Math 105 - Rates, Units, & Percents **Name:** _____

Use dimensional analysis to solve these problems

1. Oil is sold in barrels. Each barrel holds 42 gallons. How many barrels would it take to fill a tank that holds 2100 gallons?

2. There are 3 teaspoons in a Tablespoon, there are 4 Tablespoons in a quarter cup. A cup is 8 ounces. How many ounces is a teaspoon?

3. Three eighths of a cup is how many teaspoons?

4. A cubic centimeter is the same as one milliliter (mL). One milliliter of water weighs one gram. How much would a cubic meter of water weigh in kilograms? Hint: *One meter is 100 cm, but one cubic meter is not 100 cm^3, it is* $(100\ cm)^3$*. There's a big difference!*

5. If a car can drive 30 miles per gallon of gas, and gas costs \$2 per gallon, then how much money will it cost to drive 100 miles?

6. If the same car in the previous problem were to drive a 50 miles per hour for 30 minutes, how many gallons of gas would that take?

7. How many hundredths are in an eighth?

8. A furlong is an eighth of a mile. If someone takes 3 minutes to walk 1 furlong, then how fast did they walk in miles per hour?

9. A jet flies at 500 miles per hours and burns fuel at a rate of 100 gallons per hour. How many gallons of fuel would the jet need to fly 700 miles?

10. Jeff Bezos, the founder of Amazon, has a net worth of approximately 180 billion dollars. There are roughly 300 million people in the United States. If all of Jeff Bezos' wealth were divided equally by everyone in America, how much money would each person get?

Solve the following.

11. 40 is what percent of 200?

12. 60 is 20% of what number?

13. What is 5% of 60%?

14. What is 120% of 50%?

15. 100% is what percent of 40%?

16. All of the students in a class took an exam. Each student either passed or failed. 85% of the students passed and 3 students failed. How many students are in the class?

17. A baseball team won 30 of their first 50 games. How many of the remaining 40 games would the team need to win in order to finish the season having won exactly 70% of their games?

18. The faucet of a bath tub can fill the tub in 15 minutes. The drain, when opened, can empty the full tub in 20 minutes. Suppose the tub is empty and the faucet and the drain are both opened at the same time. What is the combined rate at which the tub is filling, what are the units, and how long will it take to fill the tub?

19. Alice can shovel her driveway in 1 hour. Bob can do the same job in 30 minutes. If they work together, how long will it take them to shovel the driveway?

20. A marine biologist tags 50 fish in one lake and releases them. Five days later, he captures 60 fish, of which 3 have already been tagged. Assuming that the number of fish in the lake is constant, and that 3 out of 60 is an accurate estimate for the proportion of fish in the lake that are tagged, how many fish are there in the lake?

21. An athlete's target heart rate is 80% of the theoretical maximum heart rate. The maximum heart rate, in beats per minute, is found by subtracting the athlete's age, in years, from 220. Find a formula for an athlete's target heart rate based on their age x.

22. Pressure increases linearly as you go deeper underwater. The pressure at the surface is 1 atmosphere (atm), and it increases by 1 atm every 10 meters deeper you get. Find the function for pressure P as a function of depth y underwater. What is the slope?

23. There are two cell phone companies that offer different packages. Company A charges a monthly service fee of \$34 plus \$.05/min talk-time. Company B charges a monthly service fee of \$40 plus \$.04/min talk-time. For each company, write a linear equation that models the total monthly cost C as a function of talk-time t.

24. Suppose that coffee costs \$0.60 per pound and tea costs \$1.20 per pound. A supplier has space for 50 pounds of coffee or tea. If the supplier purchases x pounds of coffee and then uses the remaining space for tea, how much will the supplier pay as a function of x?

25. Alan and Ben are running for class president. After 80% of the ballots are counted, Ben is ahead with 60% of the counted votes while Alan has 40%. Could Alan still win the election? What percent of the remaining votes would Alan need in order for there to be a tie?

26. Let F denote the final percent of the vote that Alan ends with in the previous problem. Express F as a function of p, where p is the percent of the last 20% of the votes that Alan receives.