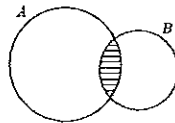


Name _____

School _____

No calculators are allowed. Make sure the answers are placed on the space provided.

1. _____ Suppose a and b are positive numbers different from 1 satisfying $ab = a^b$ and $\frac{a}{b} = a^{2b}$. Then find the value of $(8a + 3b)$.
2. _____ What is the largest prime divisor of $(2^{10} - 16)$?
3. _____ Three cowboys entered a saloon. The first ordered 4 sandwiches, a cup of coffee, and 10 doughnuts for \$8.45. The second ordered 3 sandwiches, a cup of coffee, and 7 doughnuts for \$6.30. How much did the third cowboy pay for a sandwich, a cup of coffee, and a doughnut?
4. _____ Two circles, A and B, overlap each other as shown. The area of the common part is $\frac{2}{5}$ of the area of Circle A, and $\frac{5}{8}$ of the area of Circle B. What is the ratio of the radius of Circle A to that of Circle B?



5. _____ For the final exam in Professor Ahlin's class, the average (= arithmetic mean) score of the group of failing students was 62 and the average score among the passing students was 92. The overall average for the 20 students in the class was 80. How many students passed the final?
6. _____ Five test scores have a mean (average score) of 91, a median (middle score) of 92 and a mode (most frequent score) of 95. Find the sum of the two lowest test scores.
7. _____ Suppose you visit Mars and meet some aliens who teach you their system of counting. You notice that they use a true place value system that is similar to ours, but the Martians use base 6 instead of base 10. Table 1 shows how to translate their characters into our digits.

#	&	<	@	/	*
0	1	2	3	4	5

Table 1: Martian characters

Convert the number 54 (base 10) to its Martian equivalent.

No calculators are allowed. Make sure the answers are placed on the space provided.

8. _____ Some hikers start on a walk at 10 a.m. and return at 4 p.m. One third of the distance walked is uphill, one third is level, and one third is downhill. If their speed is 4 miles per hour on level land, 2 miles per hour uphill, and 6 miles per hour downhill, how far did they walk?
9. _____ Let $r = 11 \cdot \sqrt{10!}$, $s = 10 \cdot \sqrt{11!}$, $t = \sqrt{12!}$. Rank the numbers r , s , t from the smallest to the largest.
10. _____ Simplify: $|50 + (-56)| - 20 - 5|-10|$.
11. _____ Simplify: $2\sqrt{45} - 2\sqrt{20} + 7\sqrt{125}$.
12. _____ Find the sum: $\frac{1}{1 \cdot 2} + \frac{1}{2 \cdot 3} + \frac{1}{3 \cdot 4} + \dots + \frac{1}{10 \cdot 11}$.
13. _____ A drawer contains exactly six socks—two are green, two are red, two are blue. If two socks are selected at random without replacement, what is the probability that they match?
14. _____ Suppose the value of a new car declines linearly over a ten year period from the original value of \$20,000 to the value \$2,000. What is the value of the car after six years?
15. _____ What is the rightmost (units) digit of 3^{2015} ?
16. _____ Find the value of $(-1)^{n^4+n+1}$, where n is a natural number.
17. _____ Simplify: $\frac{2^{-1}-3^{-1}}{4^{-1}-3^{-1}}$
18. _____ Statistics have shown that in a certain college course, 65% of the students pass the first time they take it. Among those who have to repeat it, 70% pass on the second attempt, and among those who have to take it three times, 50% pass on the third attempt. What percentage of students have to take the course more than three times?
19. _____ Jeremy starts jogging at a constant rate of five miles per hour. Half an hour later, David starts running along the same route at seven miles per hour. For how many minutes must David run to catch Jeremy?
20. _____ If $2^{10x-1} = 1$, find the value of $\log_{10}(x)$.