

Applications of Rational Exp/Equs.

Intro:

$$d = rt \rightarrow r = \frac{d}{t} \rightarrow t = \frac{d}{r}$$

"work"

$$W = rt \rightarrow r = \frac{W}{t} \rightarrow t = \frac{W}{r}$$

①

$$\text{Average speed} = \frac{\text{total distance}}{\text{total time}}$$

d: distance down/up hill

$$\text{Average speed} = \frac{d + d}{\frac{(0.8)d}{1.4} + \frac{d(1.4)}{0.8}} = \frac{2d}{\frac{0.8d}{1.12} + \frac{1.4d}{1.12}}$$

$$\text{Average speed} = \frac{2d}{\frac{2.2d}{1.12}} = 2d \cdot \frac{1.12}{2.2d} = 1.02 \text{ mph}$$

$$\textcircled{2} \text{ Avg. speed} = \frac{\text{total distance}}{\text{total time}}$$

$$= \frac{d + d}{\frac{d}{40} + \frac{d}{45}} = \frac{2d}{\frac{85d}{1800}}$$

$$2d \cdot \frac{1800}{85d} = 42.35 \text{ mph}$$

$$\textcircled{3} \frac{\text{Total Temp Change}}{\text{Total Time}} = \frac{100}{\frac{50}{1.5} + \frac{50}{2.4}}$$

$$= \frac{100}{95} = 0.63 \text{ } ^\circ\text{C}$$

$$100 \div (95 \div 0.6)$$

④

$$\begin{array}{c} \text{Natalie's} \\ \text{portion} \end{array} + \begin{array}{c} \text{Renzo's} \\ \text{portion} \end{array} = 1$$

$$\begin{array}{c} \text{Natalie} \\ \text{rate} \cdot \text{time} \end{array} + \begin{array}{c} \text{Renzo} \\ \text{rate} \cdot \text{time} \end{array} =$$

$$\frac{1}{8}(4.5) + \frac{1}{R}(4.5) = 1$$

$$\frac{4.5R + 8(4.5)}{8R} = \frac{18R}{8R}$$

$$4.5R + 36 = 8R$$

$$36 = 3.5R$$

$$R = 10.3 \text{ hours}$$

⑤

$$\begin{array}{c} \text{Julien's} \\ \text{portion} \end{array} + \begin{array}{c} \text{Remy's} \\ \text{portion} \end{array} = 1$$

$$\frac{1}{20}(11) + \frac{1}{R}(11) = 1$$

$$\frac{11}{20} + \frac{11}{R} = 1$$

$$\frac{11}{R} = \frac{9}{20}$$

$$9R = 220$$

$$R = \boxed{24.4 \text{ min}}$$

⑥

Time to go east + Time to go west = Total Time

$$\frac{(3950)(485-w)}{(485-w)(485+w)} + \frac{(3950)(485+w)}{(485-w)(485+w)} = \frac{16.5(485+w)(485-w)}{(485+w)(485-w)}$$

$$1915750 - 3950w + 1915750 + 3950w = 3881212.5 - 16.5w^2$$

$$3831500 = 3881212.5 - 16.5w^2$$

$$w^2 = 3012.88$$

$$w = 55 \text{ mph}$$

⑩

Time on first day - 2 = Time on second day

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

$$\frac{240}{r} - \frac{2r}{r} = \frac{144}{r}$$

first day:
5 hrs

2nd day
3 hrs.

$$240 - 2r = 144$$

$$-2r = 96$$

$$r = 48 \text{ mph}$$

(12) Two consecutive numbers: $r, r+1$

$$\frac{1}{r(r+1)} + \frac{1}{r(r+1)} = \frac{11}{r(r+1)}$$

$$r+1 + r = 11$$

$$2r = 10$$

$$r = 5$$

(5, 6)

(13)
$$\frac{2+n}{5+n} = \frac{4}{5}$$