

1 Conventional Questions

1. (a) Required probability = $\frac{C_3^5 C_4^6 C_1^3}{C_8^{14}}$ 1M
 $= \frac{150}{1001}$ 1A
 (b) Required probability = $\frac{C_2^{11} 3!3!}{C_5^{14} 5!}$ 1M+1M
 $= \frac{3}{364}$ 1A
2. (a) Required probability = $\frac{C_3^8 C_1^4}{C_4^{12}}$ 1M
 $= \frac{224}{495}$ 1A
 (b) Required probability = $\frac{C_4^8}{C_4^{12}} + \frac{224}{495}$ 1M
 $= \frac{98}{165}$ 1A
3. Required probability = $\frac{C_1^2 C_3^{22}}{C_5^{25}}$ 1M+1M
 $= \frac{4}{69}$ 1A
4. (a) Required probability = $\frac{C_2^{10} C_2^2}{C_4^{12}}$ 1M
 $= \frac{1}{11}$ 1A
 (b) Required probability = $1 - \frac{1}{11}$ 1M
 $= \frac{10}{11}$ 1A
5. (a) Required probability = $\frac{C_1^4 C_3^5}{C_3^{20}}$ 1M
 $= \frac{2}{57}$ 1A
 (b) Required probability = $1 - \frac{2}{57}$ 1M
 $= \frac{55}{57}$ 1A

6. (a) Required number = C_4^{28}
 $= 20\,475$ 1A
- (b) Required probability = $1 - \frac{C_4^{15} + C_4^{13}}{C_4^{28}}$ 1M+1M
 $= \frac{283}{315}$ 1A
7. (a) Required probability = $\frac{C_4^5 C_1^7 + C_5^5}{C_5^{12}}$ 1M
 $= \frac{1}{22}$ 1A
- (b) Required probability = $1 - \frac{C_3^5 C_2^7}{C_5^{12}} - \frac{1}{22}$ 1M
 $= \frac{91}{132}$ 1A
8. (a) Required probability = $\frac{C_2^9 C_2^3 C_2^4}{C_6^{16}}$ 1M
 $= \frac{81}{1001}$ 1A
- (b) Required probability = $\frac{C_2^9 (C_4^7 - C_4^4)}{C_6^{16}}$ 1M
 $= \frac{153}{1001}$ 1A
9. (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

10. (a) Required probability = $\frac{C_4^9 + C_4^7}{C_4^{21}}$ 1M+1M
 $= \frac{23}{855}$ 1A
- (b) Required probability = $1 - \frac{23}{855}$ 1M
 $= \frac{832}{855}$ 1A
- (c) Required probability = $\frac{C_3^9 C_1^{12} + C_3^7 C_1^{14} + C_3^3 C_1^{18}}{C_4^{21}}$ 1M
 $= \frac{1516}{5985}$ 1A
11. (a) Required probability = $\frac{C_5^5 C_1^8}{C_6^{13}}$ 1M
 $= \frac{2}{429}$ 1A
- (b) Required probability = $1 - \frac{2}{429} - \frac{C_4^5 C_2^8}{C_6^{13}}$ 1M
 $= \frac{392}{429}$ 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 = $\frac{C_2^3 C_2^6 + C_3^3 C_1^6}{C_4^9}$ 1M
 $= \frac{17}{42}$ 1A
- (b) Required probability = $1 - \frac{17}{42}$ 1M
 $= \frac{25}{42}$ 1A

14. (a) Required number = $C_4^5 4!4!$ 1M
 $= 2880$ 1A
- (b) Required probability = $\frac{2!8!}{10!}$ 1M
 $= \frac{1}{45}$ 1A
15. (a) Required probability = $\frac{C_5^{13} C_1^5}{C_6^{18}}$ 1M
 $= \frac{165}{476}$ 1A
- (b) Required probability = $1 - \frac{C_6^{13}}{C_6^{18}} - \frac{165}{476}$ 1M
 $= \frac{267}{476}$ 1A
16. (a) Required probability = $\frac{C_4^{10} C_4^{20} + C_5^{10} C_3^{20} + C_6^{10} C_2^{20} + C_7^{10} C_1^{20} + C_8^{10}}{C_8^{30}}$ 1M
 $= \frac{5987}{26013}$ 1A
- (b) Required probability = $\frac{C_4^{10} C_4^{20} \times C_4^5 4!4!}{C_8^{30} 8!}$ 1M
 $= \frac{323}{26013}$ 1A
17. (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
18. (a) Required probability = $\frac{C_5^8 C_1^{10}}{C_6^{18}}$ 1M
 $= \frac{20}{663}$ 1A
- (b) Required probability = $1 - \frac{20}{663} - \frac{C_6^8}{C_6^{18}}$ 1M
 $= \frac{214}{221}$ 1A

19. (a) Required probability = $\frac{C_2^3 C_1^7 C_1^6}{C_4^{16}}$ 1M
 $= \frac{9}{130}$ 1A
- (b) Required probability = $\frac{C_2^3 C_1^7 C_1^6 + C_1^3 C_2^6 C_1^7 + C_1^3 C_1^6 C_2^7}{C_4^{16}}$ 1M
 $= \frac{9}{20}$ 1A
20. (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
21. (a) Required probability = $\frac{C_1^7}{C_2^8}$ 1M
 $= \frac{1}{4}$ 1A
- (b) Required probability = $1 - \frac{1}{4} \times \frac{C_1^1 C_2^4}{C_3^5}$ 1M
 $= \frac{17}{20}$ 1A
22. (a) Required probability = $\frac{C_2^6}{C_2^{10}}$ 1M
 $= \frac{1}{3}$ 1A
- (b) Required probability = $\frac{1}{3} \times 1 + \frac{C_1^4 C_1^6}{C_2^{10}} \times \frac{C_2^7}{C_2^8} + \frac{C_2^4}{C_2^{10}} \times \frac{C_2^2 + C_2^6}{C_2^8}$ 1M
 $= \frac{17}{21}$ 1A
23. (a) Required probability = $\frac{C_2^4}{C_2^9}$ 1M
 $= \frac{1}{6}$ 1A
- (b) Required probability = $\frac{1}{6} + \frac{C_1^4 C_1^5}{C_2^9} \times \frac{C_3^5}{C_3^6} + \frac{C_2^5}{C_2^9} \times \frac{C_3^4}{C_3^6}$ 1M
 $= \frac{1}{2}$ 1A

24. (a) Required probability = $\frac{C_1^3 C_1^4}{C_2^7}$ 1M
 $= \frac{4}{7}$ 1A
- (b) Required probability = $\frac{4}{7} \times \frac{C_1^6}{C_2^7} + \frac{C_2^4}{C_2^7} \times \frac{C_1^5 C_1^2}{C_2^7}$ 1M
 $= \frac{44}{147}$ 1A
25. (a) Required probability = $\frac{C_3^4}{C_3^{10}}$ 1M
 $= \frac{1}{30}$ 1A
- (b) Required probability = $\frac{1}{30} \times \frac{C_3^4}{C_3^8} + \frac{C_2^4 C_1^6}{C_3^{10}} \times \frac{C_3^3}{C_3^8}$ 1M
 $= \frac{13}{1680}$ 1A
26. (a) Required probability = $\frac{C_2^6}{C_2^{20}}$ 1M
 $= \frac{3}{38}$ 1A
- (b) Required probability = $\frac{3}{38} + \frac{C_1^6 C_1^{14}}{C_2^{20}} \times \frac{C_4^{11}}{C_4^{12}} + \frac{C_2^{14}}{C_2^{20}} \times \frac{C_4^{10}}{C_4^{12}}$ 1M
 $= \frac{3617}{6270}$ 1A
27. (a) Required probability = $\left(\frac{5}{9}\right)^2 \left(\frac{4}{9}\right)$ 1M
 $= \frac{100}{729}$ 1A
- (b) Required probability = $\frac{C_2^5}{C_2^9} \times \frac{4}{7} + \frac{C_5^5}{C_5^9} \times 1$ 1M
 $= \frac{1}{6}$ 1A

2 Multiple Choice Questions

1. B

$$\text{Required probability} = \frac{C_4^{15} C_2^{11} + C_5^{15} C_1^{11} + C_6^{15}}{C_6^{26}}$$

$$= \frac{113}{230}$$

2. A

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

3. C

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

4. B

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

5. A

$$\begin{aligned}\text{Required probability} &= \frac{C_1^8 (C_3^5 C_3^7 + C_4^5 C_2^7 + C_5^5 C_1^7)}{C_1^{13} C_6^{12}} \\ &\approx 0.3077\end{aligned}$$

6. C

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

7. C

$$\begin{aligned}\text{Required probability} &= \frac{C_5^9 5! 8!}{13!} \\ &= \frac{14}{143}\end{aligned}$$

8. D

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

9. D

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

10. D

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

11. C

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

12. A

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

13. C

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

14. B

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

15. C

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

16. D

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

17. 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.

18. B

$$\begin{aligned}\text{Required probability} &= {}^5C_1 (0.7)^1 (0.3)^4 \\ &= 0.02835\end{aligned}$$

19. D

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

20. A

$$\begin{aligned}\text{Required probability} &= {}^4C_2 (0.6)^2 (0.4)^2 \\ &= 0.3456\end{aligned}$$

21. D

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

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

22. D

$$\begin{aligned}\text{Required probability} &= 1 - \frac{({}^3C_2 2!) {}^3C_1 + {}^3C_1 ({}^3C_2 2!)}{{}^6C_3 3!} \\ &= \frac{7}{10}\end{aligned}$$

23. B

$$\begin{aligned}\text{Required probability} &= 1 - (0.7)(0.8)(0.85)(0.9) \\ &= 0.5716\end{aligned}$$

24. D

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

25. C

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

26. B

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

27. C

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

28. D

$$\begin{aligned}\text{Required probability} &= 1 - 0.2^3 \\ &= 0.992\end{aligned}$$

29. B

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

30. C

$$\begin{aligned}\text{Required probability} &= 0.7^4 + C_1^4(0.7)^3(0.3) \\ &= 0.6517\end{aligned}$$

31. B

Required probability

$$\begin{aligned}
 &= (0.5)(0.4)(0.3)(0.2) + (0.5)(0.4)(0.3)(0.2) + (0.5)(0.6)(0.3)(0.2) \\
 &\quad + (0.5)(0.4)(0.7)(0.2) + (0.5)(0.4)(0.3)(0.8) \\
 &= 0.118
 \end{aligned}$$

32. B

$$\begin{aligned}
 \text{Required probability} &= \frac{C_3^{10}}{C_3^{12}} \\
 &= \frac{6}{11}
 \end{aligned}$$

33. C

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

34. C

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

35. B

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

36. C

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

37. C

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

38. C

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

Required probability

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

39. C

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

40. A

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

41. D

$$\begin{aligned}\text{Required probability} &= \frac{5}{9} \times \frac{3}{8} + \frac{4}{9} \times \frac{2}{8} \\ &= \frac{23}{72}\end{aligned}$$