

1. (a) Required probability = $\frac{6!2!}{7!}$ 1M
 $= \frac{2}{7}$ 1A
(b) Required probability = $1 - \frac{C_3^5}{C_3^7}$ 1M
 $= \frac{5}{7}$

2. (a) Required probability = $\frac{C_2^3 C_2^4 C_2^5}{C_6^{12}}$ 1M+1M
 $= \frac{15}{77}$ 1A
(b) Required probability = $\frac{C_1^3 C_5^9}{C_6^{12}}$ 1M
 $= \frac{9}{22}$ 1A

3. (a) Required probability = $\frac{C_5^6 + C_5^8}{C_5^{18}}$ 1M+1M
 $= \frac{31}{4284}$ 1A
(b) Required probability = $1 - \frac{31}{4284}$ 1M
 $= \frac{4253}{4284}$ 1A

4. (a) Required number = 14!
 $= 87\ 178\ 291\ 200$ 1A
(b) Required probability = $\frac{C_6^9 6!8!}{14!}$ 1M+1A
 $= \frac{4}{143}$ 1A

5. Required probability = $\frac{C_1^2 C_3^{22}}{C_5^{25}}$ 1M+1M
 $= \frac{4}{69}$ 1A

6. (a) Required probability = $\frac{C_6^9}{C_6^{20}}$ 1M
 $= \frac{7}{3230}$ 1A

- (b) Required probability = $\frac{C_6^9 + C_5^9 C_1^{11} + C_4^9 C_2^{11}}{C_6^{20}}$ 1M
 $= \frac{70}{323}$ 1A
7. (a) Number of ways = $C_2^6 = 15$ 1A
 (b) Required probability = $1 - \frac{15}{C_4^{12}}$ 1M
 $= \frac{32}{33}$ 1A
8. (a) Required probability = $\frac{9!4!}{12!}$ 1M
 $= \frac{1}{55}$ 1A
 (b) Required probability = $\frac{C_4^9 \times 4! \times 8!}{12!}$ 1M
 $= \frac{14}{55}$ 1A
9. (a) Required number = C_4^{28}
 $= 20475$ 1A
 (b) Required probability = $1 - \frac{C_4^{15} + C_4^{13}}{C_4^{28}}$ 1M+1M
 $= \frac{283}{315}$ 1A
10. (a) Required number = $9!$
 $= 362880$ 1A
 (b) Required probability = $\frac{C_4^6 \times 4! \times 5!}{362880}$ 1M+1M
 $= \frac{5}{42}$ 1A
11. (a) Required probability = $\frac{C_3^5}{C_3^9}$ 1M
 $= \frac{5}{42}$ 1A
 (b) Required probability = $1 - \frac{5}{42} - \frac{C_3^4}{C_3^9}$ 1M
 $= \frac{5}{6}$ 1A

12. (a) Required number = C_5^{20}
 $= 15\,504$ 1A
- (b) Required probability = $\frac{C_3^{11}C_2^9 + C_4^{11}C_1^9 + C_5^{11}}{C_5^{20}}$ 1M
 $= \frac{781}{1292}$ 1A
13. (a) Required probability = $\frac{C_2^3C_1^7C_1^6}{C_4^{16}}$ 1M
 $= \frac{9}{130}$ 1A
- (b) Required probability = $\frac{C_2^3C_1^7C_1^6 + C_1^3C_2^6C_1^7 + C_1^3C_1^6C_2^7}{C_4^{16}}$ 1M
 $= \frac{9}{20}$ 1A
14. (a) Required probability = $\frac{C_2^6}{C_2^{10}}$ 1M
 $= \frac{1}{3}$ 1A
- (b) Required probability = $\frac{1}{3} \times 1 + \frac{C_1^4C_1^6}{C_2^{10}} \times \frac{C_2^7}{C_2^8} + \frac{C_2^4}{C_2^{10}} \times \frac{C_2^2 + C_2^6}{C_2^8}$ 1M
 $= \frac{17}{21}$ 1A
15. (a) Required probability = $\frac{C_5^5C_1^8}{C_6^{13}}$ 1M
 $= \frac{2}{429}$ 1A
- (b) Required probability = $1 - \frac{2}{429} - \frac{C_4^5C_2^8}{C_6^{13}}$ 1M
 $= \frac{392}{429}$ 1A
16. (a) Required probability = $\frac{5! \times 4!}{9!}$ 1M
 $= \frac{1}{126}$ 1A
- (b) Required probability = $\frac{C_4^6 \times 4! \times 5!}{9!}$ 1M
 $= \frac{5}{42}$ 1A

$$\begin{aligned}
 17. \quad (a) \text{ Required probability} &= \frac{C_6^{18}}{C_8^{20}} && 1M \\
 &= \frac{14}{95} && 1A \\
 (b) \text{ Required probability} &= \frac{C_8^{10}(C_1^2)^8}{C_8^{20}} && 1M \\
 &= \frac{384}{4199} && 1A \\
 (c) \text{ Required probability} &= \frac{C_2^{10}C_4^8(C_1^2)^4}{C_8^{20}} && 1M \\
 &= \frac{1680}{4199} && 1A
 \end{aligned}$$

$$18. \quad \boxed{A}$$

$$\begin{aligned}
 \text{Required probability} &= \frac{3 + 2 + 2 + 1}{8 \times 7} \\
 &= \frac{1}{7}
 \end{aligned}$$

$$19. \quad \boxed{A}$$

$$\begin{aligned}
 \frac{n}{4 + 6 + n} &= \frac{1}{3} \\
 3n &= 10 + n \\
 n &= 5
 \end{aligned}$$

$$20. \quad \boxed{C}$$

$$\begin{aligned}
 \text{Probability of drawing a yellow ball} &\text{ is } \frac{n}{n+10}. \\
 \text{Probability of drawing a black ball} &\text{ is } \frac{10}{n+10}. \\
 31 &= 35 \left(\frac{n}{n+10} \right) + 21 \left(\frac{10}{n+10} \right) \\
 31n + 310 &= 35n + 210 \\
 n &= 25
 \end{aligned}$$

$$21. \quad \boxed{B}$$

$$\begin{aligned}
 \text{Required probability} &= \frac{C_2^4}{C_2^7} \\
 &= \frac{2}{7}
 \end{aligned}$$

22. D

$$\begin{aligned}\text{Required probability} &= 1 - \left(\frac{5}{5^2}\right) \\ &= \frac{4}{5}\end{aligned}$$

23. C

Required probability

$$\begin{aligned}&= 1 - \left(\frac{4}{7}\right)^2 \\ &= \frac{33}{49}\end{aligned}$$

24. C

$$\begin{aligned}\text{Required probability} &= \frac{2+4+2}{6 \times 5} \\ &= \frac{4}{15}\end{aligned}$$

25. D

$$\begin{aligned}\text{Required probability} &= \frac{5+3+1}{C_2^6} \\ &= \frac{3}{5}\end{aligned}$$

26. C

$$\begin{aligned}\text{Required probability} &= \frac{C_2^4}{C_2^5} \\ &= \frac{3}{5}\end{aligned}$$

27. D

$$\begin{aligned}56 &= 144 \left(\frac{1+2}{36}\right) + x \left(1 - \frac{3}{36}\right) \\ x &= 48\end{aligned}$$

28. A

$$\begin{aligned}\text{Required probability} &= \frac{1+2+3+4+5}{6^2} \\ &= \frac{5}{12}\end{aligned}$$

29. B

$$\begin{aligned}\text{Required probability} &= \frac{3+1}{C_2^8} \\ &= \frac{1}{7}\end{aligned}$$

30. B

$$\begin{aligned}\text{Expected gain} &= -4 + 12 \left[1 - \left(\frac{3}{6} \right)^2 \right] \\ &= \$5\end{aligned}$$

31. B

$$\begin{aligned}\text{Required probability} &= \frac{C_2^3 + C_2^2}{C_2^5} \\ &= \frac{2}{5}\end{aligned}$$

32. A

$$\begin{aligned}\frac{C_2^3}{C_2^5} &= \frac{k-2}{20} \\ k &= 8\end{aligned}$$

33. C

Square of numbers in box A: 4, 16, 36, 64

Square of numbers in box B: 1, 9, 25, 49, 81

$$\begin{aligned}\text{Required probability} &= \frac{2+2+2+2}{4 \times 5} \\ &= 0.4\end{aligned}$$

34. D

$$\begin{aligned}\text{Required probability} &= 1 \times \frac{3}{5} \\ &= \frac{3}{5}\end{aligned}$$

35. B

$$\begin{aligned}\text{Expected gain} &= 20 \left(\frac{4}{5^2} \right) + 5 \left(\frac{2+1}{5^2} \right) + 10 \left(1 - \frac{4}{5^2} - \frac{2+1}{5^2} \right) \\ &= \$11\end{aligned}$$

36. B

The possible prime numbers are 71, 73 and 79.

$$\text{Required probability} = \frac{3}{10}$$

37. D

$$\begin{aligned}\text{Required probability} &= 1 - \frac{C_2^2}{C_2^4} \\ &= \frac{5}{6}\end{aligned}$$

38. B

$$\begin{aligned}\text{Required probability} &= \frac{C_4^{15}C_2^{11} + C_5^{15}C_1^{11} + C_6^{15}}{C_6^{26}} \\ &= \frac{113}{230}\end{aligned}$$

39. D

$$\begin{aligned}\text{Required probability} &= \frac{5!2!}{6!} \\ &= \frac{1}{3}\end{aligned}$$

40. C

$$\begin{aligned}\text{Required probability} &= \frac{C_1^4C_3^5}{C_4^9} \\ &= \frac{20}{63}\end{aligned}$$

41. C

$$\begin{aligned}\text{Required probability} &= 1 - \left(1 - \frac{2}{8}\right)\left(1 - \frac{3}{8}\right)\left(1 - \frac{4}{8}\right) \\ &= \frac{49}{64}\end{aligned}$$

42. C

$$\begin{aligned}\text{Required probability} &= C_4^5(0.8)^4(0.2) + (0.8)^5 \\ &= 0.73728\end{aligned}$$

43. C

$$\begin{aligned}\text{Required probability} &= \frac{3}{5} \times \frac{7}{8} + \frac{2}{5} \times \frac{6}{8} \\ &= \frac{33}{40}\end{aligned}$$

44. A

$$\begin{aligned}\text{Required probability} &= 0.6 \times 0.15 + 0.4 \times 0.2 \\ &= 0.17\end{aligned}$$

45. D

$$\begin{aligned}\text{Required probability} &= \frac{5}{6} \times \frac{4}{5} \times \frac{1}{4} \\ &= \frac{1}{6}\end{aligned}$$

46. C

$$\begin{aligned}\text{Required probability} &= \frac{C_2^{12}}{C_2^{15}} \\ &= \frac{22}{35}\end{aligned}$$

47. B

$$\begin{aligned}\text{Required probability} &= 1 - (0.8)^5 - C_4^5(0.8)^4(0.2) \\ &= 0.26272\end{aligned}$$

48. C

Let X be the number of black balls drawn from bag A .

Required probability

$$\begin{aligned}&= P(X = 2) \times \frac{6}{12} + P(X = 1) \times \frac{5}{12} + P(X = 0) \times \frac{4}{12} \\ &= \frac{C_2^5}{C_2^8} \times \frac{6}{12} + \frac{C_1^5 C_1^3}{C_2^8} \times \frac{5}{12} + \frac{C_2^3}{C_2^8} \times \frac{4}{12} \\ &= \frac{7}{16}\end{aligned}$$

49. C

$$\begin{aligned}\text{Required probability} &= 1 - \left(\frac{4}{10}\right)^3 \\ &= \frac{117}{125}\end{aligned}$$

50. D

$$\begin{aligned}\text{Required probability} &= 1 - (0.3)(0.2)(0.6) \\ &= 0.964\end{aligned}$$

51. B

$$\left(\frac{6}{10}\right)^{n-1} \left(\frac{4}{10}\right) < 0.05$$

$$0.6^{n-1} < 0.125$$

$$(n-1) \log 0.6 < \log 0.125$$

$$n > 5.07$$

The minimum value of n is 6.

52. A

$$\begin{aligned}\text{Required probability} &= \frac{C_4^5 + C_3^5 C_1^2 + C_3^5 C_1^8}{C_4^{15}} \\ &= \frac{1}{13}\end{aligned}$$

53. C

$$\begin{aligned}\text{Required probability} &= \frac{4}{8} \times \frac{4}{9} + \frac{4}{8} \times \frac{3}{9} \\ &= \frac{7}{18}\end{aligned}$$

54. C

$$\begin{aligned}\text{Required probability} &= 1 - \left(\frac{1}{2} \times \frac{C_2^5}{C_2^8} + \frac{1}{2} \times \frac{C_2^4}{C_2^{10}} \right) \\ &= \frac{317}{420}\end{aligned}$$

55. C

$$\begin{aligned}\text{Required probability} &= 1 - 0.8^5 \\ &= 0.67232\end{aligned}$$

56. B

$$\begin{aligned}\text{Required probability} &= 1 - \frac{1}{6} \times \frac{1}{3} \times \frac{11}{12} \times \frac{3}{4} \\ &= \frac{277}{288}\end{aligned}$$

57. C

$$\begin{aligned}\text{Required probability} &= 1 - 0.7^5 - C_4^5(0.7)^4(0.3) \\ &= 0.47178\end{aligned}$$

58. C

$$\begin{aligned}\text{Required probability} &= \frac{C_4^{12}}{C_4^{17}} \\ &= \frac{99}{476}\end{aligned}$$

59. A

$$\begin{aligned}\text{Required probability} &= \frac{7!3!}{9!} \\ &= \frac{1}{12}\end{aligned}$$

60. B

$$\begin{aligned}\text{Required probability} &= \left(\frac{15}{18}\right)^2 \\ &= \frac{25}{36}\end{aligned}$$

61. B

$$\begin{aligned}\text{Required probability} &= \frac{1}{8} + \frac{1}{8} - \frac{6!}{8!} \\ &= \frac{13}{56}\end{aligned}$$

62. D

$$\begin{aligned}\text{Required probability} &= \frac{C_4^{10} + C_1^6 C_3^{10} + C_2^6 C_2^{10}}{C_4^{16}} \\ &= \frac{321}{364}\end{aligned}$$

63. C

$$\begin{aligned}\text{Required probability} &= 1 - \frac{C_2^4 + C_2^6 + C_2^5}{C_2^{15}} - \frac{C_1^4 C_1^5 C_1^6}{C_3^{15}} \\ &= \frac{86}{195}\end{aligned}$$

64. B

$$\begin{aligned}\text{Required probability} &= \frac{C_5^8 5! 7!}{12!} \\ &= \frac{7}{99}\end{aligned}$$

65. D

Needs at least 3 draws $\Leftrightarrow$ no gold coins obtained in first 2 draws

$$\text{Required probability} = \frac{C_2^3}{C_2^7} = \frac{1}{7}$$

66. D

$$\begin{aligned}\text{Required probability} &= 1 - (1 - 0.6)(1 - 0.55) \\ &= 0.82\end{aligned}$$

67. D

$$\begin{aligned}\text{Required probability} &= \frac{C_8^{12} + C_1^6 C_7^{12} + C_2^6 C_6^{12} + C_3^6 C_5^{12} + C_4^6 C_4^{12}}{C_8^{18}} \\ &= \frac{214}{221}\end{aligned}$$