

Mathematics Learning Instrument: Algebra Concept Inventory to Measure Metric Sense

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Definition of Terms:

Unary Operations

$\sqrt{\quad}$

\square^2

\square^3

Binary Operations

$\square + \square$

$\square - \square$

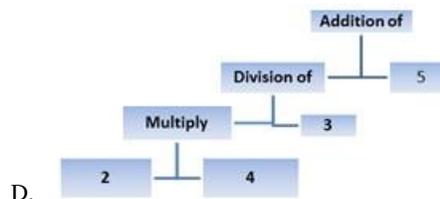
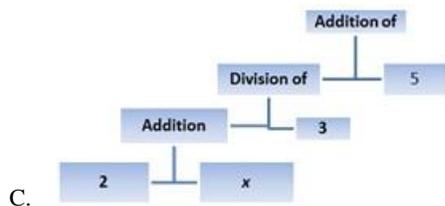
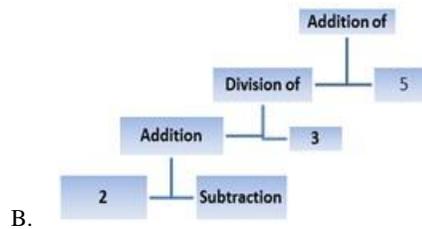
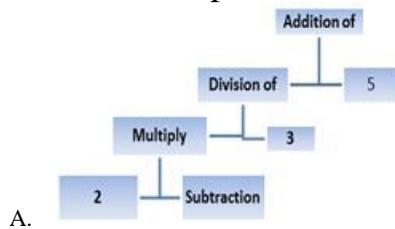
$\square \times \square$

$\square \div \square$

Answer questions 1-5 using the equation below:

$$\frac{+2(+x - 4)}{+3} + 5 = 0 \quad \text{Normally} \quad \frac{2(x - 4)}{3} + 5 = 0$$

- Which is the main operation of the expression on the **left side** of the equation; utilizing **all** of the left expression, not missing anything, considering the order of operations
 - + symbol before the x
 - ÷ division bar
 - + symbol before the 5
 - symbol before the 4
- Which is correct about the expression on the **left side** of the equation
 - four** positive symbols on terms; **one** negative symbol also as subtraction (total **five**)
 - one** positive symbol on terms; **one** negative symbol also as subtraction; **three** positive symbols also as addition (total **five**)
 - two** positive symbols on terms; **one** negative symbol also as subtraction; **two** positive symbols also as addition (total **five**)
 - three** positive symbols on terms; **one** negative symbol also as subtraction; **one** positive symbol also as addition (total **five**)
- Which is accurate about the expression on the **left side** of the equation, considering the order of operations

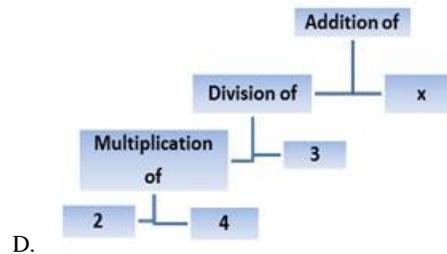
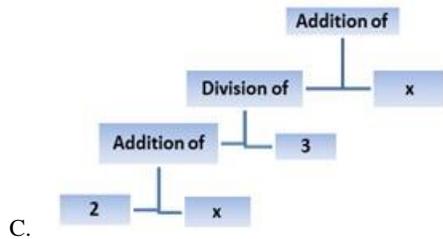
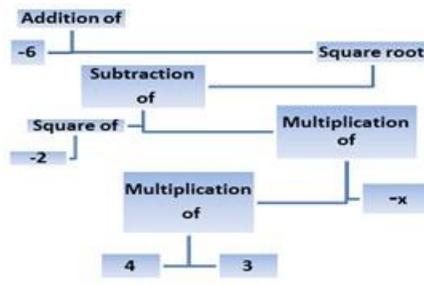
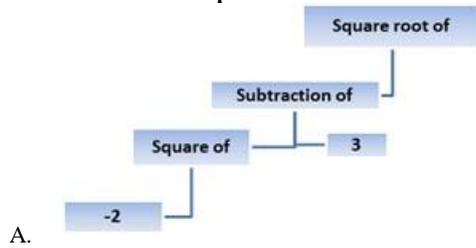


- Which is accurate about the expression on the **left side** of the equation
 - It has one binary operation
 - It has four binary operations
 - It has five binary operations
 - It has no binary operations
- What are the steps in solving the equation by reversing the main operation of the expression on the left side of the equation;
 - First subtract each side by 5 followed by multiplying by 3 as the next step
 - First subtract each side by 5 followed by adding by 4 as the next step
 - First subtract each side by 4 followed by multiplying by 3 as the next step
 - First add each side by 5 followed by dividing by 4 as the next step

Answer questions 6-10 using the equation below:

$$-6 + \sqrt{(-2)^2 - 4(+3)(-x)} = 0 \quad \text{Normally} \quad -6 + \sqrt{(-2)^2 - 4(3)(-x)} = 0$$

6. Which is the main operation of the expression on the **left side** of the equation; utilizing **all** of the left expression, not missing anything, considering the order of operations
- A. - symbol before the 4
 B. + symbol after the 6
 C. ² symbol (square)
 D. $\sqrt{\quad}$ symbol (square root)
7. Which is correct about the expression on the **left side** of the equation
- A. **one** negative symbol on terms; **one** positive symbol on terms; **two** positive symbols also as addition; **two** negative symbols also as subtraction (total **six**)
 B. **two** negative symbols on terms; **one** positive symbol on terms; **one** positive symbol also as addition; **two** negative symbols also as subtraction (total **six**)
 C. **three** negative symbols on terms; **one** positive symbol on terms; **one** positive symbol also as addition; **one** negative symbol also as subtraction (total **six**)
 D. **one** negative symbol on terms; **one** positive symbol on terms; **one** positive symbol also as addition; **three** negative symbols also as subtraction (total **six**)
8. Which is accurate about the expression on the **left side** of the equation, considering the order of operations



9. What is accurate about the expression on the **left side** of the equation
- A. It has 6 binary and 1 unary operations
 B. It has 4 binary and 1 unary operations
 C. It has 1 binary and 4 unary operations
 D. It has 4 binary and 2 unary operations
10. What are the steps in solving the equation by reversing the main operation of the expression on the left side of the equation;
- A. First add each side by 6 followed by squaring each side as the next step
 B. First square each side followed by adding each side by 6
 C. First add each side by -2 followed by squaring each side as the next step
 D. First square each side followed by adding each side by 2

Note: “Level appropriate vocabulary is integrated in the instrument which is conventionally familiar to beginning algebra students. Some latent coefficient symbols are present to accentuate *structure sense* knowledge base element identification while using the instrument. It is recommended that instructors use the instrument customized and adapted to their individual needs.” Please see Proceedings article for instruments theoretical basis and further information. Contact Jeff Lear for further information <http://jefflear.com> jefflear@jefflear.com .