Solutions to posted problems.

6. $S = \{QQ, QN, QP, QD, DN, DP, NP, NN, PP\}$. **(a)** $\{QP\}$; **(b)** $\{DN, DP, NN\}$; **(c)** $\emptyset$.

6. The probability that the first horse wins is 2/7. The probability that the second horse wins is 3/10. Since the events that the first horse wins and the second horse wins are mutually exclusive, the probability that either the first horse or the second horse will win is

$$\frac{2}{7} + \frac{3}{10} = \frac{41}{70}.$$

12. (a) False; toss a die and let $A = \{1, 2\}$, $B = \{2, 3\}$, and $C = \{1, 3\}$.

(b) False; toss a die and let $A = \{1, 2, 3, 4\}$, $B = \{1, 2, 3, 4, 5\}$, $C = \{1, 2, 3, 4, 5, 6\}$.

20. The equation has real roots if and only if $b^2 \geq 4c$. From the 36 possible outcomes for (b, c), in the following 19 cases we have that $b^2 \geq 4c$: (2, 1), (3, 1), (3, 2), (4, 1), ..., (4, 4), (5, 1), ..., (5, 6), (6, 1), ..., (6, 6). Therefore, the answer is 19/36.

11. There are $26^3 \times 10^2 = 1,757,600$ such codes; so the answer is positive.

18. $10 \times 9 \times 8 \times 7 = 5040$. **(a)** $9 \times 9 \times 8 \times 7 = 4536$; **(b)** $5040 - 1 \times 1 \times 8 \times 7 = 4984$.

17. $\dfrac{12!}{12^{12}} = 0.000054.$

27. In $\dfrac{52!}{13!\,13!\,13!\,13!} = \dfrac{52!}{(13!)^4}$ ways 52 cards can be dealt among four people. Hence the sample space contains $52!/(13!)^4$ points. Now in 4! ways the four different suits can be distributed among the players; thus the desired probability is $4!/[52!/(13!)^4] \approx 4.47 \times 10^{-28}$.