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First course in probability 8th edition pdf

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Privacy Details Note: Supplemental material (e.g. CDs, DVDs, access codes, or lab manuals) is only included with a new textbook purchase.* Savings are calculated off list price† See terms and conditions For upper-level or undergraduate/graduate level introduction to probability for math, science, engineering, and business students with a background in elementary calculus. This highly successful text is written as an elementary introduction to the mathematical theory of probability for students in mathematics, engineering, and the sciences who possess the prerequisite knowledge of elementary calculus. DenunciadoSolutions Manual A First Course in PROBABILITY Seventh Edition Sheldon Ross Prentice Hall, Upper Saddle River NJ 07458 Table of Contents Chapter 1 .....1 Chapter 2 .....10 Chapter 3 .....20 Chapter 4 .....46 Chapter 5 .....64 Chapter 6 .....77 Chapter 7 .....98 Chapter 8 .....133 Chapter 9 .....139 Chapter 10 .....141 Chapter 1 1 Chapter 1 Problems 1. (a) By the generalized basic principle of counting there are 26 · 26 · 10 · 10 · 10 · 10 · 10 = 67,600,000 (b) 26 · 25 · 10 · 9 · 8 · 7 · 6 = 19,656,000 2. 64 = 1296 3. An assignment is a sequence i1, ..., i20 where ij is the job to which person j is assigned. Since only one person can be assigned to a job, it follows that the sequence is a permutation of the numbers 1, ..., 20 and so there are 20! different possible assignments. 4. There are 4! possible arrangements. By assigning instruments to Jay, Jack, John and Jim, in that order, we see by the generalized basic principle that there are 2 · 1 · 2 · 1 = 4 possibilities. 5. There were 8 · 2 · 9 = 144 possible codes. There were 1 · 2 · 9 = 18 that started with a 4. 6. Each kitten can be identified by a code number i, j, k, l where each of i, j, k, l is any of the numbers from 1 to 7. The number i represents which wife is carrying the kitten, j then represents which of that wife's 7 sacks contain the kitten; k represents which of the 7 cats in sack j of wife i is the mother of the kitten; and l represents the number of the kitten of cat k in sack j of wife i. By the generalized principle there are thus 7 · 7 · 7 · 7 = 2401 kittens 7. (a) 6! = 720 (b) 2 · 3! · 3! = 72 (c) 4!3! = 144 (d) 6 · 3 · 2 · 2 · 1 · 1 = 72 8. (a) 5! = 120 (b) !2!2 !7 = 1260 (c) !2!4!4 !11 = 34,650 (d) !2!2 !7 = 1260 9. !4!6 !)12(= 27,720 10. (a) 8! = 40,320 (b) 2 · 7! = 10,080 (c) 5!4! = 2,880 (d) 4!24 = 384 2 Chapter 1 11. (a) 6! (b) 3!2!3! (c) 3!4! 12. (a) 305 (b) 30 · 29 · 28 · 27 · 26 13. ⎛⎞ ⎝2 20 14. ⎛⎞ ⎝5 52 15. There are ⎛⎞⎛⎞ ⎝⎠⎝5 12 5 10 possible choices of the 5 men and 5 women. They can then be paired up in 5! ways, since if we arbitrarily order the men then the first man can be paired with any of the 5 women, the next with any of the remaining 4, and so on. Hence, there are ⎛⎞⎛⎞ ⎝⎠⎝5 12 5 10!5 possible results. 16. (a) ⎛⎞ ⎝+ ⎛⎞ ⎝+ ⎛⎞ ⎝2 4 2 7 2 6 = 42 possibilities. (b) There are 6 · 7 choices of a math and a science book, 6 · 4 choices of a math and an economics book, and 7 · 4 choices of a science and an economics book. Hence, there are 94 possible choices. 17. The first gift can go to any of the 10 children, the second to any of the remaining 9 children, and so on. Hence, there are 10 · 9 · 8 · · · 5 · 4 = 604,800 possibilities. 18. ⎛⎞ ⎝⎛⎞ ⎝⎛⎞ ⎝3 4 2 6 2 5 = 600 19. (a) There are ⎛⎞ ⎝⎛⎞ ⎝⎛⎞ ⎝+ ⎛⎞ ⎝⎛⎞ ⎝2 4 1 2 3 8 3 4 3 8 = 896 possible committees. There are ⎛⎞ ⎝⎛⎞ ⎝3 4 3 8 that do not contain either of the 2 men, and there are ⎛⎞ ⎝⎛⎞ ⎝⎛⎞ ⎝2 4 1 2 3 8 that contain exactly 1 of them. (b) There are ⎛⎞ ⎝⎛⎞ ⎝⎛⎞ ⎝+ ⎛⎞ ⎝⎛⎞ ⎝3 6 2 6 1 2 3 6 3 6 = 1000 possible committees. Chapter 1 3 (c) There are ⎛⎞ ⎝⎛⎞ ⎝+ ⎛⎞ ⎝⎛⎞ ⎝+ ⎛⎞ ⎝⎛⎞ ⎝2 5 3 7 3 5 2 7 3 5 3 7 = 910 possible committees. There are ⎛⎞ ⎝⎛⎞ ⎝3 5 3 7 in which neither feuding party serves; ⎛⎞ ⎝⎛⎞ ⎝3 5 2 7 in which the feuding women serves; and ⎛⎞ ⎝⎛⎞ ⎝2 5 3 7 in which the feuding man serves. 20. ⎛⎞ ⎝+ ⎛⎞ ⎝⎛⎞ ⎝⎛⎞ ⎝+ ⎛⎞ ⎝3 6 5 6, 4 6 1 2 5 6 21. !4!3 !7 = 35. Each path is a linear arrangement of 4 r's and 3 u's (r for right and u for up). For instance the arrangement r, r, u, u, r, r, u specifies the path whose first 2 steps are to the right, next 2 steps are up, next 2 are to the right, and final step is up. 22. There are !2!2 !4 paths from A to the circled point; and !1!2 !3 paths from the circled point to B. Thus, by the basic principle, there are 18 different paths from A to B that go through the circled piont. 23. 3!23 25. ⎛⎞ ⎝13,13,13,13 52 27. !5!4!3 !12 5,4,3 12 = ⎛⎞ ⎝28. Assuming teachers are distinct. (a) 48 (b) 4)2(!8 2,2,2,2 8 = ⎛⎞ ⎝= 2520. 29. (a) (10)!/3!4!2! (b) !2!4 !7 2 33 ⎛⎞ ⎝30. 2 · 9! − 228! since 2 · 9! is the number in which the French and English are next to each other and 228! the number in which the French and English are next to each other and the U.S. and Russian are next to each other. 4 Chapter 1 31. (a) number of nonnegative integer solutions of x1 + x2 + x3 + x4 = 8. Hence, answer is ⎛⎞ ⎝3 11 = 165 (b) here it is the number of positive solutions—hence answer is ⎛⎞ ⎝3 7 = 35 32. (a) number of nonnegative solutions of x1 + ... + x6 = 8 answer = ⎛⎞ ⎝5 13 (b) (number of solutions of x1 + ... + x6 = 5) × (number of solutions of x1 + ... + x6 = 3) = ⎛⎞ ⎝⎛⎞ ⎝5 8 5 10 33. (a) x1 + x2 + x3 + x4 = 20, x1 ≥ 2, x2 ≥ 2, x3 ≥ 3, x4 ≥ 4 Let y1 = x1 − 1, y2 = x2 − 1, y3 = x3 − 2, y4 = x4 − 3 y1 + y2 + y3 + y4 = 13, yi > 0 Hence, there are ⎛⎞ ⎝3 12 = 220 possible strategies. (b) there are ⎛⎞ ⎝2 15 investments only in 1, 2, 3 there are ⎛⎞ ⎝2 14 investments only in 1, 2, 4 there are ⎛⎞ ⎝2 13 investments only in 1, 3, 4 there are ⎛⎞ ⎝2 13 investments only in 2, 3, 4 ⎛⎞ ⎝2 15 + ⎛⎞ ⎝2 14 + ⎛⎞ ⎝+ ⎛⎞ ⎝3 12 2 132 = 552 possibilities Chapter 1 5 Theoretical Exercises 2. ∑ = imi n1 3. n(n − 1) · · · (n − r + 1) = n!/(n − r)! 4. Each arrangement is determined by the choice of the r positions where the black balls are situated. 5. There are ⎛⎞ ⎝j n different 0 − 1 vectors whose sum is j, since any such vector can be characterized by a selection of j of the n indices whose values are then set equal to 1. Hence there are ⎛⎞ ⎝∑ = jnn kj vectors that meet the criterion. 6. ⎛⎞ ⎝k n 7. ⎛⎞ ⎝− −+ ⎛⎞ ⎝− 1 11 r n r n = !)1(!)(!)1(!)1(! !)1(−− −+−− − rrn n rnr n = ⎛⎞(a) By the generalized basic principle of counting there are ####### 26 · 26 · 10 · 10 · 10 · 10 · 10 = 67,600, (b) 26 · 25 · 10 · 9 · 8 · 7 · 6 = 19,656, ####### 2. 6 4 = 1296 An assignment is a sequence i 1 , ..., i 20 where ij is the job to which person j is assigned. Since only one person can be assigned to a job, it follows that the sequence is a permutation of the numbers 1, ..., 20 and so there are 20! different possible assignments. There are 4! possible arrangements. By assigning instruments to Jay, Jack, John and Jim, in that order, we see by the generalized basic principle that there are 2 · 1 · 2 · 1 = 4 possibilities. There were 8 · 2 · 9 = 144 possible codes. There were 1 · 2 · 9 = 18 that started with a 4. Each kitten can be identified by a code number i, j, k, l where each of i, j, k, l is any of the numbers from 1 to 7. The number i represents which wife is carrying the kitten, j then represents which of that wife's 7 sacks contain the kitten; k represents which of the 7 cats in sack j of wife i is the mother of the kitten; and l represents the number of the kitten of cat k in sack j of wife i. By the generalized principle there are thus 7 · 7 · 7 · 7 = 2401 kittens (b) 2 · 3! · 3! = 72 (c) 4!3! = 144 (d) 6 · 3 · 2 · 2 · 1 · 1 = 72 (b) !2! ####### ! ####### = 1260 (c) !2!4! ####### ! ####### = 34, (d) !2! ####### ! ####### = 1260 ####### 9. ####### !4! ####### !)12(####### = 27, (b) 2 · 7! = 10, (c) 5!4! = 2, (d) 4! 4 = 384 (b) 3!2!3! (c) 3!4! 5 (b) 30 · 29 · 28 · 27 · 26 ####### 13. ⎛####### ⎞####### ⎠⎛####### ⎞⎛####### ⎠⎛####### ⎞ ⎝⎛####### ⎠ ⎝⎛####### ⎞⎛####### ⎠⎛####### ⎞ ⎝⎛####### ⎠ ⎝⎛####### ⎞⎛####### ⎠⎛####### ⎞ ⎝⎛####### ⎠ ⎝2 ####### 20 ####### 14. ⎛####### ⎞####### ⎠⎛####### ⎞⎛####### ⎠⎛####### ⎞ ⎝⎛####### ⎠ ⎝⎛####### ⎞⎛####### ⎠⎛####### ⎞ ⎝⎛####### ⎠ ⎝⎛####### ⎞⎛####### ⎠⎛####### ⎞ ⎝⎛####### ⎠ ⎝5 ####### 52 ⎞⎛####### ⎠⎛####### ⎞ ⎝⎛####### ⎠ ⎝⎛####### ⎞⎛####### ⎠⎛####### ⎞ ⎝⎛####### ⎠ ⎝⎛####### ⎞⎛####### ⎠⎛####### ⎞ ⎝⎛####### ⎠ ⎝5 ####### 12 ####### 5 ####### 10 possible choices of the 5 men and 5 women. They can then be paired up in 5! ways, since if we arbitrarily order the men then the first man can be paired with any of the 5 women, the next with any of the remaining 4, and so on. Hence, there are ⎛⎞⎛⎞ ⎝⎠⎝5 ####### 12 ####### 5 ####### 10 ####### ! possible results. ⎛⎞⎛⎞ ⎝⎠⎝⎛⎞⎛⎞ ⎝⎠⎝⎛⎞⎛⎞ ⎝⎠⎝⎛⎞⎛⎞ ⎝⎠⎝+ ⎛⎞⎛⎞ ⎝⎠⎝⎛⎞⎛⎞ ⎝⎠⎝⎛⎞⎛⎞ ⎝⎠⎝⎛⎞⎛⎞ ⎝⎠⎝