Pablo Muñoz
Superintendent of Schools

Amira Presto
Mathematics Instructional Chair

Summer Math Assignment:

The Passaic High School Mathematics Department requests all students to complete the summer assignment. Students must show work on white lined paper and return the assignment to their math teacher by Monday September 11, 2017. Assessment on the summer assignment will be administered the first week of school.

Thank you and have a great summer.

Phone: 973.470.5787 | Fax: 973.909.9156 | 101 Passaic Avenue, Passaic, NJ 07055 | aalavi@passaicschools.org

Problem

What is the solution of $x + 5 = 33$?

Solve $x + 5 = 33$

$x + 5 = 33$
$-5 \quad -5$

Undo adding 5 by subtracting 5.

$x = 28$

Simplify. This isolates x.

Check $x + 5 = 33$

Check your solution in the original equation.
Substitute 28 for x.

$28 + 5 \stackrel{?}{=} 33$

$33 = 33$ ✓

Exercises

Use the Distributive Property to simplify each expression.

1. $6(z + 4)$ **2.** $2(-2 - k)$ **3.** $(5x + 1)4$ **4.** $(7 - 11n)10$

5. $(3 - 8w)\ 4.5$ **6.** $(4p + 5)2.6$ **7.** $4(y + 4)$ **8.** $6(q - 2)$

Solve each equation using addition or subtraction. Check your answer.

9. $-3 = n + 9$ **10.** $f + 6 = -6$ **11.** $m + 12 = 22$

12. $r + 2 = 7$ **13.** $b + 1.1 = -11$ **14.** $t + 9 = 4$

Solve each equation using multiplication or division. Check your answer.

15. $\frac{z}{8} = 2$ **16.** $-26 = \frac{c}{3}$ **17.** $\frac{q}{11} = -6$

18. $-\frac{a}{3} = 18$ **19.** $-25 = \frac{g}{5}$ **20.** $20.4 = \frac{s}{2.5}$

Solving Two-Step Equations

Problem

What is the solution of $5x - 8 = 32$?

$5x - 8 = 32$ $+8 \quad +8$	To get the variable term alone on the left side, add 8 to each side.
$5x = 40$	Simplify.
$\frac{5x}{5} = \frac{40}{5}$	Divide each side by 5 since x is being multiplied by 5 on the left side. This isolates x.
$x = 8$	Simplify.
Check $5x - 8 = 32$	Check your solution in the original equation.
$5(8) - 8 = 32$	Substitute 8 for x.
$32 = 32$ ✓	Simplify.

Solve each equation. Check your answer.

1. $4f - 8 = 20$

2. $25 - 6b = 55$

3. $-z + 7 = -8$

4. $\frac{w}{-9} + 7 = 10$

5. $25 = 8 + \frac{n}{2}$

6. $\frac{y-8}{3} = -7$

Solve each equation. Justify each step.

7. $6d - 5 = 31$

8. $\frac{p-7}{-2} = 5$

Define a variable and write an equation for each situation. Then solve.

9. A phone company charges a flat fee of \$17 per month, which includes free local calling plus \$0.08 per minute for long distance calls. The Taylor's phone bill for the month is \$31.80. How many minutes of long distance calling did they use during the month?

10. A delivery company charges a flat rate of \$3 for a large envelope plus an additional \$0.25 per ounce for every ounce over a pound the package weighs. The postage for the package is \$5.50. How much does the package weigh? (Hint: remember the first pound is included in the \$3.)

Variables on Both Sides	
Problem	
What is the solution of $2m - 4 + 5m = 13 - 6m - 4$?	
$7m - 4 = -6m + 9$	Add the terms with variables together on the left side and the constants on the right side to combine like terms.
$7m - 4 = -6m + 9$ $+6m \quad +6m$	To move the variables to the left side, add $6m$ to each side.
$13m - 4 = 9$	Simplify.
$13m - 4 = 9$ $+4 \quad +4$	To get the variable term alone on the left, add 4 to each side.
$13m = 13$	Simplify.
$\frac{13m}{13} = \frac{13}{13}$	Divide each side by 13 since x is being multiplied by 13 on the left side. This isolates x.
$m = 1$	Simplify.

Problem

What is the solution of $3(5x-2)=-3(x+6)$?

$15x-6=-3x-18$	Distribute 3 on the left side and -3 on the right side into the parentheses by multiplying them by each term inside.
$15x-6=-3x-18$ $+6 \quad +6$	To move all of the terms without a variable to the right side, add 6 to each side.
$15x=-3x-12$	Simplify.
$15x=-3x-12$ $+3x \quad +3x$	To get the variable terms to the left side, add $3x$ to each side.
$18x=-12$	Simplify.
$\frac{18x}{18}=-\frac{12}{18}$	Divide each side by 18 since x is being multiplied by 18 on the left side. This isolates x.
$x=-\frac{2}{3}$	Simplify and reduce the fraction.

Solve each equation. Check your answer.

1. $-5x+9=-3x+1$ **2.** $14+7n=14n+28$ **3.** $22(g-1)=2g+8$

4. $-d+12-3d=5d-6$ **5.** $4(m-2)=-2(3m+3)$ **6.** $-(4y-8)=2(y+4)$

7. $5a-2(4a+5)=7a$ **8.** $11w+2(3w-1)=15w$ **9.** $4(3-5p)=-5(3p+3)$

Literal Equations

Problem

What is the solution of $4x - 5y = 3$ for y? What is the value of y when $x = 10$?

$4x - 5y = 3$
$-4x \quad -4x$
$-5y = -4x + 3$

To get the y-term by itself on the left side, subtract $4x$ from each side.
Simplify.

$$\frac{-5y}{-5} = \frac{-4x+3}{-5}$$

Divide each side by -5 since y is being multiplied by -5 on the left side. This isolates y.

$$y = \frac{4}{5}x - \frac{3}{5}$$

Simplify by dividing each term by -5. Notice, this changes the sign of each term.

$$y = \frac{4}{5}(10) - \frac{3}{5}$$

To find the value of y when $x = 10$, substitute 10 in for x.

$$y = 7\frac{2}{5}$$

Simplify by multiplying first, then subtracting.

Problem

Solve the equation $ab - bc = cd$ for b.

$b(a - c) = cd$

Since b is a factor of each term on the left side, it can be factored out using the Distributive Property.

$$\frac{b(a-c)}{a-c} = \frac{cd}{a-c}$$

To get b by itself, divide each side by $a - c$ since b is being multiplied by $a - c$. Remember $a - c \neq 0$.

$$b = \frac{cd}{a-c}$$

Simplify.

Solve each equation for y. Then find the value of y for each value of x.

1. $y + 5x = 2; -1, 0, 1$

2. $6x = 2y - 4; 1, 2, 4$

3. $6x - 3y = -9; -2, 0, 2$

4. $4y = 5x - 8; -2, -1, 0$

5. $3y + 2x = -5; 0, 2, 3$

6. $5x = 8y - 6; -1, 0, 1$

7. $3(y - 2) + x = 1; -1, 0, 1$

8. $\frac{x+2}{y-3} = 1; -1, 0, 1$

9. $\frac{y+4}{x-5} = -3; -2, 2, 4$

Zero and Negative Exponents

Problem

What is the simplified form of each expression?

a. $3.9^0 = 1$ — Since the exponent is 0 but the base of the expression is 3.9, which is not 0, the expression has a value of 1.

b. $9^{-2} = \frac{1}{9^2}$ — The exponent is negative, so raise the reciprocal of 9, or $\frac{1}{9}$, to the exponent $-(-2)$, or 2.

$= \frac{1}{81}$ — Simplify.

Problem

What is the simplified form of $\frac{7b^{-3}}{a^2}$ using only positive exponents?

$\frac{7b^{-3}}{a^2} = \frac{7}{a^2} \cdot b^{-3}$ — Rewrite the expression as a product of factors with positive exponents and factors with negative exponents.

$= \frac{7}{a^2} \cdot \frac{1}{b^3}$ — Rewrite the factor with the negative exponent by raising the reciprocal of the base to a positive exponent.

$= \frac{7}{a^2 b^3}$ — Simplify by multiplying.

Write each expression as an integer, a simple fraction, or an expression that contains only positive exponents. Simplify.

1. 2.3^0

2. 10^{-4}

3. $2a^{-5}$

4. 113.7^0

5. 19^{-1}

6. $\frac{3^{-3}}{p}$

7. $(7q)^{-1}$

8. $\left(-\frac{7}{8}\right)^{-2}$

9. $1.8c^0$

10. $(-9.7)^0$

Write each expression so that it contains only positive exponents. Simplify.

11. -6^{-3} **12.** $-2rs^{-5}$ **13.** $7x^{-8}y^{0}$ **14.** $\left(\frac{5a}{3b}\right)^{-2}$

15. $(-8v)^{-2}w^{3}$ **16.** $\frac{2^{-3}}{m^{0}n^{-1}}$ **17.** $(3xy)^{0}z$ **18.** $\frac{-3^{-3}}{uv^{-2}}$

Multiplying Powers with the Same Base

Problem

What is each expression written as a single power?

a. $3^4 \cdot 3^2 \cdot 3^3$

All three powers have the same base, so this expression can be written as a single power by adding the exponents.

$3^4 \cdot 3^2 \cdot 3^3 = 3^{4+2+3}$ All powers have the same base. Add the exponents.

$= 3^9$ Simplify the exponent.

Even when an expression contains negative or rational exponents, the exponents can be added when the bases are the same in a product of powers.

b. $11^{-3} \cdot 11^4 \cdot 11^{-5}$

$11^{-3} \cdot 11^4 \cdot 11^{-5} = 11^{-3+4+(-5)}$ All powers have the same base. Add the exponents.

$= 11^{-4}$ Simplify the exponent.

c. $2^{\frac{1}{5}} \cdot 2^{\frac{3}{5}}$

$2^{\frac{1}{5}} \cdot 2^{\frac{3}{5}} = 2^{\frac{1}{5}+\frac{3}{5}}$ All powers have the same bases. Add the exponents.

$= 2^{\frac{4}{5}}$ Simplify the exponent.

Simplify each expression.

1. a^2a^3 **2.** $3n^3n^5$ **3.** $8k^3 \cdot 3k^6$

4. $(8p^5)(6p^4)$ **5.** $h^5 \cdot h^2 \cdot h^{10}$ **6.** $(-6.1m^4)(3m^2)$

7. $-6j^{-3}k \cdot 7jk^5$ **8.** $\left(-3x^{\frac{1}{2}}\right)\left(5w^8\right)\left(4x^{\frac{1}{3}}\right)$ **9.** $-2uvw^{-1} \cdot 3u^2v^{-2}w$

Complete each equation.

10. $4^{\square} \cdot 4^3 = 4^{13}$
11. $8^6 \cdot 8^5\, 5 = 8^{\square}$
12. $3^4 \cdot 3^{\square} = 3^{10}$
13. $k^{11} \cdot k^{\square} = k^2$
14. $w^{\square} \cdot w^{\frac{2}{5}} = w^{\frac{4}{5}}$
15. $x^2 \cdot x^{\square} \cdot x = x^9$
16. $p^{-5} \cdot p^{\square} = p^3 \cdot p^2$
17. $n^5 \cdot n^{-17} n^{\square} = n^{13}$
18. $t^5 u^2 \cdot t^{\square} u = t^{-4} u^3$

More Multiplication Properties

Problem

What is the simplified form of $(n^{-3})^6 n^4$?

Using the order of operations, first simplify the power $(n^{-3})^6$.

$(n^{-3})^6 n^4 = (n^{-3 \cdot 6}) n^4 = n^{-18} n^4$

Next, multiply. The two powers have the same base, so simplify by adding the exponents.

$n^{-18} n^4 = n^{-18+4} = n^{-14}$

Finally, write the expression using positive exponents. Rewrite the expression using the reciprocal of the base and the opposite of the exponent.

$$n^{-14} = \frac{1}{n^{14}}$$

Division Property of Exponents

Problem

How can you use the division property of exponents to show that $x^2 = \frac{x^5}{x^3}$ when $x \neq 0$?

Expand the numerator and denominator.

$$\frac{x^5}{x^3} = \frac{x \cdot x \cdot x \cdot x \cdot x}{x \cdot x \cdot x}$$

After dividing out the common factors you are left with $x \cdot x = x^2$.

Division properties of exponents work whether the bases in the problem are constants or variables. When you divide powers with the same base, subtract the exponents. In this example, x^5 and x^3 are powers with the same base and when you divided them, the result was $x^2 = x^{5-3}$.

Simplify each expression.

1. $(y^2)^3$
2. $(v^9)^6$
3. $(h^4)^5$
4. $(n^4)^{11}$
5. $\left(3a^{\frac{1}{5}}\right)^4$
6. $(7k)^0$
7. $(x^{13}y^6)^{-2}(y^{-5}x^{10})^6$
8. $4m^0n^0(6m^5)^2$

Complete each equation.

9. $(y^{\square})^{\square} = y^{\frac{3}{5}}$
10. $(6p^3q^{\square})^2 = 36p^6$
11. $(4a^{\square})^3 = 64a^{-6}$
12. $(k^{11})^{\square} = 1$
13. $(t^{-8})^{\square} = t^{16}$
14. $15(c^{-1})^{\square} = 15c^{10}$

Simplify each expression.

15. $\frac{7^5}{7^2}$
16. $\frac{3^9}{3^2}$
17. $\frac{5^2}{5}$
18. $\frac{4^z}{4^4}$
19. $\frac{m^{\frac{3}{4}}}{m^{\frac{1}{2}}}$
20. $\frac{p^6}{p^5}$
21. $\frac{r^3}{r}$
22. $\frac{x^5y^4}{x^3y}$
23. $\frac{a^3}{a^5}$
24. $\frac{10x^5}{15x^2}$

Adding Polynomials

Problem

What is the simplified form of $(3x^2 - 4x + 5) + (5x^2 + 2x - 8)$?

Write the problem vertically, lining up the like terms.
Then add each pair of like terms.

$$\begin{array}{r} 3x^2 - 4x + 5 \\ +\ 5x^2 + 2x - 8 \\ \hline \end{array}$$

Solve

Add the x^2 terms: $3x^2 + 5x^2 = 8x^2$

Add the x terms: $-4x + 2x = -2x$

Add the constant terms: $5 + (-8) = -3$

$$\begin{array}{r} 3x^2 - 4x + 5 \\ +\ 5x^2 + 2x - 8 \\ \hline 8x^2 - 2x - 3 \end{array}$$

Add the sums.

Subtracting Polynomials

Problem

What is the simplified form of $(6x^3 + 4x^2 - 3x) - (2x^3 + 3x^2 - 5x)$?

Write the problem vertically, lining up the like terms. Then subtract each pair of like terms.

$$\begin{array}{r} 6x^3 + 4x^2 - 3x \\ -(2x^3 + 3x^2 - 5x) \\ \hline \end{array}$$

Solve

Subtract the x^3 terms. $6x^3 - 2x^3 = 4x^3$

Subtract the x^2 terms. $4x^2 - 3x^2 = x^2$

Subtract the x terms. $-3x - (-5x) = 2x$

$$\begin{array}{r} 6x^3 + 4x^2 - 3x \\ -(2x^3 + 3x^2 - 5x) \\ \hline 4x^3 + x^2 + 2x \end{array}$$

Add the differences.

Simplify.

1.
$$\begin{array}{r} 5b^2 + 3b \\ +2b^2 - 5b \\ \hline \end{array}$$

2.
$$\begin{array}{r} -3e^2 - 5e + 2 \\ +e^2 + 2e - 7 \\ \hline \end{array}$$

3.
$$\begin{array}{r} 5g^3 - 2g^2 + 3g \\ +2g^3 + 5g^2 - 2g \\ \hline \end{array}$$

4. $(3h^2 + 5) + (-5h^2 - 3)$

5. $(2j^2 + 4j - 6) + (4j^2 - 3j - 3)$

6.
$$\begin{array}{r} 4k^2 + 5k \\ -3k^2 + 2k \\ \hline \end{array}$$

7.
$$\begin{array}{r} 5p^2 + 6p + 4 \\ -(7p^2 + 4p + 8) \\ \hline \end{array}$$

8.
$$\begin{array}{r} 2r^3 - 2r^2 + 5r \\ -(4r^3 + 5r^2 + 3r) \\ \hline \end{array}$$

9. $(6s^2 - 5s) - (-2s^2 + 3s)$

10. $(3w^2 + 6w - 5) - (5w^2 - 4w + 2)$

Quadratic Formula

Problem

What are the solutions of $x^2 + 7x = 60$? Use the quadratic formula.

First rewrite the equation in the form $ax^2 + bx + c = 0$.

$x^2 + 7x = 60$

$x^2 + 7x - 60 = 60 - 60$ Subtract 60 from each side.

$x^2 + 7x - 60 = 0$ Simplify.

Therefore, $a = 1$, $b = 7$, and $c = -60$.

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{-7 \pm \sqrt{7^2 - 4(1)(-60)}}{2(1)}$$

$$x = \frac{-7 \pm \sqrt{289}}{2}$$

$$x = \frac{-7 \pm 17}{2}$$

The two solutions are $\frac{-7-17}{2}$ or -12 and $\frac{-7+17}{2}$ or 5.

x={-12, 5}

Use the quadratic formula to solve each equation.

1. $x^2 - 19x + 70 = 0$

2. $x^2 + 32x + 175 = 0$

3. $2x^2 + 37x - 19 = 0$

4. $x^2 - 10x = 75$

5. $x^2 + x = 132$

6. $6x^2 + 13x = 28$

7. $20x^2 + 11x = 3$

8. $4x^2 + 24x = -35$

9. $15x^2 + 20 = 40x$