## Warm-Up...

The distance between New York City and Los Angeles is about 2500 miles. Let $S$ be the airspeed of a jet. The wind speed is 100 miles per hour. Because of the wind, it takes longer to fly one way than the other.

| | $d$ (miles) | $s$ (mph) | $t$ (h) |
|---|---|---|---|
| with | 2500 | $s+100$ | $\frac{2500}{s+100}$ |
| against | 2500 | $s-100$ | $\frac{2500}{s-100}$ |

$t = \frac{d}{s}$

5. Write an equation for $S$ if it takes 2 hours and 5 minutes longer to fly between New York and Los Angeles against the wind versus flying with the wind.

2h & 5 minutes $\Rightarrow \frac{5}{60} = \frac{1}{12}$ } $2\frac{1}{12}$h

$= \frac{25}{12}$h

6. Solve the equation you wrote in Exercise 5 for $S$.

$$\frac{2500}{s-100} - \frac{2500}{s+100} = \frac{25}{12}$$

7. Write an equation and find how much longer to fly between New York and Los Angeles if the wind speed increases to 150 miles per hour and the airspeed of the jet is 525 miles per hour.

$12(s-100)(s+100)$ $12(s-100)(s+100)$

$$\frac{2500}{s-100} - \frac{2500}{s+100} = \frac{25}{12} \qquad (12)(s-100)(s+100) \quad (s^2-10\,000)$$

$30000s + 3000000 - 30000s + 3000000 = 25s^2 - 250000$

$6000000 = 25s^2 - 250000$

$\frac{25s^2}{25} - \frac{6250000}{25} = \frac{0}{25}$

$s^2 - 250000 = 0$

$(s-500)(s+500) = 0$ $\rightarrow$ OR $\sqrt{s^2} = \sqrt{250000}$

$s = 500$ or $-500$ $\qquad s = 500$

500 mph. is plane's speed

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| | d (km) | s (km/h) | t (h) |
|---|---|---|---|
| Q → FL | 70 | $x-5$ | $\frac{70}{x-5}$ |
| FL – North | 60 | $x$ | $\frac{60}{x}$ |

(4 days longer)

$$\rightarrow \frac{70}{x-5} - \frac{60}{x} = 96 \leftarrow \text{hours!!}$$

A sorcerer's love potion boils over and leaves a huge pool of potion in his laboratory. He knows that if he asks his apprentice to clean it up, it would take 20 minutes longer than if he did it himself. So he decides to have the apprentice help him do the job. Together, they clean the mess in 30 minutes. How long would it have taken if the sorcerer did the job alone ?

| | Time to clean mess | Fraction of mess cleaned / minute |
|---|---|---|
| Sorcerer | $x$ | $\frac{1}{x}$ |
| apprentice | $x+20$ | $\frac{1}{x+20}$ |
| together | 30 | $\frac{1}{30}$ |

$$\frac{1}{x} + \frac{1}{x+20} = \frac{1}{30}$$

$30x(x+20)$

$$30x + 600 + 30x = x^2 + 20x$$

$$0 = x^2 - 40x - 600$$

$$x = \frac{40 \pm \sqrt{(40)^2 - 4(1)(-600)}}{2(1)}$$

$$x = \frac{40 \pm 63.24}{2}$$

$$x = \frac{103.24}{2} \text{ or } x = \text{(—)}$$

$$x = 51.62 \text{ minutes}$$

51 minutes & 37 seconds

$0.62 \text{ min.} \times \frac{60 \text{ sec}}{1 \text{ min}} =$

## Unit 1: Number Sense and Algebra

Topics Covered...

Radicals:
- Simplifying radical expressions: numeric, literal, any index
- Restrictions on radical expressions
- Adding, subtracting, multiplying and dividing radical expressions
- Rationalizing the denominator: monomial (any index), binomial
- Radical equations

Absolute Value:
- Understand the notation
- Simplify a numeric expression involving absolute value

Rational Expressions:
- Simplifying rational expressions
- Identifying non-permissible values (restrictions)
- Multiplying and dividing rational expressions
- Adding and subtracting rational expressions
- Simplifying complex rational expressions
- Solving rational equations
- Applications problems