

Chapter 8 Homework Solutions

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1. (a) You are counting the number of games and there are a limited number of games in a tennis match.
Answer: Finite discrete
- (b) your counting the nubmer of tickets.
Answer: Infinite discrete
- (c) Time is an interval and it doesn't skip values.
Answer: Continuous
- (d) The number may be very large(hopefully), but it is still only a fixed number.
Answer: Finite discrete
- (e) Temperature is an interval and it doesn't skip values.
Answer: Continuous

2. (a) There are $52 - 13 = 39$ non-heart cards in a deck, so the maximum number of cards you could draw is 39 without drawing a heart. So the worst case scenario is 40 cards drawn.
Answer: Finite discrete.
Values: $X = 1, 2, \dots, 40$
- (b) Continuous
Values: $\{x = \text{time in hours} \mid 0 \leq X \leq 24\}$
- (c) You could always roll a one, so it might not happen that you roll a six.
Answer: Infinite discrete
Values: $X = 1, 2, 3, 4, \dots$

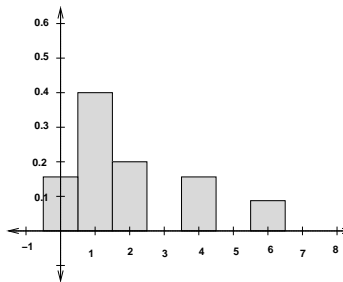
3. The areas of the rectangles must add to one since the rectangles represent probability. The missing rectangle has an area of 0.15.
Answer: $0.15 + 0.2 + 0.3 = 0.65$ or $1 - 0.1 - 0.25 = 0.65$

4. Let $P(X = 6) = J$ then $P(X = 3) = 2J$
 $0.1 + 0.25 + P(X = 3) + 0.2 + 0.15 + P(X + 6) = 1$ (from the histogram).
 $P(X = 3) + P(X + 6) = 0.3$
 $2J + J = 0.3$
 and get $J = 0.1$
 Answer: $0.45 = P(X = 4) + P(X = 5) + P(X = 6)$

5. (a) Divide the frequency by the total number of students who have waited to get relative frequency(or probability).

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

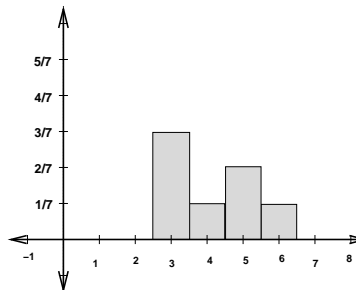
- (b) probability histogram



6. There are a total of 7 cards that will be made. Three of them will have a word with three letters: Get, Its, fun.
Answer:

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 your 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

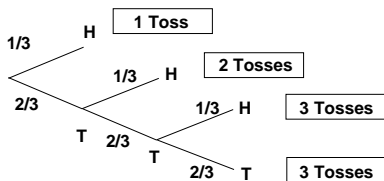
(b) prob dist.

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. Remember that the remainder is what is left over after performing long division (by hand). For example: 7 divide by 3 has a remainder of 1 since 3 goes into 7 two times (this gives $3 * 2 = 6$) and 1 will be left over.

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

10. The tree shows the experiment. Notice the tree stops on the third level since either a head is tossed or the coin has been tossed three times.



Use the branches to get the probability.

Answer:

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

11. (a) $P(X = 0) = \frac{C(4,0)C(48,3)}{C(52,3)}$

(b) $P(X = 2) = \frac{C(4,2)C(48,1)}{C(52,3)}$

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

(b) $P(X \leq 2) =$

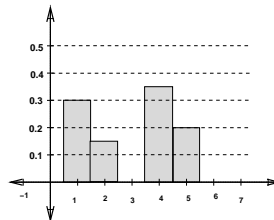
$$\frac{C(5,0) * C(7,3)}{C(12,3)} + \frac{C(5,1) * C(7,2)}{C(12,3)} + \frac{C(5,2) * C(7,1)}{C(12,3)} = \frac{210}{220}$$

or

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

13. (a) $E(x) = 1 * 0.3 + 2 * 0.15 + 4 * 0.35 + 5 * 0.2 = 3$

(b) histogram



14. To calculate $P(X = 70)$ remember that the probabilities must add to 1.

$$E(X) = 30 * 0.31 + 32 * 0.25 + 46 * 0.29 + 49 * 0.06 + 63 * 0.04 + 70 * 0.05 = 39.6$$

15. (a) Write out the cards and give the score to each card. Note: the order of the numbers is not important.

Card	Score	Card	Score	Card	Score
1,2	1	1,3	1	1,4	10
1,5	1	2,3	10	2,4	2
2,5	2	3,4	3	3,5	3
4,5	4				

Answer:

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

(b) $E(x) = 1 * \frac{3}{10} + 2 * \frac{2}{10} + 3 * \frac{2}{10} + 4 * \frac{1}{10} + 10 * \frac{2}{10} = 3.7$

16. The probabilities may be computed using a tree or combinations.

(a)

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

(b) $E(x) = 0 * \frac{19}{34} + 1 * \frac{13}{34} + 2 * \frac{2}{34} = 0.5$

17. Use a dice chart to find the probabilities.

	Red Die						
	1	2	3	4	5	6	
Green Die	1	1	2	3	4	5	6
	2	2	2	3	4	5	6
	3	3	3	3	4	5	6
	4	4	4	4	4	5	6
	5	5	5	5	5	5	6
	6	6	6	6	6	6	6

(a)

hearts	1	2	3	4	5	6
probability	$\frac{1}{36}$	$\frac{3}{36}$	$\frac{5}{36}$	$\frac{7}{36}$	$\frac{9}{36}$	$\frac{11}{36}$

(b) $E(x) = 1 * \frac{1}{36} + 2 * \frac{3}{36} + 3 * \frac{5}{36} + 4 * \frac{7}{36} + 5 * \frac{9}{36} + 6 * \frac{11}{36}$
 $E(X) = 4.47222$

18. Note: X is the **net winnings**.

(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

19. X = profit on a chip.

X	18	-23
prob.	0.95	0.05

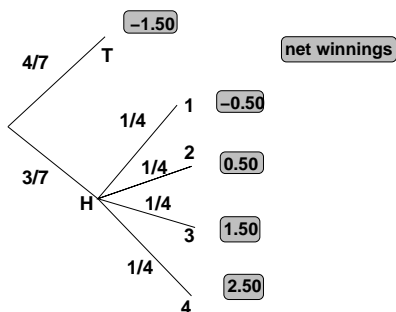
Answer: $E(x) = 18 * 0.95 + (-23) * 0.05 = 15.95$

20. X is your net winnings.

hearts	-5	-4	-1	4
probability	$\frac{1}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{1}{8}$

$E(X) = (-5) * \frac{1}{8} + (-4) * \frac{3}{8} + (-1) * \frac{3}{8} + 4 * \frac{1}{8}$
 $E(X) = -2$

21. Use a tree to set up the probability distribution.



(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.

22. Use a tree or combinations to find the probabilities.
 X is your net winnings and A be the cost of the game.

	1 red	2 red	0 red
X	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.

23. X is the your net winnings.

X	2	1	-3
prob.	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{4}{6}$

(a) -1.5

(b) No, the expected winnings are negative. For this problem the game favors the person running the game.

(c) Let A =Price of the game, then solve the following equaiton,

X	$7 - A$	$6 - A$	$2 - A$
prob.	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{4}{6}$

$$0 = (7 - A) * \frac{1}{6} + (6 - A) * \frac{1}{6} + (2 - A) * \frac{4}{6}$$

$$0 = (7 - A) + (6 - A) + (2 - AA) * 4$$

$$A = 3.5$$

Answer: \$3.50

24. (a) X is the revenue at each location.

Location A				Location B			
X	4.5	4	6.5	X	4.5	4	6.5
prob.	0.5	0.2	0.3	prob.	0.25	0.2	0.55

Expected value of each location:

Location A: $4.5 * 0.5 + 4 * 0.2 + 6.5 * 0.3 = \5

Location B: $4.5 * 0.25 + 4 * 0.2 + 6.5 * 0.55 = \5.5

(b) Total revenue at location B is
 $1500 * 5.5 = 8250$
 more than $\frac{8250}{5} = 1650$ people

25. $\frac{7}{7+4} = \frac{7}{11}$

26. $\frac{23}{23+15} = \frac{23}{38}$

27. simplify $\frac{P(J)}{P(J^c)} = \frac{0.62}{0.38} = \frac{31}{19}$

Answer: 31 to 19

28. $P(A^c) = \frac{7}{15+7} = \frac{7}{22}$

29. $P(E) = \frac{2}{9}$ and $P(F) = \frac{10}{29}$. Since E and F are independent, $P(E \cap F) = P(E) * P(F)$

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

30. $P(E) = \frac{21}{40}$

31. prob of 5th card is a heart given the information is $\frac{12}{49}$

Answer: 12 to 37

32. Mean = 4.9

Median = 5

Mode = 6

33. Mean = 21.31818

Median = 20.5

Mode = 19 and 24

34. The fifth score is less than or equal to 82 since 82 is the median and there are 2 scores that are above this number.

35. Answers will vary. I used the middle of each interval

$$\frac{2.5*8+8.5*12+14.5*24+20.5*35}{8+12+24+35} = 15.0316$$

36. Answers will vary. used the middle of each interval.

Estimated Mean: 30.96

37. Enter the x-value in list 1 and the frequency in list 2. use the command: 1-Var Stats L₁,L₂

- (a) mean: $\bar{x} = 3.75$
 median = 4
 mode = 4
 standard deviation: $\sigma_x = 1.25$
 variance: $(\sigma_x)^2 = 1.5625$
- (b) mean: $\bar{x} = 7.3333$
 median = 4
 mode = 1 and 15
 standard deviation: $\sigma_x = 6.315765$
 variance: $(\sigma_x)^2 = 39.8888754$

38. Enter the x-value in list 1 and the frequency in list 2. use the command: 1-Var Stats L₁,L₂

- (a) mean: $\bar{x} = 41.8023$
 (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.

39. Answers will vary. I used the middle of each interval.

- (a) mean = 11.42333
 (b) standard deviation: $\sigma_x = 6.561437$
 (c) 11-20

40. Enter the age in list 1 and the frequency in list 2. use the command: 1-Var Stats L₁,L₂

- (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) $S_x = 1.623672352$

(e) mean + $S_x = 4.2462$
 mean - $S_x = 0.9988$

Between 0.9988 years and 4.2462 years

(f) mean + $1.6 * S_x = 5.2204$
 mean - $1.6 * S_x = 0.0246$

Between 0.0246 years and 5.2204 years

41. Create a probability distribution from the histogram. Enter the x-values in list 1 and the probability in list 2. use the command: 1-Var Stats L₁,L₂

(a) $E(x) = \bar{x} = 3.5$

(b) $\sigma_x = 1.62788206$

(c) variance = $(\sigma_x)^2 = 2.650000001$

42. Use Chebychev's inequality.

$$\mu + k\sigma = 27.2$$

$$20 + k * 2.4 = 27.2$$

$$k = 3$$

$$P(12.8 \leq X \leq 27.2) \geq 1 - \frac{1}{3^2} = \frac{8}{9}$$

43. Use Chebychev's inequality.

$$\mu + k\sigma = 37.3$$

$$35 + k * 4.5 = 37.3$$

$$k = 0.6$$

$$P(32.3 \leq X \leq 37.7) \geq 1 - \frac{1}{0.6^2} = -1.77777$$

Note: Chebyshev's inequality doesn't really give useful information for this problem.

44. Use Chebychev's inequality.

(a) $\mu + k\sigma = 213$

$$213 = 205 + 2 * k$$

$$k = 4$$

$$P(197 \leq X \leq 213) \geq 1 - \frac{1}{4^2}$$

$$\text{Answer: } \geq .9375 = \frac{15}{16}$$

- (b) Want to compute: $P(X < 185) + P(X > 225)$

notice that:

$$P(X < 185) + P(X > 225) = 1 - P(185 \leq X \leq 225)$$

$$\mu + k\sigma = 225$$

$$225 = 205 + 2k$$

$$k = 10$$

$$P(185 \leq X \leq 225) \geq 1 - \frac{1}{10^2} = 0.99$$

Answer: ≤ 0.01

45. Use Chebychev's inequality.

$$\mu + k\sigma = 106$$

$$100 + k * 2.8 = 106$$

$$k = \frac{15}{7}$$

$$P(94 \leq X \leq 106) \geq 1 - \frac{1}{(\frac{15}{7})^2} = 0.782222$$

We would expect at least $0.78222 * 10000$ or at least 7822 boxes to have between 94 and 106 paperclips.

46. (a) $\left(\frac{1}{5}\right)^6 * \left(\frac{4}{5}\right)^2$
 (b) $C(8, 6) * 0.2^6 * 0.8^2 + C(8, 7) * 0.2^7 * 0.8^1 + C(8, 8) * 0.2^8 * 0.8^0$
 or
 $\text{binompdf}(8, 1/5, 6) + \text{binompdf}(8, 1/5, 7) + \text{binompdf}(8, 1/5, 8)$
 or
 $\text{binomcdf}(8, 1/5, 8) - \text{binompdf}(8, 1/5, 5)$
 Answer: 0.00123136
47. (a) $\text{binompdf}(80, 0.15, 5) = C(80, 5) * 0.15^5 * 0.85^{75}$
 Answer: 0.0092856108
 (b) $\text{binomcdf}(80, 0.15, 15) = 0.8624663485$
 (c) $\text{binomcdf}(80, 0.15, 10) - \text{binomcdf}(80, 0.15, 2)$
 Answer: 0.3297
 (d) $\text{binomcdf}(80, 0.15, 20) - \text{binomcdf}(80, 0.15, 12)$
 Answer: 0.4175
48. Note: expected value is an average so do not round the answer.
 (a) $E(X) = n * p = 80 * 0.18 = 14.4$
 (b) $E(X) = n * p = 80 * 0.82 = 65.6$
49. (a) $\left(\frac{1}{6}\right)^4 * \left(\frac{5}{6}\right)^6$
 (b) $\text{binomcdf}(10, 1/6, 3) = 0.9303$
 (c) $\text{binompdf}(10, 1/6, 1) + \text{binompdf}(10, 1/6, 2) + \text{binompdf}(10, 1/6, 6)$
 or
 $C(10, 1) * \left(\frac{1}{6}\right) * \left(\frac{5}{6}\right)^9 + C(10, 2) * \left(\frac{1}{6}\right)^2 * \left(\frac{5}{6}\right)^8 + C(10, 6) * \left(\frac{1}{6}\right)^6 * \left(\frac{5}{6}\right)^4$
 Answer: 0.6159
 (d) expected number of questions correct is
 $10 * \frac{6}{10} = 1.6667$
 expected grade is $10 * E(X) = 16.667$
50. (a) $\text{binompdf}(75, 0.05, 5) = C(75, 5) * 0.05^5 * 0.95^{70}$
 Answer: 0.14877
 (b) $E(x) = 75 * 0.05 = 3.75$ Note: expected value is an average so do not round the answer.
51. (a) $\text{binompdf}(12, \frac{1}{8}, 6) = C(12, 6) * \left(\frac{1}{8}\right)^6 * \left(\frac{5}{8}\right)^6$
 Answer: 0.0066
 (b) $\text{binomcdf}(12, \frac{1}{8}, 3) = 0.8748$
52. $E(x) = 20 * \frac{1}{8} = 2.5 = \frac{20}{8}$
53. $\text{binomcdf}(5, 0.65, 5) - \text{binomcdf}(5, 0.65, 2) = 0.7648$
54. (a) $\text{binompdf}(20, 0.7, 18) = C(20, 18) * 0.7^{18} * 0.3^2$
 Answer: 0.27846
 (b) $\text{binomcdf}(20, 0.7, 20) - \text{binomcdf}(20, 0.7, 16)$
 Answer: 0.1071
- (c) $\text{binompdf}(20, 0.7, 10) + \text{binompdf}(20, 0.7, 11) + \text{binompdf}(20, 0.7, 12) + \text{binompdf}(20, 0.7, 15) + \text{binompdf}(20, 0.7, 16)$
 Answer: 0.5199
55. (a) $\text{binomcdf}(7, \frac{1}{12}, 7) - \text{binomcdf}(7, \frac{1}{12}, 1)$
 Answer: 0.1100617
 (b) $\text{binomcdf}(7, \frac{31}{365}, 7) - \text{binomcdf}(7, \frac{31}{365}, 1)$
 Answer: 0.1137008179
56. $\text{binomcdf}(18, \frac{3}{12}, 18) - \text{binomcdf}(18, \frac{3}{12}, 3)$
 Answer: 0.6943108
57. (a) $\left(\frac{20}{52}\right)^4 * \left(\frac{32}{52}\right)^2$
 (b) $\text{binompdf}(6, \frac{20}{52}, 4)$
 Answer: 0.1243057
 (c) $E(x) = 6 * \frac{20}{52} = 2.30769$
58. (a) $\text{normalcdf}(1.25, 1E99, 0, 1) = 0.1056$
 (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, since z is a continuous random variable.
 (f) $\text{normalcdf}(-1E99, -1, 0, 1) + \text{normalcdf}(1.15, 1E99, 0, 1)$
 Answer: 0.2837
 (g) $A = \text{invnorm}(0.647, 0, 1) = 0.3772$
 (h) $J = \text{invNorm}(1 - .791, 0, 1) = -0.8099$
59. area not between A and -A is $1 - 0.76 = 0.24$
 Area at each end of the graph is $\frac{0.24}{2} = 0.12$
 $A = \text{invnorm}(0.12 + 0.76, 0, 1) = 1.174986$
60. (a) $\text{normalcdf}(111, 135, 100, 20) = 0.268478$
 (b) $\text{normalcdf}(85, 120, 100, 20) = 0.614717$
 (c) $\text{normalcdf}(75, 1E99, 100, 20) = 0.89435$
 (d) $A = \text{invnorm}(0.42, 100, 20) = 95.96213$
61. (a) $\text{normalcdf}(144, 156, 140, 8) = 0.285787$
 (b) $\text{normalcdf}(130, 156, 140, 8) = 0.8716$
 (c) $\text{normalcdf}(-1E99, 148, 140, 8) = 0.8413447$
 (d) zero since X is a continuous random variable
 (e) $B = \text{invnorm}(1 - .37, 140, 8) = 142.6548268$
62. (a) $\mu + 1.5\sigma = 65 + 1.5 * 6 = 74.6$
 $\mu - 1.5\sigma = 65 - 1.5 * 6 = 55.4$
 $\text{normalcdf}(55.4, 74.6, 65, 6) = 0.8663855$
 Answer: 86.63855%
 (b) $\mu + 2\sigma = 65 + 2 * 6 = 77$
 $\text{normalcdf}(77, 1E99, 65, 6) = 0.02275$
 Answer: 2.275%

63. $\text{st. dev} = \sqrt{\text{var}} = \sqrt{225} = 15$
 area to the left of $X=35$
 $\text{normalcdf}(-1E99,35,45,15) = 0.2525$
 Answer: $A = \text{invnorm}(0.2525+0.4,45,15) = 50.8809$
64. area to the left of $X=50$
 $\text{normalcdf}(-1E99,50,50,10) = 0.5$
 Area to the right of B is
 $1 - 0.5 - 0.48 = 0.02$
 Area to the left of A is $1 - .75 - .02 = 0.23$
 Answer: $A = \text{invnorm}(0.23,50,10) = 42.6115$
65. $\text{normalcdf}(-1E99,112,120,10) = 0.2111855$
66. (a) $\text{normalcdf}(27000,1E99,24000,1400) = 0.01606$
 (b) $\text{normalcdf}(22500,28000,24000,1400) = 0.85587$
 (c) $\text{binompdf}(4,0.85587,2) = 0.091301$
67. $\sigma = 15 * 24 = 360$
 (a) $\text{normalcdf}(8250, 1E99,8000,360) = 0.2437$
 (b) $\text{binompdf}(4, 0.2437,4) = 0.003527$
 (c) $400 * 0.2437 = 97.48$
 approximately 97
68. (a) $\text{normalcdf}(28,1E99,20,5) = 0.0548$
 (b) since the random variable is continuous, the probability that it takes exactly 20 minutes is zero.
 (c) $\text{normalcdf}(16,26,20,5) = 0.6731$
 $500 * 0.6731 = 336.55$
 approximately 336 or 337.
69. $\text{invnorm}(0.8,10,2.5) = 12.10405$ minutes
70. (a) $\text{normalcdf}(9.2,1E99,7.4,1.2) = 0.0668$
 (b) 0, since this is a continuous random variable
71. (a) minimum length = $1.001 - 2 * 0.002 = 0.997$
 maximum length = $1.001 + 2 * 0.002 = 1.005$
 (b) $\text{normalcdf}(0.997, 1.005,1.001,0.002) = 0.9545$
 Accept = 95.45%
 Answer: $100-95.45 = 4.55\%$
 (c) $10000 * 0.0455 = 455$.
72. (a) $\text{normalcdf}(30,1E99,28.6, 2.3) = 0.2714$
 (b) 0, since this is a continuous random variable
 (c) $\text{normalcdf}(28,32,28.6, 2.3) = 0.5332$
73. (a) $\text{normalcdf}(14,1E99, 14.1, 0.2) = 0.6915$
 (b) $\text{normalcdf}(13.8,14.5,14.1, 0.2) = 0.9104$
 (c) $\mu + 1.5\sigma = 14.1 + 1.5 * 0.2 = 14.4$
 $\mu - 1.5\sigma = 14 - 1.5 * 0.2 = 13.8$
 $\text{normalcdf}(13.8, 14.4, 14.1, 0.2) = 0.866386$
 Answer: 86.6386%
74. (a) $\text{normalcdf}(144,1E99, 128, 14) = 0.1265$
 (b) $\text{normalcdf}(-1E99, 108, 128,14) = 0.07656$
 $250 * 0.07656 = 19.14$
 Answer: about 19
75. (a) $\text{normalcdf}(45, 1E99, 42, 2) = 0.0668$
 (b) $\text{normalcdf}(-1E99, 36,42,2) = 0.0013$
 Answer: 0.13%
76. $\text{normalcdf}(2.2, 1E99,1.5, 0.4) = 0.040059$
 $120 * 0.040059 = 4.807$
 Answer: approximately 5
77. $\text{invnorm}(0.03,20, 15/12) = 17.649$ years
78. $A = \text{invnorm}(1-0.08,63,15) = 84.076$
 $B = \text{invnorm}(1 - 0.08 - 0.18, 63,15) = 72.65$
 $C = \text{invnorm}(1 - 0.08 - 0.18 - 0.25,63,15) = 62.624$