

1.10

- 1) A is 60 miles from B. An automobile at A starts for B at the rate of 20 miles an hour at the same time that an automobile at B starts for A at the rate of 25 miles an hour. How long will it be before the automobiles meet?

	r	t	d
A	20	t	20t
B	25	t	25t

$$20t + 25t = 60$$

$$\frac{45t}{45} = \frac{60}{45}$$

$$t = 1.33 \text{ hr}$$

- 3) Two trains travel toward each other from points which are 195 miles apart. They travel at rate of 25 and 40 miles an hour respectively. If they start at the same time, how soon will they meet?

	r	t	d
	25	t	25t
	40	t	40t

$$25t + 40t = 195$$

$$\frac{65t}{65} = \frac{195}{65}$$

$$t = 3 \text{ hr}$$

- 5) A passenger and a freight train start toward each other at the same time from two points 300 miles apart. If the rate of the passenger train exceeds the rate of the freight train by 15 miles per hour, and they meet after 4 hours, what must the rate of each be?

	r	t	d
P	r+15	4	4r+60
F	r	4	4r

$$4r + 4r + 60 = 300$$

$$8r + 60 = 300$$

$$\begin{array}{r} -60 \quad -60 \\ \hline 8r = 240 \\ \frac{8r}{8} = \frac{240}{8} \\ r = 30 \end{array}$$

*Passenger: 45 mph, Freight: 30 mph*

- 7) A man having ten hours at his disposal made an excursion, riding out at the rate of 10 miles an hour and returning on foot, at the rate of 3 miles an hour. Find the distance he rode.

	r	t	D
r	10	t	10t
w	3	10-t	30-3t

$$10t = 30 - 3t$$

$$\begin{array}{r} +3t \quad \quad +3t \\ \hline 13t = 30 \\ \frac{13t}{13} = \frac{30}{13} \\ t = \frac{30}{13} \\ d = 10 \left( \frac{30}{13} \right) = \frac{300}{13} \text{ mi} \end{array}$$

- 9) A boy rides away from home in an automobile at the rate of 28 miles an hour and walks back at the rate of 4 miles an hour. The round trip requires 2 hours. How far does he ride?

	r	t	d
r	28	t	28t
w	4	2-t	8-4t

$$28t = 8 - 4t$$

$$\begin{array}{r} +4t \quad \quad +4t \\ \hline 32t = 8 \\ \frac{32t}{32} = \frac{8}{32} \\ t = .25 \\ d = 28(.25) = 7 \text{ mi.} \end{array}$$

- 11) A family drove to a resort at an average speed of 30 mph and later returned over the same road at an average speed of 50 mph. Find the distance to the resort if the total driving time was 8 hours.

	r	t	d
T	30	t	30t
R	50	8-t	400-50t

$$30t = 400 - 50t$$

$$\begin{array}{r} +50t \quad \quad + 50t \\ \hline \end{array}$$

$$\frac{80t}{80} = \frac{400}{80}$$

$$t = 5$$

$$d = 30(5) = 150 \text{ mi.}$$

- 13) A, who travels 4 miles an hour starts from a certain place 2 hours in advance of B, who travels 5 miles an hour in the same direction. How many hours must B travel to overtake A?

	r	t	D
A	4	t+2	4t+8
B	5	t	5t

$$4t + 8 = 5t$$

$$\begin{array}{r} -4t \quad \quad - 4t \\ \hline \end{array}$$

$$8hr = t$$

- 15) A motorboat leaves a harbor and travels at an average speed of 8 mph toward a small island. Two hours later a cabin cruiser leaves the same harbor and travels at an average speed of 16 mph toward the same island. In how many hours after the cabin cruiser leaves will the cabin cruiser be alongside the motorboat?

	r	t	d
M	8	t+2	8t+16
C	16	t	16t

$$8t + 16 = 16t$$

$$\begin{array}{r} -8t \quad \quad - 8t \\ \hline \end{array}$$

$$\frac{16}{8} = \frac{8t}{8}$$

$$2hr = t$$

- 17) A car traveling at 48 mph overtakes a cyclist who, riding at 12 mph, has had a 3 hour head start. How far from the starting point does the car overtake the cyclist?

	r	t	d
Car	48	t	48t
Cy	12	t+3	12t+36

$$48t = 12t + 36$$

$$\begin{array}{r} -12t - 12t \\ \hline \end{array}$$

$$\frac{36t}{36} = \frac{36}{36}$$

$$t = 1$$

$$d = 48(1) = 48 \text{ mi.}$$

- 19) Two men are traveling in opposite directions at the rate of 20 and 30 miles an hour at the same time and from the same place. In how many hours will they be 300 miles apart?

	r	t	d
	20	t	20t
	30	t	30t
			300

$$20t + 30t = 300$$

$$\frac{50t}{50} = \frac{300}{50}$$

$$t = 6 \text{ hr}$$

- 21) A motorboat leaves a harbor and travels at an average speed of 18 mph to an island. The average speed on the return trip was 12 mph. How far was the island from the harbor if the total trip took 5 h?

	r	t	d
T	18	t	18t
R	12	5-t	60-12t

$$18t = 60 - 12t$$

$$\frac{+12t}{30} = \frac{+12t}{30}$$

$$\frac{30t}{30} = \frac{60}{30}$$

$$t = 2$$

$$d = 18(2) = 36 \text{ mi}$$

- 23) A jet plane traveling at 570 mph overtakes a propeller-driven plane that has had a 2 h head start. The propeller-driven plane is traveling at 190 mph. How far from the starting point does the jet overtake the propeller-driven plane?

	r	t	d
J	570	t	570t
P	190	t+2	190t+380

$$570t = 190t + 380$$

$$\frac{-190t}{380} = \frac{-190t}{380}$$

$$\frac{380t}{380} = \frac{380}{380}$$

$$t = 1$$

$$d = 570(1) = 570 \text{ mi.}$$

- 25) As part of flight training, a student pilot was required to fly to an airport and then return. The average speed on the way to the airport was 100 mph, and the average speed returning was 150 mph. Find the distance between the two airports if the total flight time was 5 h.

	r	t	d
T	100	t	100t
R	150	5-t	750-150t

$$100t = 750 - 150t$$

$$\frac{+150t}{250} = \frac{+150t}{250}$$

$$\frac{250t}{250} = \frac{750}{250}$$

$$t = 3$$

$$d = 100(3) = 300 \text{ mi.}$$

- 27) A car traveling at 56 mph overtakes a cyclist who, riding at 14 mph, has had a 3 h head start. How far from the starting point does the car overtake the cyclist?

	r	t	d
Car	56	t	56t
Cy	14	t+3	14t+42

$$56t = 14t + 42$$

$$\frac{-14t}{42} = \frac{-14t}{42}$$

$$\frac{42t}{42} = \frac{42}{42}$$

$$t = 1$$

$$d = 56(1) = 56 \text{ mi}$$

- 29) A bus traveling at a rate of 60 mph overtakes a car traveling at a rate of 45 mph. If the car had a 1 h head start, how far from the starting point does the bus overtake the car?

	r	t	d
B	60	t	60t
C	45	t+1	45t+45

$$60t = 45t + 45$$

$$\frac{-45t - 45t}{15} = \frac{45}{15}$$

$$\frac{15t}{15} = \frac{45}{15}$$

$$t = 3$$

$$d = 60(3) = 180 \text{ mi.}$$

- 31) A truck leaves a depot at 11 A.M. and travels at a speed of 45 mph. At noon, a van leaves the same place and travels the same route at a speed of 65 mph. At what time does the van overtake the truck?

	r	t	d
T	45	t+1	45t+45
V	65	t	65t

$$45t + 45 = 65t$$

$$\frac{-45t}{20} = \frac{-45t}{20}$$

$$\frac{45}{20} = \frac{20t}{20}$$

$$2.25 = t$$

$$2.25 = 2 \text{ hr } 15 \text{ min.}$$

$$12:00 \text{ pm} + 2:15 = 2:15 \text{ pm}$$

- 33) Three campers left their campsite by canoe and paddled downstream at an average rate of 10 mph. They then turned around and paddled back upstream at an average rate of 5 mph to return to their campsite. How long did it take the campers to canoe downstream if the total trip took 1 hr?

	r	t	d
d	10	t	10t
v	5	1-t	5-5t

$$10t = 5 - 5t$$

$$\frac{+5t}{15} = \frac{+5t}{15}$$

$$\frac{15t}{15} = \frac{5}{15}$$

$$t = \frac{1}{3} \text{ hr} = 20 \text{ min.}$$

- 35) A student walks and jogs to college each day. The student averages 5 km/hr walking and 9 km/hr jogging. The distance from home to college is 8 km, and the student makes the trip in one hour. How far does the student jog?

	r	t	d
W	5	t	5t
J	9	1-t	9-9t
			8

$$5t + 9 - 9t = 8$$

$$-4t + 9 = 8$$

$$\frac{-9}{-4} = \frac{-9}{-4}$$

$$-\frac{4t}{-4} = -\frac{1}{-4}$$

$$t = .25$$

$$d = 9 - 9(.25) = 9 - 2.25 = 6.75 \text{ mi}$$

- 37) On a 220 mi trip, a car traveled at an average speed of 50 mph and then reduced its average speed to 35 mph for the remainder of the trip. The trip took a total of 5 h. How long did the car travel at each speed?

	r	t	d
F	50	t	50t
S	35	5-t	175-35t
			220

$$50t + 175 - 35t = 220$$

$$15t + 175 = 220$$

$$\underline{-175 - 175}$$

$$\frac{15t}{15} = \frac{45}{15}$$

$$t = 3$$

*3hr @ 50 mph, 2 hr @ 35 mph*