# LEVEL 9 Mathematics Observation

Student: ____________________________________________________  
Assessment Date: ___________  Grade in School: __________________

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<th>Concepts Evaluated</th>
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| 1. Applying the concept of slope to determine rate of change  
   Equation of a line: slope-intercept form | | |
| 2. Finding length of one side of a right triangle from 2 known sides  
   Classifying triangles by side lengths, solving problems  
   Ratio of perimeters and areas of figures having same shape | | |
| 3. Graphing lines given equations in various forms  
   Graphing of lines: slope and where the line crosses the y-axis  
   Writing equation of a line given slope and point on line | | |
| 4. Solving an equation or formula for one of its variables  
   Calculating the volume of a pyramid and cone  
   Operations with fractions and mixed numbers | | |

Director’s Comments:
1. Determine the slope of each line.
   
a. Line \( a \) passes through point \((2.5, 3.75)\) and point \((4.0, 4.95)\).

b. Line \( b \) is represented by the linear equation \( 4y + 3x = 16 \).

c. Line \( c \) is graphed below.

[Graph of a line drawn on a grid]
2. The figures below show two similar right triangles.

\[ \triangle ABC \sim \triangle DEF \]

a. Use the Pythagorean Theorem to determine the length of \( \overline{AB} \).

b. Calculate the area of \( \triangle ABC \).

c. Use a proportion to determine the length of \( \overline{EF} \).
d. Calculate the area of $\triangle DEF$.


e. Express the ratio of the areas of $\triangle ABC$ and $\triangle DEF$ in simplest form.

f. What is the ratio of the perimeters of $\triangle ABC$ and $\triangle DEF$? Explain how this ratio can be found without calculating the perimeters of the two triangles.
3. Consider the linear equation \( y - 5 = \frac{3}{2}(x - 1) \).

   a. Graph the equation using the point-slope method. Explain each step.
b. Explain how the graph of the line through the given point will change if the slope is changed to 1.8.
4. The formula for calculating the volume of a rectangular pyramid is \[ V = \frac{1}{3} Bh, \]
   where \( B \) is the area of the base of the pyramid and \( h \) is the height of the pyramid.

   a. Use the formula for the volume of a rectangular pyramid to write a formula that can be used to solve for \( h \).

   b. Use this new formula to solve for the height of a pyramid with a volume of 378 ft\(^3\). The base of the pyramid has a length of 1\( \frac{1}{2} \) feet and a width of 2\( \frac{3}{4} \) feet. Express your answer as a mixed number.
1. line a: 0.8 or \( \frac{4}{5} \), line b: \( -\frac{3}{4} \), line c: \( \frac{3}{5} \)
   
   a. line a: \( m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{4.95 - 3.75}{4.0 - 2.5} = 0.8 \) or \( \frac{4}{5} \)
   
   b. line b: \( 4y + 3x = 16 \)
      \[
      4y = -3x + 16 \\
      y = -\frac{3}{4}x + 4 \\
      m = -\frac{3}{4}
      \]
   
   c. line c: \( m = \frac{\text{change in } y}{\text{change in } x} = \frac{3}{5} \)
      
      These skills are addressed in the following ILOs:
      
      A8-LF-5: Applying the concept of slope to determine rate of change
      A9-LF-9A: Equation of a line: slope-intercept form
      
2. a. \( AB = 15 \text{ cm} \)
   
   \[
   AB = \sqrt{AC^2 - BC^2} \\
   AB = \sqrt{25^2 - 20^2} \\
   AB = \sqrt{225} \\
   AB = 15
   \]
   
   This skill is addressed in the following ILOs:
   
   G9-8GE01: Finding length of one side of a right triangle from 2 known sides
   G9-INTRO-6: Classifying triangles by side lengths, solving problems
   
   b. \( A_{ABC} = 150 \text{ cm}^2 \)
   
   \[
   A = \frac{1}{2}bh \\
   A = \frac{1}{2}(20)(15) \\
   A = 150
   \]
   
   c. \( EF = 12 \text{ cm} \)
   
   possible proportion:
   
   \[
   \frac{15}{9} = \frac{20}{x} \\
   15x = (9)(20) \\
   x = 12
   \]
d. \( A_{\text{DEF}} = 54 \text{ cm}^2 \)

\[
A = \frac{1}{2} bh \\
A = \frac{1}{2}(12)(9) \\
A = 54
\]

e. \( \frac{A_{\text{ABC}}}{A_{\text{DEF}}} = \frac{150}{54} = \frac{25}{9} \)

f. \( \frac{P_{\text{ABC}}}{P_{\text{DEF}}} = \sqrt{\frac{25}{9}} = \frac{5}{3} \)

Possible explanation:
The ratio of the perimeters of similar triangles is equal to the square root of the ratio of the areas.

These skills are addressed in **G8-8APV01R**: Ratio of perimeters and areas of figures having same shape

3. a. Use the point-slope method:

Step 1: Identify the point: \((x_1, y_1) = (1, 5)\)

Step 2: Identify the slope: \(m = \frac{3}{2}\)

Step 3: Plot the point.

Step 4: Use the slope to plot more points on the line.
b. Possible explanation:
   The line will rise at a steeper rate if the slope is changed to 1.8.

These skills are addressed in the following ILOs:
**A8-LF-12R**: Graphing lines given equations in various forms
**A9-LF-8**: Graphs of lines: slope and where the line crosses the y-axis
**A9-LF-9B**: Writing equation of a line given slope and point on line

4. a. \( h = \frac{3V}{B} \)

   \[ V = \frac{1}{2} B h \]
   \[ 3V = Bh \]
   \[ \frac{3V}{B} = h \]

   This skill is addressed in **A8-LEI1-4**: Solving an equation or formula for one of its variables

b. \( h = 14 \frac{2}{11} \) feet

   \[ h = \frac{3V}{B} \]
   \[ = \frac{3(78)}{4 \frac{1}{2} \times 3 \frac{2}{3}} \]
   \[ = \frac{234}{\frac{23}{2}} \]
   \[ = \frac{234}{1} \times \frac{2}{33} \]
   \[ = 14 \frac{2}{11} \]

   This skill is addressed in the following ILOs:
   **G9-8APV01**: Calculating the volume of a pyramid and cone
   **N9-CA-15R**: Operations with fractions and mixed numbers