C – Expressions and Equations, Lesson 1, Dependent and Independent Variables (r. 2018)

EXPRESSIONS AND EQUATIONS
Dependent and Independent Variables

**Common Core Standards**

A-SSE.A.1 Interpret expressions that represent a quantity in terms of its context.

A-SSE.A.1a Interpret parts of an expression—such as terms, factors, and coefficients—such as terms, factors, and coefficients.

NYSED: The “such as” listed are not the only parts of an expression students are expected to know; others include, but are not limited to, degree of a polynomial, leading coefficient, constant term, and the standard form of a polynomial (descending exponents).

A-SSE.A.1b Interpret complicated expressions by viewing one or more of their parts as a single entity. For example, interpret \( P(1 + r)^n \) as the product of \( P \) and a factor not depending on \( P \).

**Next Generation Standards**

AI-A.SSE.1 Interpret expressions that represent a quantity in terms of its context.

AI-A.SSE.1a Write the standard form of a given polynomial and identify the terms, coefficients, degree, leading coefficient, and constant term.

AI-A.SSE.1b Interpret expressions by viewing one or more of their parts as a single entity.

Note: This standard is a fluency expectation for Algebra I. Fluency in transforming expressions and chunking (seeing parts of an expression as a single object) is essential in factoring, completing the square, and other mindful algebraic calculations.

**LEARNING OBJECTIVES**

Students will be able to:

1) Identify which terms in a mathematical relationship involving two variables are associated with independent and dependent variables.

**Overview of Lesson**

**Teacher Centered Introduction**

Overview of Lesson
- activate students’ prior knowledge
- vocabulary
- learning objective(s)
- big ideas: direct instruction
- modeling

**Student Centered Activities**

guided practice
- Teacher: anticipates, monitors, selects, sequences, and connects student work
- developing essential skills
- Regents exam questions
- formative assessment assignment (exit slip, explain the math, or journal entry)

**VOCABULARY**

dependent variable
independent variable
term
variable
variable expression
**BIG IDEAS**

**Function:** A function is a relation that assigns exactly one value of the dependent variable to each value of the independent variable. A function is always a relation.

Example: \( y = 2x \)

**Relation:** A relation may produce more than one output for a given input. A relation may or may not be a function.

Example: \( y^2 = x \)

This is not a function, because when \( x = 16 \), there is more than one \( y \)-value. \( \sqrt{16} = \pm 4 \).

The **input variable** is the independent variable.
- It can be any value in the domain of the mathematical relation.
- It is plotted on the x-axis in graphs.

The **output variable** is the dependent variable.
- Its value depends upon what is input.
- It is plotted on the y-axis.

A **term** is a number, a variable, or the product of numbers and variables.
- **Terms** in an expression are always separated by a plus sign or minus sign.
- **Terms** in an expression are always either positive or negative.
- Numbers and variables connected by the operations of division and multiplication are parts of the same **term**.
- **Terms**, together with their signs, can be moved around within the same expression without changing the value of the expression. If you move a **term** from the left expression to the right expression, or from the right expression to the left expression (across the equal sign), the plus or minus sign associated with the term must be changed.
DEVELOPING ESSENTIAL SKILLS

Identify the dependent and independent variables in the following mathematical relationships.

<table>
<thead>
<tr>
<th>Mathematical Relationship</th>
<th>Independent Variable</th>
<th>Dependent Variable</th>
</tr>
</thead>
<tbody>
<tr>
<td>( y = 2x + 5 )</td>
<td>( x )</td>
<td>( y )</td>
</tr>
<tr>
<td>( C = \frac{5}{9}(F - 32) )</td>
<td>( F )</td>
<td>( C )</td>
</tr>
<tr>
<td>( \frac{9}{5}C + 32 = F )</td>
<td>( C )</td>
<td>( F )</td>
</tr>
<tr>
<td>( A = \pi r^2 )</td>
<td>( r )</td>
<td>( A )</td>
</tr>
<tr>
<td>( f(t) = t^2 + 4t + 57 )</td>
<td>( t )</td>
<td>( f(t) )</td>
</tr>
</tbody>
</table>

REGENTS EXAM QUESTION (through June 2018)

A.SSE.A.1: Dependent and Independent Variables

48) The formula for the surface area of a right rectangular prism is \( A = 2lw + 2hw + 2lh \), where \( l, w, \) and \( h \) represent the length, width, and height, respectively. Which term of this formula is not dependent on the height?

1) \( A \) 
2) \( 2lw \)
3) \( 2hw \)
4) \( 2lh \)

**SOLUTION**

48) ANS: 2

The problem asks “Which term of this formula is **not** dependent on the height.”

<table>
<thead>
<tr>
<th>Term #1</th>
<th>Sign</th>
<th>Term #2</th>
<th>Term #3</th>
<th>Term #4</th>
</tr>
</thead>
<tbody>
<tr>
<td>( A )</td>
<td>( = )</td>
<td>( +2lw )</td>
<td>( +2hw )</td>
<td>( +2lh )</td>
</tr>
</tbody>
</table>

This term is the dependent variable in the equation, which is influenced by the height of the rectangular prism.

This is the only term that is **not** dependent on height.

Height is a variable in this term.

Height is a variable in this term.

PTS: 2  NAT: A.SSE.A.1  TOP: Dependent and Independent Variables