

Chapter 3 Homework Solutions

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1. (a) finite discrete
 (b) infinite discrete
 (c) continuous
 (d) finite discrete
 (e) continuous
2. (a) Finite discrete.
 1, 2, ..., 40
 (b) continuous
 $\{t = \text{time in hours} \mid 0 \leq t \leq 24\}$
 (c) infinite discrete
 1, 2, 3, 4, ...

3. 0.65

4. Let $P(X = 6) = J$ then $P(X = 3) = 2J$
 $P(X = 3) + P(X = 6) = .3$ (from the histogram).

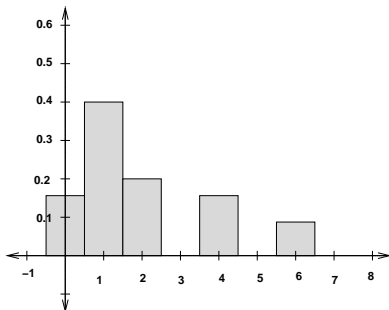
solve $2J + J = 0.3$ and get $J = 0.1$

Answer: 0.45

5. (a)

students	0	1	2	4	6
prob.	$\frac{4}{25}$	$\frac{10}{25}$	$\frac{5}{25}$	$\frac{4}{25}$	$\frac{2}{25}$

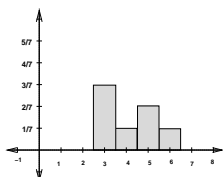
(b) probability histogram



6. (a)

letters	3	4	5	6
prob.	$\frac{3}{7}$	$\frac{1}{7}$	$\frac{2}{7}$	$\frac{1}{7}$

(b) probability histogram



7. (a) There can be different answers depending where you intervals start.

speed(x)	freq
$25 \leq x < 30$	6
$30 \leq x < 35$	7
$35 \leq x < 40$	9
$40 \leq x < 45$	8
$45 \leq x < 50$	5
$50 \leq x < 55$	5

(b) prob dist.

speed(x)	prob
$25 \leq x < 30$	6/40
$30 \leq x < 35$	7/40
$35 \leq x < 40$	9/40
$40 \leq x < 45$	8/40
$45 \leq x < 50$	5/40
$50 \leq x < 55$	5/40

8. (a) frequency table

grade(x)	freq
$90 \leq x \leq 99$	10
$80 \leq x \leq 89$	11
$70 \leq x \leq 79$	11
$60 \leq x \leq 69$	10
$50 \leq x \leq 59$	7
$40 \leq x \leq 49$	4
$30 \leq x \leq 39$	3

(b) prob dist.

grade(x)	freq
$90 \leq x \leq 99$	10/56
$80 \leq x \leq 89$	11/56
$70 \leq x \leq 79$	11/56
$60 \leq x \leq 69$	10/56
$50 \leq x \leq 59$	7/56
$40 \leq x \leq 49$	4/56
$30 \leq x \leq 39$	3/56

9.

remainder	0	1	2
prob.	$\frac{2}{8}$	$\frac{3}{8}$	$\frac{3}{8}$

10.

tosses	1	2	3
prob.	$\frac{1}{3}$	$\frac{2}{9}$	$\frac{4}{9}$

11. (a) $\frac{C(4,0)C(48,3)}{C(52,3)}$
 (b) $\frac{C(4,2)C(48,1)}{C(52,3)}$

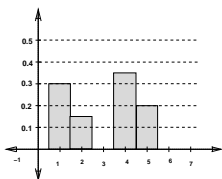
12. (a) $P(X = 2) = \frac{C(5,2)*C(7,1)}{C(12,3)} = \frac{70}{220}$
 (b) $P(X \leq 2) =$

$$\frac{C(5,0)*C(7,3)}{C(12,3)} + \frac{C(5,1)*C(7,2)}{C(12,3)} + \frac{C(5,2)*C(7,1)}{C(12,3)} = \frac{210}{220}$$

or

$$P(X \leq 2) = 1 - P(X = 3) = 1 - \frac{C(5,3)*C(7,0)}{C(12,3)}$$

13. (a) 3
 (b) histogram



14. $E(X) = 39.6$

15. (a)

score	1	2	3	4	10
probability	$\frac{3}{10}$	$\frac{2}{10}$	$\frac{2}{10}$	$\frac{1}{10}$	$\frac{2}{10}$

(b) 3.7

16. (a)

hearts	0	1	2
probability	$\frac{19}{34}$	$\frac{13}{34}$	$\frac{2}{34}$

(b) 0.5

17. (a)

X	1999	499	99	24	-1
probability	$\frac{1}{500}$	$\frac{1}{500}$	$\frac{3}{500}$	$\frac{10}{500}$	$\frac{485}{500}$

(b) 5.1

18. $E(x) = 18 * 0.95 + (-23) * 0.05 = 15.95$

19. $E(X) = \$ -2$

20. (a)

x	-1.5	-.5	.5	1.5	2.5
prob	$\frac{4}{7}$	$\frac{3}{28}$	$\frac{3}{28}$	$\frac{3}{28}$	$\frac{3}{28}$

(b) $E(x) = -.43$ so the game is not fair.

21. Let X = your net winnings and A be the cost of the game.

X	1 red	2 red	0 red
	4-A	3A-A	0-A
prob	$\frac{20}{36}$	$\frac{6}{36}$	$\frac{10}{36}$

If the game is fair then $E(x) = 0$

$$0 = \frac{20}{36} * (4 - A) + \frac{6}{36} * (2A) + \frac{10}{36} * (-A)$$

$$0 = 20(4 - A) + 12A - 10A$$

$$18A = 80$$

$$A = \frac{80}{18} = 4.44$$

so to make it fair(or as fair as possible) charge \$4.44.

22. (a) -1.5

- (b) no
 (c) \$3.50

23. (a) Location A: \$5 Location B: \$5.5
 (b) more than 1650

24. (a) 14.4
 (b) 65.6

25. $E(x) = 10 * \frac{1}{6} = 1.66666667$

Expected grade is $10 * E(X) = 16.6667$

26. 3.75

27. 2.30769

28. Mean = 4.9
 Median = 5
 Mode = 6

29. Mean = 21.31818
 Median = 20.5
 Mode = 19 and 24

30. The fifth score is less than or equal to 82.

31. Answers will vary. I used the midpoint of each interval
 $\frac{2.5*8+8.5*12+15*24+22*35}{8+12+24+35} = 15.8481$

32. Answers will vary. used the median of each interval.
 Estimated Mean: 30.96

33. use these numbers for the intervals: 2.5, 8, 15.5, and 25.5

- (a) 11.42333
 (b) 6.561437
 (c) 11-20

34. (a) mean = 3.75
 median = 4
 mode = 4
 standard deviation = 1.25
 variance = 1.5625

(b) mean = 7.3333
 median = 4
 mode = 1 and 15
 standard deviation = 6.315765
 variance = 39.8888754

35. (a) mean = 41.8023
 (b) median = 31.5
 (c) mode = 90
 (d) standard deviation = $S_x = 32.8697$
 (e) variance = $S_x^2 = 1080.4171$

- (f) $Q_1 = 12$ At least 25% of the people surveyed drink 12 or fewer Dr. Peppers during the semester.
 $Q_2 = \text{median} = 31.5$ At least 50% of the people surveyed drink 31.5 or fewer Dr. Peppers during the semester.
 $Q_3 = 90$ At least 75% of the people surveyed drink 90 or fewer Dr. Peppers during the semester.
36. (a) Mean = 2.6225
 Median = 3
 Mode = 3
 (b) $Q_1 = 2$ At least 25% of the cars are 2 years or younger.
 $Q_2 = \text{median} = 3$ At least 50% of the cars are 3 years or younger.
 $Q_3 = 3$ At least 75% of the cars are 3 years or younger.
 (c) sample since there are more than 2000 cars on campus.
 (d) 1.623672352
 (e) between 0.998827 years and 4.24617 years
 (f) between 0.0246 years and 5.22037 years
37. (a) 3.5
 (b) 1.62788206
 (c) 2.650000001
38. $E(X) = 1.6$
 st. dev. = 1.13137
39. 1.9365
40. (a) $\mu = 12$ and $\sigma = 3.1937$
 (b) within 1 standard deviation means

$$\mu - 1 * \sigma \leq X \leq \mu + 1 * \sigma$$

$$8.806 \leq X \leq 15.19 \text{ or}$$

$$x = 9, 10, 11, 12, 13, 14, 15$$
 Answer: 0.7283
 (c) $X = 7, 8, 9, \dots, 17$
 Answer: 0.9175
 (d) $X = 6, 7, 8, 9, \dots, 18$
 Answer: 0.9601
41. $P(12.8 \leq X \leq 27.2) \geq 1 - \frac{1}{3^2} = \frac{8}{9}$
42. $P(32.3 \leq X \leq 37.7) \geq 1 - \frac{1}{0.6^2} = -1.77777$
- note: Chebyshev's inequality doesn't really give useful information for this problem.
43. (a) $P(197 \leq X \leq 213) \geq 1 - \frac{1}{k^2}$
 $213 = 205 + 2 * k$ to get $k = 4$
 Answer: $\geq .9375 = \frac{15}{16}$
 (b) solve $225 = 205 + 2k$ to get $k = 10$.
 $P(185 \leq X \leq 225) \geq 1 - \frac{1}{10^2} = 0.99$
 Answer: ≤ 0.01
44. solve for k
 $100 + k * 2.8 = 106$
 $k = \frac{15}{7}$
 $P(94 \leq X \leq 106) \geq 1 - \frac{1}{(\frac{15}{7})^2} = 0.782222$
 we would expect at least $0.78222 * 10000$ or at least 7822 boxes to have between 94 and 106 paperclips.
45. (a)
 (b) $\text{normalcdf}(-1, 1.5, 0, 1) = 0.7745$
 (c) $\text{normalcdf}(-0.75, 1E99, 0, 1) = 0.7734$
 (d) $\text{normalcdf}(-1E99, 2.5, 0, 1) = 0.9938$
 (e) 0.2837
 (f) $A = \text{invnorm}(0.647, 0, 1) = 0.3772$
 (g) $J = \text{invNorm}(1 - 0.791, 0, 1) = -0.8099$
46. $A = 1.174986$
47. (a) 0.268478
 (b) 0.614717
 (c) 0.89435
 (d) 95.96213
48. (a) 0.285787
 (b) 0.8716
 (c) 0.8413447
 (d) 142.6548268
49. (a) 86.63855%
 (b) 2.275%
50. $A = 42.6115$
51. $A = 50.88087605$
52. 0.2111855
53. (a) 0.01606
 (b) 0.85587
 (c) 0.091301
54. (a) .2437
 (b) .003527
 (c) about 97
55. (a) $\text{normalcdf}(28, 1E99, 20, 5) = 0.0548$
 (b) 0
 (c) 336 or 337.
56. $\text{invnorm}(0.8, 10, 2.5) = 12.10405$ minutes
57. (a) $\text{normalcdf}(9.2, 1E99, 7.4, 1.2) = 0.0668$
 (b) 0
58. (a) minimum .997 and maximum 1.005
 (b) 4.5500%
 (c) 455.0012403 so approximately 455.

59. (a) .2714
(b) 0
(c) .5332
60. (a) .6915
(b) .9104
(c) 86.6386%
61. (a) .1265
(b) 19.14094 so about 19
62. (a) .0668
(b) 0.13%
63. 4.807 so approximately 5
64. 17.649 years
65. A = 84.076
B = 72.65
C = 62.623966