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Word Problems - Wind & Current Problems

Solve the following word problems:

1. With a tailwind, a plane can travel 3840 km in 4 hours. Against a headwind, the return trip takes 5 hours. Find the speed of the plane in still air and the speed of the wind.

$p =$ speed of plane

$w =$ speed of wind

	Rate	Time	Distance
tailwind	p + w	4	4(p + w)
headwind	p – w	5	5(p – w)

$$\frac{\cancel{4}(p+w)}{\cancel{4}} = \frac{3840}{4} \rightarrow p + \cancel{w} = 960$$

$$\frac{\cancel{5}(p-w)}{\cancel{5}} = \frac{3840}{5} \rightarrow p - \cancel{w} = 768$$

$$\frac{\cancel{2}p}{\cancel{2}} = \frac{1728}{2}$$

$$\boxed{p = 864}$$

$$\begin{array}{rcl} (864) + w &=& 960 \\ -864 & & -864 \end{array}$$

$$\boxed{w = 96}$$

Plane: 864 kph
Wind: 96 kph

2. Heading upstream, it took the barge 25 hours to travel 150 miles. Heading back downstream, however, the return trip only took 15 hours. Find the speed of the barge in still water and the speed of the current.

$b =$ speed of barge

$c =$ speed of current

	Rate	Time	Distance
upstream	b – c	25	25(b – c)
downstream	b + c	15	15(b + c)

$$\frac{\cancel{25}(b-c)}{\cancel{25}} = \frac{150}{25} \rightarrow b - \cancel{c} = 6$$

$$\frac{\cancel{15}(b+c)}{\cancel{15}} = \frac{150}{15} \rightarrow b + \cancel{c} = 10$$

$$\frac{\cancel{2}b}{\cancel{2}} = \frac{16}{2}$$

$$\boxed{b = 8}$$

$$\begin{array}{rcl} (8) + c &=& 10 \\ -8 & & -8 \end{array}$$

$$\boxed{c = 2}$$

Barge: 8 mph
Current: 2 mph

3. Asked how far his plane could fly in 9 hours, the captain said, "Well, that depends on which direction I'm going. With the wind, I can cover 2700 miles, but against it, I can only cover 2160." Find the speed of his plane in still air and the speed of the wind.

$p =$ speed of plane

$w =$ speed of wind

	Rate	Time	Distance
tailwind	p + w	9	9(p + w)
headwind	p – w	9	9(p – w)

$$\frac{\cancel{9}(p+w)}{\cancel{9}} = \frac{2700}{9} \rightarrow p + \cancel{w} = 300$$

$$\frac{\cancel{9}(p-w)}{\cancel{9}} = \frac{2160}{9} \rightarrow \underline{p - \cancel{w} = 240}$$

$$\frac{\cancel{2}p}{\cancel{2}} = \frac{540}{2}$$

$$\boxed{p = 270}$$

$$(270) + w = 300$$
$$\underline{-270} \qquad \underline{-270}$$

$$\boxed{w = 30}$$

Plane: 270 kph
Wind: 30 kph

4. Downstream, a boat traveled 64 miles in 2 hours. Heading back upstream, however, it could only travel 54 miles in 3 hours. Find the speed of the boat in still water and the speed of the current.

$b =$ speed of boat

$c =$ speed of current

	Rate	Time	Distance
downstream	b + c	2	2(b + c)
upstream	b – c	3	3(b – c)

$$\frac{\cancel{2}(b+c)}{\cancel{2}} = \frac{64}{2} \rightarrow b + \cancel{c} = 32$$

$$\frac{\cancel{3}(b-c)}{\cancel{3}} = \frac{54}{3} \rightarrow \underline{b - \cancel{c} = 18}$$

$$\frac{\cancel{2}b}{\cancel{2}} = \frac{50}{2}$$

$$\boxed{b = 25}$$

$$(25) + c = 32$$
$$\underline{-25} \qquad \underline{-25}$$

$$\boxed{c = 7}$$

Boat: 25 mph
Current: 7 mph

5. Today the current in the Bosphorus is flowing at 7 mph. If the *Hiawatha* travels 70 miles down the Bosphorus in the same amount of time that it takes to travel 42 miles back up the Bosphorus, find the speed of the boat in still water.

$b =$ speed of the boat

$t =$ time

	Rate	Time	Distance
downstream	b + 7	t	t(b + 7)
upstream	b – 7	t	t(b – 7)

$$t(b+7) = 70$$
$$t(b-7) = 42$$

$$\cancel{tb} + 7t = 70$$
$$-\cancel{tb} + 7t = -42$$

$$\frac{\cancel{14}t}{\cancel{14}} = \frac{28}{14}$$

$$\boxed{t = 2}$$

$$\frac{\cancel{(2)}(b+7)}{\cancel{2}} = \frac{70}{2}$$

$$b + 7 = 35$$
$$-7 \quad -7$$
$$\boxed{b = 28}$$

Speed of boat = 28 mph

6. The corporate jet can fly 1400 miles downwind in the same amount of time that it can fly 1100 miles into the wind. If the speed of the wind is 30 mph, find the speed of the jet.

$j =$ speed of jet

$t =$ time

	Rate	Time	Distance
downwind	j + 30	t	t(j + 30)
upwind	j – 30	t	t(j – 30)

$$t(j+30) = 1400$$
$$t(j-30) = 1100$$

$$\cancel{tj} + 30t = 1400$$
$$-\cancel{tj} + 30t = -1100$$

$$\frac{\cancel{60}t}{\cancel{60}} = \frac{300}{60}$$

$$\boxed{t = 5}$$

$$\frac{\cancel{(5)}(j+30)}{\cancel{5}} = \frac{1400}{5}$$

$$j + 30 = 280$$
$$-30 \quad -30$$
$$\boxed{j = 250}$$

Speed of jet = 250 mph

7. A fishing boat can travel 48 miles down the river in the same amount of time that it takes it to travel 32 miles up the river. If the speed of the boat in still water is 10 mph, find the speed of the current.

$c =$ speed of current

$t =$ time

	Rate	Time	Distance
downstream	10 + c	t	t(10 + c)
upstream	10 – c	t	t(10 – c)

$$t(10+c)=48$$
$$t(10-c)=32$$

$$10t+\cancel{tc}=48$$
$$10t-\cancel{tc}=32$$

$$\frac{\cancel{20}t}{\cancel{20}}=\frac{80}{20}$$

$$\boxed{t=4}$$

$$\frac{\cancel{(4)}(10+c)}{\cancel{4}}=\frac{48}{4}$$

$$10+c=12$$
$$\underline{-10}\qquad\underline{-10}$$

$$\boxed{c=2}$$

$$\boxed{\text{Speed of current = 2 mph}}$$

8. A houseboat travels 120 miles downstream in the same amount of time that it takes to travel 60 miles upstream. If the speed of the current is 9 mph, find the speed of the houseboat in still water.

$h =$ speed of houseboat

$t =$ time

	Rate	Time	Distance
downstream	h + 9	t	t(h + 9)
upstream	h – 9	t	t(h – 9)

$$t(h+9)=120$$
$$t(h-9)=60$$

$$\cancel{th}+9t=120$$
$$-\cancel{th}+9t=-60$$

$$\frac{\cancel{18}t}{\cancel{18}}=\frac{60}{18}$$

$$\boxed{t=\frac{10}{3}}$$

$$(\cancel{3})\left[\left(\frac{10}{\cancel{3}}\right)(h+9)\right]=(120)(3)$$

$$\frac{\cancel{10}(h+9)}{\cancel{10}}=\frac{360}{10}$$

$$h+9=36$$
$$\underline{-9}\qquad\underline{-9}$$

$$\boxed{h=27}$$

$$\boxed{\text{Speed of houseboat = 27 mph}}$$