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2013 Q11

11. Ted's grandfather used his treadmill on 3 days this week. He went 2 miles each day. On Monday he jogged at a speed of 5 miles per hour. He walked at the rate of 3 miles per hour on Wednesday and at 4 miles per hour on Friday. If Grandfather had always walked at 4 miles per hour, he would have spent less time on the treadmill. How many minutes less?

(A) 1 **(B)** 2 **(C)** 3 **(D)** 4 **(E)** 5

11. **Answer (D):** Because time equals distance divided by rate, Grandfather was on the treadmill for $\frac{2}{5}$ hours or 24 minutes on Monday. Similarly, he walked for $\frac{2}{3}$ hours, or 40 minutes, on Wednesday and $\frac{2}{4}$ hours, or 30 minutes, on Friday. The total time Grandfather spent on the treadmill was $24 + 40 + 30 = 94$ minutes. If he had walked the entire 6 miles at 4 miles per hour, he would have spent $\frac{6}{4}$ hours, or 90 minutes, on the treadmill, so he would have saved 4 minutes.

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1985 Q13

13. If you walk for 45 minutes at a rate of 4 mph and then run for 30 minutes at a rate of 10 mph, how many miles have you gone at the end of one hour and 15 minutes?

A) 3.5 miles B) 8 miles C) 9 miles D) $25\frac{1}{3}$ miles E) 480 miles

13. (B) To keep the units of miles and hours, first note 45 minutes $= \frac{45}{60} = \frac{3}{4}$ hour and 30 minutes $= \frac{1}{2}$ hour. Since distance = rate $\times$ time, your total distance is

$$4 \times \frac{3}{4} + 10 \times \frac{1}{2} = 3 + 5 = 8 \text{ miles.}$$

The distance is less than 4 + 10 = 14 miles, so (D) and (E) can be easily eliminated.

2006 Q13

13. Cassie leaves Escanaba at 8:30 AM heading for Marquette on her bike. She bikes at a uniform rate of 12 miles per hour. Brian leaves Marquette at 9:00 AM heading for Escanaba on his bike. He bikes at a uniform rate of 16 miles per hour. They both bike on the same 62-mile route between Escanaba and Marquette. At what time in the morning do they meet?

(A) 10:00 **(B)** 10:15 **(C)** 10:30 **(D)** 11:00 **(E)** 11:30

Problems 14, 15 and 16 involve Mrs. Reed's English assignment.

A Novel Assignment

The students in Mrs. Reed's English class are reading the same 760-page novel. Three friends, Alice, Bob and Chandra, are in the class. Alice reads a page in 20 seconds, Bob reads a page in 45 seconds and Chandra reads a page in 30 seconds.

13. **(D)** Between 8:30 and 9:00 AM Cassie travels 6 miles. At 9:00 Cassie and Brian are only 56 miles apart. After 9:00, because they are both biking towards each other, the distance between them decreases at the rate of $12+16 = 28$ miles per hour. At that rate, it will take them $\frac{56}{28} = 2$ hours to meet. So they will meet at 11:00 AM.

14. A computer can do 10,000 additions per second. How many additions can it do in one hour?

A) 6 million B) 36 million C) 60 million D) 216 million E) 360 million

1987 Q14

14. B There are 60·60 = 3600 seconds in an hour. Thus the computer does 3600·10,000 = 36,000,000 or 36 million additions in an hour.

2006 Q14

14. If Bob and Chandra both read the whole book, Bob will spend how many more seconds reading than Chandra?

(A) 7,600 **(B)** 11,400 **(C)** 12,500 **(D)** 15,200 **(E)** 22,800

A

B

C

D

E

14. **(B)** Bob takes $45 - 30 = 15$ more seconds per page than Chandra. So the difference in their total reading times is $760 \cdot 15 = 11{,}400$ seconds. Bob will spend 11,400 more seconds reading than Chandra.

2009 Q14

14. Austin and Temple are 50 miles apart along Interstate 35. Bonnie drove from Austin to her daughter's house in Temple, averaging 60 miles per hour. Leaving the car with her daughter, Bonnie rode a bus back to Austin along the same route and averaged 40 miles per hour on the return trip. What was the average speed for the round trip, in miles per hour?

(A) 46 **(B)** 48 **(C)** 50 **(D)** 52 **(E)** 54

14. **Answer (B):** Find the time traveling to Temple by dividing the distance, 50 miles, by the rate, 60 miles per hour: $\frac{50}{60} = \frac{5}{6}$ hours. Find the time returning by dividing the distance, 50 miles, by the rate, 40 miles per hour: $\frac{50}{40} = \frac{5}{4}$ hours. Find the average speed for the round trip by dividing the total distance, $2 \cdot 50 = 100$ miles, by the total time, $\frac{5}{6} + \frac{5}{4} = \frac{10}{12} + \frac{15}{12} = \frac{25}{12}$ hours. The average speed is $\dfrac{100}{\frac{25}{12}} = 100(\frac{12}{25}) = 48$ miles per hour.

NOTE: The harmonic mean h of 2 numbers a and b is found using the formula $h = \frac{2ab}{a+b}$. The harmonic mean is the average rate if the same distance is traveled at two different rates.

If $a = 60$ and $b = 40$, then $h = \frac{2 \cdot 60 \cdot 40}{60+40} = \frac{4800}{100} = 48$ miles per hour.

2016 Q14

14. Karl's car uses a gallon of gas every 35 miles, and his gas tank holds 14 gallons when it is full. One day Karl started with a full tank of gas, drove 350 miles, bought 8 gallons of gas, and continued driving to his destination. When he arrived, his gas tank was half full. How many miles did Karl drive that day?

(A) 525 **(B)** 560 **(C)** 595 **(D)** 665 **(E)** 735

14. Answer (A):

In driving 350 miles, Karl used $\frac{350}{35} = 10$ gallons of gas, so he had $14 - 10 = 4$ gallons left in his tank. After buying 8 more gallons, he had $4 + 8 = 12$ gallons. When he arrived at his destination, he had $\frac{14}{2} = 7$ gallons left, so he used an additional $12 - 7 = 5$ gallons. This let him drive an additional $5 \cdot 35 = 175$ miles, so he drove a total of $350 + 175 = 525$ miles.

OR

Karl used $14 + 8 - \frac{14}{2} = 15$ gallons of gas on his trip, so he drove $15 \cdot 35 = 525$ miles.

2001 Q15

15. Homer began peeling a pile of 44 potatoes at the rate of 3 potatoes per minute. Four minutes later Christen joined him and peeled at the rate of 5 potatoes per minute. When they finished, how many potatoes had Christen peeled?

(A) 20 (B) 24 (C) 32 (D) 33 (E) 40

15. (A) After 4 minutes Homer had peeled 12 potatoes. When Christen joined him, the combined rate of peeling was 8 potatoes per minute, so the remaining 32 potatoes required 4 minutes to peel. In these 4 minutes Christen peeled 20 potatoes.

OR

	minute	Homer	Christen	running total
	1	3		3
	2	3		6
	3	3		9
	4	3		12
	5	3	5	20
	6	3	5	28
	7	3	5	36
	8	3	5	44
Totals		24	20	

2006 Q15

15. Chandra and Bob, who each have a copy of the book, decide that they can save time by "team reading" the novel. In this scheme, Chandra will read from page 1 to a certain page and Bob will read from the next page through page 760, finishing the book. When they are through they will tell each other about the part they read. What is the last page that Chandra should read so that she and Bob spend the same amount of time reading the novel?

(A) 425 **(B)** 444 **(C)** 456 **(D)** 484 **(E)** 506

15. **(C)** The ratio of time it takes Bob to read a page to the time it takes Chandra to read a page is 45:30 or 3:2, so Bob should read $\frac{2}{3}$ of the number of pages that Chandra reads. Divide the book into 5 parts, each with $\frac{760}{5} = 152$ pages. Chandra will read the first $3 \cdot 152 = 456$ pages, while Bob reads the last $2 \cdot 152 = 304$ pages.

OR

If Chandra reads x pages, she will read for $30x$ seconds. Bob has to read $760 - x$ pages, and this takes him $45(760 - x)$ seconds. Because Chandra and Bob read the same amount of time, $30x = 45(760 - x)$.
Solving for x,

$$\begin{aligned} 30x &= 45 \cdot 760 - 45x, \\ 75x &= 45 \cdot 760, \\ x &= \frac{45 \cdot 760}{75} = 456. \end{aligned}$$

So Chandra will read the first 456 pages.