1. \( \frac{a}{b} = \frac{2}{3} \) and \( \frac{c}{d} = \frac{4}{5}, \) so \( \frac{bc - ad}{ac} = \frac{(bc - ad) / (bd)}{(ac) / (bd)} = \frac{c / d - a / b}{(a / b)(c / d)} = \frac{4/5 - 2/3}{(4/5)(2/3)} = \frac{2/15}{8/15} = \frac{1}{4}. \)

2. If the solid has dimension \( x, y \) and \( z \) we can write \( xy = 12, xz = 8, \) and \( yz = 6. \) Therefore 
\[
12 \cdot 8 \cdot 6 = xy \cdot xz \cdot yz = 576 = x^2 \cdot y^2 \cdot z^2 \quad \Rightarrow \quad xyz = 24.
\]
The volume of the solid is 24 cubic inches.

3. \[
\sqrt{5 + \sqrt{x + \frac{4 - x}{2 + \sqrt{x}}}} = \sqrt{\frac{10 + 7\sqrt{x + x + 4 - x}}{2 + \sqrt{x}}} = \sqrt{\frac{14 + 7\sqrt{x}}{2 + \sqrt{x}}} = \sqrt{7}.
\]

4. Since \( \frac{-c}{b} \cdot \frac{a}{d} = \frac{a - b}{c} \) we must have \( c < a \) and therefore \( a = c + 3 \) and \( 2a = c + 10, \) hence 
\[
2c + 6 = c + 10 \quad \Rightarrow \quad c = 4 \quad \text{and} \quad a = 7.
\]
Now \( d = 9 \) and the numbers \( abc \) are in the form \( 7b4 \) where \( b = 0, 1, 2, \ldots, 9. \)

5. Let \( p \) be the price of an ear of corn, then 
\[
12p = 14(p - 5) = 14p - 70 \quad \Rightarrow \quad 2p = 70 \quad \text{and} \quad p \text{ is 35 cents.}
\]
So a dozen ears of corn is \$4.20.

6. There are 625 such numbers starting with each of 1, 2 and 3 for a total of 1875 numbers. There are 125 such numbers starting with 41 and 5 numbers starting with each of 4211 and 4212. It follows that 42131 is the 2011\(^{th} \) number on the list and 42132 is the 2012\(^{th} \) number on the list.

7. There is one coloring where the squares are either all white or all black. There are three distinct colorings with either one black or one white square. There are six distinct colorings with either two black or two white squares. \( 2(1 + 3 + 6) = 20 \) distinct colorings.

8. Using the information given in the problem, we can determine the lengths as shown in the diagram. Thus the base of the triangle is 24 inches and, since the slope of a side of the triangle is 2, the height of the triangle is also 24 inches. Therefore the area of the triangle is 
\[
24 \cdot 24 / 2 = 288 \quad \text{square inches.}
\]
Now, the area of the three squares is \( 144 + 36 + 9 = 189 \) square inches, and thus area that is inside of the triangle and outside the three squares is 
\[
288 - 189 = 99 \quad \text{square inches.}
\]