



T1. $A = (2,5)$, let $B = (6,a)$ and $C = (6,2a)$. The center of the circle is the midpoint of AB , so Center, say $D = \left(4, \frac{5+a}{2}\right)$. now $DA = DC$, so use the distance formula and get $\sqrt{2^2 + \left(\frac{a-5}{2}\right)^2} = \sqrt{2^2 + \left(\frac{3a-5}{2}\right)^2}$, so $a = 1.25$ and C is $(6,2.5)$

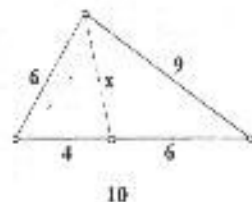
T2. Put the total amount paid in base 12, to get 3102345. The number of \$144 prizes is the digit in the 144's place, namely 3.

T3. Add 1 to each side of each equation to get $xy + x + y + 1 = 24$, $xz + x + z + 1 = 48$, $yz + y + z + 1 = 32$, and factor to get $(x+1)(y+1) = 24$, $(x+1)(z+1) = 48$, $(y+1)(z+1) = 32$. Multiply the first two and divide by the third to get $(x+1)^2 = 36$. Since we only want positive results, $x = 5$. Now substitute for x and solve to get $y = 3$, $z = 7$

T4. The number of possible games is 158, 159, 160, 161, or 162. Try various number of wins. If the total number of games is 162, no possible number rounds to .360 [58 wins is .358, 59 wins is .364]. Try the same for 161 total games, 160 total games, etc. The only one that rounds to .360 is 58 wins, 103 losses. [Note: the table feature on the TI-83 or similar graphing calculator is useful here as a time-saver]

T5. Let x = length of bisector. The largest side is divided into 4 and 6 (angle bisector ratio). Now use either Stewart's theorem or Law of Cosines twice, as below.

Let θ be the angle between the 4 and 6 sides. Using the large triangle we get $\cos \theta = \frac{11}{24}$. Now using the small triangle, $x^2 = 4^2 + 6^2 - 2 \cdot 4 \cdot 6 \cdot \frac{11}{24}$ so $x = \sqrt{30}$



T6. 1 Down is 256 (let $a = b = 1$). 6 Across must be 6765, the only 4-digit Fibonacci that starts with a 6. So the top right is a 5, since 4 Down is a palindrome. The only 3-digit cube that ends in 6 is 216, so that must be 3 Down. Now, 1 Across is divisible by 9, so the second digit is 0 or 9, but it can't be 0 because of 2 Down, so it's 9. Now 2 Down is 987. Finally, the last digit in 2 Across is a Fibonacci, 2 or 3, but by 4 Down it's odd, so 3.