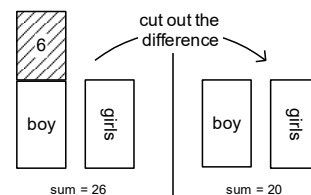


Answer Key

- | | | | |
|------------------------------------|---------------------|--|--------------------------------------|
| 1. 11.1 | 37. $\frac{1}{7}$ | 70. 7.6 | 97. $3 \times 3 + 2 \times 2 = 13$ |
| 2. 12.3 | 38. $\frac{3}{10}$ | 71. 19 | 98. $20 - 3 \times 3 = 11$ |
| 3. 12.8 | 39. $\frac{1}{4}$ | 72. 2 | $11 \div 2 = 5R1$ |
| 4. 11.9 | 40. $\frac{1}{5}$ | 73. 42 | 5 packs of paper |
| 5. 14.8 | 41. $\frac{5}{7}$ | 74. 55 | 99. $480 \div 40 = \$12$ |
| 6. 14.7 | 42. $\frac{2}{9}$ | 75. 5 | 100. $4 \times 20 \times 25 = 2000$ |
| 7. 5.3 | 43. $\frac{2}{5}$ | 76. 6 | 101. $225 \div 25 = 9$ tickets |
| 8. 0.6 | 44. $\frac{5}{6}$ | 77. 80 | 102. $10 \times 3 = 30$ |
| 9. 4.1 | 45. $\frac{4}{9}$ | 78. 3 | 103. $30 + 10 = 40$ quarts |
| 10. 1 | 46. $\frac{1}{8}$ | 79. 352 | (bigger) |
| 11. 5.8 | 47. $\frac{1}{6}$ | 80. 420 | $30 - 10 = 20$ quarts |
| 12. 4.7 | 48. $\frac{3}{7}$ | 81. $400 \div 25 = 16$ gallons | (smaller) |
| 13. 2.7 | 49. $\frac{3}{4}$ | 82. $12 \times (3 + 4 + 5) = 144$ | 104. $120 \div 60 = 2$ hrs |
| 14. 4.4 | 50. $\frac{4}{7}$ | 83. $9 + 10 + 11 + 12 = 42$ | 105. $13 - 9 = 4$ |
| 15. 13.84 | 51. $11\frac{1}{6}$ | 9 stones = $9 \times 14 = 126$ pounds | $4 \times 2 = 8$ (pounds) |
| 16. 6.97 | 52. $11\frac{1}{8}$ | 84. $8 \times 5 = 40$ | 106. $13 - 8 = 5$ (pounds) |
| 17. 8.81 | 53. $8\frac{1}{9}$ | 9 weeks $\times 5 = 45$ | 107. $160 \times 4 = 640$ (per year) |
| 18. 13.53 | 54. $10\frac{1}{4}$ | 85. $180 \times 8 \times 6 = 8640$ | 640 $\times 3 = \$1920$ |
| 19. 11.97 | 55. $6\frac{2}{6}$ | 86. $5 \times 2 + 6 \times 4 = 34$ | 108. $12 \div 3 = 4$ |
| 20. 9.98 | 56. $9\frac{2}{4}$ | 87. $12 \times 5 \times 4 = 240$ in ³ | $4 \times 2.5 = \$10$ |
| 21. {1, 2, 4, 8, 16, 32} | 57. $11\frac{1}{6}$ | 88. $83 + 3 \times 5 = 98$ pounds | 109. $26 - 6 = 20$ |
| 22. {1, 5, 7, 35} | 58. $10\frac{5}{8}$ | 89. $350 \div 7 = \$50$ | $20 \div 2 = 10$ (girls) |
| 23. {1, 2, 3, 4, 6, 9, 12, 18, 36} | 59. $8\frac{5}{9}$ | 90. $2 \times 4 \times 3 = 24$ hours | $10 + 6 = 16$ (boys) |
| 24. {1, 2, 19, 38} | 60. $7\frac{1}{6}$ | 91. $36 \times (\frac{1}{2} + \frac{1}{3} + \frac{1}{4}) \times \$2 = (18 + 12 + 9) \times 2 = 39 \times 2 = \78 | |
| 25. {1, 3, 13, 39} | 61. 8 & 8 (R) | 92. $3 \times 36 - 39 = 108 - 39 = 69$ left | |
| 26. {1, 2, 4, 5, 8, 10, 20, 40} | 62. 104 | 93. $10.50 \div 7 = \$1.50$ each box | |
| 27. {1, 2, 3, 6, 7, 14, 21, 42} | 63. 17.6 | 94. $5 \times 8 = 40$
$40 \times 50 = 2000$ | |
| 28. {1, 2, 4, 11, 22, 44} | 64. 13.8 | 95. (a) B
(b) 1 gallon = 4 quarts = 8 pint
3 gallons = 24 pints < 25 pints
$25 - 24 = 1$ pint | |
| 29. {1, 3, 5, 9, 15, 45} | 65. 11 | 96. $15 \div 5 = 3$ minutes | |
| 30. {2, 3, 5, 7, 11, 13, 17, 19} | 66. 228 | | |
| 31. $\frac{2}{7}$ | 67. 3 | | |
| 32. $\frac{5}{8}$ | 68. 9 | | |
| 33. $\frac{2}{3}$ | 69. 126 | | |
| 34. $\frac{1}{9}$ | | | |
| 35. $\frac{3}{5}$ | | | |
| 36. $\frac{4}{5}$ | | | |



Answer Key

- | | | | |
|-----------------------------------|------------------------------------|--------------------|--------------------|
| 1. $\frac{35}{2} = 17\frac{1}{2}$ | 6. $\frac{15}{2} = 7\frac{1}{2}$ | 11. 3.5 | |
| 2. $\frac{16}{3} = 5\frac{1}{3}$ | 7. $\frac{32}{3} = 10\frac{2}{3}$ | 12. 9 | 16. 20 |
| 3. $\frac{35}{3} = 11\frac{2}{3}$ | 8. $\frac{9}{2} = 4\frac{1}{2}$ | 13. 49 | 17. 9 |
| 4. $\frac{15}{2} = 7\frac{1}{2}$ | 9. $\frac{15}{2} = 7\frac{1}{2}$ | 14. 81 | 18. 12 |
| 5. $\frac{21}{5} = 4\frac{1}{5}$ | 10. $\frac{20}{3} = 6\frac{2}{3}$ | 15. 49 | 19. 48 |
| | | | 20. 60 |
| 21. 6.3 | 26. 28 | 31. $\frac{1}{5}$ | 36. $\frac{3}{20}$ |
| 22. 21 | 27. 11 | 32. $\frac{1}{8}$ | 37. $\frac{5}{12}$ |
| 23. 63 | 28. 18 | 33. $\frac{4}{15}$ | 38. $\frac{7}{24}$ |
| 24. 99 | 29. 51 | 34. $\frac{6}{25}$ | 39. $\frac{1}{9}$ |
| 25. 63 | 30. 65 | 35. $\frac{1}{9}$ | 40. $\frac{9}{40}$ |
| 41. 45 | 46. 250 | 51. 60 | 56. 100 |
| 42. 32 | 47. 72 | 52. 39 | 57. 40 |
| 43. 4.2 | 48. 360 | 53. 0.01 | 58. 5 |
| 44. 25 | 49. 35 | 54. .0008 | 59. 70 |
| 45. 36 | 50. 64 | 55. 16 | 60. 80 |
| 61. 36 | 66. 12 | 71. \$840 | 76. 79 (Wednesday) |
| 62. 10 | 67. 9 | 72. <u>8 cases</u> | 77. 60 points |
| 63. 12 | 68. 4 | 73. 50 minutes | 78. 5.65 |
| 64. 0.2 | 69. {2, 4, 5, 10, 20, 25, 50, 100} | 74. 10 (marbles) | 79. \$3.55 |
| 65. 180 | 70. 2 | 75. 5 | 80. \$2.10 |
| 81. 26 | 86. 175 | 91. 82 | 96. 8 |
| 82. \$0.45 | 87. 9 | 92. 1,002,304 | 97. True |
| 83. 420 words | 88. <u>10 wahsers</u> | 93. 4 & 1/16 | 98. 130 |
| 84. <u>18 posters</u> | 89. \$25.20 | 94. 4 | 99. 20 dimes |
| 85. <u>B</u> | 90. B | 95. 11 | 100. 8 |

MAP 249+ (T3) Issue 10

101. $17 - 5 = 12$
 $12 \div 2 = \boxed{6 \text{ yrs old}}$

102. $8 + 7 + 6 = \boxed{21}$

103. 6

104. 24 yrs old

105. Jon = 10
 Ken = 20

106. 1 yard = 3 feet = 36
 in
 $36 - 1 = \boxed{35 \text{ cuts}}$

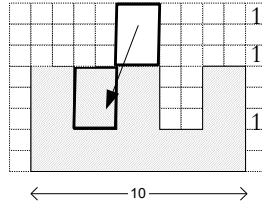
107. In three years,
 P = 30, Q = 10
 At present,
 P = 27, Q = 7

108. $0.4 \times 5 = 2$

$4.4 - 2 = 2.4$

$2.4 \div 2 = \boxed{\$1.20}$

109. $10 \times 5 - 3 \times 2 = 44$



110. $\frac{3(\text{pure})}{7(\text{alcohol})} = \frac{\Delta(\text{pure})}{56(\text{alcohol})}$
 $\Delta = 24$

111. $175:100 = 7:4$

112. $120:144 = 10:12 =$

$5:6$

113. Δ

$\checkmark \text{ midsize: } \frac{210}{7} = 30$

minivan: $\frac{246}{10} = 24.6$

114. A

Tigers = $\frac{9}{36} = \frac{1}{4} = 0.25$

$< 0.275 = \underline{\text{Bucks}} \checkmark$

115. C

Both have the same
 rate.

$\frac{20}{24} = \frac{5}{6}$

$\frac{30}{36} = \frac{5}{6}$

116. 6 min

117. 9 min

118. $\frac{40}{50} = \frac{4}{5}$

$\frac{4}{5} \times 3 = 2.4 \text{ min}$

119. 10.4 lb

120. (a) $120 \times \frac{5}{30} = \underline{20 \text{ (Ann)}}$

(b) $120 \times \frac{4}{20} = \underline{24 \text{ (Ben)}}$

Answer Key

- | | | | |
|--------------------------|------------------------|--------------------------------------|---|
| 1. 144 | 6. 289 | 11. $\frac{1}{2}$ | 16. $4 + \frac{1}{5} = 4\frac{1}{5}$ |
| 2. 169 | 7. 324 | 12. $\frac{1}{2}$ | 17. $9 + \frac{1}{5} = 9\frac{1}{5}$ |
| 3. 196 | 8. 576 | 13. $2 + \frac{1}{3} = 2\frac{1}{3}$ | 18. $12 + \frac{3}{5} = 12\frac{3}{5}$ |
| 4. 225 | 9. 625 | 14. $5 + \frac{1}{3} = 5\frac{1}{3}$ | 19. $15 + \frac{15}{14} = 16\frac{1}{14}$ |
| 5. 256 | 10. 7, 25 | 15. $4 + \frac{1}{3} = 4\frac{1}{3}$ | 20. $20 + \frac{25}{21} = 21\frac{4}{21}$ |
| 21. $47\frac{1}{7}$ | 26. $76\frac{7}{18}$ | 31. $\frac{1}{150}$ | 36. $\frac{37}{105}$ |
| 22. $60\frac{5}{32}$ | 27. $31\frac{1}{14}$ | 32. $\frac{11}{15}$ | 37. $\frac{41}{84}$ |
| 23. $66\frac{2}{15}$ | 28. $31\frac{1}{5}$ | 33. $\frac{13}{90}$ | 38. $\frac{5}{12}$ |
| 24. $74\frac{2}{35}$ | 29. $32\frac{1}{7}$ | 34. $\frac{21}{100}$ | 39. $\frac{67}{360}$ |
| 25. $75\frac{2}{35}$ | 30. $32\frac{4}{9}$ | 35. $\frac{29}{60}$ | 40. $\frac{8}{135}$ |
| 41. 60 | 46. 0.28 | 51. 2,100 | 56. 0.28 |
| 42. 6 | 47. 0.63 | 52. 4,500 | 57. 0.72 |
| 43. 30 | 48. 0.175 | 53. 4,000 | 58. 0.4 |
| 44. 75 | 49. 7.5 | 54. 0.025 | 59. \$0.64 |
| 45. 140 | 50. 1.6 | 55. 3.6 | 60. 0.6 |
| 61. 320,000 | 66. 180 | 71. 50,000 | 76. 0.032 |
| 62. 18,000 | 67. 49 | 72. 300,000 | 77. 0.32 |
| 63. 0.0008 | 68. 0.003 | 73. 20,000 | 78. 0.02 |
| 64. 0.006 | 69. 4.9 | 74. 1,200 | 79. 2,400 |
| 65. 0.08 | 70. 0.0048 | 75. 0.04 | 80. 18 |
| 81. 3 (in) | 86. 32 trees. | 91. 174.2 (mi.) | 96. $2(16 + 8) = 48$ |
| 82. \$500 | 87. $37\frac{1}{4}$ ft | 92. $16 \div 4 = 4$ | 97. 100 |
| 83. 28 (smaller squares) | 88. 200 | 93. $4 \times 4 = 16$ | 98. 100 |
| 84. 30 | 89. 98 (in.) | 94. $4 \times 2 = 8$ | 99. 24 cm^2 |
| 85. 900 in^2 | 90. 56 (yards) | 95. $16 \times 8 = 128$ | 100. $20 \times 2 \div 10 = 4$ |
| 101. 15 gal | 106. $\frac{1}{4}$ | 111. B | 116. 30 mpg |
| 102. 6 hours | 107. 65 miles per hour | 112. 15 pounds | 117. 32 mpg |
| 103. 7 hours | 108. 5:6 | 113. $3 \times 7 = 21$ mi | 118. B |
| 104. 60 miles per hour. | 109. B | 114. 24 mi | 119. 6 wins |
| 105. 26 | 110. 20% | 115. 4 | 120. C |

Answer Key

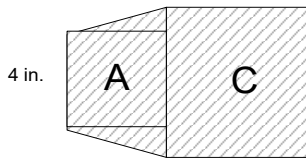
1. $x^2 + 4x - 45$
2. $x^2 - 7x + 10$
3. $3x^2 - 15x + 15$
4. $4x^2 - 16x - 20$
5. $-0.5x^2 - 1.5x + 20$
6. $\frac{1}{3}x^2 - x - \frac{10}{3}$
7. $9x^2 - 81x + 180$
8. $2x^2 - 15x + 27$
9. $4x^2 - 9$
10. $-2x^2 - 5x + \frac{8}{9}$
11. $a = 4, b = -10, c = -1$
12. $a = 4, b = 2, c = 3$
13. $a = -3, b = -3, c = 1$
14. $a = -2, b = 1, c = -2$
15. $a = 3, b = 3, c = 3$
16. $a = -3, b = -4, c = 8$
17. $a = 2, b = 1, c = -6$
18. $a = 2, b = 3, c = -12$
19. $a = 4, b = -2, c = 10$
20. $a = 4, b = 14, c = 2$
21. $x^2, x, 1$
22. 15
23. 31
24. 14
25. $15x^2 + 31x + 14$
26. $20x^2$
27. $60x^2$
28. $12x$
29. $22x$
30. $x^2 + x - 6$

$$\begin{array}{r} x \\ x) \quad x \\ \hline 3x \\ x^2 \quad -2x \\ \hline x^2 \quad +x \end{array}$$

- 31.
32. $360 \div 24 = 15$ gal
33. $10 \times \frac{1}{5} \times 8 \times 5 = \80.00
34. A
 $3.0 \div 12 = \$0.25$ per ounce (12-ounce cheaper)
 $5.4 \div 18 = \$0.30$ per ounce
35. $240 \div 60 = 4$ (hr)
 $4 - 1 = 3$ hr (expected)
 $240 \div 3 = 80$ mph
 $80 - 60 = 20$ mph faster
36. $400 \times 4 \times 0.1 = \160
37. $\frac{14}{3\frac{1}{2}} = 4$ hr
38. $\frac{30-21}{30} = 0.3 = 30\%$
39. $15 \div 0.75 = 20$
 $20 \times 4 = 80$ packets
40. B
 $42.00 \div 600 = \$0.07$ per kilowatt
 $48.00 \div 800 = \$0.06$ per kilowatt (the second cheaper)
41. $2\frac{5}{6} = \frac{17}{6}$
 $-\frac{17}{6} \div \frac{1}{6} = 17$
42. $+13 - 20\% = 1 - 0.2 = 0.8$
 $200 \times 0.8 = 160$
43. C
 -6
44. $125 \div 2.5 = 50$
 $50 \times 8 = 400$ mi

$$\begin{array}{r} 2x \quad +3y \\ \times) \quad 3x \quad +2y \\ \hline \quad +4xy \quad +6y^2 \\ 12x^2 \quad +9xy \\ \hline 12x^2 \quad +13xy \quad +6y^2 \end{array}$$

45. $\frac{1}{2}(4+6)(4) = 20$ in² (area of trapezoid)
 $6^2 = 36$ in² (square area)
 $20 + 36 = 56$ in² (total)



46. $24.5 \div 7 = 3.5$
 $3.5 \times 12 = 42$ in
47. 192
48. 2 (the only prime that is even)
49. $24 \times 25\% = 24 \times \frac{1}{4} = 6$ hr
50. $200 - 100 = 100$
 $199 - 99 = 100$
...
 $101 - 1 = 100$
 $100 + 100 + \dots + 100 = 100 \times 100$
Ans = 100

51. B
R=5, S=6, T=7

$$\begin{array}{r} 5 \quad 6 \quad 7 \\ \times \quad 7 \quad 4 \quad 1 \\ \hline 5 \quad 6 \quad 7 \\ 2 \quad 2 \quad 6 \quad 8 \\ 3 \quad 9 \quad 6 \quad 9 \\ \hline 4 \quad 2 \quad 0 \quad 1 \quad 4 \quad 7 \end{array}$$

52. P = 2R
R = 3S
P:R:S = 6:3:1
(P+S):R = 7:3
R = $\frac{3}{7} \times 140 = \60

53. C
 $3 + 5 = 8$
 $8 \div 3 = 2\frac{2}{3}$
 $3 - 2\frac{2}{3} = \frac{1}{3}$
(contribution from the first fisherman)
 $5 - 2\frac{2}{3} = 2\frac{1}{3}$
(contribution from the second fisherman)
 $2\frac{1}{3} = 1:7$
\$1 to the first, and \$7 to the second fisherman.

54. $20\% = \frac{1}{5} = 1:5$
boys:girls = 1:5
boys = $\frac{1}{6}$
girls = $\frac{5}{6}$
 $\frac{5}{6}(30) = 25$ (girls)

55. $72 \div 3 = 24$
 $96 \div 24 = 4$ (gal)
 $18 \times \frac{4}{5} = \14.40

56. See the table below.

Sleep	School	Home work	Activities
8	6	3	7
$\frac{1}{3}$	$\frac{1}{4}$	$\frac{1}{8}$	$\frac{7}{24}$
33.3%	25%	12.5%	29.2%

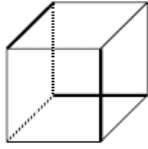
57. $3.25 \div 0.25 = 13$
 $13 \times 50 = 650 = 10$ min & 50 sec
58. 1 foot = 12 inches
8 feet = 96 inches
 $96 \div 10 = 9.6$ (hr)
 $8 \div 3 = 2R2$
 $30 \times 2 = 60$ min = 1 hr (Charlie rests twice.)
 $9.6 + 1 = 10.6$ hr = 10 hr 36 min

$12x^2 + 13xy + 6y^2$

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59. B

If the heavy black lines represent the color red, every face will have exactly one red edge. So the smallest number of red edges is 3.



60. $25^2 = 20^2 + 15^2$

61. $6 \times 5 \div 2 = 15$ chords

62. $60 + 60 \times 5\% = 60 + 3 = \boxed{\$63}$

63. $\frac{500000}{100} \times 0.36 \times 5$
 $= 5000 \times 0.36 \times 5$
 (cancellation)
 $= 50 \times 36 \times 5$ (moving decimal)
 $= 10 \times 180 \times 5$
 $= 1800 \times 5$
 $= \$9000$

64. (a) $0.2 \times 12,000 = 2,400$
 (b) $12,000 + 2,400 = 14,400$

65. $120 \times (1 - 0.2) = \$96$

66. $1\frac{1}{3} = \frac{4}{3}$
 $(\frac{4}{3})^3 = \frac{64}{27}$

67. A
 $5 + 3 = 8$ (points won by Mary)
 $8 \div 2 = 4$ (games won by Mary)
 $4 + 3 = 7$ (total games)

68. 1 foot = 12 inches
 8 feet = 96 inches
 $96 \div 10 = 9.6$ (hr)
 $8 \div 3 = 2R2$
 $30 \times 2 = 60$ min = 1 hr (Charlie rests twice.)
 $9.6 + 1 = 10.6 = 10$ hr & 36 min

69. $\frac{3}{4} \times 72 = 54$ (one way)
 $54 \times 2 = 108$ (round trip)
 $\frac{108}{2\frac{1}{4}} = 48$ mph

70. $1 + 2 + 1 = 4 = 2^2$
 $1 + 2 + 3 + 2 + 1 = 9 = 3^2$
 $1 + 2 + 3 + 4 + 5 + \dots + 15 + 14 + 13 + \dots + 3 + 2 + 1 = 15^2$
 $N = 15$

71. C
 $1 - 20\% = 0.8$
 2nd time: $0.8 \times 0.8 = 0.64$
 3rd time: $0.8 \times 0.64 = 0.512$
 4th time: $0.8 \times 0.512 = 0.4096$

Answer Key

- | | | | |
|--|--|--|-------------------------------------|
| 1. $\frac{2}{3}$ | 16. $4.5x^4 + 13x^2 + 11$
$11 + 13x^2 + 4.5x^4$ | 31. 3 | 50. $(3x + 2)(3x + 1)$ |
| 2. $\frac{2}{5}$ | 17. $15.5x^4 + 9x^3 + 25.5x^2$
$+ 1.5$ | 32. 4 | 51. D |
| 3. $3 + \frac{2}{7} = 3\frac{2}{7}$ | 1.5 + $25.5x^2 + 9x^3 +$
$15.5x^4$ | 33. 5 | 52. B |
| 4. $4 + \frac{3}{5} = 4\frac{3}{5}$ | 18. $-2x^3 + 11.5x^2 - 2x +$
15.5 | 34. 7 | 53. B |
| 5. $4 + \frac{3}{7} = 4\frac{3}{7}$ | 15.5 - $2x + 11.5x^2 -$
$2x^3$ | 35. 6 | 54. D |
| 6. $9 + \frac{4}{5} = 9\frac{4}{5}$ | 19. $11.5x^4 + 19.5x^2 - 5x$
$+ 23.5$ | 36. $\frac{1}{5}$ | 55. A |
| 7. $15 + \frac{3}{2} = 16\frac{1}{2}$ | 23.5 - $5x + 19.5x^2 +$
$11.5x^4$ | 37. 12 | 56. C |
| 8. $8 + \frac{5}{3} = 9\frac{2}{3}$ | 20. $x^4 + 5.5x^2 - 22x - 7$
$- 7 - 22x + 5.5x^2 + x^4$ | 38. 19 | 57. A |
| 9. $15 + \frac{5}{2} = 17\frac{1}{2}$ | 21. 6, 11, -10 | 39. $2(-3)^3 - (-3)^2 - 4(-3) +$
2
$= 2(-27) - (9) + 12 +$
2
$= -54 - 9 + 14$
$= -63 + 14$
$= -49$ | 58. D |
| 10. $24 + \frac{10}{3} = 27\frac{1}{3}$ | 22. 6, 23, 20 | 40. $-(3)^2 + (3) - 5 = -11$ | 59. B |
| 11. $14.5x^4 - 18x^2 + 15.5$
$15.5 - 18x^2 + 14.5x^4$ | 23. 2, -1, -2, 6 | 41. $(x + 2)(x + 4)$ | 60. B |
| 12. $2.5x^4 + 18x^2 + 11.5$
$11.5 + 18x^2 + 2.5x^4$ | 24. 1, 5, 7, 3 | 42. $(x + 4)(x + 5)$ | 61. C |
| 13. $-25.5x^3 + 22x + 4$
$4 + 22x - 25.5x^3$ | 25. 2, 5, 11 | 43. $(x + 5)(x + 7)$ | 62. C |
| 14. $4x^4 + 6.5x^2 + 9.5$
$9.5 + 6.5x^2 + 4x^4$ | 26. 1, 3, 15 | 44. $(x - 9)(x - 3)$ | 63. B |
| 15. $23.5x^4 - 4.5x^2 + 21$
$21 - 4.5x^2 + 23.5x^4$ | 27. -4, 9, -7 | 45. $(x - 6)(x - 1)$ | 64. C |
| | 28. 4, 5, 2 | 46. $(x - 8)(x + 4)$ | 65. C |
| | 29. 1, 1, 1 | 47. $(x - 5)(x + 8)$ | 66. A |
| | 30. 2, 1, 6 | 48. $2(x + 2)(x - 8)$ | 67. D |
| | | 49. $(3x + 8)(x + 3)$ | 68. 20 years old |
| | | | 69. A
$2 \times 2^{16} = 2^{17}$ |
| | | | 70. $y = x^2$ or $x^2 = y$ |

Answer Key

1. $36x^4y^2z^2$
2. $80x^5y^4z^6$
3. $2z^2$
4. $8x^4z^3$
5. $7\frac{1}{2}xy^4z^2$
6. $\frac{4}{3}x^2y^4z^2$
7. $3\frac{3x^2}{4z}$
8. $3xy^2$
9. xz^3
10. $\frac{3}{4}yz^2$
11. 8000
12. 160000
13. 729
14. 900
15. 27000
16. 4096
17. 4096
18. 1024
19. 6.25
20. 2.25
21. 3
22. 4
23. 2
24. 3
25. 4
26. 2
27. 3
28. 3
29. 2
30. 2
31. $\frac{1}{4} + \frac{3}{2} = 1\frac{3}{4}$
32. $\frac{8}{4} + \frac{2}{3} = 2\frac{2}{3}$
33. $\frac{8}{5} + \frac{5}{6} = 2\frac{13}{30}$
34. $\frac{1}{3} + \frac{1}{5} + \frac{2}{3} = 1\frac{1}{5}$
35. $\frac{8}{5} + \frac{4}{1} + \frac{1}{3} = 5\frac{14}{15}$
36. $3(8x + 5)(6x + 5)$
37. $5(5x + 3)(8x - 5)$
38. $2(3x + 7)(4x + 5)$
39. $10(x + 3)(4x - 5)$
40. $-4(3x - 4)(4x - 5)$
41. $4x + 3$
 $8x^2 + 10x + 3 =$
 $(4x + 3)(2x + 1)$
 $4x^2 + 11x + 6 =$
 $(4x + 3)(x + 2)$
42. $3x - 2$
 $9x^2 - 9x + 2 =$
 $(3x - 2)(3x - 1)$
 $6x^2 - 7x + 2 =$
 $(3x - 2)(2x - 1)$
43. $3x + 1$
 $3x^2 + 10x + 3 =$
 $(3x + 1)(x + 3)$
 $3x^2 + 13x + 4 =$
 $(3x + 1)(x + 4)$
44. $x + 1$
 $x^2 + 2x + 1 =$
 $(x + 1)(x + 1)$
 $x^2 + 3x + 2 =$
 $(x + 1)(x + 2)$
45. $x - 1$
 $x^2 - 2x + 1 =$
 $(x - 1)(x - 1)$
 $3x^2 - 5x + 2 =$
 $(x - 1)(3x - 2)$
46. Assumption of non-zero denominator: $n \neq 0$.
 Multiply both sides by $5n$.
 $5n^2 - 10 = 23n$
 $5n - 23n - 10 = 0$
 $(5n + 2)(n - 5) = 0$
 $n = \boxed{\frac{2}{5} \text{ or } 5}$
47. **No solution**
 Assumption of non-zero denominator: x cannot be 6 for the common denominator is $x - 6$. So, we can safely multiply the factor $(x - 6)$.
 $x - 3(x - 6) = 6$
 $(x - 6) - 3(x - 6) = 0$
 $-2(x - 6) = 0$
 $x = 6$ (violation of assumption)
48. $5(4x - 5) = 3(7x - 3)$
 $20x - 25 = 21x - 9$
 $x = -16$

Advanced Math (T3) Issue 10

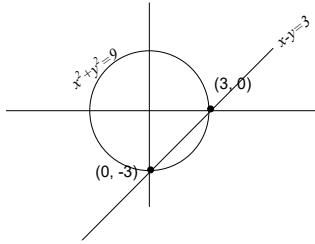
49. $3(x + 1) + 2(x - 2) = 9$
 $5x - 1 = 9$
 $5x = 10$
 $x = 2$
50. $7(x + 3) - 2(x - 4) = 14$
 $5x + 29 = 14$
 $5x = -15$
 $x = -3$
51. Multiply $(x - 4)(x + 7)$
 $2(x - 4)(x + 7) - 3x(x + 7) = 14(x - 4)$
 $2x^2 + 6x - 56 - 3x^2 - 21x = 14x - 56$
 $x^2 + 29x = 0$
 $x = 0$ or -29
52. $n = 8(65 - n) + 2$
 $n = 520 - 8n + 2$
 $9n = 522$
 $n = 58$
53. -2 or $23/8$
 Assumption of non-zero denominator: $n \neq 1$ or 6 .
 Multiply both sides by $3(n - 1)(n - 6)$.
 $9n(n - 6) - (n - 1)(n - 6) = -40(n - 1)$
 $8n^2 - 7n - 46 = 0$
 $(8n - 23)(n + 2) = 0$
 $n = -2$ or $23/8$ (both valid)
54. 8
 Assumption of non-zero denominator: $n \neq 0$.
 Multiply both sides by $2n$.
 $10 + n = 18$
 $n = 8$ (valid)
55. 5 or $-\frac{2}{5}$
 Assumption of non-zero denominator: $n \neq 0$.
 Multiply both sides by $5n$.
 $5n^2 - 10 = 23n$
 $5n^2 - 23n - 10 = 0$
 $(n - 5)(5n + 2) = 0$
 $n = 5$ or $-\frac{2}{5}$ (both valid)
56. 6
 Assumption of non-zero denominator: $x \neq 0$.
 Multiply both sides by $3x$.
 $15 + x = 21$
 $x = 6$ (valid)
57. 5
 Assumption of non-zero denominator: $n \neq 0$.
 Multiply both sides by n .
 $47 - n = 8n + 2$
 $9n = 45$
 $n = 5$ (valid)
58. $\frac{x}{3x+1} - \frac{5}{4} = \frac{3}{2x-5}$
 $\frac{4x}{4x} - 5 = \frac{12}{12}$
 $\frac{3x+1}{4x-15x-5} = \frac{2x-5}{12}$
 $\frac{3x+1}{-11x-5} = \frac{2x-5}{12}$
 $\frac{3x+1}{3x+1} = \frac{2x-5}{2x-5}$
 $36x + 12 + 22x^2 - 45x - 25 = 0$
 $22x^2 - 9x - 13 = 0$
 $(x - 1)(22x + 13) = 0$
 $x = 1$ or $-\frac{22}{13}$
59. $.7$
 $\frac{9+10x}{12x} = \frac{16}{12x}$
 $\frac{10x-7}{12x} = 0$
 $10x - 7 = 0$
 $x = .7$
60. $\frac{-8}{11}$ or 2
 The common denominator is $2(x + 2)(3x + 1)$.
 Let's assume $x \neq -2$ or $-\frac{1}{3}$, so we may safely multiply the common denominator.
 $2(3x + 1)(3x) + 2(x + 2)(3x + 1) = 35(x + 2)$
 $18x^2 + 6x + 2(3x^2 + 7x + 2) = 35x + 70$
 $24x^2 + 20x + 4 = 35x + 70$
 $24x^2 - 15x - 66 = 0$
 $8x^2 - 5x - 22 = 0$
 $(8x + 11)(x - 2) = 0$
 $x = \frac{-8}{11}$ or 2 (both valid)
61. $x = -3$, or 1
 The common denominator is $(x + 1)(x - 3)$. Let's assume $x = -1$ or 3 . So, we can safely multiply the denominator:
 $x(x - 3) - 2(x + 1)(x - 3) = 3(x + 1)$
 $x^2 - 3x - 2(x^2 - 2x - 3) = 3x + 3$
 $x^2 - 3x - 2x^2 + 4x + 6 = 3x + 3$
 $-x^2 - 2x + 3 = 0$
 $x^2 + 2x - 3 = 0$
 $(x - 1)(x + 3) = 0$
 $x = 1$ or -3 , (both valid)
62. 0 or -29
 Assumption of non-zero denominator: $x \neq 4$ or -7 .
 Multiply both sides by the factor $(x - 4)(x + 7)$.
 $2(x - 4)(x + 7) - 3x(x + 7) = 14(x - 4)$
 $-x^2 - 29x = 0$
 $-x(x + 29) = 0$
 $x = 0$ or -29 (valid)
63. 58
 $n = 8(65 - n) + 2$
 $n = 520 - 8n + 2$
 $9n = 522$
 $n = 58$

Advanced Math (T3) Issue 10

64. $\frac{1}{4}$ or 4
 Assumption of non-zero denominator: $n \neq 0$.
 Multiply both sides by $4n$.
 $4n^2 + 4 = 17n$
 $4n^2 - 17n + 4 = 0$
 $(4n - 1)(n - 4) = 0$
 $n = \frac{1}{4}$ or 4 (valid)
65. 2
66. $\frac{2}{x+4} = \frac{5}{3x}$
 $5(x+4) = 6x$
 $x = 20$
67. $(2x-3)(x-2) = (x+1)(x+6)$
 $2x^2 - 7x + 6 = x^2 + 7x + 6$
 $x^2 - 14x = 0$
 $x = 0$ or 14
68. $x+2 = \frac{5x-20}{x-4}$
 $(x+2)(x-4) = 5x-20$
 $x^2 - 2x - 8 = 5x - 20$
 $x^2 - 7x + 12 = 0$
 $(x-3)(x-4) = 0$
 $x = 3$ (4 is invalid)
69. $\frac{x^2-2x-4x-12}{(x+3)(x-2)} = \frac{-5x^2}{x^2+x-6}$
 $x^2 - 6x - 12 = -5x^2$
 $6x^2 - 6x - 12 = 0$
 $x^2 - x - 2 = 0$
 $(x-2)(x+1) = 0$
 $x = -1$ (2 is invalid)
70. $\frac{3x}{(x+2)(x+3)} + \frac{2}{(x+2)(x-1)} = \frac{5x}{(x+3)(x-1)}$
 $3x(x-1) + 2(x+3) = 5x(x+2)$
 $2x^2 + 11x - 6 = 0$
 $(2x-1)(x+6) = 0$
 $x = \frac{1}{2}$ or -6
71. Multiply $(x-1)(x-2)$, we have
 $7x - 4 = a(x-2) + b(x-1)$
 $7x - 4 = (a+b)x - 2a - b$
 Thus, we conclude
 $7 = a + b$
 $4 = 2a + b$
 $a = -3$
 $b = 10$
 Therefore, we conclude that
 $\frac{7x-4}{(x-1)(x-2)} = \frac{-3}{x-1} + \frac{10}{x-2}$
72. $\frac{4x}{x(1+\frac{1}{x})} + \frac{3 \times 2}{3(x+\frac{2}{3})} = \frac{13}{2}$
 $\frac{4x}{x+1} + \frac{6}{3x+2} = \frac{13}{2}$
 $\frac{4x(3x+2)}{(x+1)(3x+2)} + \frac{6(x+1)}{(x+1)(3x+2)} = \frac{13}{2}$
 $\frac{12x^2+4x+6}{3x^2+5x+2} = \frac{13}{2}$
 $24x^2 + 28x + 12 = 39x^2 + 65x + 26$
 $15x^2 + 37x + 14 = 0$
 $(x+2)(15x+7) = 0$
 $x = -2$ or $-\frac{7}{15}$
73. $\frac{8}{7}$
74. $\frac{6}{5}$
75. $\frac{8}{5}$
76. $\frac{9}{5}$
77. $\frac{9}{7}$
78. $\frac{6}{5}$
79. $\frac{9}{2}$
80. $\frac{5}{6}$
81. $\frac{6}{7}$
82. $\frac{5}{6}$
83. $\frac{a}{b} = C = b \Rightarrow a = b^2 \Rightarrow b = \pm\sqrt{a}$
84. $a = \frac{ax}{1-x} \Rightarrow 1 = \frac{x}{1-x}$ (cancellation)
 $1 - x = x \Rightarrow x = \frac{1}{2}$
85. $7^{0.7} = 7^{1-0.3} = 7 / 7^{0.3} = 7/a$.
86. $\frac{2d}{\frac{d}{b-a} + \frac{d}{b+a}} = \frac{2}{\frac{1}{b-a} + \frac{1}{b+a}} = \frac{2}{\frac{1}{b-a} + \frac{1}{b+a}} = \frac{2}{\frac{b-a+b+a}{(b-a)(b+a)}} = \frac{b^2-a^2}{b}$
87. $1+r+r^2+\dots+r^n = (1-r^{n+1})/(1-r)$
 $1 + .2 + .2^2 + .2^3 + \dots + .2^{10} = (1 - .2^{11})/(1-.2)$
 Note that $.2^{11} \approx 0$, we have $(1 - .2^{11})/(1-.2) = 1/.8 = 1.25$

Advanced Math (T3) Issue 10

88. Substitution method proves to be effective as follows. From the first equation, we have $y = x - 3$. Plug it in to the second equation, we have $x^2 + (x-3)^2 = 9 \Rightarrow 2x^2 - 6x + 9 = 9 \Rightarrow x^2 - 3x = 0 \Rightarrow x(x-3) = 0 \Rightarrow x = 0$ or 3 , thus, $y = x - 3 = -3$, or 0 . Therefore, the solution is $(x, y) = (0, -3)$ and $(3, 0)$. Let's picture the equation.



89. -2
90. There are $n - m + 1$ numbers in the sequence. The sum is $\frac{1}{2}(n - m + 1)(n + m)$.
Note: that the previous problem is a special case when $m = 1$.

Answer Key

- The average is the median $= \frac{1+5}{2} = 3$, the middle number.
So, the sum is $5 \times 3 = 15$
- The average is the median $= \frac{16+10}{2} = 13$.
So, the sum is $4 \times 13 = 52$
- 55
- 5050
- $60 \times 103 = 6180$
- 110
- $51 \times 25 = 1275$
- $50 \times 81 = 4050$
- $50 \times 21 = 1050$
- $101 \times 67 = 6767$
- $21.5 \times 20 = 430$
- $1515 \div 15 = 101$
 $101 + 2 \times 7 = 115$
- $\frac{19-5}{10-3} = 2$
 $2 \times (20 - 10) + 19 = 39$
- The seat numbers follow an arithmetic progression. The common difference is 3. Let there be n rows. The last row has $50 + 3(n - 1) = 3n + 47$ seats.
The capacity of the theater can be expressed as $50 + 53 + 56 + \dots + (3n + 47)$
 $= \frac{1}{2}(3n + 97) \times n = 2805$
 $3n^2 + 97n = 5610$
 $3n^2 + 97n - 5610 = 0$
 $(n - 30)(3n + 187) = 0$
 $n = 30$ (-187/3, ruled out)
- Let a be the first term, so $a + 11$ be 12th term.
 $\frac{1}{2} \times 12 \times (2a + 11) = 246$
 $2a + 11 = 41$
 $a = 15$
 $a + 11 = 26$ (12th term)
- $8 + (26 - 6)(-\frac{3}{2}) = 8 - 30 = -22$
- Since the sum $= na + \frac{1}{2}n(n-1)d$
 $= \frac{1}{2}n(2a + (n - 1)d)$
 $= \frac{1}{2}n(a + a + (n-1)d)$
 $= \frac{1}{2}n(\text{first term} + \text{last term})$
- $d = -3, a_{17} = 7 + (17 - 1)(-3) = 7 - 48 = -41$
- Yes
 $7 + (n - 1)(-3) = -200$
 $(n - 1)(-3) = -207$
 $n - 1 = 69$
 $n = 70$
- 102nd term
 $7 + (n - 1)(-3) = -296$
 $(n - 1)(-3) = -303$
 $n = 102$
- Since a_{20} is 17 terms after a_3 ,
 $a_{20} = 5 + 17(2) = 39$
- Since a_3 is 17 terms before a_{20} ,
 $a_3 = 14 - 17(-3) = 65$
- $a_5 = 14 - 15(\frac{2}{3}) = 4$
- $a_n = 15 + (n - 10)(-\frac{3}{4}) = 0 \Rightarrow n = 30$
- $7 + 14 \times 2 = 35$
- $\frac{1}{2}(7 + 35) \times 15 = 315$
- $\frac{1}{2}(5 + -3)(100 - 50 + 1) = 51$
- There are 100 terms, so the sum is $\frac{1}{2}(1 + 199)(100) = 10,000$
- There are $(98 - 14)/7 + 1 = 13$ terms, so the sum is $\frac{1}{2}(14 + 98)(13) = 728$
- $a_{20} = 2 + (20 - 1)(5) = 97$
 $S_{20} = \frac{1}{2}(2 + 97)(20) = 990$
- $a_{15} = 5 + (15 - 1)(3) = 47$
 $S_{15} = \frac{1}{2}(5 + 47)(15) = 390$
- $S_{20} = \frac{1}{2}(5 + 80)(20) = 850$
- $\frac{1}{2}(5 + 80)(n) = 255 \Rightarrow n = 6$
- $d = \frac{80-5}{6-1} = 17$
- $a_{20} = 5 + (20 - 1)(17) = 328$
- $S_n = 63.5 = \frac{1}{2}(5 + 5 + (n - 1)(0.3))(n)$
 $= \frac{1}{2}(10 + 0.3n - 0.3)n$
 $127 = 0.3n^2 + 9.7n$
 $\Rightarrow 3n^2 + 97n - 1270 = 0$
 $\Rightarrow (3n + 127)(n - 10) = 0$
 $\Rightarrow n = 10$ (-127/3 is precluded)
- $r = -2$
 $a_n = (-2)^n$
- $r = -\frac{1}{3}$
 $a_n = 18(-\frac{1}{3})^{n-1}$
- $r = 0.1$
 $a_n = \frac{80}{10^n}$
- $r = \frac{1}{5}$
 $a_n = \frac{225}{5^n}$
- $r = 10\sqrt{2}$
 $a_n = 5(10\sqrt{2})^{n-1}$
- $a_{10} = a_4 \times (\frac{1}{2})^6 = \frac{5}{64}$
- $a_1 = a_6(-1)^{1-6} = -5$
- $r = \sqrt[3]{\frac{-135}{5}} = -.3$
- $r = 3$
 $a_1 = 8$
- Hint: Find two similar right triangles and apply the theorem of proportionality of the corresponding sides.
- $9(\frac{3}{2})^2, -9(\frac{3}{2})^2, 9, -9(\frac{3}{2})^2, 9(\frac{3}{2})^2$
- $r = \frac{2}{3}$ and $n = 6$.
- $(\sqrt{3}-\sqrt{2})(6\sqrt{3}-2\sqrt{2}) = 18 - 2\sqrt{6} - 6\sqrt{6} + 4 = 22 - 8\sqrt{6} = (4 - \sqrt{6})^2$
- $x + 3 + 4x - 2 = 2(x + 7)$
 $5x + 1 = 2x + 14$
 $3x = 13$
 $x = 4\frac{1}{3}$
The first four terms are $7\frac{1}{3}, 11\frac{1}{3}, 15\frac{1}{3}, 19\frac{1}{3}$
- $(x + 3)(4x - 2) = (x + 7)^2$
 $4x^2 + 10x - 6 = x^2 + 14x + 49$
 $3x^2 - 4x - 55 = 0$
 $(3x + 11)(x - 5) = 0$
 $x = 5$ or $-3\frac{2}{3}$
If $x = 5$, then $r = 1.5$, the first four terms are 8, 12, 18, 27
If $x = -3\frac{2}{3}$, then $r = -5$, the first four terms are $-\frac{2}{3}, 3\frac{1}{3}, -16\frac{2}{3}, 83\frac{1}{3}$
- Left to the students.

Precalc (T3) Issue 10

53. The radius = 10, BC = 20.
 z = the height of the triangle = $2 \times 80 \div 20 = 8$.
 $x + y = 20$
 $xy = z^2 = 64$
 Therefore, x and y must satisfy the quadratic equation:
 $t^2 - 20t + 64 = 0$
 $(t - 4)(t - 16) = 0$
 Thus, $t = 4$ or 16 .
 Therefore, we conclude that
 $x = 4$ and $y = 16$.
54. The volume will become $5000 \cdot (\frac{3}{4})^{n-1}$ after n days.
 The loss of volume by the end of 9th day is
 $5000 - 5000 \cdot (\frac{3}{4})^{9-1}$
 $= 5000(1 - .758)$
 $= 4499.435 \text{ cm}^3$
55. (a) $a_1 = 3, a_n = 4a_{n-1}$
 (b) $a_n = 3 \cdot 4^{n-1}$
 (c) $3 \cdot 414$
 (d) $415 - 1$
56. $a + ar^1 + ar^2 + ar^3 + ar^4 + ar^5$
 $= a(1 + r + \dots + r^5)$
 $= a(2 - 0.55) = 315$
 $a = 315 \div (2 - 0.55) = 160$
57. 542.72
 $\frac{1}{18} \times \frac{3^9 - 1}{3 - 1} \approx 546.72$
58. $\frac{3^{11} - 1}{2} = 88573$
59. 24
 $16 \times \frac{1 - (\frac{-1}{2})^{11}}{1 - (\frac{-1}{2})} =$
 $16 \times \frac{2049}{3} = 16 \times \frac{2049}{2048} \times \frac{3}{2}$
 ≈ 24
60. $r = -\frac{1}{2}$
61. 9
 $\frac{1}{32} = (-8)(\frac{1}{2})^{n-1}$
 $(\frac{1}{2})^n = \frac{-1}{512}$
 $n = 9$
62. -12
 $(-8) \frac{1 - (\frac{-1}{2})^{10}}{1 - \frac{-1}{2}} =$
 $(-8) \frac{1 - \frac{1}{1024}}{\frac{3}{2}} =$
 $-8 \times \frac{1023}{1024} \times \frac{2}{3} \approx -12$
63. 2
 $\frac{1 - (\frac{1}{2})^\infty}{1 - \frac{1}{2}} = \frac{1}{1 - \frac{1}{2}} = 2$
 Note that in general it is improper to express some quantity in terms of ∞ . However, this occasion is just perfect to think of $(\frac{1}{2})^\infty = 0$.
64. $\frac{a_{i+1}}{a_i} = (\frac{a_{i+1}}{a_i})^2 = r^2$
 $\frac{a_{i+1}^3}{a_i^3} = (\frac{a_{i+1}}{a_i})^3 = r^3$
65. Since the sum of $\sum_{i=1}^{\infty} a_i^3 = \frac{a_1^3}{1 - r^3}$, we have to figure out a_1 and r .
 $S = \frac{a_1}{1 - r} = \sum_{i=1}^{\infty} a_i^3 = \frac{3}{4} \dots \textcircled{1}$
 $T = \frac{a_1^2}{1 - r^2} = \sum_{i=1}^{\infty} a_i^2 = \frac{3}{8}$
 $\frac{T}{S} = \frac{a_1}{1 + r} = \frac{1}{2} \dots \textcircled{2}$
 By doing $\textcircled{1} \div \textcircled{2}$, we have
 $\frac{1+r}{1-r} = \frac{3}{2}$
 $r = \frac{1}{5}$
 From $\textcircled{1}$, we have
 $a_1 = \frac{3}{5}$
 Now that
 $\sum_{i=1}^{\infty} a_i^3 = \frac{a_1^3}{1 - r^3} =$
 $\frac{(\frac{3}{5})^3}{1 - (\frac{1}{5})^3} = \frac{27}{124}$
66. $\frac{1 - (\frac{1}{3})^\infty}{1 - \frac{1}{3}} = 1.5$
67. $20,000 \times 1.1^{(3-1)} = 24200$
68. $\$228,717.762$
 $20,000 \times \frac{1.1^8 - 1}{1.1 - 1} = 228,717.762$
69. $\$216,000$
 Her salary in the eighth year is 20,000 + $7 \times 2000 = 20,000 + 14,000 = 34,000$.
 Thus, her total salary over the eight years is $\frac{1}{2}(8)(20,000 + 34,000) = 216,000$
70. 52.4288
 Due to a loss of 20% of its weight each hour, the remaining weight after n hours is
 200×0.8^n
 The remaining weight after 6 hours is
 $200 \times 0.8^6 = 52.4288$
71. 56.486
 Due to a loss of 10% of its weight every 30 min, the remaining weight after 1 hour is 200×0.9^2
 also, the remaining weight after n hours is
 200×0.9^{2n}
 The remaining weight after 6 hours is
 $200 \times 0.9^{12} \approx 56.486$
72. $\frac{1}{4} + (\frac{1}{4})^2 + (\frac{1}{4})^3 + (\frac{1}{4})^4 + \dots = \frac{\frac{1}{4}}{1 - \frac{1}{4}} = \frac{1}{3}$
73. $15.36 \text{ (ft)} 30 \times 0.8^3 = 15.36 \text{ (ft)}$
74. 30×0.8^n
75. 6 times Since $30 \times 0.8^7 = 6.29$ and $30 \times 0.8^6 = 5.03$
76. $150 \text{ (ft)} 30 \frac{1}{1 - 0.8} = 150 \text{ (ft)}$
77. $526.189 \text{ (million)}$
 $2007 - 1995 = 12$
 $261.5 \times 1.06^{12} = 526.189 \text{ (million)}$
78. 4095
 $1 + 2 + 4 + \dots + 2^{11} = \frac{2^{12} - 1}{2 - 1} = 2^{12} - 1 = 4095$
79. 0.775 ft
80. 8^{th}
81. 15.88 ft
82. 20 ft
83. $b_n - b_{n-1} = \log a_n - \log a_{n-1} = \log \frac{a_n}{a_{n-1}} = \log r$