PROBLEM EXPLANATIONS

1. In the number $436,921$, the thousands digit is 6 and the hundreds digit is 9. Since the hundreds digit of $436,921$ is more than 5, rounding to the nearest thousand gives $437,000$. When $437,000$ is expressed in scientific notation, the result is 4.37×10^5, which is choice (D).

2. Consider the choices in turn. At the beginning of 2006, Alan was taller than Boris; during the year, Alan grew 2 inches and Boris grew 4 inches. Since Alan grew less than Boris, it is possible that Alan was shorter than Boris at the beginning of 2007. So choice (A) is not the correct answer.

At the beginning of 2006, Alan was taller than Boris, who was taller than Charles; thus, Alan was taller than Charles. During the year, Alan grew 2 inches and Charles grew 3 inches. Since Alan grew less than Charles, it is possible that Alan was shorter than Charles at the beginning of 2007. So choice (B) is not the correct answer.

At the beginning of 2006, Dave was taller than Boris; during the year, Boris and Dave each grew 4 inches. Thus Boris was still shorter than Dave at the beginning of 2007. So choice (C) is not the correct answer.

At the beginning of 2006, Alan and Dave were each taller than Boris, but we cannot determine whether Alan was shorter than Dave or Dave was shorter than Alan, nor what the difference in their heights was. So even though Dave grew 4 inches during the year while Alan grew only 2 inches, it is possible that Dave was shorter than Alan at the beginning of 2007. So choice (D) is not the correct answer.

At the beginning of 2006, Dave was taller than Boris, who was taller than Charles; thus, Dave was taller than Charles. During the year, Dave grew 4 inches and Charles grew only 3 inches, so Dave remained taller than Charles. Thus it could not be true that Dave was shorter than Charles at the beginning of 2007. Therefore, choice (E) is the correct answer.

3. To determine the probability that a senior's name will be chosen, you must determine the total number of seniors' names that are in the lottery and divide this number by the total number of names in the lottery. Since each senior's name is placed in the lottery 3 times, there are $3 \times 100 = 300$ seniors' names. Likewise, there are $2 \times 150 = 300$ juniors' names and $1 \times 200 = 200$ sophomores' names in the lottery. The probability that a senior's name will be chosen is $\frac{300}{300+300+200} = \frac{300}{800} = \frac{3}{8}$.

4. In questions of this type, statements I, II, and III should each be considered independently of the others. You must determine which of those statements could be true.

- Statement I cannot be true. The perimeter of the triangle cannot be 11, since the sum of the two given sides is 11 without even considering the third side of the triangle.
- Continuing to work the problem, you see that in II, if the perimeter were 15, then the third side of the triangle would be $15 - (6+5)$, or 4. A triangle can have side lengths of 4, 5, and 6. So the perimeter of the triangle could be 15.
- Finally, consider whether it is possible for the triangle to have a perimeter of 24. In this case, the third side of the triangle would be $24 - (6+5) = 13$. The third side of this triangle cannot be 13, since the sum of the other two sides is not greater than 13. By the Triangle Inequality, the sum of the lengths of any two sides of a triangle must be greater than the length of the third side. So the correct answer is II only.