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Cadillac and Toyota 1.1. A pink Cadillac leaves Oklahoma City at 6AM headed west on I-40 with the cruise control set at 70 mph. A federal agent in a green Toyota follows, leaving at 6:15 AM and traveling 85 mph. When and where does the Toyota catch up?

let x = number of minutes travelled (Toyota)
$x+15$ = number of minutes travelled (Cadillac)

$\frac{14}{12} = \frac{7}{6}$ miles per minute speed of Cadillac

$\frac{17}{12}$ miles per minute speed of Toyota

$$\frac{14}{12}(x+15) = \frac{17}{12}x$$

$$\frac{14}{12}x + \frac{210}{12} = \frac{17}{12}x$$

$$\frac{\frac{210}{12}}{\frac{3}{12}} = \frac{\frac{3}{12}x}{\frac{3}{12}}$$

$x = 70$ minutes

which is at 7:25 AM.

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← Cadillac 70 mph

← Toyota 85 mph

$d = rt$ (r: rate, t: time; d: distance)

t = initial time

Cadillac: $d = 70t$

$t - 0.25 = 15$ mins later

Toyota: $d = 85(t - 0.25)$

The cars meet when the distances are equal.

$$70t = 85(t - 0.25)$$
$$70t = 85t - \frac{85}{4}$$
$$-15t = \frac{-85}{4}$$
$$t = 1.41 \text{ hrs}$$

(7:25 AM)

The cars will meet in an hour and 25 mins and 98 miles from the starting point.

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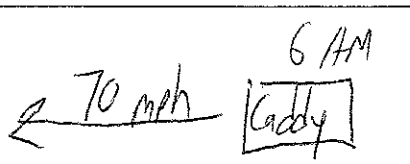

(S) speed = distance in miles (D) / Time in hours (T)

Let T be time after 6 AM.

Since the two cars will meet up when they have traveled the same distance, use this information to set the cars equal to each other. First, solve for distance

$(T)S = \frac{D}{T}(T)$ thus $D = ST$.

So for the caddy $D = (70)(T)$

For the toyota $D = (85)(T - 1/4)$

since T = 6AM and the Toyota left at 6:15 AM, thus they traveled at 85 mph for 1/4 of an hour less than the caddy.

$70T = 85(T - 1/4)$

$70T = 85T - 21.25$

$-15T = -21.25$

$T = 1.41\overline{6}$ hours.

Now, use T to find D

$D = 70T = 99.1\overline{6}$ miles.

the cars will meet up at 7:25 Am.

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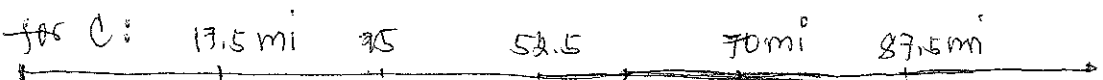
Cadillac leaves at 6:00 AM w/ a speed of 70 mph

Toyota leaves at 6:15 w/ a speed of 85 mph.

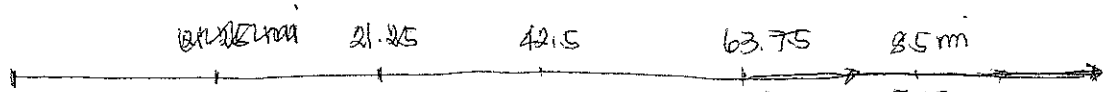
let C = distance for Cadillac

& T = distance for Toyota

Graph for C:



for T:



For Cadillac speed:

$70\ mi/hr = 70\ mi/60\ min = 1.17\ mi/min$

$= 1.17(70+15)$

$= 1.17(85) = 99.4\ mi$

For Toyota speed =

$85\ mi/hr = 85\ mi/60\ min = 1.42\ mi/min$

$= 1.42(70\ min) = 99.4\ mi$

So for Distance at 6:15 after 15 minutes

$D = rt$

$= 1.17(15)$

$= 17.55\ mi$

Distance: $D = rt$

$70t + 17.5 = 85t$

$\frac{17.5}{15} = t$

$1.167\ hrs = t$

70 minutes

Toyota will catch up w/ the Cadillac at 70 minutes of travelling fast at 6:15 w/ a speed of 85 mph.

At at around 7:25 A.M. the two cars are next to each other and both of them travels at approximately 99.4 miles.

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Cadillac and Toyota 1.1. A pink Cadillac leaves Oklahoma City at 6AM headed west on I-40 with the cruise control set at 70 mph. A federal agent in a green Toyota follows, leaving at 6:15 AM and traveling 85 mph. When and where does the Toyota catch up?

- Pink Cadillac - leaves OK City at 6AM at 70mph
- Green Toyota - leaves " at 6:15 at 85 mph
- Heading west on I-40 [Convert mph to mpm by dividing by 60]

(70 mph = 1.16 mpm, 85 mph = 1.416 mpm)

So at 7AM - Pink will have gone 70 miles

Pink = 60 min · 1.16 = 70

Green = 45 min · 1.416 = 63.75 Green will have gone 63.75 mls

At 7:30 = Pink will have gone 105 miles

Pink = 90 min · 1.16

Green = 75 min · 1.416 Green will have gone 106.25 miles

At 7:10 - Pink → 81.6 mls

Pink = 70 min · 1.16

Green = 55 min · 1.416 Green → 77.9 mls

At 7:20 - Pink → 93.3 mls.

Pink = 80 min · 1.16

Green = 65 min · 1.416 Green → 92.083 mls

At 7:25 - Pink → 99.16 mls

Pink = 85 min · 1.16

Green = 70 min · 1.416 Green → 99.16 mls

By filling in possible solutions, I found that both cars will be in the same location at 7:25am about 99.16 mls west of Oklahoma City on I-40.

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Cadillac and Toyota 1.1. A pink Cadillac leaves Oklahoma City at 6AM headed west on I-40 with the cruise control set at 70 mph. A federal agent in a green Toyota follows, leaving at 6:15 AM and traveling 85 mph. When and where does the Toyota catch up?

Since distance equals rate times time ($d=rt$). Let $d_1, r_1 + t_1$ represent the distance rate(speed) + time of the cadillac. Let $d_2, r_2 + t_2$ represent the distance, rate + time of the Toyota. Since we want both cars to have the same distance, $d_1 = d_2$. Since the Toyota left 15 minutes or 0.25 hours after the cadillac, then $t_2 = t_1 - 0.25$. Also $r_1 = 70$ and $r_2 = 85$. So, or $t_1 = t_2 + 0.25$

$$d_1 = d_2$$

$$70t_1 = 85(t_2 - 0.25)$$

$$70t_1 = 85t_1 - 21.25$$

$$-85t_1 \quad -85t_1$$

$$\frac{-15t_1}{-15} = \frac{-21.25}{-15}$$

$t_1 = 1\frac{5}{12}$ hours (1 hour + 25 min)

or $t_2 = 1\frac{1}{6}$ hours (1 hour + 10 min)

They will meet $99\frac{1}{6}$ miles east on I-40.

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Cadillac and Toyota 1.1. A pink Cadillac leaves Oklahoma City at 6AM headed west on I-40 with the cruise control set at 70 mph. A federal agent in a green Toyota follows, leaving at 6:15 AM and traveling 85 mph. When and where does the Toyota catch up?

Let h = the # of hours travelled by the two vehicles, beginning at 6:15. At that point, the Cadillac has already travelled $\frac{1}{4}$ hr, at 70 mph, it has then travelled $17\frac{1}{2}$ miles.

The expression $70h + 17.5$, then, represents the total distance travelled by the Cadillac. If we set this expression equal to $85h$ (total distance travelled by the Toyota), we should be able to find the time it takes the Toyota to overtake the Cadillac.

$$70h + 17.5 = 85h$$
$$15h = 17.5$$
$$h = 1\frac{1}{6} \text{ or } 1\text{hr } 10 \text{ min}.$$

∴ The Toyota should overtake the Cadillac at 7:25.

Proof: Cadillac $70 \cdot 1\text{hr } 25\text{min} = 99\frac{1}{6}$ mi
Toyota $85 \cdot 1\text{hr } 10\text{min} = 99\frac{1}{6}$ mi
They meet $99\frac{1}{6}$ miles west of Oklahoma City.

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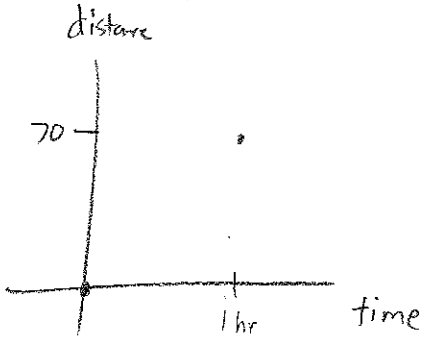
Cadillac and Toyota 1.1. A pink Cadillac leaves Oklahoma City at 6AM headed west on I-40 with the cruise control set at 70 mph. A federal agent in a green Toyota follows, leaving at 6:15 AM and traveling 85 mph. When and where does the Toyota catch up?



$y_1 = 70x$

$y_2 = 85x - 85(\frac{1}{4})$

$70x = 85x - \frac{85}{4}$

$15x = \frac{85}{4}$

$x = \frac{85}{60}$ hours

$= 85$ minutes

$70(\frac{85}{60}) = \frac{5950}{6}$ miles

≈ 99.167 miles

We express the problem as a linear equation where the distance the Cadillac travels in a specific amount of time is given by $d_C = 70x$. The Toyota travels $d_T = 85x - 85(\frac{1}{4})$. We subtract $85(\frac{1}{4})$ to account for the 15 minute delay. We want the distances to equal so setting the equations equal we find $x = \frac{85}{60}$ hours. Solving the distance, we substitute this value in $d_C = 70(\frac{85}{60}) = 99.17$ miles. This would occur at 6:00 AM + $\frac{85}{60}$ hours = 7:25 AM.

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Cadillac and Toyota 1.1. A pink Cadillac leaves Oklahoma City at 6AM headed west on I-40 with the cruise control set at 70 mph. A federal agent in a green Toyota follows, leaving at 6:15 AM and traveling 85 mph. When and where does the Toyota catch up?

Cadillac → $\frac{70\text{ mi}}{60\text{ min}} = \frac{17.5\text{ mi}}{15\text{ min}} = \frac{1.167\text{ mi}}{1\text{ min}}$

Toyota → $\frac{85\text{mi}}{60\text{min}} = \frac{21.25\text{mi}}{15\text{min}} = \frac{1.417\text{mi}}{1\text{min}}$

Time	C	T
6am	0mi	0mi
7am	70mi	63.75mi
7:15am	87.5mi	85mi ← cross paths
7:30am	105mi	106.25mi

$1.167x = 1.417(x-15)$

$1.167x = 1.417x - 21.255$

$\frac{-.25x}{-.25} = \frac{21.255}{-.25}$

$x = 85.02$ min

↓

85 min 1.2 sec

↓

7:25 min 1.2sec @

99.218 miles

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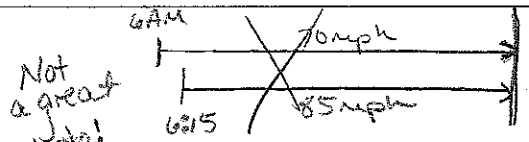
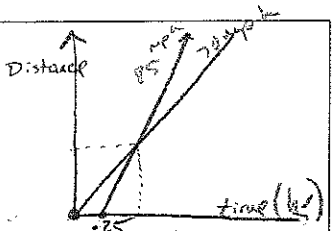


Not a great photo!



$D = r \cdot t$

Distance is equal to rate times time.

equation of a line: $y = mx + b$

where y is Distance,

m is slope, or rate of change, or speed

x is time beginning when the Cadillac leaves.

b is y intercept

$y = mx + b$

$D = 70t$

$0 = 85(.25) + B$

$-21.25 = B$

$D = 85t - 21.25$

Convert 15 min into hours:

$15 \text{ min} = \frac{1}{4} \text{ hour}$

$15 \text{ min} = .25 \text{ hour}$

Solve System of equations by substitution:

$70t = 85t - 21.25$

$-85t \quad -85t$

$\frac{-15t}{-15} = \frac{-21.25}{-15}$

$t = 1.41\overline{66} \text{ hour}$

convert to min:

$.41\overline{66} \text{ hr} \times \frac{60 \text{ min}}{1 \text{ hr}} = 25 \text{ min}$

So, 1 hour 25 min is when they meet.

Plug this into one of the original to find the distance:

$D = 70t$

$D = 70(1.41\overline{66}) = 99.1\overline{66} \text{ miles}$

OR! $D = rt$ at what time will they have traveled the same distance knowing that the Toyota has left 15 min later?

This assumes t is the time the Cadillac leaves

$70t = 85(t - .25)$

$70t = 85t - 21.25$

$-85t \quad -85t$

$\frac{-15t}{-15} = \frac{-21.25}{-15}$

$t = 1.41667$ hours converts to: 1hr 25min

Now, plug this into an original to find the Distance traveled.

$D = 70(1.41667) = 99.1667$

$D = 85(1.41667 - .25) = 99.1667$

FINAL ANSWER:

When will they meet?

1 hour, 25 minutes after the Cadillac left.

Where will they meet?

99.17 miles

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$D = R \times T$ D = Distance T = time R = Rate

PK $T_1 = (60 \text{ min})(70) =$ Distance 4200 m.

GT $T_2 = (45 \text{ min})(85) =$ Distance 3825 m.

$(60 \text{ min})(t) =$

$85t_1 = 70t_2$

1.16 m per min

1.41 m per min

PK $(75 \text{ min})(70) = 5250$

GT $(60 \text{ min})(85) = 5100$

PK $(85)(70) = 5950$

GT $(70)(85) = 5950$

Green toyota catches up at 7:25 AM 99.11 miles of starting loc

70 + 70 2hrs i40 105 miles

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$d = rt$

P = Pink Cadillac

G = Green toyota

y = same time

$y = 70x + 420$

$y = 85x + 531.25$

$d = rt$

$d = rt$

$d = 70(6) = 420$ miles

$d = 85(6.25) = 531.25$

~~420x +~~

$$\begin{array}{r} 420 \\ +\ 531.25 \\ \hline 951.25 \end{array}$$

$$2\overline{)951.25}\quad 475.625$$

8
15
14
11
10
12
12

they will catch up on 475.625 miles

P ‖ $70x + 6y = 420 \rightarrow 35x + 3y = 210$

G ‖ $85x + 6.25y = 531.25 \rightarrow 17x + 1.25y = 106.25$

Solve using elimination

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$\frac{7}{6}$ mph $x = \frac{8.5}{6} y$

70mph ← O.K.C

1h − 1¼h

7am = 140 70

7:15 = 170 85

$\frac{7m}{6m}$ = 105

$\frac{8.5m}{6m}$ = 120

85

70

1 hour

6:00	6:06	6:12	6:18	6:24	6:30	6:36	6:42	6:48	6:54	7:00
		14	21	28	35	42	49	56	63	70

6:15	6:21	6:28	6:34	6:40	6:46	6:52	6:58	7:04	7:10	7:16
	8.5	17	25.5	34.0	42.5	51	59.5	68.0	76.5	85

7:00	7:12	7:18	7:24	7:30	7:36	7:42
77	84	91	98	105	112	119

7am = 70m

7:15 = 85m

7:22	7:28	7:34	7:40
93.5	102	110.5	119

7:34 − 7:40

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Cadillac leaves Oklahoma @ 6AM W
70 mph 7:10 7AM → 70 miles
81.67mi

Toyota leaves @ 6:15 85mph W 99.17 miles
7:25

d = r · t

6:00	6:15	6:30	6:45	7:00	
Caddy	17.5m	35			
6:15	6:30	6:45	7:00		
Toyota	21.25	42.5			

1.167

Caddy 1.167 mi/min

Toyota 1.42 mi/min

$\frac{70}{60}(x+15) = \frac{85}{60}y$

$\frac{70}{60}x + 17.5 = \frac{85}{60}y$

$(70 \cdot 60)x = (85 \cdot 60)y$

$4200x = 5100y$

$x = \frac{5100}{4200}y$

where x = # minutes
y = # min

$\frac{70}{60}\left(\frac{51}{42}y\right) + 17.5 = \frac{85}{60}y$

$\frac{17}{12}y + 17.5 = \frac{85}{60}y$

NOT DONE!

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