C11 - 6.1 - Simplifying Rationals Notes

Simplify.

$\frac{2}{4} = \frac{2 \div 2}{4 \div 2} = \frac{1}{2}$

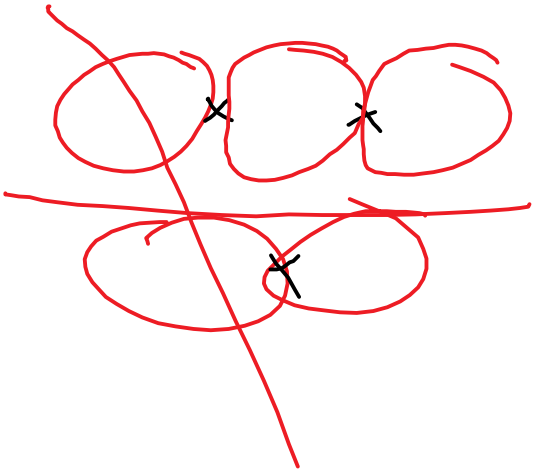
$\frac{2}{4} = \frac{2}{2 \times 2} = \frac{1}{2}$

$\frac{36}{18} = \frac{2 \times 2 \times 3 \times 3}{2 \times 3 \times 3} = 2$

$\frac{6x^2}{2x} = \frac{6 \times x \times x}{2 \times x} = 3x$

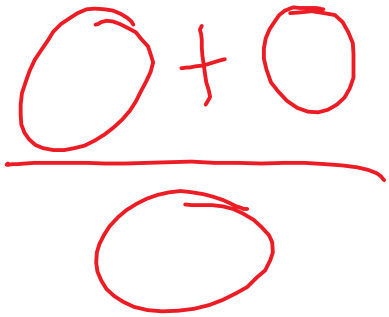
Factor, Simplify.

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



$\frac{x^2 + 5x + 6}{x + 3} = \frac{(x + 2)(x + 3)}{x + 3} = (x + 2)$

$\frac{x + 3}{x^2 - 9} = \frac{x + 3}{(x + 3)(x - 3)} = \frac{1}{x - 3}$



$\frac{1}{2 - x} = \frac{1}{-(x - 2)} = \frac{-1}{x - 2}$

$\frac{x - 4}{4 - x} = \frac{x - 4}{-(-4 + x)} = -\frac{x - 4}{x - 4} = -1$

$\frac{x^2 - 3x - 4}{x^2 - 1} = \frac{(x - 4)(x + 1)}{(x - 1)(x + 1)} = \frac{x - 4}{x - 1}$

$\frac{x^2 - 5x + 6}{x + 2} = \frac{(x - 2)(x - 3)}{x + 2}$ Cannot Simplify

C11 - 6.2 - Multiplying Dividing/Restrictions Rationals Notes

Multiplication and division.

$\frac{1}{2} \times \frac{1}{3} = \frac{1}{6}$ Multiply Tops
Multiply Bottoms

$\frac{3}{8} \times \frac{4}{9} = \frac{3 \times 4}{8 \times 9} = \frac{3 \times 2 \times 2}{2 \times 2 \times 2 \times 3 \times 3} = \frac{1}{6}$

$\frac{a}{2} \div \frac{1}{3} =$
$\frac{a}{2} \times \frac{3}{1} = \frac{3a}{2}$ Flip and multiply

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$\frac{x+2}{x+3} \times \frac{2}{x+2} = \frac{2(x+2)}{(x+3)(x+2)} = \frac{2}{x+3}$

Factor
Simplify

Restrictions

$x + 2 \neq 0$
$x \neq -2$

$x + 3 \neq 0$
$x \neq -3$

$\frac{x+1}{x^2-5x+6} \times \frac{x-2}{x^2+5x+4} =$
$\frac{x+1}{(x-3)(x-2)} \times \frac{x-2}{(x+4)(x+1)} =$
$\frac{(x-2)(x+1)}{(x-3)(x-2)(x+4)(x+1)} = \frac{1}{(x-3)(x+4)}$

$x - 2 \neq 0$
$x \neq 2$

$x + 1 \neq 0$
$x \neq -1$

$x + 4 \neq 0$
$x \neq -4$

$x - 3 \neq 0$
$x \neq 3$

$x \neq 2, -1, 3, -4$

$\frac{x-4}{x+5} \div \frac{x-4}{x-3} =$
$\frac{x-4}{x+5} \times \frac{x-3}{x-4} =$
$\frac{(x-4)(x-3)}{(x+5)(x-4)} = \frac{x-3}{x+5}$

Flip and multiply

$x - 3 \neq 0$
$x \neq 3$

$x + 5 \neq 0$
$x \neq -5$

$x - 4 \neq 0$
$x \neq 4$

$x \neq 3, -5, 4$

$\frac{x-7}{x+4} \div \frac{x^2-2x-15}{x^2-x-20}$
$\frac{x-7}{x+4} \div \frac{(x-5)(x+3)}{(x-5)(x+4)} =$
$\frac{x-7}{x+4} \times \frac{(x-5)(x+4)}{(x-5)(x+3)} =$
$\frac{(x-7)(x-5)(x+4)}{(x+4)(x-5)(x+3)} = \frac{x-7}{x-3}$

Factor 1st

$x + 4 \neq 0$
$x \neq -4$

$x - 5 \neq 0$
$x \neq 5$

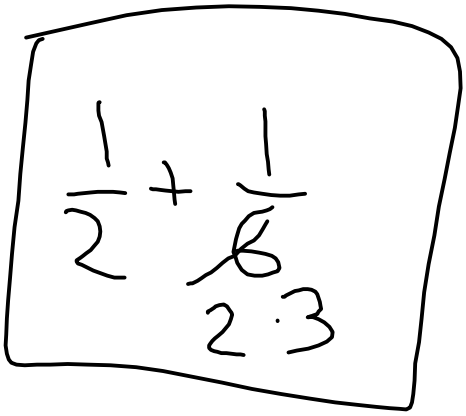
$x \neq -4, 5$

C11 - 6.3 - Adding Subtracting Rationals Notes

$$\frac{1}{2}+\frac{1}{3}=$$
$$\frac{3\times 1}{3\times 2}+\frac{1\times 2}{3\times 2}=$$
$$\frac{3}{6}+\frac{2}{6}=\frac{5}{6}$$

$LCD = 6$

LCD
Do to top, do to bottom
Add/subtract



$$\frac{x}{2}+\frac{1}{2}=\frac{x+1}{2}$$ $LCD = 2$

$$\frac{x}{2}-\frac{1}{6}=$$
$$\frac{3\times x}{3\times 2}-\frac{1}{6}=$$
$$\frac{3x}{6}-\frac{1}{6}=\frac{3x-1}{6}$$

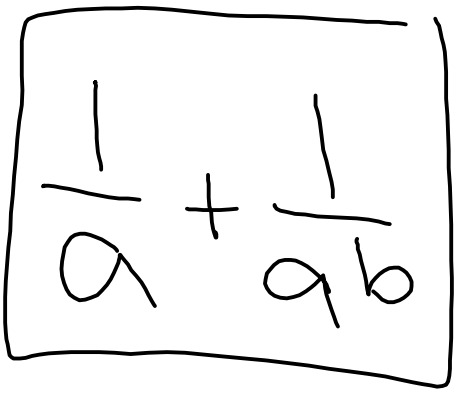
$LCD = 6$

$$\frac{3}{2}-\frac{x+2}{2}=$$
$$\frac{3-x-2}{2}=\frac{1-x}{2}$$

Don't forget to distribute the negative

$$\frac{x}{x+2}+\frac{1}{x+2}=\frac{x+1}{x+2}$$ $LCD = x+2$

$x+2\neq 0$
$x\neq -2$



$$\frac{1}{x+2}+\frac{1}{(x+2)(x+3)}=$$
$$\frac{x+3}{x+3}\times\frac{1}{x+2}+\frac{1}{(x+2)(x+3)}=$$
$$\frac{x+3}{(x+2)(x+3)}+\frac{1}{(x+2)(x+3)}=$$
$$\frac{x+3+1}{(x+2)(x+3)}=\frac{x+4}{(x+2)(x+3)}$$

C11 - 6.3 - Adding Subtracting Rationals Notes

$$\frac{1}{x} + \frac{3}{(x+2)} =$$

$$\frac{x+2}{x+2} \times \frac{1}{x} + \frac{3}{(x+2)} \times \frac{x}{x} =$$

$$\frac{x+2}{x(x+2)} + \frac{3x}{x(x+2)} =$$

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

$$\frac{1}{a} + \frac{1}{b} = \frac{?}{ab}$$

$$\frac{1}{ab} + \frac{1}{c} = \frac{1}{abc}$$

$$\frac{1}{ab} + \frac{1}{ac} = \frac{1}{abc}$$

$$\frac{x+2}{x^2+5x+6} + \frac{1}{x+3} =$$

$$\frac{\cancel{x+2}}{(x+2)(x+3)} + \frac{1}{x+3} =$$

$$\frac{1}{x+3} + \frac{1}{x+3} =$$

$$\frac{1+1}{x+3} = \frac{2}{x+3}$$

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

$$\frac{x}{(x-2)(x+2)} - \frac{2}{(x-2)(x+2)} =$$

$$\frac{\cancel{x-2}}{(x-2)(x+2)} = \frac{1}{x+2}$$

C11 - 6.4 - Rational Equations Notes

Solve for x.

Get an LCD then Multiply by the LCD

1)
$$\frac{x}{2}+\frac{1}{4}=\frac{3}{4}$$
$$\frac{2}{2}\times\frac{x}{2}+\frac{1}{4}=\frac{3}{4}$$
$$\frac{2x}{4}+\frac{1}{4}=\frac{3}{4}$$
$$\left(\frac{2x}{4}+\frac{1}{4}=\frac{3}{4}\right)\times LCD$$
$$2x+1=3$$
$$-1\quad -1$$
$$2x=2$$
$$\frac{2x}{2}=\frac{2}{2}$$
$$\boxed{x=1}$$

Multiply by the LCD=4

$$\frac{x}{2}+\frac{1}{4}=\frac{3}{4}$$
$$\left(\frac{x}{2}+\frac{1}{4}=\frac{3}{4}\right)\times 4$$
$$\frac{4x}{2}+\frac{4}{4}=\frac{12}{4}$$
$$2x+1=3$$
$$-1\quad -1$$
$$2x=2$$
$$\frac{2x}{2}=\frac{2}{2}$$
$$\boxed{x=1}$$

$$\left(\frac{x}{2}+\frac{1}{4}=\frac{3}{4}\right)\times LCD:4$$
$$2x+1=3$$
$$2x=2$$
$$\boxed{x=1}$$

Instead of actually multiplying by the LCD we are going to multiply and simplify at the same time.

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2)
$$\frac{2}{x+2}+3=\frac{11}{x+2}$$
$$LCD=x+2$$
$$\left(\frac{2}{x+2}+3=\frac{11}{x+2}\right)\times LCD$$
$$\frac{2(x+2)}{x+2}+3(x+2)=\frac{11(x+2)}{x+2}$$
$$2+3(x+2)=11$$
$$2+3x+6=11$$
$$3x=3$$
$$\boxed{x=1}$$

$$x+2\neq 0$$
$$\boxed{x\neq -2}$$

$$\left(\frac{2}{x+2}+3=\frac{11}{x+2}\right)\times LCD$$
$$2+3(x+2)=11$$
$$2+3x+6=11$$
$$3x=3$$
$$x=1$$

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3)
$$\frac{2}{x+2}=\frac{4}{x-3}$$
$$\left(\frac{2}{x+2}=\frac{4}{x-3}\right)\times LCD$$
$$LCD=(x+2)(x-3)$$
$$2(x-3)=4(x+2)$$
$$2x-6=4x+8$$
$$-14=2x$$
$$\boxed{x=-7}$$

$$x+2\neq 0$$
$$\boxed{x\neq -2}$$

$$x-3\neq 0$$
$$x\neq 3$$

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4)
$$\frac{15}{x^2+5x+6}-\frac{2}{x+2}=\frac{1}{x+2}$$
Factor
$$\left(\frac{15}{(x+2)(x+3)}-\frac{2}{x+2}=\frac{1}{x+2}\right)\times LCD$$
$$LCD=(x+2)(x+3)$$
$$15-2(x+3)=1(x+3)$$
$$15-2x-6=x+3$$
$$9=3x$$
$$\boxed{x=3}$$

$$x+2\neq 0$$
$$\boxed{x\neq -2}$$

$$x+3\neq 0$$
$$\boxed{x\neq -3}$$