

# HM3 Applications of Rationals

①  $\frac{x}{8} + \frac{x}{6} = 1$  CD: 24

$$\frac{3x}{24} + \frac{4x}{24} = \frac{24}{24}$$

$$7x = 24$$

$$x = 24/7$$

$$x \approx 3.4 \text{ minutes}$$

②  $\frac{x}{3} + \frac{x}{4} = 1$  CD: 12

$$\frac{4x}{12} + \frac{3x}{12} = \frac{12}{12}$$

$$7x = 12$$

$$x = 12/7$$

$$x \approx 1.7 \text{ hours}$$

③  $\frac{x}{6} + \frac{x}{4.5} = 1$  CD: 18

$$\frac{3x}{18} + \frac{4x}{18} = \frac{18}{18}$$

$$7x = 18$$

$$x = 18/7$$

$$x \approx 2.6 \text{ days}$$

④  $\frac{x}{10} - \frac{x}{15} = 1$  CD: 30

$$\frac{3x}{30} - \frac{2x}{30} = \frac{30}{30}$$

$$x = 30 \text{ hours}$$

⑤  $\frac{x}{3} + \frac{x}{4} = 1$  CD: 12

$$\frac{4x}{12} + \frac{3x}{12} = \frac{12}{12}$$

$$7x = 12$$

$$x = 12/7$$

$$x \approx 1.7 \text{ days}$$

⑥  $\frac{x}{15} - \frac{x}{25} = 1$  CD: 75

$$\frac{5x}{75} - \frac{3x}{75} = \frac{75}{75}$$

$$2x = 75$$

$$x = 75/2$$

$$x = 37.5 \text{ hours}$$

⑦  $\frac{2}{3} + \frac{2}{x} = 1$  CD: 3x

$$\frac{2x}{3x} + \frac{6}{3x} = \frac{3x}{3x}$$

$$2x + 6 = 3x$$

$$\text{hours } 6 = x$$

⑧ Tom: Huck: CD: x(x+1)

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

$$\frac{20(x+1)}{x(x+1)} + \frac{20x}{x(x+1)} = \frac{x(x+1)}{x(x+1)}$$

$$20x + 20 + 20x = x^2 + x$$

$$20 + 40x = x^2 + x$$

$$0 = x^2 - 39x - 20 \quad x = 39.5$$

$$x = \frac{39 \pm \sqrt{(-39)^2 - 4(1)(-20)}}{2(1)} \quad x = -0.51$$

doesn't make sense in context

So it takes Huck 40.5 hours

$$\frac{x}{20} + \frac{x}{25} + \frac{x}{40} = 1 \quad \underline{CD: 200}$$

$$\frac{10x}{200} + \frac{8x}{200} + \frac{5x}{200} = \frac{200}{200}$$

$$23x = 200$$

$$x \approx 8.7 \text{ minutes}$$

(11) distance = rate · time so

$$\text{time} = \frac{\text{distance}}{\text{rate}}$$

$$\text{time}_{\text{Batman}} = \text{time}_{\text{Robin}}$$

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

$$\frac{100}{x-10} = \frac{125}{x}$$

$$100x = 125x - 1250$$

$$-25x = -1250$$

$$x = 50 \text{ mph}$$

$$(13) \frac{d}{r} = \frac{d}{r}$$

$$\frac{180}{x+15} = \frac{135}{x}$$

$$180x = 135x + 2025$$

$$45x = 2025$$

$$x = 45 \text{ km/h Guffey}$$

$$x = 60 \text{ km/h Enns}$$

$$(10) \text{ Minnie: } \frac{2}{x} + \text{ Mickey: } \frac{2}{2x} = 1 \quad \underline{CD: 2x}$$

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

$$6 = 2x$$

$$3 = x$$

so Mickey takes 6 hours

$$(12) \frac{d}{r} = \frac{d}{r}$$

$$\frac{30}{x+15} = \frac{20}{x}$$

$$30x = 20x + 300$$

$$10x = 300$$

$$x = 30 \text{ mph Allison}$$

$$45 \text{ mph Karen}$$

(14) time going + time returning = total time of trip

$$\frac{d}{r} + \frac{d}{r} = \text{time}$$

$$\frac{40}{x} + \frac{40}{2x} = 2 \quad \underline{CD: 2x}$$

$$\frac{80}{2x} + \frac{40}{2x} = \frac{4x}{2x}$$

$$80 + 40 = 4x$$

$$120 = 4x$$

$$30 = x$$

return trip speed: 60 mph

$$\text{time going} + \text{time returning} = 5$$

$$\frac{36}{x} + \frac{36}{x+6} = 5 \quad \underline{d}: x(x+6)$$

$$\frac{36(x+6)}{x(x+6)} + \frac{36x}{x(x+6)} = \frac{5x(x+6)}{x(x+6)}$$

$$36x + 216 + 36x = 5x^2 + 30x$$

$$72x + 216 = 5x^2 + 30x$$

$$0 = 5x^2 - 42x - 216$$

$$x = \frac{42 \pm \sqrt{(42)^2 - 4(5)(-216)}}{2(5)}$$

$$x = \frac{42 \pm \sqrt{6084}}{10}$$

$$x = \frac{42 \pm 78}{10}$$

$$x = 12$$

mph

~~$x = 3.6$~~   
Doesn't make sense

$$\text{(16) time upstream} = \text{time downstream}$$

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

$$\star \frac{6}{x-1} \neq \frac{10}{x+1}$$

$$6(x+1) = 10(x-1)$$

$$6x+6 = 10x-10$$

$$16 = 4x$$

$$4 \text{ mph} = x$$

$$\text{(17) time down} = \text{time up}$$

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

$$\frac{104}{30+x} \neq \frac{91}{30-x}$$

$$104(30-x) = 91(30+x)$$

$$3120 - 104x = 2730 + 91x$$

$$390 = 195x$$

$$2 = x$$

mph

be careful.... the wording of the question says we want the speed of the river current