P.1 Intro. Algebra, Absolute Value

http://www.battaly.com/algebra_trig/schedule.pdf

GOAL:

1. Evaluate algebraic equations by substitution. *(Review)*
2. Learn the definition of absolute value
3. Find absolute values of numerical expressions, using the definition.

Study P.1 # 17, 19, 43-65, 95

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Review: Algebraic Substitution

Given: $86^\circ F$ Find: $^\circ C$

$$C = \frac{5}{9}(F - 32)$$

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Review: Algebraic Substitution

Given: 86°F Find: ℃

$$C = \frac{5}{9}(F - 32)$$

$$= \frac{5}{9}(86-32)$$

$$= \frac{5}{9}(54)$$

$$= 5(6) = 30^{\circ}C$$

Review: Algebraic Substitution

G: $h = 4 + 60\,t - 16\,t^2$ F: h ft when t=3 sec.

Review: Algebraic Substitution

G: $h = 4 + 60\,t - 16\,t^2$ F: h ft when t=3 sec.

$h = 4 + 60\,(\quad) - 16\,(\quad)^2$ use place holders

$h = 4 + 60\,(3) - 16\,(3)^2$ substitute values

$h = 4 + 180 - 16\,(9)$

$h = 184 - 144$

$h = 40$ ft

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True or False: $-6 > 2$?

True or False: $0 \geq -13$?

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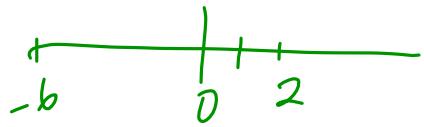
True or False: $-6 > 2$?

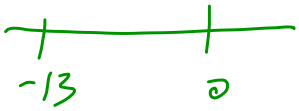
T or F



-6 is left of +2 on number line. ∴ -6 is less than 2

True or False: $0 \geq -13$?

T or F



0 is to right of -13 on number line. ∴ 0 is greater than -13

P.1 Intro. Algebra, Absolute Value

Absolute Value

$|2| =$ ____ $|-2| =$ ____

$|10| =$ ____ $|-10| =$ ____

14670 BW at Hook

Commemorate special BW day at Hook with gift of lens cleaners at luncheon that year. I ordered 30. 28 people attended.

What was the difference in the number of lens cleaners ordered and the number needed?

Then realized that needed 4 more for hawk watchers who did not come, but had contributed to our big year. What was the difference in the number of lens cleaners ordered and the number needed?

P.1 Intro. Algebra, Absolute Value

Absolute Value

| 2 | = 2 | -2 | = 2

| 10 | = 10 | -10 | = 10

14670 BW at Hook

Commemorate special BW day at Hook with gift of lens cleaners at luncheon that year. I ordered 30. 28 people attended.

What was the difference in the number of lens cleaners ordered and the number needed? have extra: | 30-28 | = | 2 | = 2

Then realized that needed 4 more for hawk watchers who did not come, but had contributed to our big year. What was the difference in the number of lens cleaners ordered and the number needed?

need: | 30-32 | = | -2 | = 2

P.1 Intro. Algebra, Absolute Value

Absolute Value

| 2 | = 2 | -2 | = 2

| 10 | = 10 | -10 | = 10

How does the result relate to ***a*** ?

| ***a*** | = ____ ?

in terms of ***a***, if ***a*** is a real number

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P.1 Intro. Algebra, Absolute Value

Absolute Value Definition

If a is a real number

$$|a| = \begin{cases} a, & \text{if } a \geq 0 \\ -a, & \text{if } a < 0 \end{cases}$$

absoluteValue.mp3

sound: absoluteValue

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Homework Problems

P.1 Intro. Algebra, Absolute Value

Absolute Value

$|203| =$ ____

$|7 - \pi| =$ ____

$|-7 - \pi| =$ ____

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Homework Problems

P.1 Intro. Algebra, Absolute Value

Absolute Value

$|203| =$ 203, since $203 \geq 0$

$|7 - \pi| =$ $7-\pi$, since $7-\pi \geq 0$

$|-7 - \pi| =$ $7+\pi$, since $-7-\pi < 0$
use $-(7+\pi)$

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P.2 Exponents and Scientific Notion

GOALS: Learn and use

1. The meaning of an exponent.
2. The Product Rule
3. The Quotient Rule
4. The Power Rule
5. The Zero Exponent Rule
6. The Power of a Product Rule
7. The Power of a Quotient Rule
8. Simplification of exponential expressions
9. Scientific notation.

Study P.2 CVC #1-4, 6, 7;
Problems # 1, 5, 9, 13, ..., 113, 63, 115, 119

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P.2 Exponents and Scientific Notion

1. The meaning of an exponent.

$2^3 = 2 \cdot 2 \cdot 2 = 8$

3 factors of 2

$2^5 = 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 = 32$

☐ factors of 2

$b^5 = b \cdot b \cdot b \cdot b \cdot b$

☐ factors of b

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P.2 Exponents and Scientific Notion

2. The Product Rule

$2^4 2^3 = (2 \cdot 2 \cdot 2 \cdot 2)(2 \cdot 2 \cdot 2) = 2^7 = 128$

4 factors of 2 3 factors of 2

$2^4 2^3 = 2^{(4+3)} = 2^7 = 128$

$b^5 b^3 = b^{5+3} = b^8$

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P.2 Exponents and Scientific Notion

2. The Product Rule

$b^m b^n = b^{\square}$

$b^m b^n = b^{m+n}$ Product Rule

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P.2 Exponents and Scientific Notion

2. The Product Rule

$a^3 a^7 =$

$a^2 a^5 b b^2 =$

$a^3 b^2 a b^7 a^4 =$

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P.2 Exponents and Scientific Notion

2. The Product Rule

$a^3 a^7 = a^{10}$

$a^2 a^5 b b^2 = a^7 b^3$

$a^3 b^2 a b^7 a^4 = a^8 b^9$

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P.2 Exponents and Scientific Notion

8. Simplification

$2^3 \cdot 3^2 = 8 \cdot \square = \square$

$(-2)^3 3^2 = \square \cdot 9 = \square$

odd power of negative base is negative

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P.2 Exponents and Scientific Notion

8. Simplification

$2^3 \cdot 3^2 = 8 \cdot 9 = 72$

$(-2)^3 3^2 = -8 \cdot 9 = -72$

odd power of negative base is negative

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P.2 Exponents and Scientific Notion

8. Simplification

$(-2)^4 3^2$

$\square \cdot 9 = \square$

even power of negative base is positive

$-2^4 \cdot 3^2$

$= -\square \cdot 9 = \square$

even power of positive base is positive

so $2^4 = 16$

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P.2 Exponents and Scientific Notion

8. Simplification

$(-2)^4 3^2$

$16 \cdot 9 = 144$

even power of negative base is positive

$-2^4 \cdot 3^2 = -16 \cdot 9$

$= -144$

even power of positive base is positive

so $2^4 = 16$

and $-2^4 = -16$

order of operations: exponent 1st

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P.2 Exponents and Scientific Notion

3. The Quotient Rule

$$\frac{a^m}{a^n} = a^{\square}$$

$$\frac{2^5}{2^3} = \frac{2 \cdot 2 \cdot 2 \cdot 2 \cdot 2}{2 \cdot 2 \cdot 2} = \square$$

$$= \frac{2}{2} \cdot \frac{2}{2} \cdot \frac{2}{2} \cdot \frac{2}{1} \cdot \frac{2}{1}$$

$$\frac{a^m}{a^n} = a^{m-n}$$

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P.2 Exponents and Scientific Notion — 3. The Quotient Rule

$$\frac{a^m}{a^n} = a^{\square}$$

$$\frac{a^m}{a^n} = a^{m-n}$$

$$\frac{a^4 b^2}{a^2 b^1} = a^{(4-2)} \cdot b^{(2-1)} = a^2 b$$

must be the same base

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P.2 Exponents and Scientific Notion — 3. The Quotient Rule

$$\frac{a^m}{a^n} = a^{m-n}$$

Quotient Rule

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P.2 Exponents and Scientific Notion 6. Power of a Product Rule

$$(ab)^m = a^{\square} b^{\square}$$

$(ab)^3 = ab \cdot ab \cdot ab = a^3 b^3$

$(abc)^2 =$ _____

P.2 Exponents and Scientific Notion 6. Power of a Product Rule

$$(ab)^m = a^m b^m$$

P.2 Exponents and Scientific Notion

4. The Power Rule

$$(a^m)^n = a^{\square}$$

$$(a^2)^3 = a^2 \cdot a^2 \cdot a^2 = \square$$

$$(b^2)^5 = \square$$

$b^2\ b^2\ b^2\ b^2\ b^2$

$$(a^m)^n = a^{mn}$$ Power Rule

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P.2 Exponents and Scientific Notion

7. Power of a Quotient Rule

$$\left(\frac{a}{b}\right)^n = \frac{a^n}{b^n}$$

$$\left(\frac{a}{b}\right)^3 = \frac{a}{b} \cdot \frac{a}{b} \cdot \frac{a}{b} = \square$$

$\frac{a^3}{b^3}$

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P.2 Exponents and Scientific Notion

7. Power of a Quotient Rule

$$\left(\frac{a^2 b}{c}\right)^3 = \frac{(a^2 b)^3}{c^3} = \square$$

$$=$$

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P.2 Exponents and Scientific Notion

6. Power of a Product Rule
7. Power of a Quotient Rule

$$\left(\frac{a^2 b}{c}\right)^3 = \frac{(a^2 b)^3}{c^3} = \frac{(a^2)^3 b^3}{c^3}$$

$$= \frac{a^6 b^3}{c^3}$$

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P.2 Exponents and Scientific Notion 5. Zero Exponent Rule

$2^0 = ?$

P.2 Exponents and Scientific Notion 5. Zero Exponent Rule

$2^0 = ?$ $2^0 =$ definition

We know:

$2^{-1} = \frac{1}{2}$

$2^{-3} = \frac{1}{2^3}$

$\frac{a^{-m}}{1} = \frac{1}{a^m}$

from the meaning of exponents:

$2^{-2} = \frac{1}{2^2}$

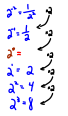
$2^{-1} = \frac{1}{2}$

$2^1 = 2$

$2^2 = 4$

$2^3 = 8$

We need a definition of 2^0 that fits the pattern of exponents.
What is the pattern?



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P.2 Exponents and Scientific Notion 5. Zero Exponent Rule

$2^0 = ?$

$2^0 =$ definition

We know:

$2^{-1} = \frac{1}{2}$

$2^{-3} = \frac{1}{2^3}$

$\frac{a^{-m}}{1} = \frac{1}{a^m}$

from the meaning of exponents:

$2^{-2} = \frac{1}{2^2}$

$2^{-1} = \frac{1}{2}$

$2^1 = 2$

$2^2 = 4$

$2^3 = 8$

We need a definition of 2^0 that fits the pattern of exponents.

What is the pattern?

$2^{-2} = \frac{1}{2^2}$ ×2

$2^{-1} = \frac{1}{2}$ ×2

$2^0 =$ ×2

$2^1 = 2$ ×2

$2^2 = 4$ ×2

$2^3 = 8$

1

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P.2 Exponents and Scientific Notion 5. Zero Exponent Rule

$2^0 = ?$

We know:

$2^{-1} = \frac{1}{2}$

$2^{-3} = \frac{1}{2^3}$

$\frac{a^{-m}}{1} = \frac{1}{a^m}$

from the meaning of exponents:

$2^{-2} = \frac{1}{2^2}$

$2^{-1} = \frac{1}{2}$

$2^0 = 1$ definition

$2^1 = 2$

$2^2 = 4$

$2^3 = 8$

We need a definition of 2^0 that fits the pattern of exponents.

What is the pattern?

$2^{-2} = \frac{1}{2^2}$ ×2

$2^{-1} = \frac{1}{2}$ ×2

$2^0 =$ ×2

$2^1 = 2$ ×2

$2^2 = 4$ ×2

$2^3 = 8$

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P.2 Exponents and Scientific Notion 5. Zero Exponent Rule

$3^0 = ?$

$10^0 = \_$

$5^0 = \_$

$(-3)^0 = \_$

$\left(-\frac{1}{2}\right)^0 = \_$

$3^{-2} = \frac{1}{9}$

$3^{-1} = \frac{1}{3}$

$3^0 =$

$3^1 = 3$

$3^2 = 9$

$3^3 = 27$

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P.2 Exponents and Scientific Notion 5. Zero Exponent Rule

$a^0 = 1,\ a \neq 0$ definition

$(2 \cdot 3^2 \cdot 5)^0 = \_$?

$(2-2)^0$?

0^0 ?

0^0 DNE

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P.2 Exponents and Scientific Notion 5. Zero Exponent Rule

$$a^0 = 1,\ a \neq 0 \quad \text{definition}$$

$(2 \cdot 3^2 \cdot 5)^0 = \_\_ \ ?$

$(2-2)^0$?

0^0 ?

0^0 DNE

$$\left(\frac{a^2 b}{c^{-1} d^6}\right)^0 = 1$$

When is this true?

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P.2 Exponents and Scientific Notion 5. Zero Exponent Rule

$$\left(\frac{a^2 b}{c^{-1} d^6}\right)^0 = 1$$

When is this true?

$a, b, c, d \neq 0$

NEED TO QUALIFY RESULT

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P.2 Exponents and Scientific Notion

Practice Exercises

$\frac{3^{-2}}{1} =$

$(a^m)^n = a^{mn}$

$(5^{-1})^{-2} =$

$a^{-1} a^4 =$

$2^{-1} 2^4 =$

$\frac{1}{2^{-1}} + \frac{1}{3^{-1}} = ?$

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P.2 Exponents and Scientific Notion

Practice Exercises

$\frac{3^{-2}}{1} = \frac{1}{3^2} = \frac{1}{9}$

$(a^m)^n = a^{mn}$

$(5^{-1})^{-2} = 5^2 = 25$

$a^{-1} a^4 = a^3$

$2^{-1} 2^4 = 2^3 = 8$

$\frac{1}{2^{-1}} + \frac{1}{3^{-1}} = ? \quad \frac{2}{1} + 3 = 5$

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P.2 Exponents and Scientific Notion

8. Simplification

$(4b^{-9})(5b^4) =$

$(4b^3c^7)^2 (2b^5c^4)^3$

4. The Power Rule

$(a^m)^n = a^{mn}$

6. Power of a Product Rule

$(b^3)^2 = b^3 \cdot b^3 = b^6$

$(c^7)^2 = c^7 \cdot c^7$

P.2 Exponents and Scientific Notion

8. Simplification

$(4b^{-9})(5b^4) = 20b^{-5} = \frac{20}{b^5}$

$(4b^3c^7)^2 (2b^5c^4)^3$

$(4^2 b^6 c^{14})(2^3 b^{15} c^{12})$

$16 \cdot 8\ b^{21} c^{26}$

$128\ b^{21} c^{26}$

4. The Power Rule

$(a^m)^n = a^{mn}$

6. Power of a Product Rule

$(b^3)^2 = b^3 \cdot b^3 = b^6$

$(c^7)^2 = c^7 \cdot c^7$

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P.2 Exponents and Scientific Notion

8. Simplification

$$\frac{(16b^{-2}c)(25b^{4}c^{-5})}{(15b^{5}c^{-1})(8b^{-7}c^{-2})}$$

$$a^m a^n = a^{m+n}$$

$$\frac{a^s}{a^r} = a^{s-r}$$

P.2 Exponents and Scientific Notion

8. Simplification

$$\frac{(16b^{-2}c)(25b^{4}c^{-5})}{(15b^{5}c^{-1})(8b^{-7}c^{-2})}$$

$$a^m a^n = a^{m+n}$$

$$\frac{a^s}{a^r} = a^{s-r}$$

$$\frac{\overset{2}{\cancel{16}}(25)}{\underset{3}{\cancel{15}}(\underset{1}{8})}\; b^{\cancel{-2+4-5+7}}\; c^{1-5+1+2}$$

RLT

$$\frac{10}{3}b^{4}c^{-1} = \frac{10b^{4}}{3c}$$

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P.2 Exponents and Scientific Notion

9. Scientific notation

In scientific work all numbers are assumed to be derived from measurements and therefore the last digit in each number is uncertain. ***All certain digits plus the first uncertain digit are significant.*** Only numbers determined by definition or by counting are exact. These are said to have an infinite number of significant figures.

Scientific Notation: To express a number in scientific notation it must have **one, and only one, non-zero digit to the left of the decimal point** to be followed by the appropriate power of ten.

$$\mathbf{n.nn\ (10^{k})}$$

For example:

$3.00(10^{7})$ and $2.59(10^{-5})$ are in scientific notation,

but numbers such as $0.25(10^{3})$ and $63.0(10^{-6})$ are NOT.

from *Significant Figures*

P.2 Exponents and Scientific Notion

9. Scientific notation

Write in decimal notation:

$2.3\ (10^{3}) =$ 2,300

$2.3(10^{-3})$ .0023

P.2 Exponents and Scientific Notion

9. Scientific notation

Write in decimal notation:

$2.3(10^{3}) =$

$2.3(10^{-3})$

2,300

.0023

Move decimal 3 places to the right

2300

Move decimal 3 places to the left

0.0023

2,300

.0023

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P.2 Exponents and Scientific Notion

9. Scientific notation

Write in decimal notation:

$-8.17\ (10^{6})$

$9.2\ (10^{-5})$

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Homework Problems

P.2 Exponents and Scientific Notion

9. Scientific notation

Write in decimal notation:

$-8.17\ (10^{6})$

$= -\ 8{,}170{,}000$

$9.2\ (10^{-5})$

0.000092

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P.2 Exponents and Scientific Notion

9. Scientific notation

Write in scientific notation:

$-\ 0.0083$

$64{,}000$

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P.2 Exponents and Scientific Notion

9. Scientific notation

Write in scientific notation:

- 0.0083

- $8.3\ (10^{-3})$

64,000

$6.4\ (10^{4})$

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P.2 Exponents and Scientific Notion

9. Scientific notation

$[1.4\ (10^{15})]\ [4.1\ (10^{-11})]$

$(1.1 \times 10^{9})\ (1.1 \times 10^{-12})$

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P.2 Exponents and Scientific Notion

9. Scientific notation

$[1.4\ (10^{15})]\ [4.1\ (10^{-11})]$

$[(1.4)(4.1)]\ [(10^{15})(10^{-11})]$

$(5.74)(10^{4}) = 57{,}400$

$(1.1\text{x}10^{9})\ (1.1\text{x}10^{-12})$

$(1.1\text{x}1.1)\ (10^{9}\text{x}10^{-12})$

$(1.21)(10^{-3}) = 0.00121$

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Homework Problems

Attachments

absoluteValue.wma

absoluteValue2.wma