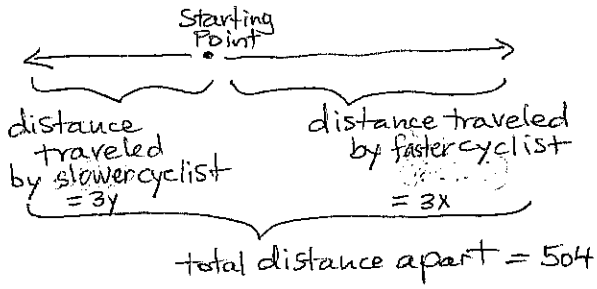
4.4.35 Two motorcyclists start at the same point and travel in opposite directions. One travels 10 mph faster than the other. In 3 hours they are 504 miles apart. How fast is each traveling?

The speed of the slower motorcyclist is ☐ mph. y = rate of slower

The speed of the faster motorcyclist is ☐ mph. x = rate of faster

$D = R \cdot T$

faster cyclist	$3x$	x	3
slower cyclist	$3y$	y	3



faster cyclist 10 mph faster:

$x = y + 10$.

$3x + 3y = 504$

opposite directions ⇒ add distances
(same direction ⇒ subtract distances)

Two equations, two unknown variables:

$$\left.\begin{aligned} 3x+3y &= 504 \quad (A)\\ x &= y+10 \quad (B)\end{aligned}\right\}$$

Solve by elimination or substitution. I choose substitution. But first, divide (A) by 3, to make smaller numbers.

$$\frac{3x}{3} + \frac{3y}{3} = \frac{504}{3}$$

$$\left.\begin{aligned} x+y &= 168 \quad (A)\\ x &= y+10 \quad (B)\end{aligned}\right\}$$

Substitute (B) into (A):

$$y+10+y = 168$$
$$2y+10 = 168$$
$$2y = 158$$
$$y = \boxed{79 \text{ mph}} \text{ (slower motorcyclist!)}$$
$$x = y+10$$
$$x = 79+10 = \boxed{89 \text{ mph}} \text{ (faster motorcyclist)}$$