Solving Equations With Rational Coefficients

Recall: How do we solve the following equation?

3x = 18

We divide each side by 3 because we would like to "undo" the multiplication of the 3.

How would we solve this equation?

$$\frac{122}{r} = 3 \quad r \neq 0$$

why is r ? Can 122 be divided into 0 groups?

The variable is in the denominator. To see a complete answer with r= _____ , we need a way to make sure that it is in the numerator

Solution: Multiply each side by the denominator

$$\frac{122}{r} = 3$$

$$r * \frac{122}{r} = 3 * r$$

$$122 = 3 * r$$

$$\frac{122}{3} = r$$

So r = $\frac{122}{3}$ or $40 \frac{2}{3}$ or $40.\overline{6}$

How can we check this?
Replace r in the original equation with our solution….

Left Side		Right Side
	=	3
	=	3
*	=	3

3   =   3   So this solution is correct!

Ex. 2   Here the variable is in the numerator, but we have a number of rational coefficients.

$$\frac{2a}{3} = \frac{4a}{5} + 7$$

Notice that this time, there are multiple **different denominators**.
We would like our final answer to not have any fractions with the variable.

To fix this, we can **multiply each side by the common denominator.**

The denominators are 3, 5 and 1. All of them have the common denominator of **15.**

$$\frac{2a}{3} * \frac{15}{1} = (\frac{4a}{5} + 7) * \frac{15}{1}$$ Multiply each side by 15

$$\frac{2a}{3} * \frac{15}{1} = \frac{4a}{5} * \frac{15}{1} + 7 * \frac{15}{1}$$ Use the distributive property

$$2a * 5 = 4a * 3 + 7 * 15$$

$$10a = 12a + 105$$

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$$10a = 12a + 105$$

$$-2a = 105$$

$$a = -52.5$$

Check your answer!
+ 7
+ 7
-35 = -35

Solve and check your answers

Ex. $$\frac{45}{r} = 15$$ $$\frac{-6}{p} = -10$$

Ex. $$\frac{4a}{2} = \frac{4a}{5} + 2$$ $$\frac{3a}{2} + 5 = \frac{5a}{6} + 2$$