Sec. 7.5 - Exponents

HW #37-38, 43-68, 70, 72, 77, 81, 85, 87-90, 95

Today's Agenda:

- Answer HW questions
- Hand out Problem Set #4 (due Tue. 11/11)
- Lesson on 7.5 - Exponents
- Quiz over 7.1-7.3

Nov 3-7:40 AM

HW #57 and #59

57) Taxicab fare: \$1.50 for first 1/5 mile and \$.25 for each additional 1/5 mile. What is max distance you can travel with \$3.75?

Let x = # of $(\frac{1}{5})$ mile sections.

$1.50 + .25(x-1) \leq 3.75$

$-1.50 \quad\quad -1.50$

$.25x - .25 \leq 2.25$

$.25x \leq 2.50$

$x \leq 10.$

So $10(\frac{1}{5}) = 2$ is the max distance.

59) Scores are 90 and 82 on first 2 tests. What score must she make on 3rd test to keep an average of 84 or greater?

$$\frac{90+82+x}{3} \geq 84$$

$90+82+x \geq 252$

$172+x \geq 252$

$x \geq 80.$

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$$27\left|6\left(\frac{2}{3}(3k-1)\right) \geq \left(\frac{3}{2}(2k-3)\right)6\right.$$

$$4(3k-1) \geq 9(2k-3)$$

$$12k-4 \geq 18k-27$$

$$-18k \quad +4 \qquad -18k \quad +4$$

$$-6k \geq -23$$

$$k \leq \frac{23}{6}$$

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61) 35/day, .14/mi 34/day, .16/mi

how many miles does price A exceed B?

$$34 + .16(x) > 35 + .14(x)$$

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7.4 - Exponents

Exponents represent repeated multiplication

For real numbers x and natural numbers n, we can write:

$x^n = x \cdot x \cdot x \cdot x \cdot \ldots \cdot x$ (n times)

Examples:

a) $2^4 =$ $2 \cdot 2 \cdot 2 \cdot 2 = 16$

b) $-5^2 =$

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

(order of operations!)

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Extend to integers:

$2^3 = (2)(2)(2) = 8$

$2^2 = (2)(2) = 4$

$2^1 =$ 2 $= 2$

$2^0 =$ $2 \div 2 = 1$

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

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

In general, for non-zero numbers x,

$x^{(-n)} = \frac{1}{x^n}$

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Rules of Exponents:

1. $a^0 = 1$

2. $a^{-n} = \frac{1}{a^n}$

3. $\frac{1}{a^{-n}} = \frac{a^n}{1}$

4. $a^n \, a^m = a^{n+m}$

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

6. $(a^n)^m = a^{nm}$

In general, an expression is *simplified* when there are no negative exponents and each base appears only once.

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In general, an expression is *simplified* when there are no negative exponents and each base appears only once.

Ex. Simplify:

1. $\frac{(2k)^3 g^{-2}}{4k^{-2} g^4}$

$= \frac{2^3 k^3 g^{-2}}{4k^{-2} g^4}$

$= \frac{2k^3 \cdot k^2}{g^4 \cdot g^2}$

$= \frac{2k^5}{g^6}$

2. $2x^3(4xy)^{-2} y^3$

$= \frac{2x^3 y^3}{(4xy)^2}$

$= \frac{2x^3 y^3}{16 x^2 y^2}$

$= \frac{xy}{8} = \frac{xy}{8}$

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Two additional rules:

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

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

More Examples. Simplify:

3. $\left(\frac{2x^{-2}y^3}{x^{-4}}\right)^{-3}$

$= \frac{(x^{-4}y^3)^{-3}}{(2x^{-2}y^3)^{-3}} = \frac{x^{-12}}{2^{-3}(x^{-2})^{-3}(y^3)^{-3}}$

$= \frac{x^{-12}}{8x^{6}y^{9}}$

$= \frac{x^{(-12-(-6))}}{8y^9}$

$= \frac{x^{-6}}{8y^9}$

$= \frac{1}{8x^6y^9}$

4. $\left(\frac{3a^2}{b^3}\right)^{-2}$

$= \frac{(b^3)^2}{(3a^2)^2} = \frac{b^6}{9a^4}$

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