

Warm-Up π

- _____ cm^2 In triangle TAH, the midpoint of line TA is R, the midpoint of line AH is S, and the midpoint of line HT is E. Segments TS, RH, and AE intersect at Y. If triangle SAY has an area of 50cm^2 , then what is the area of triangle HEY?
- _____ If $f(x) = (x + 4)(x^2 + 8x + 16)$, and $g(x) = (x - 3)(x^2 - 6x + 9)$, what is $f(g(2))$?
- _____ steps Karen, Bob, Ash, and Jim are standing in a line. Jim is 5 steps ahead of Karen and Karen is in front of Bob by 3 steps. Ash is ahead of Karen by a whole number of steps less than the number Jim is away from Karen but more than the number Bob is away from Karen. How many steps apart is Bob from Ash?
- _____ \$ Working for his father, Bob earns \$15 a day. Bob's father also pays him an additional $30/x$ dollars each day when $30/x$ is a whole number, where x represents the total number of days worked in the month. What is the greatest number of dollars Bob can earn in any month?
- _____ Four of the eight members of student council must be selected to receive citizenship awards. What is the square of the number of ways the awarded members can be chosen?
- _____ What is the sum of the reciprocals of the number of factors of 1,440 and 900?
- _____ In an election, 2% of ballots are cast illegally. Voting machines detect illegal ballots with 90% accuracy (with 10% of legal ballots mistakenly detected as illegal). What fraction of the ballots that were detected as illegal are actually illegal? Express your answer as a common fraction.
- _____ Usain begins running at 2pm on a long path at a constant rate of 10mph. Two hours later, Lance begins biking at a constant rate of 30mph from the same point along the same path and in the same direction. What time is it when the number of minutes since Lance crossed the 10-mile mark and the number of minutes until he passes Usain are equal?
- _____ In the picture to the right, ABCD and CDEF are congruent squares. The four circles in the square on the left each have a radius of $\frac{1}{4}BC$. What is the ratio of the circumference of the circle inscribed within square CDEF to the circumference of the four smaller circles contained within square ABCD? Express your answer as a common fraction.
- _____ Frugal numbers are numbers which have more digits than the number of digits (including exponents) in their prime factorization. The first two frugal numbers are 125 (5^3) and 128 (2^7). Primes like $13 = 13^1$ are not frugal. What is the sum of the third and fourth frugal numbers?

