

INTRODUCTION TO MATH FOR POLITICAL SCIENTISTS

J. Alexander Branham

Fall 2016

ARITHMETIC

LET'S START REAL SLOW...

- So we all know that

$$2 + 2 = 4$$

LET'S START REAL SLOW...

- So we all know that

$$2 + 2 = 4$$

- But addition and subtraction have some rules

PROPERTIES OF ADDITION AND SUBTRACTION

- Communicative:

- Commutative:

- $a \pm b = b \pm a$

PROPERTIES OF ADDITION AND SUBTRACTION

- Commutative:

- $a \pm b = b \pm a$

- Associative

PROPERTIES OF ADDITION AND SUBTRACTION

- Commutative:

- $a \pm b = b \pm a$

- Associative

- $(a \pm b) \pm c = a \pm (b \pm c)$

MULTIPLICATION

- Multiplication - I have these 4 things 10 times.

4 + 4 + 4 + 4 + 4 + 4 + 4 + 4 + 4 + 4

```
## [1] 40
```

MULTIPLICATION

- Multiplication - I have these 4 things 10 times.

4 + 4 + 4 + 4 + 4 + 4 + 4 + 4 + 4 + 4

```
## [1] 40
```

MULTIPLICATION

- Multiplication - I have these 4 things 10 times.

4 + 4 + 4 + 4 + 4 + 4 + 4 + 4 + 4 + 4

```
## [1] 40
```

Or I could just do

4 * 10

```
## [1] 40
```

- Just fancy multiplication.

- Just fancy multiplication.

- Just fancy multiplication.
- I have these four things one of ten times.

```
4 * (1 / 10)
```

```
## [1] 0.4
```

PROPERTIES OF MULTIPLICATION AND DIVISION

- Communicative

PROPERTIES OF MULTIPLICATION AND DIVISION

- Communicative

- $a * b = b * a$

PROPERTIES OF MULTIPLICATION AND DIVISION

- Communicative

- $a * b = b * a$

- Associative

PROPERTIES OF MULTIPLICATION AND DIVISION

- Communicative

- $a * b = b * a$

- Associative

- $(ab)c = a(bc)$

PROPERTIES OF MULTIPLICATION AND DIVISION

- Communicative

- $a * b = b * a$

- Associative

- $(ab)c = a(bc)$

- Distributive

PROPERTIES OF MULTIPLICATION AND DIVISION

- Communicative

- $a * b = b * a$

- Associative

- $(ab)c = a(bc)$

- Distributive

- $a(b + c) = ab + ac$

PROPERTIES OF MULTIPLICATION AND DIVISION

- Communicative

- $a * b = b * a$

- Associative

- $(ab)c = a(bc)$

- Distributive

- $a(b + c) = ab + ac$

- Note that this works for division: $\frac{a+b}{c} = \frac{a}{c} + \frac{b}{c}$

PROPERTIES OF EQUALITIES

RELATIONSHIPS THAT HOLD WITH (REAL) NUMBERS

- $a = b \iff b = a$ (Symmetric relationships)

RELATIONSHIPS THAT HOLD WITH (REAL) NUMBERS

- $a = b \iff b = a$ (Symmetric relationships)
- $a = b$ and $b = c \Rightarrow a = c$ (Transitive relationships)

RELATIONSHIPS THAT HOLD WITH (REAL) NUMBERS

- $a = b \iff b = a$ (Symmetric relationships)
- $a = b$ and $b = c \Rightarrow a = c$ (Transitive relationships)
 - $a > b$ and $b > c \Rightarrow a > c$

PEMDAS

- Parentheses

PEMDAS

- Parentheses
- Exponents

PEMDAS

- Parentheses
- Exponents
- Multiplication and division (left to right)

PEMDAS

- Parentheses
- Exponents
- Multiplication and division (left to right)
- Addition and subtraction (left to right)

$$(10 - 48 \div 12 * 2)^2 + 3^2 * (8 - 6)$$