

Spanos, Rhodes, Dale, & Crandall, 1988 (pp. 224-232)	Comprehension (Reading, Writing, Listening, Speaking) of:	
	Features	Examples
<p>Syntactics: The study of how linguistic symbols behave in relation to each other</p>	<p><u>Comparatives</u> -greater than/less than; -n times as much as; -as...as</p>	<p>-all numbers greater than 4 -Hilda earns six times as much as I do. Hilda earns \$40,000 a year. What do I earn? -Wendy is as old as Jack. Jack is three years older than Frank. Frank is 25. How old is Wendy?</p>
	<p><u>Prepositions</u> -divided <i>into</i> -divided <i>by</i> -<i>by</i></p>	<p>-four (divided) into nine ($9/4$ or $9\div 4$) -four divided by nine ($4/9$ or $4\div 9$) -four divided into nine groups -four divided into groups of nine -two is multiplied by itself three times (multiplication) vs. x exceeds two by seven (addition)</p>
	<p><u>Passive Voice</u> -when you make the object of an action into the subject of a sentence. That is, whoever or whatever is performing the action is not the grammatical subject of the sentence.</p>	<p>-x is defined to be greater than or equal to zero; -When 15 <i>is added</i> to a number the result is 21. What is the number?</p>
	<p><u>Reversal Errors</u> -Variable reversal</p>	<p>-The number <i>a</i> is five less than the number <i>b</i>. Correct: $a = b - 5$ Incorrect: $a = 5 - b$ -There are five times as many students as professors in the mathematics department. Correct: $5p = s$ Incorrect: $5s = p$</p>
	<p><u>Logical Connectors</u> -if...then -if and only if -given that</p>	<p>-If <i>a</i> is positive then $-a$ is negative. -$a + b = c$ if and only if $b + a = c$ -Given that $a = 0$, $a \times b = 0$.</p>

Semantics: the study of how linguistic signs behave in relation to the objects they refer to, or their connotations	1. Lexical	
	<u>New Technical Vocabulary</u> -specific to math	-additive inverse -binomial -coefficient -monomial
	<u>Natural Language Vocabulary</u> -has a different meaning in math than “every day” use	-square -power -rational -equality
	<u>Complex Strings of Words or Phrases</u> -specific to math	-least common denominator -negative exponent -the quantity, $y + 3$, squared
	<u>Synonymous Words and Phrases</u> -used interchangeably in math	-For addition: add, plus, combine, sum, more than, and increase by -For subtraction: subtract, minus, differ(ence), less than, and decreased by
	<u>Symbols and Mathematical Notation as “Vocabulary”</u> -The symbols used to create meaning in math	= \neq \sim \leq < \geq >
	2. Referential	
	<u>Articles/Pre-Modifiers</u> - <i>a</i> number... <i>the</i> number -A word that is placed before a word that it modifies (e.g., one number...another number)	-Five times <i>a</i> number is two more than ten times <i>the</i> number. - <i>One</i> number is ten times <i>another</i> number. If the first number is seven, find the second number.
	<u>Variables</u> -number of persons or things of which a problem is about (not the persons or things themselves)	-There are five times as many apples as bananas in the fruit bowl. Correct: $5b = a$, where <i>b</i> refers to the <i>number</i> of bananas and <i>a</i> refers to the <i>number</i> of apples
	<u>Vagueness in Problems and Directions</u> -Resulting in confusion about what information is needed to solve the problem	-Food expenses take 26% of the average family’s income. A family makes \$700 a month. How much is spent on food? It is unclear if the problem should be solved for each month, year, or how much time needs to be factored in to the equation.
	<u>Similar Terms, Different Functions</u> -used in different ways, depending on concept/construct	-less vs. less than -the square vs. the square root -divided by vs. divided into -multiply by vs. increased by

Pragmatics: the study of how linguistic signs are used and interpreted by speakers of natural languages in specific contexts of use	1. Epistemological	
	<u>Lack of Experience or Knowledge</u>	-market-place concepts (discounts, cost, selling price, markup, wholesale, retail, sales tax rates, interest)
	<u>Restricted Experience or Knowledge</u>	-attempt to substitute known quantities like local tax rates for tax rates referred to in word problems
	<u>Conflicting Experience or Knowledge</u>	-inability to solve for tax rate because in practical experience this is a given fact
	<u>Contradictory Experience or Knowledge</u>	-discrepancy between the way sales tax is rounded off on actual sales tax charts and the way it is rounded off conventionally

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