Solutions to problems posted:

2. The number of choices Virginia has is equal to the number of subsets of $\{1, 2, 5, 10, 20\}$ minus 1 (for empty set). So the answer is $2^5 - 1 = 31$.

10. $6! = 720$.

24. (a) $\dfrac{\binom{4}{2}\binom{48}{24}}{\binom{52}{26}} = 0.390$; (b) $\dfrac{\binom{40}{1}}{\binom{52}{13}} = 6.299 \times 10^{-11}$;

12. $P(A) = 1$ implies that $P(A \cup B) = 1$. Hence, by

$$P(A \cup B) = P(A) + P(B) - P(AB),$$

we have that $P(B) = P(AB)$. Therefore,

$$P(B \mid A) = \frac{P(AB)}{P(A)} = \frac{P(B)}{1} = P(B).$$

13. $P(A \mid B) = \dfrac{P(AB)}{b}$, where

$$P(AB) = P(A) + P(B) - P(A \cup B) \geq P(A) + P(B) - 1 = a + b - 1.$$

20. The numbers of 333 red and 583 blue chips are divisible by 3. Thus the reduced sample space has $333 + 583 = 916$ points. Of these numbers, $[1000/15] = 66$ belong to red balls and are divisible by 5 and $[1750/15] = 116$ belong to blue balls and are divisible by 5. Thus the desired probability is $182/916 = 0.199$.

7. $$\frac{(0.92)(1/5000)}{(0.92)(1/5000) + (1/500)(4999/5000)} = 0.084.$$

14. $$\frac{\frac{2}{4}\cdot\frac{\binom{5}{2}\binom{3}{2}}{\binom{8}{4}}}{0\cdot\frac{\binom{5}{4}}{\binom{8}{4}}+\frac{1}{4}\cdot\frac{\binom{5}{3}\binom{3}{1}}{\binom{8}{4}}+\frac{2}{4}\cdot\frac{\binom{5}{2}\binom{3}{2}}{\binom{8}{4}}+\frac{3}{4}\cdot\frac{\binom{5}{1}\binom{3}{3}}{\binom{8}{4}}}=0.571.$$