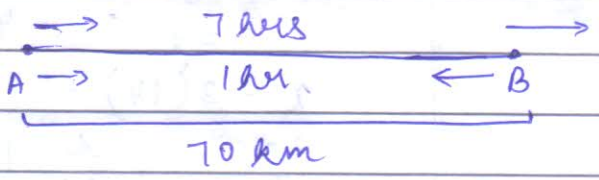
Exercise 3.10

Q.1



Let the speeds of first car & second car be x & y

ATB,

CASE I: $D_1 = S_1 t$

$D_1 = 7x$

$D_2 = S_2 t$

$D_2 = 7y$

$\therefore 7x - 7y = 70$

$x - y = 10$ ——— ①

CASE II : $x + y = 70$ —— ②

Add ① & ②,

$x - y = 10$

$(+)\ x + y = 70$

$2x = 80$

$\boxed{x = 40}$

Putting value of x in ①

$x - y = 10$

$40 - y = 10$

$40 - 10 = y$

$\boxed{y = 30}$

∴ Speed of first car = 40 km/h

Speed of second car = 30 km/h

Q. 3 Let the speed of boat be x and the speed of stream be y.

Upstream speed = $x - y$

Downstream speed = $x + y$

ATQ,

CASE I : $t_1 = \frac{D_1}{S_1}$ | $t_2 = \frac{D_2}{S_2}$

$t_1 = \frac{30}{x-y}$ | $t_2 = \frac{44}{x+y}$

$\therefore \frac{30}{x-y} + \frac{44}{x+y} = 10$ —— ①

CASE II : $t_1 = \frac{D_1}{S_1}$ | $t_2 = \frac{D_2}{S_2}$

$t_1 = \frac{40}{x-y}$ | $t_2 = \frac{55}{x+y}$

$$\therefore \frac{40}{x-y} + \frac{55}{x+y} = 13 \quad \text{——— (1)}$$

Let $\frac{1}{x-y} = A$ and $\frac{1}{x+y} = B$

$$30A + 40B = 10$$
$$3A + 4B = 1 \quad \text{——— (3)}$$

$$40A + 55B = 13 \quad \text{——— (4)}$$

Multiply (3) by 40 and (4) by 3.

$$120A + 160B = 40 \quad \text{——— (5)}$$
$$120A + 165B = 39 \quad \text{——— (6)}$$

Subtract (6) from (5),

$$120A + 160B = 40$$
$$120A + 165B = 39$$
$$(-) \quad (-) \quad (-)$$
$$-5B = 1$$
$$B = \frac{-1}{5}$$

$$\frac{1}{x+y} = \frac{-1}{5}$$

$$5 = -x - y$$
$$-x - y = 5$$
$$x + y = -5$$

Putting value of B in (3)

$$3A + 4B = 1$$
$$3A + 4\left(\frac{-1}{5}\right) = 1$$
$$3A = 1 + \frac{4}{5}$$
$$A = \frac{5+4}{5 \times 3}$$
$$A = \frac{9}{15}$$

Multiply ③ by 5.

$$60A + 70B = 15 \quad \text{—— ⑤}$$

Subtract ④ from ⑤,

$$\begin{array}{r} 60A + 70B = 15 \\ 60A + 42B = 13 \\ (-) \quad (-) \quad (-) \\ \hline 28B = 2 \end{array}$$

$$B = \frac{1}{14}$$

$$\frac{1}{x+y} = \frac{1}{14}$$

$$x + y = 14 \quad \text{—— ⑥}$$

Putting value of B in ③

$$12A + 14B = 3$$

$$12A + 14\left(\frac{1}{14}\right) = 3$$

$$A = \frac{3-1}{12}$$

$$\frac{1}{x-y} = \frac{1}{12}$$

$$x - y = 6 \quad \text{—— ⑦}$$

Add ⑥ & ⑦,

$$\begin{array}{r} x + y = 14 \\ (+)\ x - y = 6 \\ \hline 2x = 20 \end{array}$$

$$\boxed{x = 10}$$

Putting value of x in ⑥,

$$x + y = 14$$

$$y = 14 - 10$$

$$\boxed{y = 4}$$

∴ Speed of boat = $\boxed{10 \text{ km/h}}$

Speed of stream = $\boxed{4 \text{ km/h}}$

$30A + 44B = 10$ —— (3)

$40A + 55B = 13$ —— (4)

Multiply (3) by 4 and (4) by 3

$120A + 176B = 40$ —— (5)

$120A + 165B = 39$ —— (6)

Subtract (6) from (5)

$120A + 176B = 40$

$120A + 165B = 39$

(−) (−) (−)

$11B = 1$

$B = \frac{1}{11}$

$\frac{1}{x+y} = \frac{1}{11}$

$x + y = 11$ —— (7)

Putting value of B in (3)

$30A + 44B = 10$

$30A + 44\left(\frac{1}{11}\right) = 10$

$30A = 10 - 4$

$A = \frac{6}{30} \frac{1}{5}$

$\frac{1}{x-y} = \frac{1}{5}$

$x - y = 5$ —— (8)

Add (7) & (8)

$x + y = 11$

(+) $x - y = 5$

$2x = 16$

$\boxed{x = 8}$

Putting value of x in (7)

$x + y = 11$

$y = 11 - 8$

$\boxed{y = 3}$

∴ Speed of boat = $\boxed{8 \text{ km/h}}$

Speed of stream = $\boxed{3 \text{ km/h}}$

Q.4 Let the speed of boat be x and the speed of stream be y.

ATQ,

CASE I: $t_1 = \frac{D_1}{S_1}$ | $t_2 = \frac{D_2}{S_2}$

$t_1 = \frac{24}{x-y}$ | $t_2 = \frac{28}{x+y}$

$\therefore \frac{24}{x-y} + \frac{28}{x+y} = 6$ ——— (1)

CASE II: $t_1 = \frac{D_1}{S_1}$ | $t_2 = \frac{D_2}{S_2}$

$t_1 = \frac{30}{x-y}$ | $t_2 = \frac{21}{x+y}$

$\therefore \frac{30}{x-y} + \frac{21}{x+y} = \frac{13}{2}$ ——— (2)

Let $\frac{1}{x-y} = A$ and $\frac{1}{x+y} = B$

$24A + 28B = 6$

$12A + 14B = 3$ ——— (3)

$30A + 21B = \frac{13}{2}$

$60A + 42B = 13$ ——— (4)

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Q.5 Let the distance be x and the speed be y.

ATQ,

CASE I : $t = \frac{d}{s} = \frac{x}{y}$

$$\therefore \frac{x}{y + \frac{1}{2}} = \frac{x}{y} - 1$$

$$\frac{2x}{2y+1} = \frac{x-y}{y}$$

$$2xy = (2y+1)(x-y)$$

$$2xy = 2xy - 2y^2 + x - y$$

$$2y^2 - x + y = 0$$

$$x = 2y^2 + y \quad \text{——— (1)}$$

CASE II : $t = \frac{d}{s} = \frac{x}{y}$

$$\therefore \frac{x}{y-1} = \frac{x}{y} + 3$$

$$\frac{x}{y-1} = \frac{x+3y}{y}$$

$$(y-1)(x+3y) = xy$$

$$xy + 3y^2 - x - 3y = xy$$

$$3y^2 - x - 3y = 0$$

$$x = 3y^2 - 3y \quad \text{——— (2)}$$

From ① & ②,

$3y^2 - 3y = 2y^2 + y$

$3y^2 - 3y - 2y^2 - y = 0$

$y^2 - 4y = 0$

$y(y - 4) = 0$

$y = 0$ (Neglected) | $y - 4 = 0$, $\boxed{y = 4}$

Putting value of y in ①

$x = 2y^2 + y$

$x = 2(4)^2 + 4$

$x = 2(16) + 4$

$x = 32 + 4$

$\boxed{x = 36}$

$\therefore$ Speed = $\boxed{4 \text{ km/h}}$

Distance = $\boxed{36 \text{ km}}$

3.8 Let the speed of train and car be x and y.

ATQ,

CASE I : Time = $6\frac{1}{2} = 13/2$ hrs

$\therefore \frac{400}{x} + \frac{200}{y} = \frac{13}{2}$ ——— ①

CASE II : Time = $6\frac{1}{2} + \frac{1}{2} = 7$ hrs

$\therefore \frac{200}{x} + \frac{400}{y} = 7$ ——— ②

Let $\frac{1}{x} = A$ and $\frac{1}{y} = B$

$400A + 200B = \frac{13}{2}$

$800A + 400B = 13$ ——— ③

$200A + 400B = 7$ ——— (4)

Subtract (4) from (3),

$800A + 400B = 13$

$200A + 400B = 7$

(-) (-) (-)

$600A = 6$

$A = \frac{6}{600}^{1}$

$\frac{1}{x} = \frac{1}{100}$

$\boxed{x = 100}$

Putting value of A in (4)

$200A + 400B = 7$

$2\cancel{00}\left(\frac{1}{\cancel{100}}\right) + 400B = 7$

$400B = 7 - 2$

$B = \frac{5}{\cancel{400}^{80}}$

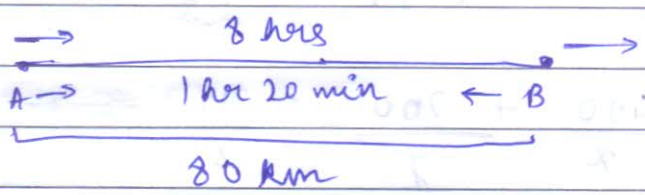
$\frac{1}{y} = \frac{1}{80}$

$\boxed{y = 80}$

$\therefore$ Speed of train = $\boxed{100 \text{ km/h}}$

Speed of car = $\boxed{80 \text{ km/h}}$

Q. 9



Let the speed of the first car and the second car be x and y.

ATQ,

CASE I : $D_1 = S_1 t_1 = 8x$

$D_2 = S_2 t = 8y$

$\therefore 8x - 8y = 80$

$x - y = 10$ ——— (1)

CASE II : Time = 1 hr 20 min = $1\frac{20}{60} = 1\frac{1}{3}$

$= \frac{4}{3}$ hrs

$\therefore \frac{4}{3}x + \frac{4}{3}y = 80$

$\frac{4}{3}(x+y) = 80$

$x+y = \frac{20\cancel{80} \times 3}{\cancel{4}}$

$x+y = 60 \longrightarrow (2)$

Add (1) & (2),

$x - y = 10$

$(+)\ x + y = 60$

$2x = 70$

$\boxed{x = 35}$

Putting value of x in (2)

$x + y = 60$

$y = 60 - 35$

$\boxed{y = 25}$

$\therefore$ Speed of first car = 35 km/h

Speed of second car = 25 km/h

Q.11 Same as NCERT

Q.13 Let the speed of boat and stream be x and y.

Downstream speed = $x + y$

Upstream speed = $x - y$

ATQ,

CASE I : $\frac{30}{x-y} + \frac{28}{x+y} = 7$

CASE II : $\frac{21}{x-y} + \frac{21}{x+y} = 5$

Let $\frac{1}{x-y} = A$ and $\frac{1}{x+y} = B$

$30A + 28B = 7$ ——— (1)

$21A + 21B = 5$

$A + B = \frac{5}{21}$ ——— (2)

Multiply (2) by 28

$28A + 28B = \frac{140}{21}$ ——— (3)

Subtract (3) from (1),

$30A + 28B = 7$

$28A + 28B = \frac{140}{21}$

(−) (−) (−)

$2A = 7 - \frac{20}{3}$

$2A = \frac{21 - 20}{3}$

$A = \frac{1}{3 \times 2}$

$\frac{1}{x-y} = \frac{1}{6}$

$x - y = 6$ ——— (4)

Putting value of A in (2),

$A + B = \frac{5}{21}$

$B = \frac{5}{21} - \frac{1}{6}$

$B = \frac{10 - 7}{42}$

$B = \frac{3}{42}\ \frac{1}{14}$

$\frac{1}{x+y} = \frac{1}{14}$

$x + y = 14$ ——— (5)

Add (4) & (5),

$$x - y = 6$$
$$(+)\ x + y = 14$$
$$2x = 20$$
$$\boxed{x = 10}$$

Putting value of x in (5),

$$x + y = 14$$
$$y = 14 - 10$$
$$\boxed{y = 4}$$

$\therefore$ Speed of boat = $\boxed{10\ km/h}$

Speed of stream = $\boxed{4\ km/h}$

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Q. 14 Let the speed of the train and the ~~take~~ taxi be x & y

ATQ,

CASE I : Time = 5 hrs 30 min = $\frac{11}{2}$ hrs

$\therefore \frac{300}{x} + \frac{200}{y} = \frac{11}{2}$ ——— ①

CASE II : Time = 5 hrs 36 min = $\frac{11}{2} + \frac{6}{60}$ 10

$= \frac{55+1}{10} = \frac{56}{10}$

$\therefore \frac{260}{x} + \frac{240}{y} = \frac{56}{10}$ ——— ②

Let $\frac{1}{x} = A$ and $\frac{1}{y} = B$

$300A + 200B = \frac{11}{2}$

$600A + 400B = 11$ ——— ③

$260A + 240B = \frac{56}{10}$

$2600A + 2400B = 56$

$1300A + 1200B = 28$

$325A + 300B = 7$ ——— ④

Multiply ③ by 3 and ④ by 4.

$1800A + 1200B = 33$ ——— ⑤

$1300A + 1200B = 28$ ——— ⑥

Subtract ⑥ from ⑤

$1800A + 1200B = 33$

$1300A + 1200B = 28$

(−) (−) (−)

$500A = 5$

$A = \frac{5}{500}^{1}_{100}$

$\frac{1}{x} = \frac{1}{100}$

$\boxed{x = 100}$

Putting value of A in ③

$600A + 400B = 11$

$6\cancel{00}\left(\frac{1}{\cancel{100}}\right) + 400B = 11$

$400B = 11 - 6$

$B = \frac{5}{\cancel{400}}^{1}_{80}$

$\frac{1}{y} = 80$

$\boxed{y = 80}$

∴ Speed of train = 100 km/h

Speed of taxi = 80 km/h

Let the speed of Ajeet and Amit be x and y.

ATQ,

CASE I: $\frac{30}{x} = \frac{30}{y} + 2$

$\frac{30}{x} - \frac{30}{y} = 2$ ——— ①

CASE II: $\frac{30}{2x} = \frac{30}{y} - 1$

$\frac{30}{2x} - \frac{30}{y} = -1$ ——— ②

Let $\frac{1}{x} = A$ and $\frac{1}{y} = B$.

$30A - 30B = 2 \longrightarrow (3)$

~~15A~~

$\frac{30}{2}A - 30B = -1$

$15A - 30B = -1 \longrightarrow (4)$

Subtract (4) from (3)

$30A - 30B = 2$

$15A - 30B = -1$

(−) (+) (+)

$15A = 3$

$A = \frac{3}{15}1$

$\frac{1}{x} = \frac{1}{5}$

$\boxed{x = 5}$

Putting value of A in (3)

$30A - 30B = 2$

$30\left(\frac{1}{5}\right) - 30B = 2$

$-30B = 2 - 6$

$B = \frac{+4}{+30}\frac{2}{15}$

$\frac{1}{y} = \frac{2}{15}$

$\boxed{y = 7.5}$

∴ Speed of Ajeet = $\boxed{5 \text{ km/h}}$

Speed of Amit = $\boxed{7.5 \text{ km/h}}$

Q. 18 Let the speed of A and B be x and y.

ATQ,

CASE I : $\frac{30}{x} = \frac{30}{y} + 3$

$\frac{10}{x} - \frac{10}{y} = 1 \longrightarrow (1)$

CASE II : $\frac{30}{2x} = \frac{30}{y} - \frac{3}{2}$

$\frac{10}{2x} - \frac{10}{y} = \frac{-1}{2}$

$\frac{5}{x} - \frac{10}{y} = \frac{-1}{2}$ ——— (2)

Let $\frac{1}{x} = A$ and $\frac{1}{y} = B$

$10A - 10B = 1$ ——— (3)

$5A - 10B = \frac{1}{2}$

$10A - 20B = -1$ ——— (4)

Subtract (3) from (4),

$10A - 20B = -1$

$10A - 10B = 1$

(−) (+) (−)

$-10B = -2$

$B = \frac{+2}{+10}$

$\frac{1}{y} = \frac{1}{5}$

$y = 5$

Putting value of B in (3),

$10A - 10B = 1$

$10A - 10\left(\frac{1}{5}\right) = 1$

$10A = 1 + 2$

$A = \frac{3}{10}$

$\frac{1}{x} = \frac{3}{10}$

$x = 3.33$

∴ Speed of A = 3.33 km/h

Speed of B = 5 km/h