Performance Indicator: Factor polynomials.

12 Factor: $(x^3 + 3x^2) + (2x + 6)$

F $x(x^2 + 3x + 8)$

G $x(x^2 + 3x + 2)$

H $(x + 3)(x^2 + 2)$

J $(x + 2)(x^2 + 3)$

$x^2(x+3) + 2(x+3)$

$(x^2+2)(x+3)$

12-4 Multiplying and Dividing Rational Expressions

Objective:

I can and I will multiply rational expressions.

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12-4 Multiplying and Dividing Rational Expressions

The rules for multiplying rational expressions are the same as the rules for multiplying fractions. You multiply the numerators, and you multiply the denominators.

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Watch This!

Multiply. Simplify your answer.

$$\frac{a+3}{2} \cdot \frac{6}{3a+9}$$

$$\frac{6(a+3)}{2(3a+9)} \qquad \frac{6a+18}{6a+18} = 1$$

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12-4 Multiplying and Dividing Rational Expressions

Ex 1)

Multiply. Simplify your answer.

$$\frac{c-1}{2} \cdot \frac{4}{3c-3}$$

$$\frac{4(c-1)}{2(3c-3)} = \frac{4c-4}{6c-6} \qquad \frac{4(c-1)}{6(c-1)} = \frac{4}{6} = \frac{2}{3}$$

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Multiplying and Dividing Rational Expressions

Ex. 2)

Multiply. Simplify your answer.

$$\frac{8x^2y^3}{5yz^2} \cdot \frac{10y^2z^2}{16y^3} = \frac{8 \cdot 10 \cdot x^2 \cdot y^3 \cdot y^2 \cdot z^2}{5 \cdot 16 \cdot y \cdot y^3 \cdot z^2} =$$

$$\frac{80 \cdot x^2 \cdot y^5 \cdot z^2}{80 \cdot y^4 \cdot z^2} = x^2y$$

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Multiplying and Dividing Rational Expressions

Ex. 3)

Multiply. Simplify your answer.

$$\frac{6r^2}{5s^3} \cdot \frac{3r^2}{7s} = \frac{6 \cdot 3 \cdot r^2 \cdot r^2}{5 \cdot 7 \cdot s^3 \cdot s} = \frac{18r^4}{35s^4}$$

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Multiplying and Dividing Rational Expressions

Remember!

See the Quotient of Powers Property in Lesson 7-4.

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

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12-4 Multiplying and Dividing Rational Expressions

Watch This!

$$\frac{(x^2 + 8x + 15)}{1} \cdot \frac{4}{2x + 6} = \frac{(x+5)(x+3)}{1} \cdot \frac{4}{2(x+3)}$$

$$\frac{4(x+5)}{2} = 2(x+5) = 2x+10$$

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12-4 Multiplying and Dividing Rational Expressions

Ex. 4

Multiply $\dfrac{m-5}{m^2-4m-12} \cdot 3m+6$. **Simplify your answer.**

-12, -6, 2, -4

$$\frac{m-5}{(m-6)(m+2)} \cdot \frac{3(m+2)}{1} =$$

$$\frac{3(m-5)}{m-6} = \frac{3m-15}{m-6}$$

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Multiplying and Dividing Rational Expressions

Remember!

Just as you can write an integer as a fraction, you can write any expression as a rational expression by writing it with a denominator of 1.

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Multiplying and Dividing Rational Expressions

There are two methods for simplifying rational expressions. You can simplify first by dividing out and then multiply the remaining factors. You can also multiply first and then simplify. Using either method will result in the same answer.

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12-4 Multiplying and Dividing Rational Expressions

Watch This!

$$\frac{4d^3 + 4d}{16f} \cdot \frac{2f}{7d^2f + 7f}$$

$$\frac{4d(d^2+1)}{2 \cdot 4 \cdot 4f} \cdot \frac{2f}{7f(d^2+1)} = \frac{d}{14f}$$

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Multiplying and Dividing Rational Expressions

Ex. 5)

Multiply $\frac{3a^2 + 6a}{12b^2} \cdot \frac{2b^3}{3ab + 6b}$. **Simplify your answer.**

$$\frac{3a(a+2)}{12b^2} \cdot \frac{2b^3}{3b(a+2)} = \frac{a}{6}$$

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12-4 Multiplying and Dividing Rational Expressions

Ex. 6)

Multiply $\dfrac{n-5}{n^2+4n} \cdot \dfrac{n^2+8n+16}{n^2-3n-10}$

-10
-5 2
-3

$$\frac{n-5}{n(n+4)} \cdot \frac{(n+4)(n+4)}{(n-5)(n+2)} = \frac{n+4}{n(n+2)} = \frac{n+4}{n^2+2n}$$

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Practice!

Pg. 902, # 4 – 9 and 13 - 15

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