Do Now:

Please place a magnet on the emoji that best describes your feelings about the midterm process as a whole.

Solve:

$$\frac{4x}{(x-3)}+\frac{x}{(2)}=\frac{12}{(x-3)}$$

(2)(x-3) (2)(x-3) (2)(x-3)

LCD: (2)(x-3)

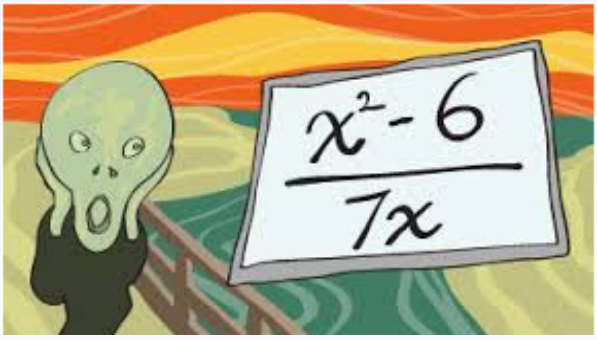
$8x + x^2 - 3x = 24$

$x^2 + 5x - 24 = 0$

$(x+8)(x-3)=0$

$x=-8$ $x=3$

Mini Unit: Rational Expressions
~ Applications
~ Rational Inequalities
~ Graphing Rational Functions



Applications of Rational Equations

How fast can you row?

Objectives:
~ To construct a rational equation based on a given scenario
~ To solve rational equations

Rational Applications

Solving the application is just like solving an equation.

But we have to construct the equation based on the situation given.

Work Rate:

Example 1)

~ Work rate problems usually involve two people that are trying to help each other finish a single job.

Fran can clean the garage in 3 hours, but it takes Angie 4 hours to do the same job. How long would it take them to clean the garage if they worked together?

Fran 3 hrs → $\frac{1}{3}$ work per hr

Angie 4 hrs → $\frac{1}{4}$ work per hr

Let x = # hrs. to clean garage together

Together: $\frac{1}{x}$ of work per hour

$$\frac{1}{3}(12x) + \frac{1}{4}(12x) = \frac{1}{x}(12x)$$

LCD: 12x

$4x + 3x = 12$ $x = 1.7$ hrs.

$\frac{7x}{7} = \frac{12}{7}$

If they worked together, it would take 1.7 hrs.

Example 2) Wind / Current

Garth can row 5 miles per hour in still water. It takes him as long to row 4 miles upstream as 16 miles downstream. How fast is the current?

r d t

Equations for rate, distance and time:

$d = rt, \quad r = \frac{d}{t}, \quad t = \frac{d}{r}$

Let x: speed in still water (5 mi/h)

Let c: speed of current

A table can be beneficial here:

	Distance	Rate	Time
Upstream	4 mi	$x-c$ $5-c$	$\frac{4}{5-c}$
Downstream	16 mi	$x+c$ $5+c$	$\frac{16}{5+c}$

$\frac{4}{5-c} = \frac{16}{5+c}$

$4(5+c) = 16(5-c)$

$20+4c = 80-16c$

$20c = 60$

$c = 3$ mi/h

The current is 3 mph

Example 3) Kayaking

A kayaker spends an afternoon paddling on a river. She travels 3 mi upstream and 3 mi downstream in a total of 4 hours. In still water, the kayaker can travel at an average speed of 2mi/h. Based on this information, what is the average speed of the river's current? Is your answer reasonable?

Let c = speed of current

	Distance	Rate	Time
Up	3mi	$2-c$	$\frac{3}{2-c}$
Down	3mi	$2+c$	$\frac{3}{2+c}$

$$\frac{3}{(2-c)}+\frac{3}{(2+c)}=\frac{4}{1} \quad 4 \text{ hrs}$$

LCD: $(2+c)(2-c)$

$$6+3c+6-3c=4[(2+c)(2-c)]$$

$$12=4(4+2c-2c-c^2)$$

$$12=4(4-c^2)$$

$$12=16-4c^2$$

$$-16\ \ -16$$

$$\frac{-4}{-4}=\frac{-4c^2}{-4} \qquad c=\pm 1$$

$$1=c^2$$

Try this!

Jason can clean a large tank at an aquarium in about 6 hours. When Jason and Lacy work together, they can clean the tank in about 3.5 hours. About how long would it take Lacy to clean the tank by herself?

Jason: $\frac{1}{6}$

Lacy: $\frac{1}{x}$

Total: $3.5 \rightarrow \frac{1}{3.5}$

LCD: $(6)(x)(3.5)$ $\frac{1}{6}+\frac{1}{x}=\frac{1}{3.5}$

$3.5x+21=6x$

$21=2.5x$

$x=8.4$

$$\text{rate} = \frac{\text{total change}}{\text{total time}} = \frac{100}{158.33} = .6\,^{\circ}C/\text{min}$$

	Δ temp	rate	Time
First	50°C	1.5°C/min	$\frac{50}{1.5} \approx 33.33$ min
2nd	50°C	0.4°C/min	$\frac{50}{.4} = 125$ min
	Total: 100		Total: 158.33