Order of Operations

Sometimes, always, or never…

COABE/TALAE National Conference

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Sheraton Dallas Hotel, Dallas Ballroom D2, Level 1

2:00pm-3:15pm,

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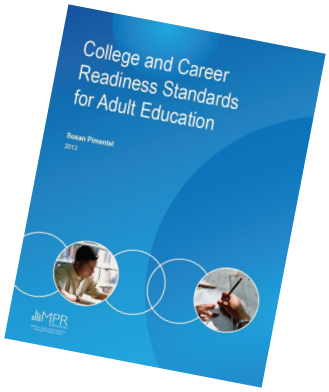
Digging in...



CCRS: Mathematical Shifts

Shift 1 – Focus:

- Focusing strongly where the standards focus

Shift 2 – Coherence:

- coherent progressions in the content within and across levels

Shift 3 - Rigor:

- Pursuing conceptual understanding, procedural skill and fluency, and application—all with equal intensity

<u>Standards for Mathematical Practice:</u>

- Make sense of problems and persevere in solving them. (MP.1)
- Reason abstractly and quantitatively. (MP.2)
- Construct viable arguments and critique the reasoning of others. (MP.3)
- Model with mathematics. (MP.4)
- Use appropriate tools strategically. (MP.5)
- Attend to precision. (MP.6)
- Look for and make use of structure. (MP.7)
- Look for and express regularity in repeated reasoning. (MP.8)

Review:

Basic math operations:

- Addition
- Subtraction
- Multiplication
- Division

Mathematical properties:

- Commutative property of addition: a+b=b+a
  means:
- Commutative property of addition: (a)(b)=(b)(a)
  means:
- Associative Property of addition: (a+b)+c=a+(b+c)
  means:
- Associative Property of multiplication: (ab)c=a(bc)
  Means:
- Distributive Property of multiplication over addition: a(b+c)=ab+ac
  Means:

Order of Operations:

PEMDAS	PERMDAS	BEDMAS	BODMAS/BIDMAS
Parenthesis Exponent Multiply/Divide Add/Subtract	Parenthesis Exponent/Roots Multiply/Divide Add/Subtract	Brackets Exponents Divide/Multiply Add/Subtraction	Brackets Orders (Indices) Divide/Mult Add/Subt

What are the main ideas?

HOW MUCH MONEY?

(Each pile above contains one $20, one $10, and one $5.)

$1+2(5)+3(5+10+20)$

Apply to Algebraic Thinking…

- Simplify expressions by using PEMDAS
- “Undo” by working through the last step first (Find the inverse operations).

$1+2(x)+3(20+10+5)=126$

<u>Order of Operations</u>

Sometimes…

always…

Never…

"Order of Operations" ***<u>never</u>*** *should be taught as an unbreakable rule that people just "invented" thousands of years ago, and now we have to blindly follow it to get the same answer. Although it does* ***<u>always</u>*** *work, it should be taught as a guide that they can use. They can also* ***<u>sometimes</u>*** use their understanding of basic mathematical operations and properties, and mix up the order a bit .

Additional Resources:

http://atlasabe.org/ (ABE Teaching and Learning Advancement System)

Youtube channel: MN ABE Professional Development (Search for "mnabepd")

CCRS pdf: https://lincs.ed.gov/professional-development/resource-collections/profile-521

http://www.adultnumeracynetwork.org/