S5.1-20. Sol: Let n be the minimum number of children they should plan to have. Since the probability of all girls is $1/2^n$ and the probability of all boys is $1/2^n$, we must have $1 - 1/2^n - 1/2^n \geq 0.95$. This gives $1/2^{n-1} \leq 0.05$ or $n - 1 \geq \frac{\ln 0.05}{\ln 0.5} = 4.32$ or $n \geq 5.32$. Therefore, $n = 6$.

S5.1-26. Sol: (a). A four-engine is preferable to a two-engine plane if and only if

$$1 - \binom{4}{0} p^0 (1-p)^4 - \binom{4}{1} p^1 (1-p)^3 > 1 - \binom{2}{0} p^0 (1-p)^2$$

This inequality gives $p > 2/3$. Hence a four-engine plane is preferable if and only if $p > 2/3$. If $p = 2/3$, it makes no difference.
(b) A five-engine plane is preferable to a three-engine plane if and only if

$$\binom{5}{5} p^5 (1-p)^0 + \binom{5}{4} p^4 (1-p)^1 + \binom{5}{3} p^3 (1-p)^2$$
$$> \binom{3}{3} p^3 (1-p)^0 + \binom{3}{2} p^2 (1-p)^1$$

Simplifying this inequality, we get $3(p-1)^2(2p-1) > 0$ which implies that a five-engine plane is preferable if and only if $2p - 1 > 0$. That is, for $p > 1/2$, a five-engine plane is preferable; for $p < 1/2$, a three-engine plane is preferable; for $p = 1/2$ it makes no difference.

S5.2-6. Sol: $\lambda = (3/10)35 = 10.5$. The probability of 10 misprints in a given chapter is $e^{-10.5} \cdot (10.5)^{10}/10! \approx 0.124$. Therefore, the desired probability is about $(0.124)^2 = 0.0154$.

S5.2-8. Sol: The probability that a bun contains no raisins is $e^{-n/k} \cdot (n/k)^0/0! = e^{-n/k}$. So the answer is $\binom{4}{2} e^{-2n/k}(1 - e^{-n/k})^2$.

S5.3-4. Sol: (a). $(1 - pq)^{r-1}pq$; (b). $1/(pq)$.

S5.3-16. Sol: We have that $560(0.35) = 196$ persons make contributions. So the answer is

$$1 - \frac{\binom{364}{15}}{\binom{560}{15}} - \frac{\binom{364}{14}\binom{196}{1}}{\binom{560}{15}} \approx 0.987.$$

R5-14. Sol: Binomial with $n = 6$ and $p = 0.30 \cdot 0.85 = 0.255$.

R5-18. Sol: $1 - \sum_{i=0}^{2} \binom{20}{i}(0.06)^i(0.94)^{20-i} \approx 0.115$. We can also use Poisson approximation with $\lambda = 20 \cdot 0.06 = 1.2$.

R5-22. Sol: Let X be the number of children having the disease. Then the desired probability is

$$\begin{aligned} \mathbb{P}(X = 3 | X \geq 1) &= \frac{\mathbb{P}(X = 3)}{\mathbb{P}(X \geq 1)} = \frac{\binom{5}{3}(0.23)^3(0.77)^2}{1 - (0.77)^5} \\ &= 0.0989. \end{aligned}$$