability to think through an unusual task and develop a longer chain of reasoning.

Time: 3-4 days composed of 2 class periods and time to work and to explore for homework in between. On the first day the teacher should launch the task by stating, “I have some interesting problems for you to try. I am curious to see how you can apply what you’ve learned when presented with an unusual problem. I want to see how well you can persevere with a problem that may involve some false starts, changes in approach, revising and refining your ideas. George Polya, a famous mathematician, said that a problem isn’t a problem if you can solve it in 24 hours. Today, I am going to read the problem and give you 5 to 10 minutes to think about how to solve the problem on your own. Then you may work in pairs or groups of three or four to discuss and work on the problem together. Make sure that everyone in the group has a chance to share ideas and to ask questions of each other to make sure you understand what is being said and why it makes sense. You may use any materials in the classroom to help you investigate the problem. (You might individualize this statement if you have the blocks or isometric dot paper available.)

1. The question requires you to show your work and explain your thinking. You may use drawings, words, and numbers in your explanations. Your answer should be clear enough so that another person can read it and understand your thinking. It is important that you show all you work.

2. If you make a mistake, do not erase. Just put a small line through false starts or mistakes and continue with your thinking.

3. This is an opportunity to show your best mathematical skills and thinking.

While students may talk to each other during this period, neither the teacher nor the students should make explanations or share findings with the class. The teacher should resist answering clarifying questions or giving hints about solution strategies or how to organize their work. This is an
opportunity for students to develop their abilities at working on longer chains of reasoning than those tasks given in traditional textbooks.

Allow or encourage students to continue working on the task for the next two or three days for homework.

On the final day, students should be given a clean copy of the task and access to all their notes. They should then work individually to produce a final product with their thinking, solutions, and justifications. Students should be reminded that, “The question requires you to show your work and explain your thinking. You may use drawings, words, and numbers in your explanations. Your answer should be clear enough so that another person can read it and understand your thinking. It is important that you show all you work. This is an opportunity to show your best mathematical skills and thinking. At the end of class, students should turn in their clean copy and staple their draft and/or notes to the paper.
<table>
<thead>
<tr>
<th>Item Name:</th>
<th>Not Applicable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Item Type:</td>
<td>Constructed Response (Long)</td>
</tr>
<tr>
<td>Subject and/or Domain:</td>
<td>Mathematics/ Linear Relationships</td>
</tr>
<tr>
<td>Common Core Standards:</td>
<td>F-IF Interpret functions that arise in applications in terms of context. F-BF Build a function that models a relationship between two quantities. 1. Write a function that describes a relationship between two quantities. a. Determine an explicit expression. MP 3. Construct viable arguments and critique the reasoning of others.</td>
</tr>
<tr>
<td>Developer/Source:</td>
<td>University of Cambridge International Assessments</td>
</tr>
<tr>
<td>Item Features:</td>
<td>Administration: On demand / standardized Length of time for response: 25 min/section Method of scoring: Correct/Incorrect (Closed response) Opportunity for student collaboration: None Opportunity for teacher feedback and revision: None</td>
</tr>
</tbody>
</table>

Collection of assessment items compiled by

```
SCALE
Stanford Center for Assessment, Learning, & Equity
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Stanford University

2011
Ameera makes a sequence of patterns using counters. The first three patterns are shown.

<table>
<thead>
<tr>
<th>Pattern number (p)</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of counters (c)</td>
<td>5</td>
<td>8</td>
<td>11</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(a) Complete the table.  

(b) Work out the number of counters in Pattern 10.

(c) Find the formula for the number of counters, c, in pattern p.

\[ c = \boxed{...} \]  

(d) Ameera thinks that she can make one of these patterns with exactly 60 counters. Explain why she is wrong.

\[ \boxed{...} \]
<table>
<thead>
<tr>
<th><strong>Item Name:</strong></th>
<th><em>Not Applicable</em></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Item Type:</strong></td>
<td>Complex Extended Project</td>
</tr>
<tr>
<td><strong>Subject and/or Domain:</strong></td>
<td>Mathematics/ Linear Relationships/Rate of Change</td>
</tr>
<tr>
<td><strong>Developer/Source:</strong></td>
<td>West Virginia, Department of Education Teach 21st Century Skills Project <a href="http://wvde.state.wv.us/teach21/">http://wvde.state.wv.us/teach21/</a></td>
</tr>
</tbody>
</table>

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Stanford Center for Assessment, Learning, & Equity

Stanford University, 2011
**Title:** Is There Safety in Slopes?

**Creator:** Holland, Myrtle  
*mholland@access.k12.wv.us*

**Source:** Secondary PBL Project, 2008-2009

---

**Project Idea:** Due to overcrowding at Mountaineer High School, new portable classrooms have been added. The new classrooms do not have wheelchair ramps. New ramps need to be designed. Your group is on the school improvement committee and has been asked to design these ramps. Your group should consider recommendations from wheelchair bound persons, available space, regulation codes, materials, and monetary constraints. Your team will create a presentation that has a design/model for the ramps and a cost estimate for the design. That presentation will be made to the principal and the head of maintenance for the board of education.

**Entry Event:** Have students use a wheelchair on pre-existing ramps. This will spur their thoughts toward the reality of using a wheelchair. Following the activity, discuss student perceptions of the activity. Invite the head of maintenance and/or the county safety director in to discuss ramps and the related code regulations.

**Power Standard:** Students will identify slope and rate of change in linear relationships and utilize the patterns developed to pose a question, collect and analyze data, and justify solutions of real life situations with and without technology.

---

<table>
<thead>
<tr>
<th>Content Standards &amp; Objectives</th>
<th>Identified Learning Target</th>
<th>Evidence of Success in Achieving Identified Learning Target</th>
</tr>
</thead>
</table>
| **Objectives Directly Taught or Learned Through Discovery** | Knowledge  
- Define slope in various situations. (e.g. linear, rate of change, geometric)  
- Determine the slope from an equation.  
- Determine the slope from a graph. Determine slope from two points on a line. | - Student created crossword/word search for definitions of slope  
- Group PowerPoint presentation  
- Journal/Notebook  
- Teacher created quiz/test  
- Journal reflections |
| M.O.A.1.2.6 | | |
| - determine the slope of a line through a variety of strategies (e.g. given an equation or graph). | |
| **M.O.A.1.2.7** | Knowledge  
- Recognize the equation of a line.  
- Use the equation of a line to analyze and solve real world problems.  
- Determine the equation of a line given the graph of a line.  
- Determine the equation of a line given two points on the line.  
- Determine the equation of a line given the slope and a point on the line.  
- Determine the equation of a line given the slope of a line and the y intercept. | - Journal/Notes  
- Teacher created test/quiz  
- Matching Activity  
- Matching Instructions  
- Equation/table/graph Cards  
- Project: Culminating Assessment |
| - analyze situations and solve problems by determining the equation of a line given a graph of a line, two points on the line, the slope and a point, or the slope and y intercept. | |
| **M.O.A.1.2.8** | Knowledge  
- Define rate of change.  
- Pose a question; make a hypothesis as to the answer.  
- Develop, justify, and implement a method to collect, organize, and analyze related data; extend the nature of collected, discrete data to that of a continuous linear function that describes the known data set; generalize the results to make a conclusion; compare the hypothesis and the | - Journal /Notebook  
- Teacher supplied situations (business, construction, stairs, roofs, ramps, )  
- Pythagorean Theorem Applications  
- Project: Culminating Assessment |
<p>| - identify a real life situation that involves a constant rate of change; pose a question; make a hypothesis as to the answer; develop, justify, and implement a method to collect, organize, and analyze related data; extend the nature of collected, discrete data to that of a continuous linear function that describes the known data set; generalize the results to make a conclusion; compare the hypothesis and the | |</p>
<table>
<thead>
<tr>
<th>21st Century Skills</th>
<th>Learning Skills &amp; Technology Tools</th>
<th>Teaching Strategies Culminating Activity</th>
<th>Evidence of Success</th>
</tr>
</thead>
<tbody>
<tr>
<td>Information and Communication Skills:</td>
<td>21C.O.9-12.1.LS1 - Student recognizes information needed for problem solving, can efficiently browse, search and navigate online to access relevant information, evaluates information based on credibility, social, economic, political and/or ethical issues, and presents findings clearly and persuasively using a range of technology tools and media.</td>
<td>-The teacher will provide opportunities utilizing direct instruction, collaborative grouping, graphing calculators, and/or computer skills for students to accomplish LS.1.</td>
<td>-Students will be given opportunities to use various media/technology tools find information that is relevant for problem solving. Wheelchair Ramp PPT Culminating Assessment</td>
</tr>
<tr>
<td></td>
<td>21C.O.9-12.1.TT4 - Student uses audio, video, pictures, clip art, moviemaker programs, webpage design software, electronic documents and other files to collaborate for the creation of electronic products that inform multiple audiences both inside and outside the school environment.</td>
<td>-Teachers will provide opportunities for students to use software, digital cameras, flip cameras, etc. to accomplish TT.4.</td>
<td>-Students will create slide shows, movies, etc. to demonstrate knowledge. Wheelchair Ramp PPT Culminating Assessment Presentation Medium Proposal</td>
</tr>
<tr>
<td>Thinking and Reasoning Skills:</td>
<td>21C.O.9-12.2.LS2 - Student draws conclusions from a variety of data sources to analyze and interpret systems.</td>
<td>-Teacher will provide direct instruction, collaborative grouping, and data for accomplishment of LS.2.</td>
<td>-Students will be given opportunities to draw conclusions from a variety of sources. Matching Game Wheelchair Ramp PPT Culminating Assessment</td>
</tr>
<tr>
<td></td>
<td>21C.O.9-12.2.TT2 - Student collaborates with peers, experts and others to contribute to a content-related knowledge base by using technology to compile, synthesize, produce, and disseminate information, models, and other creative</td>
<td>-Teacher will provide opportunities for students to work in collaborative groups.</td>
<td>-Students will be given opportunities to collaborate with peers and others to contribute information to produce a product.</td>
</tr>
</tbody>
</table>
### Personal and Workplace Skills:

<table>
<thead>
<tr>
<th>21C.O.9-12.3.LS4</th>
<th>21C.O.9-12.3.TT8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student demonstrates ethical behavior and works responsibly and collaboratively with others in the context of the school and the larger community, and he/she demonstrates civic responsibility through engagement in public discourse and participation in service learning.</td>
<td>Student uses technology to seek strategies and information to address limits in their own knowledge.</td>
</tr>
</tbody>
</table>

### Performance Objectives:

#### Know:
- Definitions of slope
- Definition of rate of change
- The slope–intercept form of a linear equation \((y=mx+b)\)
- How to recognize slope and y-intercept in a linear equation.
- What the slope and y-intercept represent in a real world situation.
- How to recognize the solution of a linear equation.
- How slope and rate of change are related.
- How slope, rate of change, and proportionality are related.
- How slope and right angle properties are related.
- How to recognize a linear equation in different forms.
- The Pythagorean Theorem

#### Do:
- Identify the slope and y-intercept in various linear equation forms.
- Write linear equations in various forms.
- Determine the solution to a linear equation.
- Graph linear equations in different forms.
- Find slope using various method and in various situations.
- Identify the rate of change in a graph and/or real life situation
- Use slope concepts to solve a real world problem
- Use scale models to represent and solve real world problems.
- Use the Pythagorean Theorem to find distance.
Measure and construct angles.

### Driving Question:
How can mathematics be used to create a wheelchair ramp that is appropriate for a given site?

### Assessment Plan:

<table>
<thead>
<tr>
<th>Activity One - PPT</th>
<th>Different types of Wheelchair Ramps</th>
</tr>
</thead>
<tbody>
<tr>
<td>In this project, students will find various pictures of wheelchair ramps and will put their findings and perceptions into a power point presentation.</td>
<td></td>
</tr>
</tbody>
</table>

Scenario: Use the internet and/or digital cameras to make a slide show of wheelchair ramps. Use your earlier perceptions of the ramps around the school to evaluate the safety and ease of use of the ramps you will use in your project. Include pictures of ramps that appear safe and unsafe.

**Wheelchair Ramp PPT Rubric**

<table>
<thead>
<tr>
<th>Activity Two- Pythagorean Theorem Applications</th>
</tr>
</thead>
<tbody>
<tr>
<td>In this activity students will sketch and calculate various problems using the Pythagorean Theorem. Each group will present to the class one of the problems using chart paper, document camera, etc. Each group will turn in problem seven as an assessment.</td>
</tr>
</tbody>
</table>

### Culminating Assessment – Ramp Project Presentation

The culminating Activity has students using all the tools learned from the unit to make and display a model in some form of a wheelchair ramp. Students will use the measurements taken during the project, to make a presentation that includes an appropriate scaled model. The model can be on graph paper, in a power point, an actual 3D representation made of some material. This will be left up to the group. The presentation needs to make recommendations about the safety of the ramp, its possible costs, materials to be used, and why the ramp was designed as it was.

Scenario: Due to overcrowding at Mountaineer High School, new portable classrooms have been added. The new classrooms do not have wheelchair ramps. New ramps need to be designed. Your group is on the school improvement committee and has been asked to design these ramps. Your group should consider recommendations from wheelchair bound persons, available space, regulation codes, materials, and monetary constraints. Your team will create a presentation that has a design/model for the ramps and a cost estimate for the design and make a presentation to the principal and the head of maintenance for the board of education.

**Culminating Assessment Rubric**

<table>
<thead>
<tr>
<th>Major Group Products</th>
<th>Slide shows/movie- Project- Wheelchair Model Presentation- Rubric</th>
</tr>
</thead>
</table>
| Major Individual Projects | Crossword puzzles  
Slope triangles  
Slope-Project Journal /Notebook |

### Assessment and Reflection:

<table>
<thead>
<tr>
<th>Rubric(s) I Will Use:</th>
</tr>
</thead>
</table>
| Collaboration  
Project- Culminating assessment presentation Rubric |
| Written Communication  
Culminating assessment |
| Critical Thinking & Problem Solving |
| Content Knowledge |
| Oral Communication  
Project Presentation Rubric –see above Rubric |
| Other |

### Other Classroom Assessments For Learning:

| Quizzes/Tests  
Self-Evaluation  
Individual Responsibility sheet  
Self and Team Evaluation |
| Practice Presentations  
Notes |
**Project Map for Is There Safety in Slopes?**

### Knowledge and Skills Needed

<table>
<thead>
<tr>
<th>Knowledge and Skills Needed</th>
<th>Already Have Learned</th>
<th>Taught Before the Project</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Measuring and Drawing Angles</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>2. Pythagorean Theorem Review</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>3. Constructing Scale Drawings/Proportionality</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>4. Slope/Rate of Change Concepts</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Distance Formula</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Linear Equations Concepts</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Right Triangle Properties</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>8. Presentation Software</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Oral Presentation Skills</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Group Collaboration Skills</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Resources:

**School-based Individuals:** Head custodian, students or staff principal, wheelchair-bound member, School nurse, Technology:

Computer Lab, ELMO, Interactive Whiteboard, Internet Access, Digital Cameras

**Community:** Head of County Maintenance, County Planning Commission member, Contractor/Building supply employee

**Materials:** Copies of project plan, graph paper, dot paper, Protractors, compasses, PPT software, word processing software, computer lab access

### Manage the Process:

**Phase one: Days 3-11**

During the first phase, the teacher will use various strategies of instruction to teach the following concepts: angle measurement, right triangle relationships, angle of slope/rise/run, proportionality, scale model, (specifically triangles), Pythagorean Theorem and applications, and the distance formula.

**Lesson strategies:**

To teach right angle relationships and angle measurement, use square dot paper (see attachment) to draw right triangles. Students will then find rise and run measurements and measure the angles to investigate the relationships. Give students the angle of slope to draw in order to determine the rise and run measurements. Students can also investigate how steps and stairways relate to ramps/right triangles. After these investigations, have student move on to scale drawing as related to right triangles. This will naturally move the students into the Pythagorean Theorem and applications using the theorem. The Pythagorean Theorem Application handout should be used by the team/group and the teacher may want to work problem 7 with students or give a similar problem in another class period before giving problem 7. To check for understanding different groups could present to the class the first six problems and the hand in the seventh as an assessment if desired by the teacher. Problem 7 is necessary as an ingredient to help create and solve the culminating assessment. Students groups can be asked to create their own application problems which can shared with other groups. Students should always be given the
opportunity to record vocabulary, notes and reflections in their journals/notebooks during the length of the project.

**Phase Two: Days 15-19; 23-29**

During phase two, the emphasis will be on algebraic slope concepts. Utilizing a variety of teaching and technology strategies, develop slope as related to change in y values over the change in x values, slope as rate of change, and slope as related to linear equations.

**Lesson strategies:**

To teach these concepts, first have students collect and record all of the synonyms of the word SLOPE and all the things that have slope. Students can then play a game of “Cross Out”. In groups of 3 or four, students give their list of words meaning slope. If others share that word, they all cross out the word in their list. After everyone has given their list, the person with the most words not crossed out wins. Do the same with things that have slope. As an assessment, students may create a word search that contains all the words that mean slope and the list of things that have slope. [http://puzzlemaker.discoveryeducation.com/WordSearchSetupForm.asp](http://puzzlemaker.discoveryeducation.com/WordSearchSetupForm.asp).

An interesting option here would be to look at NASCAR Tracks and the angles of slope that are found in the banked sections of the tracks. [http://www.nascar.com/races/tracks/](http://www.nascar.com/races/tracks/).

To introduce slope of a line, give each student a coordinate plane and have them graph and connect two ordered pairs, i.e. (-2,-3), (3,5). Ask students how to find the slope of the line. Hopefully someone will suggest finding the rise/run or to make the right triangle to determine the slope. If no suggestions are given, use questioning techniques to bring out the solution. From here move into the different types of slope, using the formula to find slope, slope as rate of change, using slope/rate of change to interpret charts, slope intercept form, graphing lines using slope intercept, determining linear equations given two points, etc.

**Phase Three: Days 15-35**

This phase can run concurrently or after the assessment of phase two. In this phase students will start their group presentation. Student groups will need to decide which medium/format they will use for their presentation. They will turn in their proposals to the teacher. ([Presentation Medium Proposal](#)) The students need to take measurements of an area to be used for the ramp or be given the dimensions if a place is not available. Also during this time period, students will need to determine possible construction and material costs to be included in their presentation. The remainder of the time can be left for student group prep time and presentation prep time.

**Differentiated Instruction Strategies:**

This project is created to increase understanding of students of all levels. Student groups can be teacher designed or student designed but always make sure that students with disabilities have someone that can be ‘player-coach’ with them. Higher level students can be given enrichment topics and lower level students can have their assignments shortened. The teacher should continually be moving around the room checking student understanding. Also sporadically checking student journals may also keep students on the correct track. For students that may be having problems with a specific topic, during group meeting time have small learning centers set up for review of the topic. All students have gifts. Some may struggle with computation but their spatial reasoning is great, so if the teacher notices this, during group meeting time, the teacher can counsel with each group making recommendations for assignments. This is also helpful when students do not have access to technology at home, so one person in the group can be assigned a topic to research at home. Give opportunities during the whole process for student groups to present small presentations as well as individual student presentations. This will increase student comfort in front of a group as well as presentation skills.

**Project Evaluation:**

Evaluate the culminating presentation- students will use the [culminating assessment rubric](#) to evaluate their presentation before the actual presentation. The teacher and others will use the rubric to evaluate the presentation of each group.

Team and Self Evaluations –students have several self and team evaluation and reflection forms: [Need and Need to Know](#) form which lets the students brainstorm where they need help with the project. The [Individual Responsibility Sheet](#) has students listing the individual responsibilities that they have during the project/presentation. The [Team Presentation Responsibility Sheet](#) has the whole team listing the responsibilities needed to accomplish the presentation. The [Team and Self Evaluation](#) form is completed
after the final presentation. Students will evaluate and reflect about themselves and then the group. The **Team Timeline** form allows the team to set time goals for every part of the project to keep the team on schedule.

Teacher Evaluation forms – the teacher will get a copy of all the above forms to keep for each group to review for student evaluations. Especially important is the Team and Self Evaluation form and the Presentation rubric. The teacher will also get the **Presentation Medium Proposal** form from each group which outlines how each presentation will be made and in what medium. The teacher will also have to determine a way to evaluate student journals. Perhaps students should keep a list of topics in order for the teacher to check off.

**Resource Files**

- UP3329WS2.doc (http://wveis.k12.wv.us/Teach21/CSO/Upload/UP3329WS2.doc)
- UP3329WS5.doc (http://wveis.k12.wv.us/Teach21/CSO/Upload/UP3329WS5.doc)
- UP3329WS15.doc (http://wveis.k12.wv.us/Teach21/CSO/Upload/UP3329WS15.doc)