Chapter 11 Student Success Sheet (SSS)

GCF and Rational Expressions

Olathe East High School – Intermediate Algebra

Name:_____

Hour: ____

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"There are no secrets to success. It is the result of preparation, hard work, and learning from failure."

Colin Powell

Concept #	What we will be learning…
Pre-	Divisibility Rules and review GCF before factoring
1	Simplifying rational expressions
2	Multiplying rational expressions
3	Dividing rational expressions
4	Adding and subtracting rational expressions (with like denominators)
5	Solving rational equations (2 terms)

Divisibility Math Tricks - MEMORIZE THESE!

Dividing by 2

1. All even numbers are divisible by 2.
   - *For example: all numbers ending in 0,2,4,6 or 8*

Dividing by 3

1. Add up all the digits in the number.
2. Find out what the sum is. If the sum is divisible by 3, so is the number
   - *For example: 12123 (1+2+1+2+3=9) 9 is divisible by 3, therefore 12123 is too!*

Dividing by 4

1. Can you divide your number by 2 TWICE? If so, your number is divisible by 4!
   - *For example: 244 divided by 2 is 122, 122 divided by 2 is 61. Therefore 244 is divisible by 4*

Dividing by 5

1. Numbers ending in a 5 or a 0 are always divisible by 5.

Dividing by 6

1. If the Number is divisible by 2 **and** 3 it is divisible by 6 also.

Dividing by 9

1. Almost the same rule as dividing by 3. Add up all the digits in the number.
2. Find out what the sum is. If the sum is divisible by 9, so is the number.
   - *For example: 43785 (4+3+7+8+5=27) 27 is divisible by 9, therefore 43785 is too!*

Dividing by 10

1. If the number ends in a 0, it is divisible by 10.

Review Factoring and finding GCF

$6x^2 + 42x + 60$

Is there a GCF? Yes/no

$6(x^2 + 7x + 10)$

$5n^2 + 9n - 2$

Is there a GCF? Yes/no

$5n^2 + 9n - 2$

$-5r^2 + 19r + 4$

Is there a GCF? Yes/no

$-1(5r^2 - 19r - 4)$

Answer:

6( )( )

Answer:

( )( )

Answer:

-1( )( )

11) $3n^2 - 12n - 15$

12) $-2x^2 - 4x + 70$

13) $8p^2 - 60p + 28$

14) $-3x^2 - 10x + 8$

15) $48v^2 - 75$

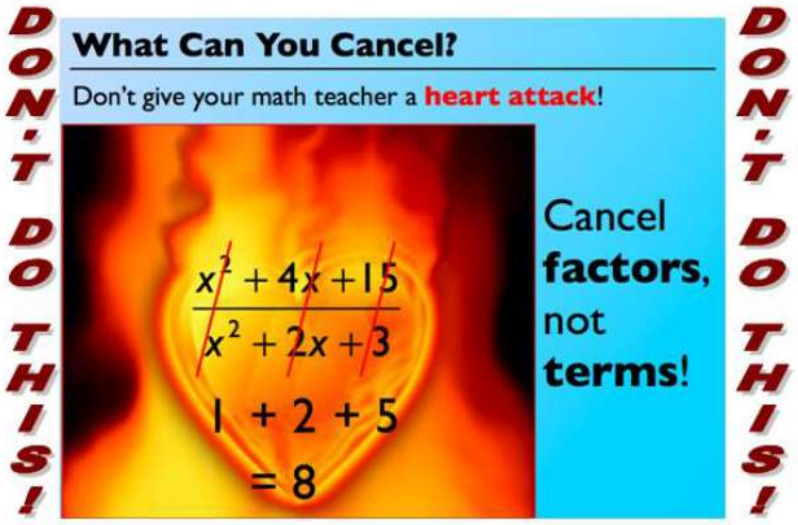
4

#1 Simplifying rational expressions

Reminder... divisibility rules!

Draw 6 bridge maps representing the divisibility rules for 2,3,4,5,6, and 9.

Relating factor: Something is divisible by ____ if _____



Think about it...
How is what you are trying to cancel connected to the stuff next to it?

If it is connected by a + (addition) or a – (subtraction), DON'T DO IT! [these are **terms**]

Example:

$$\frac{2x+3}{x+3} \qquad \frac{2x^2-2x+5}{x^2+3} \qquad \frac{5x+3}{5x+2}$$

If it is connected by ( ) (multiplication), DO IT IF THEY ARE **IDENTICAL**! [these are **factors**]

Example:

$$\frac{(2x+3)(x+3)}{(x+3)} \qquad \frac{(x)(2x+5)}{(x)(x+3)} \qquad \frac{(5)(x+3)}{(5)(x+2)}$$

Notes

Rational --- **Expressions**
Have a top --- **Numerator**
And a bottom --- **Denominator**
That are both --- **Polynomials**
Other than --- zero!

1. Look for GREATEST COMMON FACTORS (GCF) for all parts
2. Look to FACTOR any remaining *QUADRATIC* pieces using grouping
3. Look to cancel any IDENTICAL factors if ONE IS ON TOP and ONE IS ON BOTTOM!
4. Look to REDUCE any coefficients that have something in common (use divisibility rules!)

Examples

#1 $\frac{25r^2-5r}{25r^3}$

#2 $\frac{m+1}{5m+5}$

#3 $\frac{4x^2+8x}{x+2}$

#4 $\frac{6n+2}{8n}$

Examples

#5 $\dfrac{5b^2+19b-4}{2b^2+13b+20}$

#6 $\dfrac{2r^2+8r-10}{5r^2+20r-25}$

#7 $\dfrac{3x^2-17x+10}{3x^2-15x}$

#8 $\dfrac{3v^2-7v+2}{5v-10}$

#2 Multiplying rational expressions

N O T E S

ONE STEP AT A TIME...

one part at a time!

1. Look for GREATEST COMMON FACTORS (GCF) for all parts
2. Look to _____ any remaining _____ pieces using grouping
3. Look to cancel any _____ factors if ONE IS ON TOP and ONE IS ON BOTTOM!
4. Look to _____ any _____ that have something in common (use divisibility rules!)

Examples

#9 $\frac{2(3n+5)}{(3n+5)(5n+1)} \cdot \frac{5n+1}{3n}$

#10 $\frac{x-5}{3x-1} \cdot \frac{2(3x-1)(x+2)}{2(x+3)(x+2)}$

#11 $\frac{b+1}{2b(3b-1)} \cdot \frac{2b(3b-1)}{4b}$

#12 $\frac{2v^2(2x-3)}{4v(2v-3)} \cdot \frac{4v}{2v^2}$

#13 $\frac{5x^2-5}{5} \cdot \frac{5}{10x^2+10x}$

#14 $\frac{2}{4a^3+8a^2} \cdot \frac{4a^3+8a^2}{2}$

#15 $\frac{x+1}{20x^3+12x^2} \cdot \frac{20x^3+12x^2}{4x^3-4x^2}$

#16 $\frac{3m-15}{2m} \cdot \frac{10m^2-6m}{5m^2-28m+15}$

#3 Dividing rational expressions

N O T E S

ONE STEP AT A TIME!
one part at a time!

Pre-Step Take the RECIPROCAL of the SECOND rational expression (FLIP THE FRACTION!)

1. Look for _____ (GCF) for all parts
2. Look to _____ any remaining _____ pieces using the "box"
3. Look to cancel any _____ factors if ONE IS ON TOP and ONE IS ON BOTTOM!
4. Look to _____ any _____ that have something in common (use divisibility rules!)

Examples

#17 $\dfrac{3v-4}{(3v-4)(2v-5)} \div \dfrac{1}{(v-4)(2v-5)}$

#18 $\dfrac{x+3}{4x^2} \div \dfrac{3(5x-3)}{4x^2(5x-3)}$

#19 $\dfrac{2(n+2)}{2(n+2)(5n-1)} \div \dfrac{n-4}{4(5n-1)}$

#20 $\dfrac{3a-2}{(a-2)(3a-2)} \div \dfrac{4(a+2)}{2(a+5)(a+2)}$

#21 $\frac{10x^2-2x}{5x^2-16x+3} \div \frac{2x}{5x^2}$

#22 $\frac{15n^2-25n}{n-5} \div \frac{6n-10}{2}$

#23 $\frac{10p+20}{2p^2-2p-12} \div \frac{3p-4}{6p-8}$

#24 $\frac{5x^2-5}{25x^2+45x+20} \div \frac{2x^2-15x+25}{10x^2-17x-20}$

#4 Adding and subtracting rational expressions (like denominators)

Notes **Subtracting is the same as adding... with one small exception...**

you MUST _____ the _____

into the _____ expression!

1. Add or subtract the _____
2. Keep the denominators the _____
3. Fully _____ both the _____ and the _____ to see if anything _____

If they already have COMMON DENOMINATOR...

#25 $\frac{2}{(x+4)(x-5)} + \frac{x+5}{(x+4)(x-5)}$

#26 $\frac{3n}{4(5n-3)} + \frac{n-4}{4(5n-3)}$

#27 $\frac{6}{3(p+6)(p+1)} + \frac{2p+2}{3(p+6)(p+1)}$

#28 $\frac{m+5}{(m+3)^2} + \frac{2}{(m+3)^2}$

#29 $\frac{4n+5}{8(n-2)} - \frac{n+1}{8(n-2)}$

#30 $\frac{r+1}{2r(r-5)} - \frac{r+2}{2r(r-5)}$

#31 $\frac{x-3}{(2x+5)(x+3)} - \frac{x+5}{(2x+5)(x+3)}$

#32 $\frac{m+4}{(m+3)(2m+5)} - \frac{3m}{(m+3)(2m+5)}$

#33 $\frac{x-6}{x^2-3x+2} + \frac{x-4}{x^2-3x+2}$

#34 $\frac{3b}{2b^2-4b} + \frac{5}{2b^2-4b}$

#35 $\frac{3m}{4m+20} - \frac{m+5}{4m+20}$

#36 $\frac{2n-3}{3n^2+9n} - \frac{r+4}{3n^2+9n}$

#5 Solving rational equations (2 terms)

Notes **There can only be one rational expression on each side…**

CROSS-MULTIPLY

$$\frac{A}{B}=\frac{C}{D} \text{ MEANS } AD = BC \text{ … so}$$

$$\frac{x+2}{7}=\frac{2x-4}{9} \text{ MEANS}$$

$$9(x+2) = 7(2x-4)$$

DISTRIBUTE AND SOLVE!

Examples

#37 $\frac{6}{p}=\frac{7}{8}$

#38 $\frac{4}{m+3}=\frac{3}{7}$

#39 $\frac{r}{5r+5}=\frac{2}{3}$

#40 $\frac{7}{4}=\frac{n}{n+3}$

#41 $\frac{2b}{4}=\frac{3b+1}{8}$

#42 $\frac{8}{4}=\frac{7v+1}{v-4}$

#43 $\frac{2}{4}=\frac{3n-8}{3n-7}$