Solve these motion problems. Include a sketch of each problem.

1. Two trains left the station at 8:30 a.m., traveling in opposite directions. The first train traveled at 50 mph and the second at 90 mph. What time will it be when the trains are 350 miles apart?

2. A horse trotted at 12 mph, and then walked at 5 mph for a total distance of 39 miles. If the trip took five hours, how long did the horse trot, and how long did it walk?

3. The prodigal son and his father began running toward each other when they were one mile apart. The father ran at a rate of 10 miles an hour, and the son, who was weak and tired, ran at a rate of 5 miles an hour. How long did it take them to meet?

4. Madison walked north at 3 mph. Logan left one hour later and walked south at 5 mph. If Madison started at 2:30 p.m., what time was it when they were 19 miles apart?

5. For the first part of my trip, I could average only 40 mph. Later, I was able to travel at 65 mph. If it took me seven hours to go a total of 360 miles, how long did I travel at each rate of speed?

Answer the questions.

1. Major Eugene Brown kept in shape over the summer by doing pushups. In the beginning of the summer, he did 50 pushups in one-half minute. What was his rate per minute?

2. In midsummer, Major Brown did 20 pushups in one-third minute. What was his rate per minute?

3. By the end of summer, Major Brown did 35 pushups at a rate of 70 per minute. How long did it take him?

4-5. Driving to work, Jeff found the roads clear. That afternoon, the roads were covered with snow and ice. During morning rush hour he made it to work in 2 hours and 45 min. On the way home, he averaged 15 mph less than in the morning, and it took him 4 hours. How far is it to work, and what was his average speed coming home?

6-8. On the first leg of the 1,600-mile trip, Gerry drove by himself. For the second part of the trip, another driver helped. With several breaks, Gerry averaged 40 mph on the first leg. On the second leg, with two drivers, they averaged 20 mph more, and they drove for three more hours than on the first part of the trip. How may hours did Gerry drive on the first day? How many hours did the team drive on the second day? What was the team's rate on the second day?

9-11. On a walk-a-thon to raise money for Hosanna Home, John found he could run for some of the trek. He walked for 3 hours at 4 mph. He then ran 2 mph faster than he walked for the rest of the trek. If the walk-a-thon was for 20 miles, how long and how fast did John run?

Use unit multipliers to change the units of measure.

12. 9 yd = _____ ft

13. 35 m^2 = _____ cm^2

Use unit multipliers to convert from imperial to metric or metric to imperial measure.

14. 300 g = _____ oz

15. 16 mi = _____ km

For #16-18: Nitrogen and hydrogen are present in 646 grams of NH_3.

16. List all the possible equations.

17. What is the mass of the nitrogen?

18. What is the mass of the hydrogen?

Follow the directions.

19. Tell how many terms in the expression $(X - 3)^4$ and then expand it.

20. What is the third term of $(2X + 5)^5$?