Chapter 1 Homework Solutions
Compiled by Joe Kahlig

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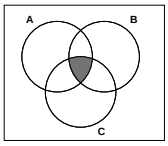
1. (a) $\{0, 1, 11, 13\}$
   (b) $\{0, 1, 11, 13\}$
   (c) $\{1, 13\}$
   (d) false
   (e) false

2. (a) $\{1\}$
   (b) $\{2\}$
   (c) $\{0, 2, 3, 4, 5, 6, 7, 8\}$
   (d) $\{3, 5, 6, 7\}$
   (e) $\{\}$ or $\emptyset$
   (f) $\{7, 9\}$
   (g) $\{1, 3, 5, 9\}$
   (h) $\{6, 7\}$
   (i) U or $\{0, 1, 2, 3, 4, 5, 6, 7, 8, 9\}$
   (j) yes
   (k) no
   (l) no
   (m) $2^5 = 32$
   (n) $2^6 - 1 = 63$
   (o) yes
   (p) no

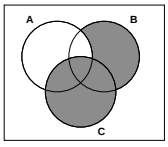
3. $\emptyset$, $\{m\}$, $\{n\}$, $\{p\}$, $\{m, n\}$, $\{m, p\}$, $\{n, p\}$, $\{m, n, p\}$

4. $\emptyset$, $\{m\}$, $\{n\}$, $\{p\}$, $\{m, n\}$, $\{m, p\}$, $\{n, p\}$

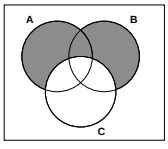
5. (a) $A \cap B \cap C$



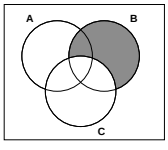
   (b) $(A^C \cap B) \cup C$



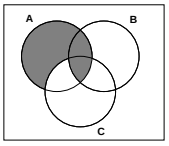
   (c) $(A \cup B) \cap C^C$



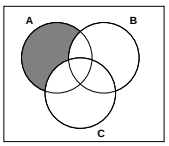
   (d) $B \cap C^C$



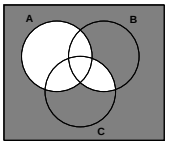
   (e) $A \cap (B \cup C^C)$



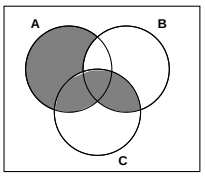
   (f) $A \cap B^C \cap C^C$



   (g) $A^C \cap (B^C \cup C^C)$



   (h) $(A \cap B^C) \cup (B \cap C)$



6. (a) $(A \cup M \cup E)^C$
   (b) $(E \cup M) \cap A^C$
   (c) Those students that have not had a course in Economics but have had a course in Accounting.
   (d) The students that have had a Marketing class but not an Accounting class combined with the students that have had an Economics class.

7. (a) $(D \cup C) \cap F^C$
   (b) $D \cap C^C \cap F^C$ or $D \cap (C \cup F)^C$

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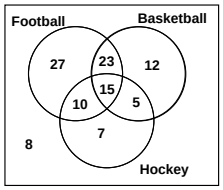
8. (a) $2^{14} = 16384$
   (b) 6
   (c) 8

9. 20

10. 17

11. venn diagram



12. (a) 119
    (b) 62
    (c) 23
    (d) 46

13. (a) $20 + 15 + 10 + 8 + 12 + 9 = 74$
    (b) 10
    (c) $10 + 15 + 9 + 12 + 20 + 45 + 60 = 171$
    (d) $15 + 12 = 27$

14. (a) $20 + 12 + 45 = 77$
    (b) $15 + 12 + 8 + 9 + 10 + 45 = 99$
    (c) $15 + 9 + 12 = 36$
    (d) $60 + 45 = 105$

15. (a) 30
    (b) 62
    (c) 28

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16. (a) S = { (h,r), (h,w), (t,r), (t,w)}
    (b) there are multiple answers for this part.
    E = { (h,r), (h,w)}
    F = { (t,w)}

17. (a) Note: since we are drawing them out simultaneously, we don't care about the order. i.e. (1,2) is the same as (2,1)
    $S = \{(1,2),(1,3),(1,4),(1,5),(1,6),(1,7),(2,3),(2,4),(2,5),(2,6),(2,7),(3,4)(3,5),(3,6),(3,7),(4,5),(4,6),(4,7),(5,6),(5,7),(6,7)\}$
    (b) $E = \{(1,3),(1,5),(1,7),(3,5),(3,7),(5,7)\}$
    (c) $F = \{(2,4),(2,6),(4,6)\}$
    (d) no, missing the one even and one odd draws.
    (e) There are multiple answers for this part.
    G = {(1,3), (1,4), (1,5), (2,3)}
    H = {(2,5), (3,4), (3,5), (4,5)}

18. S = { 6, 10, 11, 15, 20}

19. Answers will vary.
    E = {HHH}
    F = {HHT, HTT, TTT}

20. let w = white ball, g=green ball, and y = yellow ball.
    (a) S= { ww, wg, wy, gw, gg, gy, yw, yq}
    (b) G = { wg, gw, gy, yg}
    (c) answer will vary. pick E such that $E \cap G = \phi$
    E={ww, wy}

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21. (a) not equally likely since the chance of drawing a red ball is more likely than drawing a white ball.
    (b) see part a for the answer since uniform and equally likely mean the same thing.

22. (a) $\frac{27}{90}$
    (b) $\frac{21}{90}$

23. $\frac{55}{210}$

24. (a) $\frac{6}{11}$
    (b) $\frac{8}{11}$

25. (a) $\frac{41}{713}$
    (b) $\frac{55+41+52}{713} = \frac{181-33}{713} = \frac{148}{713}$
    (c) $\frac{171+199-41}{713} = \frac{329}{713}$
    (d) $\frac{199+141}{713} = \frac{340}{713}$

26. (a) $\frac{85+35}{300}$
    (b) $\frac{85}{300}$
    (c) $\frac{58}{300}$
    (d) $\frac{170+26+154-12-138}{300} = \frac{200}{300}$

27. (a) $\frac{70}{1000}$
    (b) $\frac{350}{1000}$
    (c) $\frac{830}{1000}$

28. (a) $\frac{2}{36}$
    (b) $\frac{12}{36}$
    (c) $\frac{2}{36}$

29. $\frac{11}{24}$

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30. (a) 0.2
    (b) 0.4

31. $P(a) = 0.55$
    $P(b) = 0.2$
    $P(c) = 0.25$

32. (a) 0.6
    (b) 0.4
    (c) 0.8

33. (a) 0.4
    (b) 0.1
    (c) 0.3

34. (a) 0.55
    (b) 0.3
    (c) 0.6

35. (a) 0.6
    (b) 0.65

36. (a) $\frac{1}{6} + \frac{1}{8} + \frac{1}{8}$
    (b) $\frac{1}{3} + \frac{1}{6}$
    (c) $1 - \left(\frac{1}{3} + \frac{1}{6}\right)$
    (d) 2^6
    (e) A and B are mutually exclusive
    C and D are mutually exclusive

37. $\frac{180+85}{500} = \frac{265}{500} = 0.53$

38. $\frac{7}{11}$

39. $\frac{23}{38}$

40. 31 to 19

41. $P(A^C) = \frac{7}{22}$

42. $\frac{21}{40}$

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43. (a) $\frac{0.25}{.4+.25} = \frac{0.25}{0.65}$
    (b) $\frac{0.25}{.15+.25} = \frac{0.25}{0.4}$

44. (a) $P(J|K) = \frac{P(J \cap K)}{P(K)} = \frac{.3}{.3+.22+.09} = \frac{.3}{.61}$
    (b) $P(M|K^C) = \frac{P(M \cap K^C)}{P(K^C)} = \frac{.14}{.15+.14+.1} = \frac{.14}{.39}$
    (c) $P(M|N) = \frac{P(M \cap N)}{P(N)} = \frac{0}{.09+.1} = 0$

45. (a) $\frac{.2}{.75}$
    (b) $\frac{.25}{.45}$

46. $\frac{18}{24}$

47. (a) $\frac{5}{26}$
    (b) $\frac{83}{120}$

48. (a) $\frac{40}{210}$
    (b) $\frac{180}{570}$

49. (a) $\frac{0.4}{0.6}$
    (b) $\frac{0.3}{0.7}$
    (c) $\frac{0.1}{0.4}$

50. (a) $\frac{1/3+1/6}{1/8+1/3+1/6}$
    (b) $\frac{1/3+1/6}{1/3+1/6+1/12}$

51. (a) $0.6 * 0.3 + 0.4 * 0.2 = 0.26$
    (b) $0.4 * 0.2 + 0.4 * 0.5 = 0.28$
    (c) $0.6 * 0.7 + 0.4 * 0.3 = 0.54$
    (d) $0.4 * 0.5 = 0.2$
    (e) $0.6 + 0.54 - 0.42 = 0.72$
    (f) 0.5
    (g) 0.7
    (h) $\frac{0.6*0.7}{0.6*0.7+0.4*0.3}$
    (i) 1
    (j) $\frac{0.6*0.3}{0.6*0.3+0.4*0.2}$
    (k) 0

52. (a) $0.1 * 0.2 + 0.6 * 0.7 = 0.44$
    (b) $0.3 * 0.25 = 0.075$
    (c) 0.8
    (d) $\frac{0.3*0.75}{0.6*00.3+00.3*0.75}$
    (e) no
    (f) yes
    (g) no
    (h) no

53. (a) $\frac{0.25*0.45}{0.25*0.45+0.75*0.8}$
    (b) 0.8625

54. $\frac{20}{79}$

55. 96.2%

56. (a) $\frac{0.7*0.12}{0.7*0.12+0.3*0.28}$
    (b) $0.7 * 0.12 + 0.3 * 0.28 = 0.168$

57. T = attended the training program, Q = meets production quota
    (a) $P(T|Q) = \frac{.75*.9}{.75*.9+.25*.45}$
    (b) $P(Q^C \cap T^C) = .25 * .55$

58. (a) $\frac{3}{6} * \frac{3}{5}$
    (b) $\frac{2/6*1/4}{1/6*3/7+2/6*1/4+3/6*2/5}$

59. $\frac{13}{50}$

60. (a) $\frac{12}{46}$
    (b) $\frac{3}{46}$
    (c) 0

61. $\frac{15}{56}$

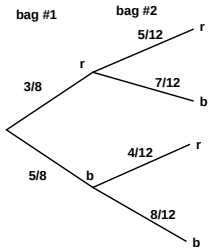
62. 12 to 37

63. (a) 0.956
    (b) $\frac{0.3*0.1}{0.7*0.02+0.3*0.1}$
    (c) 0.03

64. (a) $P(not \cap (B \cup C)) = 0.2 * 0.94 + 0.5 * 0.91 = 0.643$
    (b) $P(not|C) = \frac{P(not \cap C)}{P(C)} = \frac{0.5*0.91}{0.5} = 0.91$
    (c) $P(A|def) = \frac{P(A \cap def)}{P(def)} = \frac{0.3*0.2}{0.3*0.02+0.2*0.06+0.5*0.09} = 0.095238$

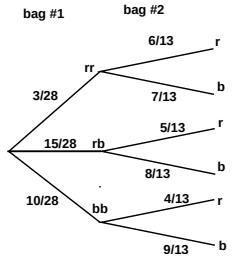
65. (a) $\frac{5}{14}$
    (b) $\frac{3}{9}$
    (c) $\frac{3}{14}$
    (d) $\frac{1}{4}$

66. (a) probability tree.



    (b) $\frac{61}{96}$
    (c) $\frac{4}{12}$
    (d) $\frac{21}{61}$
    (e) $\frac{3}{7}$

67. (a) probability tree.



(b) $\frac{40}{91}$

(c) $\frac{3}{52}$

(d) $\frac{5}{13}$

(e) $\frac{75}{133}$

(f) $\frac{93}{133}$

68. (a) 0.65

(b) $\frac{10}{17}$

(c) $P(F) = \frac{5}{9}$
$P(O) = \frac{17}{45}$
$P(F \cap O) = \frac{2}{9}$
Since $P(F)P(O) = \frac{17}{81}$ is not equal to $P(F \cap O)$ these events are dependent.

69. (a) $\frac{35}{156}$

(b) yes since $P(E \cap F) = P(E) * P(F)$

70. (a) 0.18

(b) 0.72

71. $P(E \cap F) = \frac{2}{9} * \frac{10}{29} = \frac{20}{261}$

72. $\frac{3}{7} * \frac{7}{13} + \frac{4}{7} * \frac{5}{13}$

73. (a) $0.02 * 0.97 + 0.98 * 0.03$

(b) $0.98 * 0.97$

74. $P(E) = \frac{2}{4}$
$P(F) = \frac{2}{4}$
$P(E \cap F) = \frac{1}{4}$
Since $P(E) * P(F) = \frac{2}{4} * \frac{2}{4} = \frac{1}{4} = P(E \cap F)$, these events are independent.

75. Independent.

76. $0.075 * 0.87 + 0.925 * 0.13$

77. (a) $\frac{9}{10} * \frac{17}{20} * \frac{7}{15}$

(b) $\frac{1}{10} * \frac{17}{20} * \frac{7}{15} + \frac{9}{10} * \frac{3}{20} * \frac{7}{15} + \frac{9}{10} * \frac{17}{20} * \frac{8}{15}$