1. B: P(E and F)=P(E)+P(F)-P(E or F)=0→E and F are mutually exclusive
2. D: Assume the man pulls the smallest coins. It will take him 1 penny, 3 nickels and 1 dime to exceed $0.25, thus he will need 5 coins
3. C: $P(point\ in\ outer\ ring) = \frac{25\pi - 9\pi}{25\pi} = \frac{16}{25}$.
4. B: $Ex.Value = 25\% * \$10 + 50\% * \$5 + 25\% * \$1 = \$5.25$
5. D: There are $3^4 = 81$ total possibilities for files to go to receptionists. There are three groupings where the conditions are satisfied (namely, one receptionist receives 2 files, the others each receive 1). These are equally likely to occur, so we only need to calculate one outcome and then multiply by 3.

   Let's assume the first typist gets two files. There are $\binom{4}{2}\binom{2}{1}\binom{1}{1} = 12$ ways the files could be allocated so this happens. Accounting for the second and third typist getting two files yields $12(3) = 36$ possible combinations. Hence, $P(at\ least\ one\ file) = \frac{36}{81} = \frac{4}{9}$
6. E: None of them are true.
7. C: $\frac{Supervisors}{496} = \frac{3}{16} \to Supervisors = 93$
8. A: The area of ABCD is 576, implying each side is 24. If AE is one-fourth of AD, then AE is $\frac{24}{6} = 6$. Since ABGE is divided into three equal rectangles, the length of each small rectangle is $\frac{24}{3} = 8$. Hence, the area of the smaller shaded rectangle is $6(8) = 48$.

   If FD is one-half of ED, then FD is $\frac{24-6}{2} = 9$. The length of each large rectangle is $\frac{24}{2} = 12$. Hence, the area of the larger shaded region is $9(12) = 108$. Thus, the total probability is $\frac{48+108}{576} = \frac{156}{576} = \frac{13}{48}$.
9. A: $\frac{1+2+5+9+x}{5} = 4 \to x = 3; \frac{2+3+y}{3} = 6 \to y = 13$. Hence, $x + y = 16$
10. B: Let x be the random variable that represents the length of time. Thus, $P(50 < x < 70) = P(0 < Z < 1.33) = 0.9082 - 0.5 \approx 40\%$.
11. E: List in order from low to high: 2, 6, 7, 10, 13, 15. Any value less than 10 will make the median less than 10. Hence, all of the listed options could be values of x.
12. A: Let x be the random variable that represents annual salary. Thus, $P(x < 40) = P(Z < -0.5) = 0.3085 \approx 30\%$. Remember to convert variance into standard deviation!
13. E: Restating the question, the player will have 9 misses followed by a success. Hence, $P(no\ misses\ until\ 10th\ try) = (1 - .2)^9(.2)$.

14. D: $P(not\ a\ birthday\ card) = \frac{21-14}{21} = \frac{7}{21} = \frac{1}{3}$
15. A: $P(G|H) = \frac{P(G \cap H)}{P(H)} \rightarrow \frac{1}{4} = \frac{P(G \cap H)}{0.3} \rightarrow P(G \cap H) = \frac{3}{40}$
16. D: There are 8 spots where Amos may sit. One of those will have cherry bubble tea. Thus, Amos has a 1/8 chance.
17. A: For a number to be divisible by 4, the last two digits must be divisible by 4. In this case, the last two digits must be either 16, 36, and 64. $P(divisible\ by\ 4) = \frac{3(2)}{4!} = \frac{1}{4}$
18. B: $P(Thelma\ and\ Fernanda\ selected) = \binom{10}{4} / \binom{12}{6} = \frac{5}{22}$
19. C: $P(at\ least\ one\ vowel) = P(one\ vowel\ from\ set\ 1) + P(one\ vowel\ from\ set\ 2) - P(one\ vowel\ from\ set\ 1\ and\ from\ set\ 2) = \frac{1}{2} + \frac{1}{4} - \frac{1}{2} * \frac{1}{4} = \frac{5}{8}$
20. D: Using the z-table in the back, we see that a student needs a z-score between 1.03 and 1.04 to qualify. Using 1.03, we find: $\frac{Score-60}{15} = 1.03 \rightarrow Score = 75.45$. Thus, a student needs a score greater than 75.45 to qualify (since the 85th percentile z-score is greater than 1.03). The next possible score is 76.
21. D: If C = the number of rooms that need to replaced, then $E(C) = 0 * 0.3 + 1 * 0.2 + 2 * 0.35 + 3 * 0.05 + 4 * 0.1\ =\ 1.45$ rooms. If Z = the number of rooms' worth of chalk not used, then $E(Z) = 8 - E(Y) = 8 - 1.45 \approx 7$ rooms worth of chalk.
22. C: Within each square, there is a smaller square where the center of the disk can land and the disk would not touch the square's side. The smaller square's length is: $length\ of\ square - 2(radius\ of\ disc) = 64 - 2 \cdot 8 = 12$. Thus, $P(not\ touching) = \frac{12^2}{16^2} = 9/16$. Note that it does not matter how many squares compose the square grid.
23. D: $\frac{(5-1)!}{2} = \frac{24}{2} = 12$
24. A: $P(turn\ left|no\ sigal) = \frac{P(turn\ left \cap no\ signal)}{P(no\ signal)} = \frac{(.7)(.2)}{(.7)(.2)+(.2)(.2)+.1} = \frac{1}{2}$. Remember that the car could go straight, and thus would not need its signal!
25. B: $Ex.Value = \frac{1}{6} * 1 + \cdots + \frac{1}{6} * 6 = 3.5$
26. E: We know that each dice roll is independent. Hence the expected value of the second dice roll is 3.5. Thus, you would only keep your first dice roll if it was greater than 3.5 (i.e. you roll a 4, 5, 6). Otherwise, you would re-roll (with 50% probability). Thus, $Ex.Value = \frac{1}{6} * 4 + \frac{1}{6} * 5 + \frac{1}{6} * 6 + \frac{1}{2} * 3.5 = 4.25 \approx 4.3$
27. C: The expected value is higher. Since the individual has another chance to roll, this provides her with additional optionality, which has positive value since re-rolling can allow her to improve her payout.
28. B: If you can roll the dice an infinite number of times, then you will at some point roll a 4, 5, or 6. Once you do, you will stop rolling. Hence, the expected value is $Ex.Value = \frac{1}{2} * 5 + \frac{1}{4} * 5 + \frac{1}{8} * 5 + \cdots = 5$.

29. E: The expected payout of one game play is $25p - 25(1-p) = 50p - 25 = 25(2p-1)$. After n plays, the expected payout is $25n(2p-1)$. Thus, the expected value of her wealth is $200 + 25n(2p-1)$.
30. E: There are 27 ways to sum to 10 using three dice. There are $6^3 = 216$ total outcomes. Hence, $P(sum = 10) = \frac{27}{216} = \frac{1}{8}$.