

1.2.49

Fritz normally commutes at an average speed of 54 miles per hour, but this morning's heavy traffic held him to only 36 miles per hour. He must determine whether he can drive home fast enough this evening in order to maintain his usual round-trip average speed.

$D =$ Distance to work (in mi)
 $r_c =$ rate of speed coming home (in $\frac{mi}{hr}$)
 Fritz normally commutes at an average speed of 54 miles per hour, but this morning's heavy traffic held him to only 36 miles per hour. He must determine whether he can drive home fast enough this evening in order to maintain his usual round-trip average speed. In order to maintain his usual average round-trip speed, Fritz will have to drive home at 108 miles per hour.

Want $\frac{2D}{\frac{D}{36} + \frac{D}{r_c}} = 54$

LOW: $36r_c$

Forgot this factor of 2!

$$\Rightarrow \frac{2D}{\frac{D r_c + 36D}{36 r_c}} = (2D) \left(\frac{36 r_c}{D(r_c + 36)} \right) = \frac{2 \cdot 36 \cdot r_c}{r_c + 36} = 54$$

$$\Rightarrow 72 r_c = 54(r_c + 36)$$

$$72 r_c = 54 r_c + 54 \cdot 36$$

$$\frac{D}{36} \cdot \frac{r_c}{r_c} + \frac{D}{r_c} \cdot \frac{36}{36} = \frac{D r_c + 36 D}{36 r_c}$$

$$72 r_c - 54 r_c = 54 \cdot 36$$

$$18 r_c = 54 \cdot 36$$

$$r_c = \frac{54 \cdot 36}{18} = +54 \cdot 2$$

$$= +108 \frac{mi}{hr}$$

Fixed!
 Dropped a sign, somewhere, but

$$+108 \frac{mi}{hr} \text{ is answer}$$