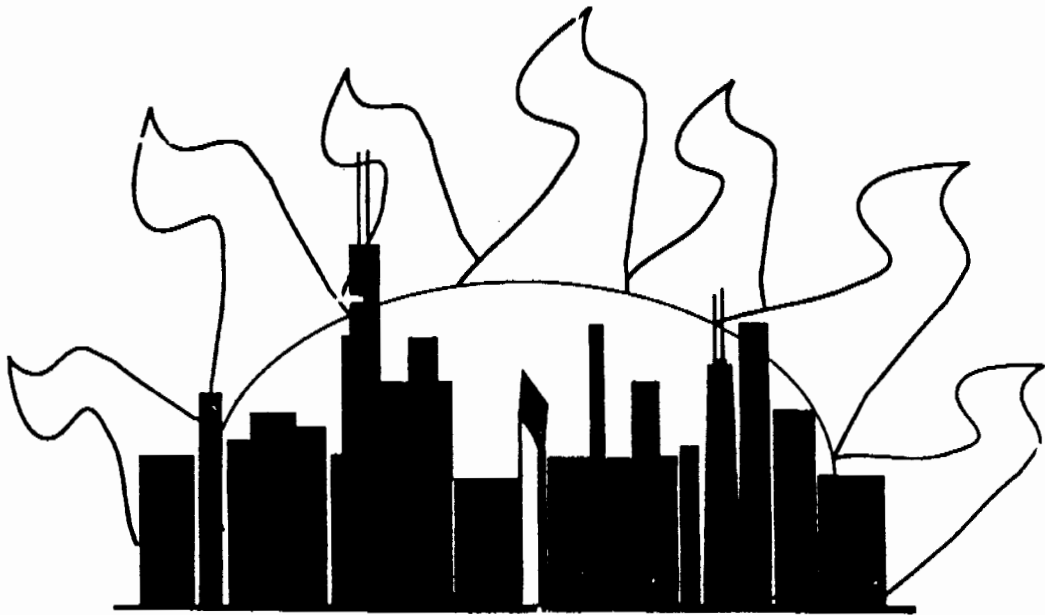


Theta Division

Topic Test 3

Word Problems



**Mu Alpha Theta National Convention
Chicago 1998**

General Instructions:

Unless otherwise stated all answers should be written as decimals.

If you are asked to give your answer as a fraction, please give your answer in a/b form where a and b are relatively prime.

Questions

1. The ratio of the tens digit to the units digit of a two digit number is 3 : 4. The number that results when the digits are reversed is 18 more than the original number. Find the original number.
2. One woman says to another woman, "I have three daughters whose ages are whole numbers and want you to ascertain their ages from these clues. Stop me when you know their ages.
 - a) The sum of their ages is thirteen.
 - b) The product of their ages is a perfect square number.
 - c) My oldest daughter has blue eyes."

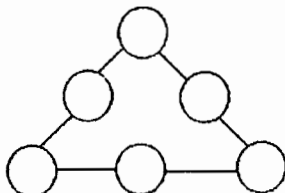
"Stop," says the second woman. "I know their ages."

What is the age of the oldest daughter?

3. Tyler buys sacks of grain for \$3.20 each. On the way home from the market, three sacks fall off the cart and are lost. He sells the remaining sacks for \$3.60 each. His profit on the entire transaction is \$9.20. How many sacks did Tyler buy?
4. A sign company wants to print the numbers from 1 to 1000, inclusive. How many ones will they need to print?
5. If John gives Paul one apple, they will have the same number of apples. If Paul gives John one apple, John will have twice as many apples as Paul has. What is the total number of apples that John and Paul have?
6. A motorcyclist was sent by the post office to meet a plane at the airport. The plane landed ahead of schedule and its mail was taken toward the post office by a horseman. After half an hour, the horseman met the motorcyclist on the road and gave her the mail. The motorcyclist returned to the post office 20 minutes before she was expected. How many minutes early did the plane arrive?

7. A man born in the year x^2 and died, on his 87th birthday, in the year $(x + 1)^2$. In what year was he born?
8. Liz has her choice of two different jobs for three months of the summer. The first job she found herself and pays \$5.50 an hour. The second job she located through an employment agency which will charge her 10% of her gross income. This job pays \$7.20 an hour for the first month, and a fixed rate for the next two months based on her first month's performance. What must this fixed rate be so that the two jobs would have the same value to Liz? Give your answers in dollars per hour, rounded to the nearest cent. Assume that all months are the same and consist of four forty hour work weeks.
9. Two movie theaters, Cinema I and Cinema II, each had movies that started at 7:00 on Saturday evening. The movie at Cinema I lasted for 90 minutes and the movie at Cinema II lasted for 75 minutes. If the movie theaters ran the movies continuously, how many hours later will it be before the next time that the movies begin at the same time?
10. Assume that every 7-digit whole number is a possible telephone number except for those that begin with 0 or 1. What fraction of telephone numbers begin and end with a 4? Give your answer as a reduced fraction.
11. Rhonda Off used 3.14 to approximate π and computed the area of a circle. Then she used 3.142 to approximate π and computed the area of the same circle. Her answers differed by exactly 1. Find the radius of the circle correct to four significant digits.
12. Find the smallest of three consecutive positive even integers such that the sum of the numbers is $\frac{1}{2}$ of their product.
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13. The cost per gallon of gas of grade A is \$1.15, grade B is \$1.27, and grade C is \$1.35. A local service station sold 230 gallons of gas yesterday afternoon for a total of \$289.62. The number of gallons of grade A gas sold exceeded the number of gallons of grade B gas sold by 26 gallons. How many gallons of grade A gas were sold?
14. As you are approaching Chicago from the south, you have a choice of going through the center of the city with heavy traffic, or you can take a bypass around the city. The bypass is a longer distance but has less traffic. The bypass is a semicircle with an average speed of 55 mph and the route through the city is a diameter of the semicircle. What is the maximum speed, rounded to the nearest mph, that the city center traffic would have to maintain, on average, to make it worth taking the bypass?

15. In a magic triangle, each of the six numbers 30, 31, 32, 33, 34, 35 is placed in one of the circles (a number cannot be used more than once) so that the sum, S , of the three numbers on each side of the triangle is the same. What is the largest possible value for S ?



16. Two pipes can be used to fill a swimming pool. The first can fill the pool in three hours and the second can fill the pool in four hours. There is also a drain that can empty the pool in six hours. Both pipes were being used to fill the pool. After an hour, a careless maintenance person (obviously not a mathlete) accidentally opened the drain. How many hours from then will it take for the pool to fill?
17. The hands of a clock are directly opposite each other at 6:00. In how many minutes from then will it be the second time that the hands will be directly opposite?
18. Grandfather Alvarez has figured out the following: "My son Roberto is 24 years younger than I am and 35 years older than my grandson, Guario. Together our combined ages add up to 100." How many years old is Grandfather Alvarez?
19. Speedy and Tardy are going to participate in a 5 mile race. Speedy starts out at an average rate of 22 ft/sec. He can only maintain this pace for 2 miles and thereafter must slow to a pace of 18 ft/sec. Tardy runs at a steady pace of 20 ft/sec. If Speedy completes the race in s seconds and Tardy completes the race in t seconds, what is the value of $s - t$?
Note: 5280 feet = 1 mile.
20. A store owner has an item with a sticker price of \$10,000. She marks up the price 20%. A week later, she decreases the price by 20%. A week after that, she increases the price by 20%. The final week, she decreases the current price by 20% and the item is sold. What is the final sales price, in dollars, of the item?