





# CHAPTER ONE

## CRITICAL THINKING SKILLS

### Exercise Set 1.1

- |   |  |
|---|--|
| <p>1. Natural</p> <p>3. Counterexample</p> <p>5. Inductive</p> <p>7. Deductive</p> <p>9. <math>5 \times 3 = 15</math></p> <p>10. <math>19 \times 10 = 190</math></p> <p>11. <math>1 \ 5(=1+4) \ 10(=4+6) \ 10(=6+4) \ 5(=4+1) \ 1</math></p> <p>13.</p> <p style="text-align: center;"></p> <p>15.</p> <p style="text-align: center;"></p> <p>17. 9, 11, 13 (Add 2 to previous number.)</p> <p>19. 5, -5, 5 (Alternate 5 and -5.)</p> <p>21. <math>\frac{1}{5}, \frac{1}{6}, \frac{1}{7}</math> (Increase the denominator value by 1.)</p> <p>23. 36, 49, 64 (The numbers in the sequence are the squares of the counting numbers.)</p> | <p>2. Divisible</p> <p>4. Hypothesis</p> <p>6. Deductive</p> <p>8. Inductive</p> <p>12. <math>100,000 = 10^5</math></p> <p>14.</p> <p style="text-align: center;"></p> <p>16.</p> <p style="text-align: center;"></p> <p>18. 16, 19, 22 (Add 3 to the previous number.)</p> <p>20. -1, -3, -5 (Subtract 2 from previous number.)</p> <p>22. 3125, -15,625, 78,125 (Multiply previous number by -5.)</p> <p>24. 21, 28, 36 (<math>15 + 6 = 21</math>, <math>21 + 7 = 28</math>, <math>28 + 8 = 36</math>)</p> |
|---|--|



39. a) You should obtain the number 5.  
 b) You should obtain the number 5.  
 c) Conjecture: No matter what number is chosen, the result is always the number 5.  
 d)  $n, n+1, n+(n+1) = 2n+1, 2n+1+9 = 2n+10, \frac{2n+10}{2} = \frac{2n}{2} + \frac{10}{2} = n+5, n+5-n = 5$
40. a) You should obtain the number 0.  
 b) You should obtain the number 0.  
 c) Conjecture: No matter what number is chosen, the result is always the number 0.  
 d)  $n, n+10, \frac{n+10}{5}, 5\left(\frac{n+10}{5}\right) = n+10, n+10-10 = n, n-n = 0$
41.  $3 \times 5 = 15$  is one counterexample.
42.  $10+11+12=33$ , which is not a three digit number.
43. Two is a counting number. The sum of 2 and 3 is 5. Five divided by two is  $\frac{5}{2}$ , which is not an even number.
44. 900 is a three-digit number. The product of 900 and 900 is 810,000, which is not a five-digit number.
45. One and two are counting numbers. The difference of 1 and 2 is  $1-2 = -1$ , which is not a counting number.
46. The sum of the odd numbers 1 and 5 is 6, which is not divisible by 4.
47. a) The sum of the measures of the interior angles should be  $180^\circ$ .  
 b) Yes, the sum of the measures of the interior angles should be  $180^\circ$ .  
 c) Conjecture: The sum of the measures of the interior angles of a triangle is  $180^\circ$ .
48. a) The sum of the measures of the interior angles should be  $360^\circ$ .  
 b) Yes, the sum of the measures of the interior angles should be  $360^\circ$ .  
 c) Conjecture: The sum of the measures of the interior angles of a quadrilateral is  $360^\circ$ .
49. Inductive reasoning: a general conclusion is obtained from observation of specific cases.
50. Inductive reasoning: a general conclusion is obtained from observation of specific cases.
51. 129, the numbers in positions are found as follows:  $\begin{matrix} a & b \\ c & a+b+c \end{matrix}$
52. 1881, 8008, 8118 (They look the same when looked at in a mirror.)
53. c

**Exercise Set 1.2**

(Note: Answers in this section will vary depending on how you round your numbers. The answers may differ from the answers in the back of the textbook. However, your answers should be something near the answers given. All answers are approximate.)

1. Estimation
2. Equal

3.  $26.7 + 67.6 + 219 + 143.3$   
 $\approx 30 + 67 + 220 + 143 = 460$

4.  $86 + 47.2 + 289.8 + 532.4 + 12.8$   
 $\approx 90 + 50 + 290 + 530 + 10 = 970$

5.  $197,500 \div 4.063 \approx 200,000 \div 4.000 = 50,000$

6.  $1776 \times 0.0098 \approx 1800 \times 0.01 = 18$

7.  $\frac{405}{0.049} \approx \frac{400}{0.05} = 8000$

8.  $0.63 \times 1523 \approx 0.6 \times 1500 = 900$

4 CHAPTER 1 Critical Thinking Skills

9.  $51,608 \times 6981 \approx 50,000 \times 7000 = 350,000,000$
10. 11% of 8221  
 $\approx 10\% \text{ of } 8000$   
 $= 0.10 \times 8000 = 800$
11.  $22\% \times 9116 \approx 20\% \times 9000 = 0.20 \times 9000 = 1800$
12.  $296.3 \div 0.0096 \approx 300 \div 0.01 = 30,000$
13.  $\frac{\$410}{4} \approx \frac{\$400}{4} = \$100$
14.  $\frac{\$210}{8} \approx \frac{\$200}{8} = \$25$
15. 12 months  $\times \$47 \approx 12 \times \$50 = \$600$
16. 12 gallons  $\times \$3.75 \approx 10 \times \$4 = \$40$
17.  $\$7.99 + \$4.23 + \$16.82 + \$3.51 + \$20.12$   
 $\approx \$8 + \$4 + \$17 + \$4 + \$20 = \$53$
18.  $\$1.29 + \$6.86 + \$12.43 + \$25.62 + \$8.99$   
 $\approx \$1 + \$7 + \$12 + \$26 + \$9 = \$55$
19.  $95 \text{ lb} + 127 \text{ lb} + 210 \text{ lb} \approx 100 + 100 + 200 = 400 \text{ lb}$
20.  $\frac{3.25 \text{ lb}}{6} \approx \frac{3.00 \text{ lb}}{6} = 0.5 \text{ lb}$
21. 15% of  $\$26.32 \approx 15\% \text{ of } \$26$   
 $= 0.15 \times \$26 = \$3.90$
22.  $\frac{\$400}{\$23} \approx \frac{\$400}{\$25} = 16$
23.  $\$595 + \$289 + \$120 + \$110 + 230$   
 $\approx \$600 + \$300 + \$100 + \$100 + \$200 = \$1300$
24. Team A:  $189 + 172 + 191 \approx 190 + 170 + 190 = 550$   
 Team B:  $183 + 229 + 167 \approx 180 + 230 + 170 = 580$   
 $580 - 550 = 30 \text{ lb}$
25.  $11 \times 8 \times \$1.50 \approx 10 \times 8 \times \$1.50$   
 $= 10 \times \$12 = \$120$
26. 9 min, 55 sec/mi  $\times 26.2 \text{ mi}$   
 $\approx 10 \text{ min} \times 26 \text{ mi} = 260 \text{ min/mi}$   
 $\frac{260 \text{ min}}{60 \text{ min}} \approx 4\frac{1}{3} \text{ hours}$
27. 100 Mexican pesos =  $100 \times 0.068$  U.S. dollars  
 $\approx 100 \times 0.07$  U.S. dollars = 7 U.S. dollars  
 $\$50 - \$7 = \$43$
28.  $\$973 + 6(\$61) + 6(\$97) + 6(\$200)$   
 $\approx \$970 + 6(\$60) + 6(\$100) + 6(\$200)$   
 $= \$970 + \$360 + \$600 + \$1200 = \$3130$
29.  $\approx 90$  miles
30.  $\approx 75$  miles
31. a) 23% of 700  $\approx 25\% \text{ of } 700 = 0.25 \times 700 = 175$   
 b) 12% of 700  $\approx 10\% \text{ of } 700 = 0.10 \times 700 = 70$   
 c) 21% of 700  $\approx 20\% \text{ of } 700 = 0.20 \times 700 = 140$
32. a) 18% of 2987  $\approx 18\% \text{ of } 3000 = 0.18 \times 3000 = 540$   
 b) 42% of 2987  $\approx 42\% \text{ of } 3000 = 0.42 \times 3000 = 1260$   
 c) 7% of 2987  $\approx 7\% \text{ of } 3000 = 0.07 \times 3000 = 210$

33. a) 5 million  
 b) 98 million  
 c) 98 million  $-$  33 million = 65 million  
 d) 19 million + 79 million + 84 million  
 + 65 million + 33 million = 280 million
34. a) 19%  
 b) 25%  
 c) 20% of 179 lb  $\approx$  20% of 180 =  $0.2 \times 180 = 36$  lb
35. a) 85%  
 b)  $68\% - 53\% = 15\%$   
 c) 85% of 70 million acres = 59,500,000 acres  
 d) No, since we are not given the area of each state.
36. a)  $2(410) + 4(545)$   
 $\approx 2(400) + 4(500) = 800 + 2000 = 2800$  calories  
 b) Running:  $4(920) \approx 4(900) = 3600$  calories  
 Walking:  $4(330) \approx 4(300) = 1200$  calories,  
 $3600 - 1200 = 2400$  calories  
 c)  $3(545) + 3(545) \approx 3(550) + 3(550)$   
 $= 1650 + 1650 = 3300$  calories per week,  
 3300 calories per week (52 weeks)  
 $\approx 3000 \times 50 = 150,000$  calories
37. 20
38. 25
39.  $\approx 120$  bananas
40.  $\approx 100$  grapes
41.  $150^\circ$
42.  $315^\circ$
43. 10%
44. 25%
45. 9 square units
46. 12 square units
47. 160 feet
48.  $4(60) = 240$  in. or  $\frac{240}{12} \approx 20$  ft
- 49.-57. Answers will vary.
58. There are 118 ridges around the edge.
59. a) Answers will vary.  
 b) 11.6 days. There are  
 $24 \cdot 60 \cdot 60 = 86400$  seconds in a day,  
 $1,000,000 / 86400 = 11.574074$ .

**Exercise Set 1.3**

1.  $\frac{1 \text{ in.}}{12 \text{ mi}} = \frac{4.25 \text{ in.}}{x \text{ mi}}$   
 $1x = 12(4.25)$   
 $x = 51 \text{ mi}$
2.  $\frac{1 \text{ in.}}{2.5 \text{ yd}} = \frac{22.4 \text{ in.}}{x \text{ yd}}$   
 $1x = 2.5(22.4)$   
 $x = 56 \text{ yd}$

6 CHAPTER 1 Critical Thinking Skills

$$3. \quad \frac{3 \text{ ft}}{1.2 \text{ ft}} = \frac{x \text{ ft}}{15.36 \text{ ft}}$$

$$3(15.36) = 1.2x$$

$$\frac{46.03}{1.2} = \frac{1.2x}{1.2}$$

$$x = \frac{46.03}{1.2} = 38.4 \text{ ft}$$

$$4. \quad \frac{1 \text{ bag}}{4000 \text{ ft}^2} = \frac{x \text{ bags}}{35,000 \text{ ft}^2}$$

$$4000x = 1(35,000)$$

$$\frac{4000x}{4000} = \frac{35,000}{4000}$$

$$x = \frac{35,000}{4000} = 8.75 \text{ bags}$$

$$5. \quad 2.9\% \text{ of } \$8642 = 0.029 \times \$8642 = \$250.62$$

$$\$8642 + \$250.62 = \$8892.62 \approx \$8893$$

$$6. \quad 12.9\% \text{ of } \$387 = 0.129 \times \$387 = \$49.92$$

$$\$387 - \$49.92 = \$337.08 \approx \$337$$

$$7. \quad \text{a) Ent./Misc.: } 19.1\% \text{ of } \$1950$$

$$= 0.191 \times \$1950 = \$372.45$$

$$\text{Food: } 12.7\% \text{ of } \$1950$$

$$= 0.127 \times \$1950 = \$247.65$$

$$\$372.45 - \$247.65 = \$124.80$$

$$8. \quad \text{a) Business: } 20.5\% \text{ of } 1,791,000$$

$$= 0.205 \times 1,791,000 = 367,155$$

$$\text{Education: } 5.9\% \text{ of } 1,791,000$$

$$= 0.059 \times 1,791,000 = 105,669$$

$$367,155 - 105,669 = 261,486 \text{ degrees}$$

$$\text{b) Housing: } 34.4\% \text{ of } \$1950$$

$$= 0.344 \times \$1950 = \$670.80$$

$$\text{Transportation: } 16\% \text{ of } \$1950$$

$$= 0.16 \times \$1950 = \$312.00$$

$$\$670.80 - \$312.00 = \$358.80$$

$$\text{b) Social Sciences: } 10\% \text{ of } 1,791,000$$

$$= 0.10 \times 1,791,000 = 179,100$$

$$\text{Health Professions: } 9\% \text{ of } 1,791,000$$

$$= 0.09 \times 1,791,000 = 161,190$$

$$179,100 - 161,190 = 17,910 \text{ degrees}$$

$$9. \quad \text{a) } 20.7\% \text{ of } \$200,000 = 0.207 \times 200,000$$

$$= \$41,400$$

$$\$200,000 + \$41,400 = \$241,400$$

10.  $40 \text{ rides} \times \$2.50 \text{ per ride} = \$100$ . In order for the cost of rides with the \$112 MetroCard to be less than the cost of the rides without the MetroCard, Chandler would have to take 45 rides per month.

$$\text{b) } 1.4\% \text{ of } \$220,000 = 0.014 \times 220,000$$

$$= \$3080$$

$$\$220,000 + \$3080 = \$223,080$$

$$\text{c) Bremerton, WA: } -30.9\% \text{ of } \$200,000$$

$$= -0.309 \times \$200,000$$

$$= -\$61,800$$

$$\$200,000 - \$61,800 = \$138,200$$

$$\text{Seattle, WA: } -23.5\% \text{ of } \$200,000$$

$$= -0.235 \times \$200,000$$

$$= -\$47,000$$

$$\$200,000 - \$47,000 = \$153,000$$

$$\$153,000 - \$138,200 = \$14,800$$

$$\frac{\$112}{45 \text{ rides}} \approx \$2.49 \text{ per ride}$$

$$11. \quad \$250 + \$130(18) = \$250 + \$2340 = \$2590$$

$$\text{Savings: } \$2590 - \$2500 = \$90$$

$$12. \quad \$349.72 - \$32.39(4)$$

$$= \$349.72 - 129.56 = \$220.16$$

13. 15 year mortgage:  $\$887.63(12)(15) = \$159,773.40$   
 30 year mortgage:  $\$572.90(12)(30) = \$206,244.00$   
 Savings:  $\$206,244.00 - \$159,773.40 = \$46,470.60$
14. Points needed for 80 average:  
 $80(5) = 400$  points  
 Wallace's points so far:  
 $79 + 93 + 91 + 68 = 331$  points  
 Grade needed on fifth exam:  $400 - 331 = 69$
15. a)  $10 \times 10 \times 10 \times 10 = 10,000$   
 b) 1 in 10,000
16. a)  $\frac{460}{25} = 18.4$  min  
 b)  $\frac{1550}{50} = 31$  min  
 c)  $\frac{1400}{35} = 40$  min  
 d)  $\frac{1550}{80} + \frac{2200}{80} = \frac{3750}{80} \approx 47$  min
17.  $38,687.0 \text{ mi} - 38,451.4 \text{ mi} = 235.6 \text{ mi}$   
 $\frac{235.6 \text{ mi}}{12.6 \text{ gal}} \approx 18.698 \approx 18.7$  mpg
18. a)  $40 \times \$8.50 \times 52 = \$17,680$   
 b) Each week he makes  $40 \times \$8.50 = \$340$ .  
 $\frac{\$1275}{\$340} = 3.75$  weeks
19. By mail:  $(\$52.80 + \$5.60 + \$8.56) \times 4$   
 $= \$66.96 \times 4 = \$267.84$   
 Tire store:  $\$324 + 0.08 \times \$324$   
 $= \$324 + \$25.92 = \$349.92$   
 Savings:  $\$349.92 - \$267.84 = \$82.08$
20.  $\$1750 - \$50(15) = \$1750 - \$750 = \$1000$   
 $\frac{\$1000}{\$40} = 25$  hours
21.  $15,000 \text{ ft} - 3000 \text{ ft} = 12,000 \text{ ft}$  decrease in elevation. Temperature increases  $2.4^\circ \text{F}$  for every 1000 ft decrease in elevation.  
 $2.4^\circ \text{F} \times 12 = 28.8^\circ \text{F}$   
 $-6^\circ \text{F} + 28.8^\circ \text{F} = 22.8^\circ \text{F}$   
 The precipitation at the airport will be snow.
22. a)  $\$620(0.12) = \$74.40$   
 b)  $\$1200(0.22) = \$264$   
 c) The store lost  $\$1200 - \$1000 = \$200$  on the purchase.  
 Store's profit:  $\$264 - \$200 = \$64$
23. The family paid more than  $\$10,162.50$  but less than  $\$28,925$ , so they paid  $\$10,162.50$  plus 25% of the amount over  $\$73,800$ .  
 If  $x =$  adjusted gross income, taxes are  
 $12,715 = 10,162.50 + .25(x - 73,800)$   
 $12,715 = 10,162.50 + .25x - 18,450$   
 $21,002.5 = .25x$   
 $x = \$84,010$
24. a)  $0.1 \text{ cm}^3 \times 60 \frac{\text{sec}}{\text{min}} \times 60 \frac{\text{min}}{\text{hr}} \times 24 \frac{\text{hr}}{\text{day}} \times 365 \text{ days}$   
 $= 3,153,600 \text{ cm}^3$   
 b)  $30 \text{ cm} \times 20 \text{ cm} \times 20 \text{ cm} = 12,000 \text{ cm}^3$   
 $0.1 \text{ cm}^3 \times 60 \frac{\text{sec}}{\text{min}} \times 60 \frac{\text{min}}{\text{hr}} \times 24 \frac{\text{hr}}{\text{day}} = 8640 \frac{\text{cm}^3}{\text{day}}$   
 $\frac{12,000}{8640} = 1.3\bar{8} \approx 1.4$  days

25. a)  $1 \times 60 \times 24 \times 365$   
 $= 525,600 \text{ oz}$   
 $\frac{525,600}{128} = 4106.25 \text{ gal}$   
 b)  $\frac{4106.25}{1000} \times \$11.20 = 4.10625 \times \$11.20$   
 $= \$45.99$
26. a) Short:  $\$33 \times 5 = \$165$   
 Long:  $\$18 \times 5 = \$90$   
 $\$165 - \$90 = \$75$ ; Jeff saves \$75.  
 b)  $8 \times \$4$  for a total of \$32.  
 c) Short: 5 hours = \$33  
 Long: \$18  
 Long term is cheaper by \$15.
27. a)  $\frac{20,000}{20.8} - \frac{20,000}{21.6} \approx 961.538 - 925.926$   
 $= 35.612 \approx 35.61 \text{ gal}$   
 b)  $35.61 \times \$3.00 = \$106.83$   
 c)  $140,000,000 \times 35.61 = 4,985,400,000 \text{ gal}$
28. a) Yes, divide the total amount spent by the amount spent per person.  
 b)  $\frac{\$91,564.63}{\$291.70} \approx 313.9 \text{ million}$   
 c)  $\frac{\$587.03}{\$124.90} \approx 4.7 \text{ million}$
29. Cost after 1 year:  $\$999 + 0.02(\$999)$   
 $= \$999 + \$19.98 = \$1018.98$   
 Cost after 2 years:  $\$1018.98 + 0.02(\$1018.98)$   
 $= \$1018.98 + \$20.38 = \$1039.36$
30. Value after first year:  $\$1000 + 0.10(\$1000)$   
 $= \$1000 + \$100 = \$1100$   
 Value after second year:  $\$1100 - 0.10(\$1100)$   
 $= \$1100 - \$110 = \$990$   
 \$990 is less than the initial investment of \$1000.
31. After paying the \$100 deductible, Yungchen must pay 20% of the cost of x-rays.  
 First x-ray:  
 $\$100 + 0.20(\$620) = \$100 + \$124 = \$224$   
 Second x-ray:  $0.20(\$980) = \$196$   
 Total:  $\$224 + \$196 = \$420$
32. \$3000 is the difference between one-fourth of the cost and one-fifth of the cost.  
 $\frac{1}{4} - \frac{1}{5} = \frac{1}{20}$ ;  $20 \times \$3000 = \$60,000$ .
33. a) water/milk:  $3(1) = 3 \text{ cups}$     salt:  $3\left(\frac{1}{8}\right) = \frac{3}{8} \text{ tsp}$   
 Cream of wheat:  $3(3) = 9 \text{ tbsp} = \frac{9}{16} \text{ cup}$  (because 16 tbsp = 1 cup)
- b) water/milk:  $\frac{2 + 3\frac{3}{4}}{2} = \frac{\frac{11}{4}}{2} = \frac{11}{8} = 2\frac{3}{8} \text{ cups}$   
 salt:  $\frac{\frac{1}{4} + \frac{1}{2}}{2} = \frac{\frac{3}{4}}{2} = \frac{3}{8} \text{ tsp}$   
 cream of wheat:  $\frac{\frac{1}{2} + \frac{3}{4}}{2} = \frac{\frac{5}{4}}{2} = \frac{5}{8} \text{ cups}$
- c) water/milk:  $3\frac{3}{4} - 1 = \frac{15}{4} - \frac{4}{4} = \frac{11}{4} = 2\frac{3}{4} \text{ cups}$   
 salt:  $\frac{1}{2} - \frac{1}{8} = \frac{4}{8} - \frac{1}{8} = \frac{3}{8} \text{ tsp}$       cream of wheat:  $\frac{3}{4} - \frac{3}{16} = \frac{12}{16} - \frac{3}{16} = \frac{9}{16} \text{ cup} = 9 \text{ tbsp}$
- d) Differences exist in water/milk because the amount for 4 servings is not twice that for 2 servings.  
 Differences also exist in Cream of Wheat because  $\frac{1}{2} \text{ cup}$  is not twice 3 tbsp.



34. a) rice:  $\frac{1}{2}(4) = 2$  cups  
 water:  $1\frac{1}{3}(4) = \frac{4}{3}(4) = \frac{16}{3} = 5\frac{1}{3}$  cups  
 salt:  $\frac{1}{4}(4) = 1$  tsp  
 butter/margarine:  $1(4) = 4$  tsp
- b) rice:  $1(2) = 2$  cups  
 water:  $2\frac{1}{4}(2) = \frac{9}{4}(2) = \frac{18}{4} = 4\frac{2}{4} = 4\frac{1}{2}$  cups  
 salt:  $\frac{1}{2}(2) = 1$  tsp  
 butter/margarine:  $2(2) = 4$  tsp
- c) rice:  $\frac{1}{2} + 1\frac{1}{2} = \frac{1}{2} + \frac{3}{2} = \frac{4}{2} = 2$  cups  
 water:  $1\frac{1}{3} + 3\frac{1}{3} = \frac{4}{3} + \frac{10}{3} = \frac{14}{3} = 4\frac{2}{3}$  cups  
 salt:  $\frac{1}{4} + \frac{3}{4} = \frac{4}{4} = 1$  tsp  
 butter/margarine:  $1$  tsp +  $1$  tbsp =  $1$  tsp +  $3$  tsp =  $4$  tsp
- d) rice:  $3 - 1 = 2$  cups  
 water:  $6 - 2\frac{1}{4} = \frac{24}{4} - \frac{9}{4} = \frac{15}{4} = 3\frac{3}{4}$  cups  
 salt:  $1\frac{1}{2} - \frac{1}{2} = 1$  tsp  
 butter/margarine:  $2$  tbsp =  $2(3\text{tsp}) = 6$  tsp  
 $6$  tsp -  $2$  tsp =  $4$  tsp
- e) Differences exist in water because the amount for 4 servings is not twice that for 2 servings.
35. a)  $\$425 - \$240$  (one box of 20 DVDs) =  $\$185$   
 $\$185 - \$180$  (one box of 12 DVDs) =  $\$5$   
 One box of 20 DVDs and one box of 12 DVDs are the maximum number of DVDs that can be purchased.
- b)  $\$240 + \$180 = \$420$
36. Mark will win.
37.  $1 \text{ ft}^2$  would be 12 in. by 12 in.  
 Thus,  $1 \text{ ft}^2 = 12 \text{ in.} \times 12 \text{ in.} = 144 \text{ in.}^2$
38.  $1 \text{ ft}^3 = 12 \text{ in.} \times 12 \text{ in.} \times 12 \text{ in.} = 1728 \text{ in.}^3$
39. Area of original rectangle =  $lw$   
 Area of new rectangle =  $(2l)(2w) = 4lw$   
 Thus, if the length and width of a rectangle are doubled, the area is 4 times as large.
40.  $20 \text{ ft} \times 20 \text{ ft} = 400 \text{ ft}^2$   
 $5 \text{ ft} \times 5 \text{ ft} = 25 \text{ ft}^2$   
 $\frac{400 \text{ ft}^2}{25 \text{ ft}^2} = 16$  squares
41. Volume of original cube =  $lwh$   
 Volume of new cube =  $(2l)(2w)(2h) = 8lwh$   
 Thus, if the length, width, and height of a cube are doubled, the volume is 8 times as large.
42. 11 ft is one-sixth of the pole, so the length is  
 $6 \times 11 \text{ ft} = 66 \text{ ft}$ .

43.  $\frac{10 \text{ pieces}}{\$x} = \frac{1000 \text{ pieces}}{\$10}$   
 $1000x = 10(10)$   
 $\frac{1000x}{1000} = \frac{100}{1000}$   
 $x = \frac{100}{1000} = \$0.10 = 10\text{¢}$

44. Left side:  $1(-6) = -6$       Right side:  $1(2) = 2$   
 $2(-2) = -4$        $1(3) = 3$   
 $-6 + -4 = -10$        $1(6) = 6$   
 $2 + 3 + 6 = 11$

Place it at  $-1$  so the left side would total  $-10 + -1 = -11$

45. 3

46. 10; 2002, 2112, 2222, 2332, 2442, 2552, 2662, 2772, 2882, 2992

48. Answers will vary.

50. Eight pieces

52.

10	5	6
3	7	11
8	9	4

54. 15, 12, 33

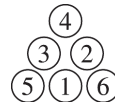
Multiply the number in the center of the middle row by 3.

56.  $35 - 15 = 20$  cubes

58. Each shakes with four people.

47. a) refresh  
b) workout

49.



51.

8	6	16
18	10	2
4	14	12

53.  $8 + 6 + 2 + 4 = 20$ ;  $3 + 7 + 5 + 1 = 16$ ;

$10 + 14 + 12 + 8 = 44$

The sum of the four corner entries is 4 times the number in the center of the middle row.

55. 45, 36, 99

Multiply the number in the center of the middle row by 9.

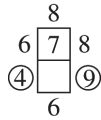
57.  $3 \times 2 \times 1 = 6$  ways

59.

	7	
3	1	4
5	8	6
	2	

Other answers are possible, but 1 and 8 must appear in the center.

60.



(The diagram shows the number of times each part is used.)

62. With umbrella policy:

Mustang reduced premium:

$$\$1648 - \$90 = \$1558$$

Focus reduced premium:

$$\begin{aligned} & \$1530 - 0.12(\$1530) \\ & = \$1530 - \$183.60 = \$1346.40 \end{aligned}$$

Total for umbrella policy:

$$\$1558 + \$1346.40 + \$450 = \$3354.40$$

Without umbrella policy:

$$\$1648 + \$1530 = \$3178$$

Net amount for umbrella policy:

$$\$3354.40 - \$3178 = \$176.40$$

64.  $16 + 16 + 4 + 4 + 4 = 44$

66. Let  $x$  be the amount Samantha had to start.

$$\text{After first store: } x - \frac{1}{2}x - 20 = \frac{1}{2}x - 20$$

$$\text{After second store: } \frac{1}{2}\left(\frac{1}{2}x - 20\right) - 20 = \frac{1}{4}x - 30$$

$$\frac{1}{4}x - 30 = 0$$

$$x = 120$$

The original amount was \$120.

61.

1	2	3	4	5
2	3	4	5	1
3	4	5	1	2
4	5	1	2	3
5	1	2	3	4

Other answers are possible.

63. Mark plays the drums.

65. Areas of the colored regions are:

$$\begin{aligned} & 1 \times 1, 1 \times 1, 2 \times 2, 3 \times 3, 5 \times 5, 8 \times 8, 13 \times 13, \\ & 21 \times 21; 1 + 1 + 4 + 9 + 25 + 64 + 169 + 441 \\ & = 714 \text{ square units} \end{aligned}$$

67. Thomas would have opened the box labeled *grapes and cherries*. Because all the boxes are labeled incorrectly, whichever fruit he pulls from the box of grapes and cherries, will be the only fruit in that box. If he pulled a grape, he labeled the box *grape*. If he pulled a cherry, he labeled the box *cherries*. That left two boxes whose original labels were incorrect. Because all labels must be changed, there was only one way for Thomas to assign the two remaining labels.

**Review Exercises**

1. 23, 28, 33 (Add 5 to previous number.)

2. 16, 13, 10 (Subtract 3 from the previous number)

3. 64, -128, 256 (Multiply previous number by -2.)

4. 25, 32, 40 ( $19 + 6 = 25$ ,  $25 + 7 = 32$ ,  $32 + 8 = 40$ )

5. 10, 4, -3 (subtract 1, then 2, then 3, ...)

6.  $\frac{3}{8}, \frac{3}{16}, \frac{3}{32}$

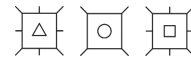
(Multiply previous number by  $\frac{1}{2}$ .)

12 CHAPTER 1 Critical Thinking Skills

7.



8.



9. c

10. a) The final number is twice the original number.

b) The final number is twice the original number.

c) Conjecture: The final number is twice the original number.

d)  $n, 10n, 10n + 5, \frac{10n + 5}{5} = \frac{10n}{5} + \frac{5}{5} = 2n + 1, 2n + 1 - 1 = 2n$

11. This process will always result in an answer of 3.  $n, n + 5, 6(n + 5) = 6n + 30, 6n + 30 - 12$

$$= 6n + 18, \frac{6n + 18}{2} = \frac{6n}{2} + \frac{18}{2} = 3n + 9, \frac{3n + 9}{3} = \frac{3n}{3} + \frac{9}{3} = n + 3, n + 3 - n = 3$$

12.  $1^2 + 2^2 = 5, 5$  is an odd number. Other answers are possible.

(Note: Answers for Ex. 13 - 25 will vary depending on how you round your numbers. The answers may differ from the answers in the back of the textbook. However, your answers should be something near the answers given. All answers are approximate.)

13.  $205,123 \times 4002 \approx 200,000 \times 4000$   
 $= 800,000,000$

14.  $215.9 + 128.752 + 3.6 + 861 + 792$   
 $\approx 200 + 100 + 0 + 900 + 800 = 2000$

15.  $21\% \text{ of } 2095 \approx 20\% \text{ of } 2000$   
 $= 0.20 \times 2000 = 400$

16. Answers will vary.

17.  $48 \text{ bricks} \times \$3.97 \approx 50 \times 4 = \$200$

18.  $8\% \text{ of } \$20,000 \approx 7\% \text{ of } 2000$   
 $= 0.08 \times 20,000 = \$1600$

19.  $\frac{1.1 \text{ mi}}{22 \text{ min}} \approx \frac{1 \text{ mi}}{20 \text{ min}} = \frac{3 \text{ mi}}{60 \text{ min}} = 3 \text{ mph}$

20.  $\$2.49 + \$0.79 + \$1.89 + \$0.10 + \$2.19 + \$6.75$   
 $\approx \$2 + \$1 + \$2 + \$0 + \$2 + \$7 = \$14.00$

21.  $5 \text{ in.} = \frac{20}{4} \text{ in.} = 20 \left( \frac{1}{4} \right) \text{ in.} = 20(0.1) \text{ mi} = 2 \text{ mi}$

22.  $2.5 \text{ million} - 1.9 \text{ million} = 0.6 \text{ million}$

23.  $2.8 \text{ million} - 1.8 \text{ million} = 1.0 \text{ million}$

24. 13 square units

25. Length = 1.75 in.,  $1.75(12.5) = 21.875 \approx 22 \text{ ft}$

26.  $\$50 + \$40(12) = \$530$

Savings:  $\$530 - \$500 = \$30$

Height = 0.625 in.,  $0.625(12.5) = 7.8125 \approx 8 \text{ ft}$

27.  $4(\$1.99) = \$7.96$  for four six-packs

28. Freemac:  $\$15 \times 4 \times 2 = \$120$

Savings:  $\$7.96 - \$4.99 = \$2.97$

Sylvan:  $\$25 \times 4 \text{ hours} = \$100$

$\$120 - \$100 = \$20$

Sylvan Rental is less expensive by \$20.

29. Cost per person with 5 people:  $\frac{\$445}{5} = \$89$

30. a)

Cost per person with 6 people:  $\frac{\$510}{6} = \$85$

$$\frac{30 \text{ lb}}{2500 \text{ ft}^2} = \frac{x}{24,000 \text{ ft}^2}; x = \frac{30 \times 24,000}{2500} = 288 \text{ lb}$$

$\$89 - \$85 = \$4$  savings

b)  $\frac{150 \text{ lb}}{30 \text{ lb/bag}} = 5 \text{ bags, and } 5 \times 2500 = 12,500 \text{ ft}^2$

31.  $10\%$  of  $\$1030 = 0.10 \times \$1030 = \$103$   
 $\$103 \times 7 = \$721$   
 Savings:  $\$721 - \$60 = \$661$

33.  $\$5500 - 0.30(\$5500) = \$5500 - \$1650$   
 $= \$3850$  take-home  
 $28\%$  of  $\$3850 = 0.28 \times \$3850 = \$1078$

35. 3 P.M.  $- 4$  hr = 11 A.M.  
 July 26, 11:00 A.M.

37. Each figure has an additional two dots. To get the hundredth figure, 97 more figures must be drawn,  $97(2) = 194$  dots added to the third figure. Thus,  $194 + 7 = 201$ .

39.

23	25	15
13	21	29
27	17	19

41. 6

42. Nothing. Each friend paid  $\$9$  for a total of  $\$27$ ;  $\$25$  to the hotel,  $\$2$  to the clerk.  
 $\$25$  for the room +  $\$3$  for each friend +  $\$2$  for the clerk =  $\$30$

43. Let  $x$  = the score on the fifth exam

$$\frac{93 + 88 + 81 + 86 + x}{5} = 80, \quad \frac{348 + x}{5} = 80, \quad 348 + x = 400, \quad x = 52$$

44. Yes; 3 quarters and 4 dimes, or 1 half dollar, 1 quarter and 4 dimes, or 1 quarter and 9 dimes.

45.  $6 \text{ cm} \times 6 \text{ cm} \times 6 \text{ cm} = 216 \text{ cm}^3$

46. Place six coins in each pan with one coin off to the side. If it balances, the heavier coin is the one on the side. If the pan does not balance, take the six coins on the heavier side and split them into two groups of three. Select the three heavier coins and weigh two coins. If the pan balances, it is the third coin. If the pan does not balance, you can identify the heavier coin.

47.  $1 + 500 = 501, 2 + 499 = 501, \dots$

There are 250 such pairs and  $250(501) = 125,250$ .

48. 16 blue: 4 green  $\rightarrow$  8 blue, 2 yellow  $\rightarrow$  5 blue, 2 white  $\rightarrow$  3 blue

49. 90: 101, 111, 121, 131, 141, 151, 161, 171, 181, 191, ...

50. The fifth figure will be an octagon with sides of equal length. Inside the octagon will be a seven sided figure with sides of equal length. The figure will have one antenna.

32.  $\frac{1.5 \text{ mg}}{10 \text{ lb}} = \frac{x \text{ mg}}{52 \text{ lb}}$   
 $10x = 52(1.5)$   
 $\frac{10x}{10} = \frac{78}{10}$   
 $x = 7.8 \text{ mg}$

34. 9 A.M. Eastern is 6 A.M. Pacific,  
 from 6 A.M. Pacific to 1:35 P.M. Pacific  
 is 7 hr 35 min, 7 hr 35 min  $-$  50 min stop  
 $= 6$  hr 45 min

36. a)  $\frac{65 \text{ mi}}{1 \text{ hr}} \times \frac{1.6 \text{ km}}{\text{mi}} = \frac{104 \text{ km}}{1 \text{ hr}} \approx 104 \text{ km/hr}$

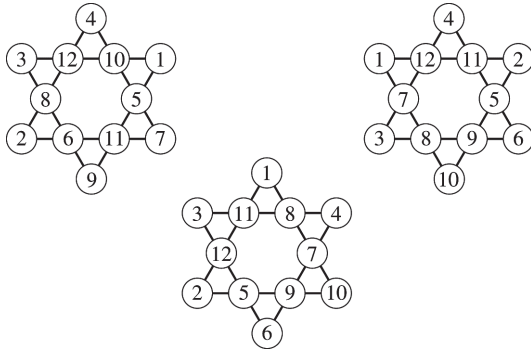
b)  $\frac{90 \text{ km}}{1 \text{ hr}} \times \frac{1 \text{ mi}}{1.6 \text{ km}} = \frac{90 \text{ mi}}{1.6 \text{ km}}$   
 $\approx 56.25 \text{ mi/hr}$

38.

21	7	8	18
10	16	15	13
14	12	11	17
9	19	20	6

40. 59 min 59 sec Since it doubles every second, the jar was half full 1 second earlier than 1 hour.

51. 61: The sixth figure will have 6 rows of 6 tiles and 5 rows of 5 tiles ( $6 \times 6 + 5 \times 5 = 36 + 25 = 61$ ).  
 52. Some possible answers are given below. There are other possibilities.



53. a) 2  
 b) There are 3 choices for the first spot. Once that person is standing, there are 2 choices for the second spot and 1 for the third. Thus,  $3 \times 2 \times 1 = 6$ .  
 c)  $4 \times 3 \times 2 \times 1 = 24$   
 d)  $5 \times 4 \times 3 \times 2 \times 1 = 120$   
 e)  $n(n-1)(n-2) \cdots 1$ , (or  $n!$ ), where  $n$  = the number of people in line

**Chapter Test**

1. 26, 32, 38 (Add 6 to previous number.)  
 2.  $\frac{1}{5}, \frac{1}{6}, \frac{1}{7}$  (Add 1 to the denominator of the previous number.)  
 3. a) The result is the original number plus 1.  
 b) The result is the original number plus 1.  
 c) Conjecture: The result will always be the original number plus 1.  
 d)  $n, 5n, 5n+10, \frac{5n+10}{5} = \frac{5n}{5} + \frac{10}{5} = n+2, n+2-1 = n+1$

(Note: Answers for #4 - #6 will vary depending on how you round your numbers. The answers may differ from the answers in the back of the textbook. However, your answers should be something near the answers given. All answers are approximate.)

4.  $0.51 \times 96,000 \approx 0.5 \times 100,000 = 50,000$   
 5.  $\frac{188,000}{0.11} \approx \frac{200,000}{0.1} \approx 2,000,000$   
 6. 9 square units  
 7. a)  $\frac{130 \text{ lb}}{63 \text{ in.}} \approx 2.0635$   
 $\frac{2.0635}{63 \text{ in.}} = 0.032754$   
 $0.032754 \times 703 \approx 23.03$   
 b) He is in the at risk range.  
 8. a) 7.9 billion  
 b) 2.8 billion  
 9.  $\$50.40 - \$35.00 = \$15.40$   
 $\frac{\$15.40}{\$0.20} = 77 \text{ miles}$

10.  $\frac{\$15}{\$2.59} \approx 5.79$

The maximum number of 6 packs is 5.  
 $\$15.00 - (5 \times \$2.59) = \$15.00 - \$12.95 = \$2.05$

$$\frac{\$2.05}{\$0.80} = 2.5625$$

Thus, two individual cans can be purchased.

6 packs	Indiv. cans	Number of cans
5	2	32
4	5	29
3	9	27
2	12	24
1	15	21
0	18	18

The maximum number of cans is 32.

12. 2.5 in. by 1.875 in.  
 $\approx 2.5 \times 15.8$  by  $1.875 \times 15.8 = 39.5$  in. by 29.625 in.  
 $\approx 39.5$  in. by 29.6 in.

(The actual dimensions are 100.5 cm by 76.5 cm.)

14.

40	15	20
5	25	45
30	35	10

15. Mary drove the first 15 miles at 60 mph which took  $\frac{15}{60} = \frac{1}{4}$  hr, and the second 15 miles at 30 mph which

took  $\frac{15}{30} = \frac{1}{2}$  hr for a total time of  $\frac{3}{4}$  hr. If she drove the entire 30 miles at 45 mph, the trip would take

$\frac{30}{45} = \frac{2}{3}$  hr (40 min) which is less than  $\frac{3}{4}$  hr (45 min).

16.  $\frac{6\text{lb}}{2\text{lb}} = 3$ ;  $3 \times \frac{1}{2} \text{ tsp} = \frac{3}{2} \text{ tsp}$  or  $1\frac{1}{2} \text{ tsp}$

$$1\frac{1}{2} \text{ tsp} = \frac{1}{2} \text{ tbsp}$$

17. Area of lawn including walkway:  $(10+2) \times (12+2) = 12 \times 14 = 168 \text{ m}^2$

$$\text{Area of lawn only: } 10 \times 12 = 120 \text{ m}^2$$

$$\text{Area of walkway: } 168 - 120 = 48 \text{ m}^2$$

18. 243 jelly beans;  $260 - 17 = 243$ ,  $234 + 9 = 243$ ,  $274 - 31 = 243$

19. a)  $3 \times \$3.99 = \$11.97$

b)  $9(\$1.75 \times 0.75) = 11.8125 \approx \$11.81$

c)  $\$11.97 - \$11.81 = \$0.16$  Using the coupon is least expensive by \$0.16.

20. 24 (The first position can hold any of four letters, the second any of the three remaining letters, and so on.  $4 \times 3 \times 2 \times 1 = 24$ )

11. 1 cut yields 2 equal pieces. Cut each of these 2 equal pieces to get 4 equal pieces.  
 3 cuts  $\rightarrow 3(2.5 \text{ min}) = 7.5 \text{ min}$

13.  $\$12.75 \times 40 = \$510$   
 $\$12.75 \times 1.5 \times 10 = \$191.25$   
 $\$510 + \$191.25 = \$701.25$   
 $\$701.25 - \$652.25 = \$49.00$

