



Math Olympiad and Problem Solving Programs
E120 - Honors Algebra Problem Solving

Problem Set 20.2 - Speed

Name:

Date:

1. Average speed is the total distance divided by total time for the journey. The distance Dale travelled for the first 30 minutes is $56 \text{ mph} \times \frac{1}{2} \text{ hrs} = 28 \text{ mi}$ and for the last 45 minutes is $60 \text{ mph} \times \frac{3}{4} \text{ hrs} = 45 \text{ mi}$ for a total of $28 \text{ mi} + 45 \text{ mi} = 73 \text{ mi}$. She travelled for a total of $\frac{1}{2} \text{ hrs} + \frac{3}{4} \text{ hrs} = \frac{5}{4} \text{ hrs}$. Her average speed, then, is $73 \text{ mi} \div \frac{5}{4} \text{ hrs} = \boxed{58.4 \text{ mph}}$.
2. $\boxed{6:55 \text{ p.m.}}$
3. $\boxed{4 \text{ mph}}$
4. $\boxed{592 \text{ feet}}$
5. $\boxed{306 \text{ mi}}$
6. $\boxed{360 \text{ km}}$
7. Mitchell drives for a total of 45 minutes, or $\frac{3}{4} \text{ hr}$, before Ethan begins driving. Mitchell drives for a total of $\frac{3}{4} \times 80 = 60 \text{ km}$. This means that by the time Ethan starts driving, they only need to cover a total of $535 - 60 = 475 \text{ km}$ together. The distance that they travel will total 475 km when they meet. If we let t be time, in hours, we get the following equation:

$$80t + 110t = 475$$

$$190t = 475$$

$$t = 2.5$$

This means 2.5 hours after 3:15 p.m. is when they meet, or $\boxed{5:45 \text{ p.m.}}$

8. From 11:40 a.m. to 12:20 p.m., 40 minutes or $\frac{2}{3} \text{ hr}$, only the moving van is travelling for a total distance of $51 \times \frac{2}{3} = 34 \text{ miles}$. Now when the motorcycle leaves for Las Vegas, he is 34 miles away from the van. Let t_1 be the time, in hours, it takes the motorcycle to overtake the van after 12:20 p.m. The motorcycle will overtake the van when both vehicles have travelled the same distance. This gives us the following equation:

$$34 + 51t_1 = 68t_1$$

$$34 = 17t_1$$

$$t_1 = 2$$

Now we know that the motorcycle will overtake the moving van 2 hours after 12:20 p.m., at which time it will be $\boxed{2:20 \text{ p.m.}}$

For the second part of the question, let t_2 be the time, in hours, it takes the motorcycle to be 51 miles ahead of the van after 2:20 p.m. The difference between their total travelled distance from this point will be 51 miles. This gives us the following equation:

$$68t_2 - 51t_2 = 51$$

$$17t_2 = 51$$

$$t_2 = 3$$

Now we know that the motorcycle will be 51 miles ahead of the moving van 3 hours after 2:20 p.m., at which time it will be $\boxed{5:20 \text{ p.m.}}$



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9. Let t be the time, in seconds, it takes the lioness to catch the gazelle. The lioness will catch the gazelle when the total distances that the gazelle has travelled is exactly 200 yards less than the total distance the lioness has travelled. This gives us the following equation:

$$8t = 12t - 200$$

$$200 = 4t$$

$$t = 50$$

Now we know that the lioness ran for 50 seconds before she caught her lunch, and at 12 yards per second, that's a total distance of $50 \times 12 = \boxed{600 \text{ yards}}$

10. We know that it took Jason 39 minutes to travel the last 13 miles to the cave. This means that Jason travelled at a speed of $13 \div 39 = \frac{1}{3}$ miles per minute. The time it took Jason to travel the first $15 - 13 = 2$ miles, Ankur had already travelled the entire 15 miles. This means that Ankur travels $\frac{15}{2}$ times as fast as Jason, for a speed of $\frac{15}{2} \times \frac{1}{3} = \frac{5}{2}$ miles per minute or $\frac{5}{2} \times 60 = \boxed{150 \text{ mph}}$.