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

EXPRESSIONS AND EQUATIONS
Dependent and Independent Variables

Common Core Standards	Next Generation Standards
A-SSE.A.1 Interpret expressions that represent a quantity in terms of its context.	**AI-A.SSE.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.~~ ~~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).~~	**AI-A.SSE.1a** Write the standard form of a given polynomial and identify the terms, coefficients, degree, leading coefficient, and constant term.
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.*	**AI-A.SSE.1b** Interpret expressions by viewing one or more of their parts as a single entity. e.g., Interpret $P(1+r)^n$ as the product of P and a factor not depending on P. 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.

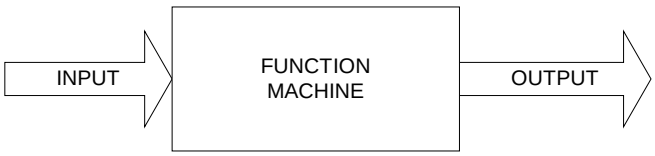
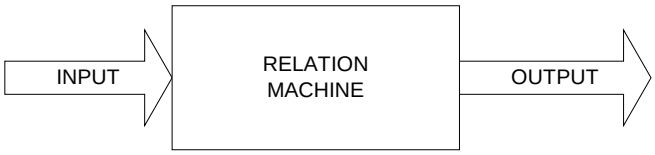
Overview of Lesson

Teacher Centered Introduction	Student Centered Activities
Overview of Lesson **- activate students' prior knowledge** **- vocabulary** **- learning objective(s)** **- big ideas: direct instruction** **- modeling**	**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: $y^2 = x$ $y = \sqrt{x}$ 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.

Mathematical Relationship	Independent Variable	Dependent Variable
$y = 2x + 5$	*x*	*y*
$C = \frac{5}{9}(F - 32)$	*F*	*C*
$\frac{9}{5}C + 32 = F$	*C*	*F*
$A = \pi r^2$	*r*	*A*
$f(t) = t^2 + 4t + 57$	*t*	*f(t)*

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) 2*lw*
3) 2*hw*
4) 2*lh*

SOLUTION

48) ANS: 2

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

Term #1	Sign	Term #2	Term #3	Term #4
A	=	+2lw	+2hw	+2lh
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