4.3.26 Let Y denote the cross-sectional area of a tube. Then $p = P(\text{tube does not fit properly}) =$

$$P(Y < 12.0) + P(Y > 13.0) = 1 - P(12.0 \le Y \le 13.0) = 1 - P\left(\frac{12.0-12.5}{0.2} \le \frac{Y-12.5}{0.2} \le \frac{13.0-12.5}{0.2}\right) =$$

$1 - P(-2.50 \le Z \le 2.50) = 1 - 0.9876 = 0.0124$. Let X denote the number of tubes (out of 1000) that will not fit. Since X is a binomial random variable, $E(X) = np = 1000(0.0124) = 12.4$.

4.3.30 Let Y = a random 18-year-old woman's weight. Since $\mu = \dfrac{103.5 + 144.5}{2} = 124$,

$$P(103.5 \leq Y \leq 144.5) = 0.80 = P\left(\frac{103.5 - 124}{\sigma} \leq \frac{Y - 124}{\sigma} \leq \frac{144.5 - 124}{\sigma}\right) =$$

$P\left(\dfrac{-20.5}{\sigma} \leq Z \leq \dfrac{20.5}{\sigma}\right)$. According to Appendix Table A.1, $P(-1.28 \leq Z \leq 1.28) \doteq 0.80$, so

$\dfrac{20.5}{\sigma} = 1.28$, implying that $\sigma = 16.0$ lbs.

4.3.34 If $P(1.9 \le \overline{Y} \le 2.1) \ge 0.99$, then $P\left(\frac{1.9-2}{2/\sqrt{n}} \le Z \le \frac{2.1-2}{2/\sqrt{n}}\right) \ge 0.99$. But $P(-2.58 \le Z \le 2.58) \doteq 0.99$, so $2.58 = \frac{2.1-2}{2/\sqrt{n}}$, which implies that $n = 2663$.

4.4.4 If $p = P(\text{child is a girl})$ and X = birth order of first girl, then $E(X) = \dfrac{1}{p} = \dfrac{1}{\frac{1}{2}} = 2$.