





CHAPTER ONE

CRITICAL THINKING SKILLS

Exercise Set 1.1

1. Counting
2. Divisible
3. Hypothesis
4. Counterexample
5. Inductive
6. Deductive
7. Deductive
8. Inductive
9. Inductive reasoning, because a general conclusion was made from observation of specific cases.
10. Inductive reasoning, because a general conclusion was made from observation of specific cases.
11. $5 \times 5 = 25$
12. $12 \times 14 = 168$
13. $1 \ 5 (= 1 + 4) \ 10 (= 4 + 6) \ 10 (= 6 + 4) \ 5 (= 4 + 1) \ 1$
14. $100,000 = 10^5$
15. 
16. 
17. 
18. 
19. 10, 12, 14 (Add 2 to previous number.)
20. 19, 23, 27 (Add 4 to the previous number.)
21. 3, -3, 3 (Alternate 3 and -3.)
22. -3, -5, -7 (Subtract 2 from previous number.)
23. $\frac{1}{5}, \frac{1}{6}, \frac{1}{7}$ (Increase the denominator value by 1.)
24. 2500, -12,500, 62,500 (Multiply previous number by -5.)
25. 36, 49, 64 (The numbers in the sequence are the squares of the counting numbers.)
26. 21, 28, 36 ($15 + 6 = 21$, $21 + 7 = 28$, $28 + 8 = 36$)

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27. 34, 55, 89 (Each number in the sequence is the sum of the previous two numbers.)

29. There are three letters in the pattern.
 $39 \times 3 = 117$, so the 117th entry is the second R in the pattern. Therefore, the 118th entry is Y.

31. a) 36, 49, 64

b) Square the numbers 6, 7, 8, 9 and 10.

c) $8 \times 8 = 64$ $9 \times 9 = 81$

72 is not a square number since it falls between the two square numbers 64 and 81.

28. $\frac{243}{256}, -\frac{729}{1024}, \frac{2187}{4096}$ (Multiply previous number by $-\frac{3}{4}$.)

30. a) Answers will vary.
 b) The sum of the digits is 9.
 c) When a one- or two-digit number is multiplied by 9, repeated summing of the digits in the product yields the number 9.

32. a) 28 and 36

b) To find the 7th triangular number, add 7 to the 6th triangular number. To find the 8th triangular number, add 8 to the 7th triangular number. To find the 9th triangular number, add 9 to the 8th triangular number. To find the 10th triangular number, add 10 to the 9th triangular number. To find the 11th triangular number, add 11 to the 10th triangular number.

c)

$36 + 9 = 45; 45 + 10 = 55; 55 + 11 = 66; 66 + 12 = 78$

72 is not a triangular number since it falls between the consecutive triangular numbers 66 and 78.

33. Blue: 1, 5, 7, 10, 12 Purple: 2, 4, 6, 9, 11 Yellow: 3, 8

34. a) 19 (Each new row has two additional triangles.)

b) $1 + 3 + 5 + 7 + 9 + 11 + 13 + 15 + 17 + 19 = 100$

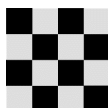
35. a) $\approx \$200,000$

b) We are using observation of specific cases to make a prediction.

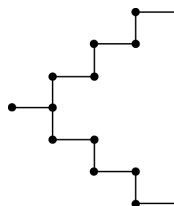
36. a) $\approx \$3.7$ trillion

b) We are using observation of specific cases to make a prediction.

- 37.



- 38.



39. a) You should obtain the original number.
 b) You should obtain the original number.
 c) Conjecture: The result is always the original number.

d) $n, 4n, 4n + 12, \frac{4n + 12}{4} = \frac{4n}{4} + \frac{12}{4} = n + 3, n + 3 - 3 = n$

40. a) You should obtain twice the original number.
 b) You should obtain twice the original number.
 c) Conjecture: The result is always twice the original number.

d) $n, 4n, 4n + 6, \frac{4n + 6}{2} = \frac{4n}{2} + \frac{6}{2} = 2n + 3, 2n + 3 - 3 = 2n$

41. 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) $n, n+1, n+(n+1) = 2n+1, 2n+1+9 = 2n+10, \frac{2n+10}{2} = \frac{2n}{2} + \frac{10}{2} = n+5, n+5-n = 5$
42. 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) $n, n+10, \frac{n+10}{5}, 5\left(\frac{n+10}{5}\right) = n+10, n+10-10 = n, n-n = 0$
43. $7-5 = 2$ is one counterexample.
44. $5 \div 2 = 2\frac{1}{2}$, which is not a counting number.
45. 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.
46. 900 is a three-digit number. The product of 900 and 900 is 810,000, which is not a five-digit number.
47. One and two are counting numbers. The difference of 1 and 2 is $1-2 = -1$, which is not a counting number.
48. The sum of the odd numbers 1 and 5 is 6, which is not divisible by 4.
49. a) The sum of the measures of the interior angles should be 180° .
 b) Yes, the sum of the measures of the interior angles should be 180° .
 c) Conjecture: The sum of the measures of the interior angles of a triangle is 180° .
50. a) The sum of the measures of the interior angles should be 360° .
 b) Yes, the sum of the measures of the interior angles should be 360° .
 c) Conjecture: The sum of the measures of the interior angles of a quadrilateral is 360° .
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

$$3. \quad \begin{aligned} &261 + 127.4 + 273.9 + 16.2 + 81.5 \\ &\approx 260 + 127 + 274 + 16 + 82 = 759 \end{aligned}$$

$$5. \quad 198,600 \times 3.072 \approx 200,000 \times 3.000 = 600,000$$

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

$$4. \quad \begin{aligned} &2.57 + 212.6 + 176.2 + 83 \\ &\approx 0 + 210 + 180 + 80 = 470 \end{aligned}$$

$$6. \quad 1854 \times 0.0096 \approx 1900 \times 0.01 = 19$$

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

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9.

$$51,608 \times 6981 \approx 50,000 \times 7000 = 350,000,000$$

11. $18\% \times 1576 \approx 20\% \times 1600 = 0.20 \times 1600 = 320$

13. $\frac{\$10.49}{5} \approx \frac{\$10}{5} = \$2$

15. $12 \text{ months} \times \$120.80 \approx 12 \times \$120 = \$1440$

17. One third of an annual profit of \$8795
 $\approx \frac{1}{3} \times \$9,000 = \$3000$

19. $95 \text{ lb} + 127 \text{ lb} + 210 \text{ lb} \approx 100 + 100 + 200 = 400 \text{ lb}$

21.

$$15\% \text{ of } \$26.32 \approx 15\% \text{ of } \$26 = 0.15 \times \$26 = \$3.9$$

23.

$$(\$65.99 + \$49.99 + \$49.95) - \$114.99 \\ \approx (\$66 + \$50 + \$50) - \$115 = \$166 - \$115 = \$51$$

25. $11 \times 8 \times \$1.50 \approx 10 \times 8 \times \$1.50 \\ = 10 \times \$12 = \120

27. $100 \text{ Mexican pesos} = 100 \times 0.083 \text{ U.S. dollars} \\ \approx 100 \times 0.08 \text{ U.S. dollars} = 8 \text{ U.S. dollars} \\ \$50 - \$8 = \42

29. $\approx 60 \text{ miles}$

10.

$$11\% \text{ of } 8221 \approx 10\% \text{ of } 8000 = 0.10 \times 8000 = 800$$

12. $296.3 \div 0.0096 \approx 300 \div 0.01 = 30,000$

14. $\frac{\$37.80}{20} \approx \frac{\$40}{20} = \$2$

16. $8\% \text{ of } \$11,250 \approx 0.08 \times \$11,000 = \$880$

18. $\$1.29 + \$6.86 + \$12.43 + \$25.62 + \$8.99 \\ \approx \$1 + \$7 + \$12 + \$26 + \$9 = \$55$

20. $\frac{3.25 \text{ lb}}{6} \approx \frac{3.00 \text{ lb}}{6} = 0.5 \text{ lb}$

22. $\frac{\$400}{\$23} \approx \frac{\$400}{\$25} = 16$

24.

$$\text{Team A: } 189 + 172 + 191 \approx 190 + 170 + 190 = 550$$

$$\text{Team B: } 183 + 229 + 167 \approx 180 + 230 + 170 = 580 \\ 580 - 550 = 30 \text{ lb}$$

26.

$$6 \text{ min, } 25 \text{ sec} \times 26.2 \text{ mi} \\ \approx 6.5 \text{ min} \times 26 \text{ mi} = 169 \text{ min} \\ \frac{169 \text{ min}}{60 \text{ min}} \approx 3 \text{ hours}$$

28. $\$973 + 6(\$61) + 6(\$97) + 6(\$200) \\ \approx \$970 + 6(\$60) + 6(\$100) + 6(\$200) \\ = \$970 + \$360 + \$600 + \$1200 = \$3130$

30. $\approx 55 \text{ miles}$

31. a) 33% of 700 \approx 30% of 700 = $0.30 \times 700 = 210$
 b) 9% of 700 \approx 10% of 700 = $0.10 \times 700 = 70$
 c) 24% of 700 \approx 25% of 700 = $0.25 \times 700 = 175$
32. a) 100
 b) 50
 c) 125
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) $2(410) + 4(545)$
 $\approx 2(400) + 4(550) = 800 + 2200 = 3000$ calories
 b) Running: $4(920) \approx 4(925) = 3700$ calories
 Casual bike riding: $4(300) = 1200$ calories,
 $3700 - 1200 = 2500$ 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. ≈ 120 bananas
40. ≈ 160 berries
41. 150°
42. 315°
43. 10%
44. 25%
45. 9 square units
46. 12 square units
47. 150 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) Answers will vary.

Exercise Set 1.3

1. $\frac{1 \text{ in.}}{12 \text{ mi}} = \frac{5.75 \text{ in.}}{x \text{ mi}}$
 $1x = 12(5.75)$
 $x = 69$ mi
2. $\frac{1 \text{ in.}}{2.5 \text{ yd}} = \frac{20.1 \text{ in.}}{x \text{ yd}}$
 $1x = 2.5(20.1)$
 $x = 50.25$ yd

$$3. \quad \frac{3 \text{ ft}}{1.2 \text{ ft}} = \frac{x \text{ ft}}{19.36 \text{ ft}}$$

$$3(19.36) = 1.2x$$

$$\frac{58.08}{1.2} = \frac{1.2x}{1.2}$$

$$x = \frac{58.08}{1.2} = 48.4 \text{ ft}$$

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

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

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

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

$$5. \quad 6.4\% \text{ of } \$7605 = 0.064 \times \$7605 = \$486.72$$

$$\$7605 + \$486.72 = \$8091.72 \approx \$8092$$

$$6. \quad 30\% \text{ of } \$117 = 0.30 \times \$117 = \$35.10$$

$$\$117 - \$35.10 = \$81.90$$

$$7. \quad \text{a) Ent./Misc.: } 19.4\% \text{ of } \$1750 = 0.194 \times \$1750 \\ = \$339.50$$

$$\text{Food: } 12.7\% \text{ of } \$1750 = 0.127 \times \$1750 \\ = \$222.25$$

$$\$339.50 - \$222.25 = \$117.25$$

b)

$$\text{Housing: } 33.9\% \text{ of } \$1750 = 0.339 \times \$1750 \\ = \$593.25$$

$$\text{Transportation: } 17\% \text{ of } \$1750 = 0.17 \times \$1750 \\ = \$297.50$$

$$\$593.25 - \$297.50 = \$295.75$$

$$8. \quad \text{a) } 11 - 20 \text{ years: } 25\% \text{ of } 6.2 \text{ million} = 0.25 \times 6.2 \\ = 1.55 \text{ million}$$

$$0 - 3 \text{ years: } 16\% \text{ of } 48 \text{ million} = 0.16 \times 6.2 \\ = 0.992 \text{ million}$$

$$1.55 - 0.992 = 0.558 \text{ million} = 558,000$$

$$\text{b) } 4 - 10 \text{ years: } 33\% \text{ of } 6.2 \text{ million} = 0.33 \times 6.2 \\ = 2.046 \text{ million}$$

$$11 - 20 \text{ years: } 25\% \text{ of } 6.2 \text{ million} = 0.25 \times 6.2 \\ = 1.55 \text{ million}$$

$$2.046 - 1.55 = 0.496 \text{ million} = 496,000$$

$$9. \quad \text{a) } 54.46\% \text{ of } \$200,000 = 0.5446 \times \$200,000 \\ = \$108,920$$

$$\$200,000 + \$108,920 = \$308,920$$

$$\text{b) } 2.9\% \text{ of } \$180,000 = 0.029 \times \$180,000 \\ = \$5220$$

$$\$180,000 + \$5220 = \$185,220$$

$$\text{c) Flagstaff, AZ: } -1.85\% \text{ of } \$200,000 \\ = -0.0185 \times \$200,000 \\ = -\$3700$$

$$\$200,000 - \$3700 = \$196,300$$

$$\text{Bellingham, WA: } -1.04\% \text{ of } \$200,000 \\ = -0.0104 \times \$200,000 \\ = -\$2080$$

$$\$200,000 - \$2080 = \$197,920$$

$$\$197,920 - \$196,300 = \$1620$$

$$11. \quad \$120 + \$80(15) = \$120 + \$1200 = \$1320$$

$$\text{Savings: } \$1320 - \$1250 = \$70$$

$$10. \quad 40 \text{ rides} \times \$2 \text{ per ride} = \$80. \text{ In order for the cost of rides with the } \$81 \text{ MetroCard to be less than the cost of the rides without the MetroCard, Chandler would have to take 41 rides per month.}$$

$$\frac{\$81}{41 \text{ rides}} \approx \$1.98 \text{ per ride}$$

$$12. \quad 2005: \$20 \times 2 \text{ million} = \$40 \text{ million}$$

$$2006: \$20 + 0.25 \times \$20 = \$25$$

$$\$25 \times 2 \text{ million} = \$50 \text{ million}$$

$$50 - 40 = \$10 \text{ million or } \$10,000,000$$

13.

$$15 \text{ year mortgage: } \$777.83(12)(15) = \$140,009.4$$

$$30 \text{ year mortgage: } \$521.65(12)(30) = \$187,794.0$$

$$\text{Savings: } \$187,794.00 - \$140,009.40 = \$47,784.6$$

15. a) $10 \times 10 \times 10 \times 10 = 10,000$

b) 1 in 10,000

17. $38,687.0 \text{ mi} - 38,451.4 \text{ mi} = 235.6 \text{ mi}$

$$\frac{235.6 \text{ mi}}{12.6 \text{ gal}} \approx 18.698 \approx 18.7 \text{ mpg}$$

19. By mail: $(\$52.80 + \$5.60 + \$8.56) \times 4$

$$= \$66.96 \times 4 = \$267.84$$

$$\text{Tire store: } \$324 + 0.08 \times \$324$$

$$= \$324 + \$25.92 = \$349.92$$

$$\text{Savings: } \$349.92 - \$267.84 = \$82.08$$

21. $15,000 \text{ ft} - 3000 \text{ ft} = 12,000 \text{ ft}$ decrease in elevation. Temperature increases 2.4°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.

14. Points needed for 80 average:

$$80(5) = 400 \text{ points}$$

Wallace's points so far:

$$79 + 93 + 91 + 68 = 331 \text{ points}$$

$$\text{Grade needed on fifth exam: } 400 - 331 = 69$$

16. a) $\frac{460}{50} = 9.2 \text{ min}$

b) $\frac{1550}{25} = 62 \text{ min}$

c) $\frac{1400}{35} = 40 \text{ min}$

d) $\frac{1550}{80} + \frac{2200}{80} = \frac{3750}{80} \approx 47 \text{ min}$

18. a) $40 \times \$8.50 \times 52 = \$17,680$ b) Each week he makes $40 \times \$8.50 = \340 .

$$\frac{\$1275}{\$340} = 3.75 \text{ weeks}$$

$$\$885 - \$25(15) = \$885 - \$375 = \$510$$

20. $\frac{\$510}{\$30} = 17 \text{ hours}$

22. a) $\$620(0.12) = \74.40

b) $\$1200(0.22) = \264

c) The store lost $\$1200 - \$1000 = \$200$ on the purchase.

$$\text{Store's profit: } \$264 - \$200 = \$64$$

23. Steve and Maureen paid more than \$9362.50 but less than \$26,687.50, so they paid \$9362.50 plus 25% of the amount over \$68,000.

$$\$13,365 - \$9362.50 = \$4002.50$$

$$\text{The amount over \$68,000 was } \frac{\$4002.5}{0.25} = \$16,010$$

$$\$68,000 + \$16,010 = \$84,010$$

24. a) $0.1 \text{ cm}^3 \times 60 \text{ sec} \times 60 \text{ min} \times 24 \text{ hr} \times 365 \text{ days}$
 $= 3,153,600 \text{ cm}^3$
 b) $30 \text{ cm} \times 20 \text{ cm} \times 20 \text{ cm} = 12,000 \text{ cm}^3$

$$0.1 \text{ cm}^3 \times 60 \text{ sec} \times 60 \text{ min} \times 24 \text{ hr} = 8640 \text{ cm}^3$$

$$\frac{12,000}{8640} = 1.3\bar{8} \approx 1.4 \text{ days}$$

25. a)
 $1 \text{ oz} \times 60 \text{ min} \times 24 \text{ hr} \times 365 \text{ days} = 525,600 \text{ oz}$
 $\frac{525,600}{128} = 4106.25 \text{ gal}$

b)
 $\frac{4106.25}{1000} \times \$11.20 = 4.10625 \times \$11.20 = \45.99

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) $140,000,000 \times 35.61 = 4,985,400,000 \text{ gal}$

26. a) Short: $\$33 \times 5 = \165
 Long: $\$18 \times 5 = \90
 $\$165 - \$90 = \$75$; Jeff saves \$75.
 b) \$6 for first hour, plus $6 \times \$3$ for remaining 3 hours, for a total of \$24.
 c) Short: $\$6 + 8 \times \$3 = \$30$
 Long: \$18
 Long term is cheaper by \$12.

28. a) Yes, divide the total amount spent by the amount spent per capita.

b) $\frac{\$45,592.59}{\$151.40} \approx 301.14 \text{ million}$

c) $\frac{\$11,237.53}{\$184.90} \approx 60.78 \text{ million}$

29. Cost after 1 year: $\$799 + 0.06(\$799)$
 $= \$799 + \$47.94 = \$846.94$
 Cost after 2 years: $\$846.94 + 0.06(\$846.94)$
 $= \$846.94 + \$50.82 = \$897.76$

31. After paying the \$100 deductible, Yungchen must pay 20% of the cost of x-rays.

First x-ray:

$$\$100 + 0.20(\$540) = \$100 + \$108 = \$208$$

Second x-ray: $0.20(\$920) = \184

Total: $\$208 + \$184 = \$392$

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.

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 $16 \text{ tbsp} = 1 \text{ cup}$)

$$\text{b) water/milk: } \frac{2+3.75}{2} = \frac{5.75}{2} = 2.875 \text{ cups} = 2\frac{7}{8} \text{ cups}$$

$$\text{salt: } \frac{0.25+0.5}{2} = \frac{0.75}{2} = 0.375 \text{ tsp} = \frac{3}{8} \text{ tsp}$$

$$\text{cream of wheat: } \frac{0.5+0.75}{2} = \frac{1.25}{2} = 0.625 \text{ cups} = \frac{5}{8} \text{ cup} = \frac{5}{8}(16 \text{ tbsp}) = 10 \text{ tbsp}$$

$$\text{c) water/milk: } 3\frac{3}{4} - 1 = \frac{15}{4} - \frac{4}{4} = \frac{11}{4} = 2\frac{3}{4} \text{ cups}$$

$$\text{salt: } \frac{1}{2} - \frac{1}{8} = \frac{4}{8} - \frac{1}{8} = \frac{3}{8} \text{ tsp}$$

$$\text{cream of wheat: } \frac{3}{4} - \frac{3}{16} = \frac{12}{16} - \frac{3}{16} = \frac{9}{16} \text{ cup} = 9 \text{ tbsp}$$

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 $\frac{1}{2}$ cup is not twice 3 tbsp.

$$34. \text{ a) rice: } \frac{1}{2}(4) = 2 \text{ cups}$$

$$\text{b) rice: } 1(2) = 2 \text{ cups}$$

$$\text{water: } 1\frac{1}{3}(4) = \frac{4}{3}(4) = \frac{16}{3} = 5\frac{1}{3} \text{ cups}$$

$$\text{water: } 2\frac{1}{4}(2) = \frac{9}{4}(2) = \frac{18}{4} = 4\frac{2}{4} = 4\frac{1}{2} \text{ cups}$$

$$\text{salt: } \frac{1}{4}(4) = 1 \text{ tsp}$$

$$\text{salt: } \frac{1}{2}(2) = 1 \text{ tsp}$$

$$\text{butter/margarine: } 1(4) = 4 \text{ tsp}$$

$$\text{butter/margarine: } 2(2) = 4 \text{ tsp}$$

$$\text{c) rice: } \frac{1}{2} + 1\frac{1}{2} = \frac{1}{2} + \frac{3}{2} = \frac{4}{2} = 2 \text{ cups}$$

$$\text{water: } 1\frac{1}{3} + 3\frac{1}{3} = \frac{4}{3} + \frac{10}{3} = \frac{14}{3} = 4\frac{2}{3} \text{ cups}$$

$$\text{salt: } \frac{1}{4} + \frac{3}{4} = \frac{4}{4} = 1 \text{ tsp}$$

$$\text{butter/margarine: } 1 \text{ tsp} + 1 \text{ tbsp} = 1 \text{ tsp} + 3 \text{ tsp} = 4 \text{ tsp}$$

$$\text{d) rice: } 3 - 1 = 2 \text{ cups}$$

$$\text{water: } 6 - 2\frac{1}{4} = \frac{24}{4} - \frac{9}{4} = \frac{15}{4} = 3\frac{3}{4} \text{ cups}$$

$$\text{salt: } 1\frac{1}{2} - \frac{1}{2} = 1 \text{ tsp}$$

$$\text{butter/margarine: } 2 \text{ tbsp} = 2(3\text{tsp}) = 6 \text{ tsp}$$

$$6 \text{ tsp} - 2 \text{ tsp} = 4 \text{ tsp}$$

e) Differences exist in water because the amount for 4 servings is not twice that for 2 servings.

$$35. \text{ a) } \$425 - \$240 \text{ (one box of 20 DVDs)} = \$185$$

$$\$185 - \$180 \text{ (one box of 12 DVDs)} = \$5$$

One box of 20 DVDs and one box of 12 DVDs are the maximum number of DVDs that can be purchased.

$$\text{b) } \$240 + \$180 = \$420$$

36. Mark will win.

$$37. \text{ } 1 \text{ ft}^2 \text{ would be } 12 \text{ in. by } 12 \text{ in.}$$

$$\text{Thus, } 1 \text{ ft}^2 = 12 \text{ in.} \times 12 \text{ in.} = 144 \text{ in.}^2$$

$$38. \text{ } 1 \text{ ft}^3 = 12 \text{ in.} \times 12 \text{ in.} \times 12 \text{ in.} = 1728 \text{ in.}^3$$

39. Area of original rectangle =
- lw

$$\text{Area of new rectangle} = (2l)(2w) = 4lw$$

Thus, if the length and width of a rectangle are doubled, the area is 4 times as large.

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 or increases eight-fold.

$$43. \frac{10 \text{ pieces}}{\$x} = \frac{1000 \text{ pieces}}{\$10}$$

$$1000x = 10(10)$$

$$\frac{1000x}{1000} = \frac{100}{1000}$$

$$x = \frac{100}{1000} = \$0.10 = 10\text{¢}$$

$$44. \text{Left side: } 1(-6) = -6$$

$$\text{Right side: } 1(2) = 2$$

$$2(-2) = -4$$

$$1(3) = 3$$

$$-6 + -4 = -10$$

$$1(6) = 6$$

$$2 + 3 + 6 = 11$$

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

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

48. a) Place the object, 1 g, and 3 g on one side and 9 g on the other side.

b) Place the object, 9 g, and 3 g on one side and 27 g and 1 g on the other side.

50. Eight pieces

$$20 \text{ ft} \times 20 \text{ ft} = 400 \text{ ft}^2$$

$$40. \quad 5 \text{ ft} \times 5 \text{ ft} = 25 \text{ ft}^2$$

$$\frac{400 \text{ ft}^2}{25 \text{ ft}^2} = 16 \text{ squares}$$

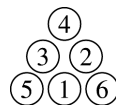
42. 11 ft is one-sixth of the pole, so the length is $6 \times 11 \text{ ft} = 66 \text{ ft}$.

45. 3

$$47. \text{ a) } (4 \times 4) + (3 \times 3) + (2 \times 2) + (1 \times 1) = 16 + 9 + 4 + 1 = 30$$

$$\text{ b) } (7 \times 7) + (6 \times 6) + (5 \times 5) + 30 = 49 + 36 + 25 + 30 = 140$$

- 49.



- 51.

8	6	16
18	10	2
4	14	12

- 52.

10	5	6
3	7	11
8	9	4

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

$$10 + 14 + 12 + 8 = 44$$

The sum of the four corner entries is

4 times the number in the center of the middle row.

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.

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.

	8	
6	7	8
④		⑨
	6	

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

62. With umbrella policy:

Mustang reduced premium:

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

Focus reduced premium:

$$\$1530 - 0.12(\$1530)$$

$$= \$1530 - \$183.60 = \$1346.40$$

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

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. Mary is the skier.

65. Areas of the colored regions are:

$$1 \times 1, 1 \times 1, 2 \times 2, 3 \times 3, 5 \times 5, 8 \times 8, 13 \times 13,$$

$$21 \times 21; 1 + 1 + 4 + 9 + 25 + 64 + 169 + 441$$

$$= 714 \text{ square units}$$

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

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

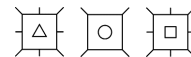
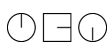
After second store: $\frac{1}{2}\left(\frac{1}{2}x - 20\right) - 20 = \frac{1}{4}x - 30$

This is equal to \$0, so the original amount was \$120.

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. 27, 32, 37 (Add 5 to previous number.)
2. 26, 37, 50 ($17 + 9 = 26$, $26 + 11 = 37$, $37 + 13 = 50$)
3. -48, 96, -192 (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 $\frac{1}{2}$.)
- 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. $210,302 \times 1992 \approx 210,000 \times 2000 = 420,000,000$
14. $215.9 + 128.752 + 3.6 + 861 + 792 \approx 200 + 100 + 0 + 900 + 800 = 2000$
15. 19% of 1025 \approx 20% of 1000 $= 0.20 \times 1000 = 200$
16. Answers will vary.
17. 52 shovels \times \$99.97 \approx 50 \times 100 = \$5000
18. 7% of \$1999 \approx 7% of 2000 $= 0.07 \times 2000 = \$140$
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. 2.35 million - 1.95 million = 0.4 million
23. 2.8 million - 1.8 million = 1.0 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(\$2.69) = \10.76 for four six-packs
Savings: $\$10.76 - \$9.60 = \$1.16$

29. Cost per person with 5 people: $\frac{\$445}{5} = \89
Cost per person with 6 people: $\frac{\$510}{6} = \85
 $\$89 - \$85 = \$4$ savings

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

33. $\$5000 - 0.30(\$5000) = \$5000 - \1500
 $= \$3500$ take-home
 28% of $\$3500 = 0.28 \times \$3500 = \$980$

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 total weight of the four women

- Taylor: \$45 for 8 hours
Admar: $\$8 \times 6$ hours = \$48
\$48 $-$ \$45 = \$3
Taylor Rental is cheaper by \$3.

30. a) $\frac{30}{2500} = \frac{x}{24,000}$; $x = \frac{30 \times 24,000}{2500} = 288$ lb
b) $\frac{150}{30} = 5$ bags, and $5 \times 2500 = 12,500$ ft²

32. $\frac{1.5 \text{ mg}}{10 \text{ lb}} = \frac{x \text{ mg}}{47 \text{ lb}}$
 $10x = 47(1.5)$
 $\frac{10x}{10} = \frac{70.5}{10}$
 $x = 7.05$ 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) $\frac{5280 \text{ ft}}{1} \times \frac{1 \text{ hr}}{60 \text{ min}} \times \frac{1 \text{ min}}{60 \text{ sec}} = \frac{5280 \text{ ft}}{3600 \text{ sec}} \approx 1.47 \text{ ft/sec}$

- b) $\frac{55 \text{ mi}}{1 \text{ hr}} \times \frac{5280 \text{ ft}}{1 \text{ mi}} \times \frac{1 \text{ hr}}{60 \text{ min}} \times \frac{1 \text{ min}}{60 \text{ sec}} = \frac{290,400 \text{ ft}}{3600 \text{ sec}}$
 $\approx 80.67 \text{ ft/sec}$

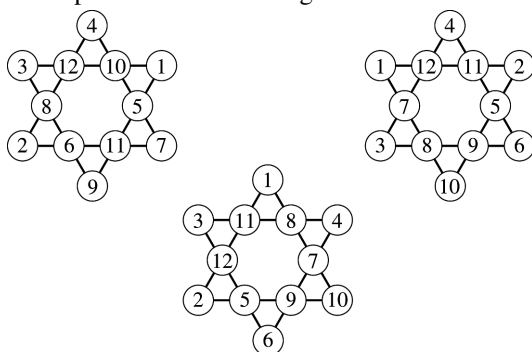
- 38.

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.

$$\frac{x}{4} = 130, \quad x = 520, \quad \frac{520 + 180}{5} = \frac{700}{5} = 140 \text{ lb}$$

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. $\frac{n(n+1)}{2} = \frac{500(501)}{2} = \frac{250,500}{2} = 125,250$
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 each side of equal length. The figure will have one antenna.
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. 27, 33, 39 (Add 6 to previous number.)
2. $\frac{1}{16}, \frac{1}{32}, \frac{1}{64}$ (Multiply previous number by $\frac{1}{2}$.)
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. $0.21 \times 82,000 \approx 0.2 \times 80,000 = 16,000$

6. 9 square units

8. a) 3.5 million

b) 0.3 million

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.

<u>6 packs</u>	<u>Indiv. cans</u>	<u>Number of cans</u>
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.
 ≈ 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

5. $\frac{175,000}{0.09} \approx \frac{170,000}{0.1} \approx 1,700,000$

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.

$$\$85.99 - \$59.99 = \$26$$

9. $\frac{\$26}{\$0.40} = 65$ additional minutes

11. 1 cut yields 2 equal pieces. Cut each of these 2 equal pieces to get 4 equal pieces.

$$3 \text{ cuts} \rightarrow 3(2.5 \text{ min}) = 7.5 \text{ min}$$

13. $\$12.75 \times 40 = \510

$$\$12.75 \times 1.5 \times 10 = \$191.25$$

$$\$510 + \$191.25 = \$701.25$$

$$\$701.25 - \$652.25 = \$49.00$$

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

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

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: $(10+2) \times (12+2) = 12 \times 14 = 168\text{ m}^2$
 Area of lawn only: $10 \times 12 = 120\text{ m}^2$
 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. $4 \times 3 \times 2 \times 1 = 24$)

Group Projects

1. a) $\frac{\$325}{3} \approx \108.33
 b) Let x = the amount before tax
 $x + 0.07x = 325$
 $\frac{1.07x}{1.07} = \frac{325}{1.07}$
 $x = 303.7383178 \approx \303.74
 $\frac{\$303.74}{3} = 101.24\bar{6} \approx \101.25
- c) Inductive reasoning - arriving at a general conclusion from specific cases
 d) Combination set: $\$62.00 - (\$62.00 \times 0.10) = \$62.00 - \$6.20 = \$55.80$
 Individual sets: $2 \times \$36.00 = \$72.00, \$72.00 - (\$72.00 \times 0.20) = \$72.00 - \$14.40 = \$57.60$
 Therefore, the combination set is cheaper.
- e) Combination with tax: $\$55.80 \times 1.07 \approx \59.71
 Individual set with tax: $\$57.60 \times 1.07 \approx \61.63
 $\$61.63 - \$59.71 = \$1.92$
2. a) - d) Answers will vary.
 e) $400\text{ mi} \div 50\text{ mi/hr} = 8\text{ hrs}, 9\text{ A.M.} + 8\text{ hrs} = 5\text{ P.M.}$
 f) - h) Answers will vary.
- 3.
- | Order | Name | Apparel |
|-------|-------|---------|
| 1 | Ernie | holster |
| 2 | Zeke | vest |
| 3 | Jed | chaps |
| 4 | Tex | Stetson |