D = RT Recitation Week of 8/31

Sunday, August 30, 2020 7:54 AM

Problem #1

Drive from A to B at avg speed of 30 miles per hour.
We return at an avg speed of 60 miles per hour.
What is our avg speed for the round trip?

Many people incorrectly answer 45 miles per hour.

Let D = the distance between locations A and B.

D = 30 mph*t1 (going there)
D = 60 mph*t2 (coming back)

t1 = D/30 mph
t2 = D/60 mph

Let's consider the whole trip!

2D = r(t1 + t2)
2D = r(D/30 + D/60)
2D = r(2D/60 + D/60)
2D = r3D/60, note that D's cancel.
r = (2*60)/3 = 40 mph.

Problem #2
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40 mph 3 min late
60 mph 3 min early

Let t be the time in hours to arrive at work on time.
Let D be the distance to work.

D = (40 mph)(t + 1/20)
D = (60 mph)(t - 1/20)

D = 40t + 2
D = 60t - 3

$40t + 2 = 60t - 3$
$5 = 20t$
$t = 1/4$

So, he should take 15 minutes to get to work.
$D = 40(1/4) + 2 = 12$ miles

12 miles = r(1/4 hour)
r = 48 miles per hour

Problem #3

Let D be the distance from home to airport.
Let t be the correct driving time in hours.

D = (35 mph)(t+1)

Info given is for a split trip. First hour is at 35 mph, so he drove 35 miles. The second part of the trip is D - 35 miles, and he goes at 50 miles an hour, arrives half an hour early.

So data for the second part of the trip:

Distance = D - 35
time = (t - 1 - 1/2)
rate = 50 miles per hour

D - 35 = (50 mph)(t - 3/2)

$D = 35t + 35$
$D = 35 + 50t - 75$

$35t + 35 = 35 + 50t - 75$
$15t = 75$
$t = 5$ hours

D = (35 mph)(5 + 1 hours) = 210 miles

Problem #4

This one is a disguised D = RT problem!

For this case, total volume leaked equals rate of volume leaked times time the leak occurred.

Pool 12 feet by 10 feet by 8 feet (deep)

Leak is 1 cubic inch water/second

Total Volume Leaked = (1 in^3/sec)*(1 day) = 60 x 60 x 24 in^3

Convert Days to Seconds:

60 seconds in a minute
60 minutes in a hour
24 hours in a hay

$$1 \quad \frac{60\ sec}{1\ min} \times \frac{60\ min}{1\ hr} \times \frac{24\ hr}{day}$$

$$86{,}400\ sec/day$$

Cross sectional area of the pool is 12 feet by 10 feet

144 inches by 120 inches

Volume lost = 60 x 60 x 24 in^3 = 144 in x 120 in x D in

where D is the depth lost in inches.

$$D = \frac{5\cancel{0} \times \cancel{6}\cancel{0} \times 2\cancel{4}}{\cancel{12} \times \cancel{12} \times \cancel{12} \times \cancel{10}} = 5\ in$$

Intended answer for what doesn't matter is the depth of the pool (8 feet).