

Answer Key

- | | |
|--|-----------------------------------|
| 1. 23 | 32. 1200 |
| 2. 43 | 33. 6,000 |
| 3. 33 | 34. 4800 |
| 4. 47 | 35. 3600 |
| 5. 56 | 36. 9 |
| 6. $9\frac{5}{6}$
$59 \div 6 = 9 \text{ r } 5$ | 37. 27 |
| 7. $4\frac{1}{12}$
$49 \div 12 = 4 \text{ r } 1$ | 38. 9 |
| 8. $9\frac{1}{7}$
$64 \div 7 = 9 \text{ r } 1$ | 39. 15 |
| 9. $4\frac{3}{8}$
$35 \div 8 = 4 \text{ r } 3$ | 40. 21 |
| 10. $7\frac{1}{8}$
$57 \div 8 = 7 \text{ r } 1$ | 41. 10 |
| 11. $2\frac{8}{9}$
$26 \div 9 = 2 \text{ r } 8$ | 42. 15 |
| 12. $3\frac{2}{9}$
$29 \div 9 = 3 \text{ r } 2$ | 43. 20 |
| 13. $7\frac{2}{9}$
$65 \div 9 = 7 \text{ r } 2$ | 44. 35 |
| 14. $5\frac{1}{11}$
$56 \div 11 = 5 \text{ r } 1$ | 45. 20 |
| 15. $5\frac{1}{12}$
$61 \div 12 = 5 \text{ r } 1$ | 46. $\frac{10}{7} = 1\frac{3}{7}$ |
| 16. 120 | 47. $\frac{10}{7} = 1\frac{3}{7}$ |
| 17. 1,200 | 48. $\frac{9}{4} = 2\frac{1}{4}$ |
| 18. 100 | 49. $\frac{10}{7} = 1\frac{3}{7}$ |
| 19. 400 | 50. $\frac{10}{8} = 1\frac{2}{8}$ |
| 20. 800 | 51. $\frac{11}{4} = 2\frac{3}{4}$ |
| 21. 600 | 52. $\frac{11}{3} = 3\frac{2}{3}$ |
| 22. 1,000 | 53. $\frac{11}{6} = 1\frac{5}{6}$ |
| 23. 800 | 54. $\frac{9}{7} = 1\frac{2}{7}$ |
| 24. 600 | 55. $\frac{9}{5} = 1\frac{4}{5}$ |
| 25. 200 | 56. 72 |
| 26. 2000 | 57. 25 |
| 27. 12,000 | 58. 900 |
| 28. 4,000 | 59. 9.6 |
| 29. 4,000 | 60. 3150 |
| 30. 60,000 | 61. 112 |
| 31. 600 | 62. 84 |
| | 63. 3 |
| | 64. 50 |
| | 65. 10 |
| | 66. 192 |
| | 67. 5 |
| | 68. 2 |
| | 69. 5.2 |

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70. 77
71. 520
72. 8.5
73. 117
74. 28
75. 3.6
76. 3 years older
77. $5 \times 15 = 75$
 $2 \times 5 = 10$
 $75 - 10 = \underline{65}$
78. 12.5 (Each amount is $\frac{1}{2}$ of the previous one.)
79. $7 + 2 \times 9 = 25$
80. $300 \div 2 = 150$
 $150 - 50 = \underline{110 \text{ ft}}$
81. 38.4
82. $2 \times (4 + 5 + 7) = \underline{32 \text{ inches}}$
83. $3:15 + 1:55 = \underline{5:10 \text{ P.M.}}$
84. 5
85. 90
86. 13
87. 23 racquets
88. $2 \times 60 = 120$
 $\frac{3}{4} \times 60 = 45$
 $120 + 45 = 165 \text{ min}$
89. $24 \times 60 = \underline{1440}$
90. $4 \times 1.5 = 6$
 $2 \times 6 = 12$
 $6 + 12 = \underline{\$18}$
91. $14 \div 2 = 7$ (for 2 notebooks)
 $6 \div 2 = 3$
 $3 \times 7 = \$21$
92. B
A) $\frac{1}{9} + \frac{8}{9} = 1$
B) $\frac{3}{5} + \frac{3}{5} = \frac{6}{5} > 1$
C) $\frac{1}{4} + \frac{1}{2} = \frac{3}{4}$
93. $6:35 + 1:30 = 8:05 \text{ P.M.}$
94. $12 + 1 = 13$
 $13 \times 3 = 39$
 $2 \text{ bags} \times 20 = 40$
 $\underline{2 \text{ bags}}$ will be enough.
95. $4 \times 52 = 208$

Answer Key

- | | |
|---------------------------------|--|
| 1. $\frac{1}{18}$ | 38. 10.25 |
| 2. $\frac{1}{6}$ | 39. 6.125 |
| 3. $\frac{11}{18}$ | 40. 2.625 |
| 4. $\frac{7}{48}$ | 41. 2 |
| 5. $\frac{13}{36}$ | 42. 75 |
| 6. $\frac{6}{42} = \frac{1}{7}$ | 43. 0.2 |
| 7. $\frac{17}{72}$ | 44. 0.8 |
| 8. $\frac{1}{24}$ | 45. 5 |
| 9. $\frac{8}{15}$ | 46. 80% |
| 10. $\frac{4}{35}$ | 47. 60 |
| 11. 0.5 | 48. 100 |
| 12. 35000 | 49. 0.625 |
| 13. 0.4 | 50. 80 |
| 14. 30000 | 51. .08 |
| 15. 900 | 52. 3.6 |
| 16. 2800 | 53. .6 |
| 17. 0.8 | 54. 70 |
| 18. 1000 | 55. 260 |
| 19. 0.6 | 56. 200 |
| 20. 15000 | 57. 120 |
| 21. 900 | 58. $2^3 \times 3 \times 5^2$ |
| 22. 36000 | 59. 8 |
| 23. 5 | 60. A |
| 24. 480000 | 61. $5.75 + 4.35 = \$10.10$ |
| 25. 90 | 62. $18.13 + 33.50 = \$51.63$ |
| 26. 420000 | 63. $32.45 - 17.45 = \$15$ |
| 27. 0.04 | 64. $24 \times 5 = 120$ (students) |
| 28. 120000 | 65. $20 \times 24 \times 12 = 5760$ (eggs) |
| 29. 30 | 66. $5 \times 4 = 20$ (in) |
| 30. 4000 | 67. $4 \times 20 = 80$ |
| 31. 2.3 | 68. Shelby = $2 \times 6 = 12$
Vanessa = $3 \times 12 = 36$ |
| 32. 8.5 | 69. $6 \times 25 = 150$ miles |
| 33. 3.8 | 70. $10 - 2.67 = \$7.33$ |
| 34. 5.5 | 71. $504 \times 4 = 2016$ (yo-yos) |
| 35. 6.2 | 72. $3.5 \div 5 = \$0.70$ |
| 36. 4.25 | 73. $12 \div 3 = 4$
$4 \times 2.5 = 10$ |
| 37. 5.75 | 74. True |

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75. False
0 is a whole number, but it is not positive.

76. 50 (negative numbers)

77. $1881 - 25 = 1856$

78. $20 \times 2\frac{3}{4} = 40 + 15 = \underline{\$55}$

79. $2,500 \times 6 = 15,000$

80. $5 \times 500 = 2500$ (cards)

81. $\frac{25}{10} \times 3 = 7.5$ lbs

82. $6 \times 43 = 258$

$8 \times 51 = 408$

$408 - 258 = 150$

$150 \div 2 = 75$

83. C

$$\frac{1}{6} - \frac{1}{12} = \frac{1}{12}$$

$$\frac{1}{12} \div 3 = \frac{1}{36}$$

$$\frac{1}{12} + \frac{1}{36} = \frac{4}{36} = \frac{1}{9}$$

84. $\frac{6-4.8}{4.8} = \frac{1}{4} = 0.25 = 25\%$

85. $42.67 + 50 - 15 - 21 + 16.25 + 25 = \97.92

86. 4 A & 1 B & 4 C

$$\begin{array}{r} 4 \quad 3 \quad \boxed{1} \quad 2 \\ \quad \quad 4 \quad 5 \quad \boxed{4} \\ + \quad \boxed{4} \quad 1 \quad 2 \quad 7 \\ \hline 8 \quad 8 \quad 9 \quad 3 \end{array}$$

87. a unit = 3

length = $3 \times 3 = 9$

width = $2 \times 3 = 6$

$9 \times 6 = 54$

88. $140 \div 20 = 7$

89. $25 \times 7 = 175$

90. $385 \div 7 = 55$ min

91. $120 \div 1600 = 0.075 = 7.5\%$

92. B

93. Since the average of B, C and D is 14, the total of the four boys is

$$10 + 14 \times 3 = 52,$$

thus the average of the four boys is

$$52 \div 4 = 13$$

94. 3 meters

95. $20 \times 8\% = 20 \times 0.08 = 2 \times 0.8 = \1.60

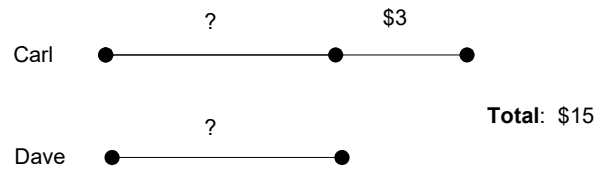
96. $\frac{\text{discount}}{\text{price}} = \frac{10}{40} = \frac{1}{4} = 25\%$

97. $15 - 3 = 12$

$12 \div 2 = \$6.00$ (Dave)

$6 + 3 = \$9.00$ (Carl)

Use the following diagram to solve.



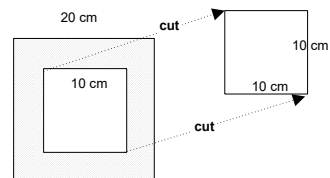
98. $\frac{800-600}{800} = \frac{1}{4} = 25\%$

99. $\frac{21}{4-2.5} \times (4+2.5) = \91
 $\frac{21}{4-2.5}$: the hourly rate
 $4+2.5$: total time

100. $\frac{13}{25} = 0.52 = 52\%$

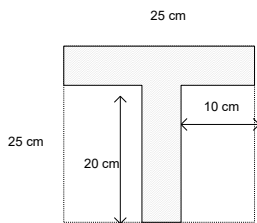
Answer Key

1. $1\frac{1}{2}$
2. $2\frac{11}{35}$
3. $5\frac{3}{7}$
4. $1\frac{1}{10}$
5. $5\frac{17}{35}$
6. $12\frac{13}{24}$
7. $16\frac{41}{63}$
8. $4\frac{7}{8}$
9. $1\frac{15}{16}$
10. $15\frac{8}{15}$
11. 575%
12. 405%
13. 187.5%
14. 237.5%
15. 362.5%
16. $\frac{1}{4}$
17. $\frac{1}{2}$
18. $\frac{3}{8}$
19. $\frac{3}{4}$
20. $\frac{5}{8}$
21. 60
22. 6
23. 30
24. 75
25. 140
26. 0.28
27. 0.63
28. 0.175
29. 7.5
30. 1.6
31. 2,100
32. 4,500
33. 4,000
34. 0.025
35. 3.6
36. 0.28
37. 0.72
38. 0.4
39. \$0.64
40. 0.6
41. 7.5
42. 8
43. 14.4
44. 60
45. 35
46. 60
47. 16%
48. 15%
49. 25%
50. 40%
51. 60%
52. 70%
53. 80%
54. 18
55. 24
56. 80
57. 60
58. 120
59. 16
60. 40
61. 24 sq. units.
62. 28 sq. units.
63. 20 sq. units.
64. $\frac{1}{2} \times (12 + 6) \times 5 = 45$ (m)
65. Area: $400 - 100 = 300$

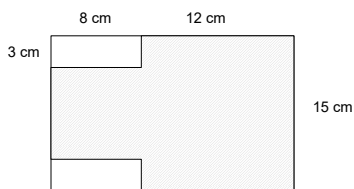


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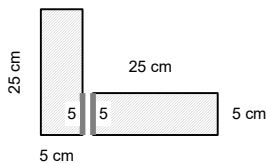
66. (a) $25 \times 25 - 2(10 \times 20) = 625 - 400 = 225 \text{ cm}^2$ (area)
 (b) $4 \times 25 = 100 \text{ cm}$ (perimeter)



67. (a) $20 \times 15 - 2(3 \times 8) = 300 - 48 = 252 \text{ cm}^2$ (area)
 (b) $2 \times (20 + 15) = 70 \text{ cm}$ (perimeter)



68. $72 \div 24 = 3$
 $3 \times 2 = 6$ (ft)
 69. $2 \times (25 + 5) \times 2 = 120$ is the perimeter of two rectangles, but when they are merged the two segments will be lost, so $120 - 10 = 110$.



70. $25 \times 5 \times 2 = 250$
 71. $8 \times 5 = 40$
 72. $2.5 \times 4 = 10$
 73. $5 \times 3 = 15$
 74. $(3\frac{1}{2}) \times 4 = (3 + \frac{1}{2}) \times 4 = 12 + 2 = 14$ (in.)
 75. $9\frac{1}{4} \times 4 = (9 + \frac{1}{4}) \times 4 = 36 + 1 = 37$ (feet)
 76. 2 ft. = 24 in, so the perimeter of the triangle is $12 + 16 + 24 = 52$ (in.)
 77. 200 in.^2
 78. 60 in.
 79. $100 \div 2 = 50$
 $50 - 20 = 30$ in (length)
 80. $20 \times 30 = \boxed{600 \text{ in}^2}$
 81. $80 \times 3\frac{3}{4} = 240 + 60 = 300$ miles
 82. $\frac{140}{60} = 2\frac{1}{3}$
 $9:00 + 2:20 = 11:20$ am
 83. $180 \times \frac{16}{3\frac{1}{5}} = 180 \times 5 = \underline{900 \text{ mi}}$

84. (a) $1220 \div 50 > 24$ miles per gallon (black)
 (b) $1400 \div 60 < 24$ miles per gallon (green)
Black car is more efficient.

85. a) $6 \div 1.5 = 4$ hrs
 $6 \div 3 = 2$ hrs
 $4 + 2 = 6$ hrs

b) $\frac{\text{total distance}}{\text{total time}}$

86. $20\% \times 40 = 8$
 $8 \times 10 = 80$
 $80 - 40 = 40$

87. $40\% \times 50 = 20$
 $20 \div \frac{1}{4} = 80$
 $80 - 50 = 30$

88. $24 \times 25\% = 6$
 $6 \div 20\% = 30$
 $30 - 24 = 6$

89. $75\% \times 12 = 9$
 $9 \div 50\% = 18$
 $18 - 12 = 6$

90. $60 \times 30\% = 18$
 $18 \div 15\% = 120$
 $120 - 60 = 60$

91. price : discount
 $= 80\% : 20\%$
 $= 4 : 1$
 $= \$124 : \31
 Ans = \$31 (discount)

92. -2
 The larger one is 9.

93. A
 $4.68/32 \approx \$0.14$ (32-ounce cheaper)
 $5.39/30 \approx \$0.17$

94. $\frac{1}{2} \times 0.4 = 0.2$
 $0.2 \times 1.5 = 0.3$
 $0.3 \times (1 - 0.5) = 0.3 \times 0.5 = 0.15$

95. $420 \div 2 = 210$
 $210 \times 3 = 630$ cups

96. $12 \div 3 = 4$
 $4 \times (3 + 2) = 20$

97. $1.5 \text{ million} / 30 \text{ million} = 1.5/30$ (million is canceled) $= 0.05 = 5\%$

98. $7\pi = 21.98$

99. $\frac{3}{8}, \frac{4}{8}$, and $\frac{5}{8}$

100. $3 + 39 = 42$
 $42 \times 9 = 378$

101. $\frac{1}{12} \times \frac{1}{45} = \frac{1}{540}$
 Ans = 540 bees

MAP 259+ (T2) Issue 12

102. A

How much play money did each one have before the 3rd game?

	at 3 rd game	Reverse	at 2 nd game	Reverse	at 1 st game	Reverse	Start
Alex	24	-12	12	-6	6	+33	39
Ben	24	-12	12	+30	42	-21	21
Carl	24	+24	48	-24	24	-12	12

So, Alex lost the most (-\$15).

Brian (+\$3)

Carl (+\$12)

103. $5 \times 4 = 20$

104. $15 \div 90 = \frac{1}{6}$, 1 out of 6 is defective
 $20 \times \frac{1}{6} = 20$ defectives

105. A

If two of the statements are false and one statement is true, then Kim and Jim lied, Tim told the truth.

\Rightarrow Kim took the cookie.

106. 2

107. $1^2 = 1, 2^2 = 4, \dots, 7^2 = 49, 14^2 = 196$
 Ans = 14 (perfect squares)

108. $13 - 10 = 3$

$$1 - \frac{2}{3} = \frac{1}{3} \text{ (left)}$$

$3 \div \frac{1}{3} = 3 \times 3 = 9$ (weight of the water in the full capacity)

$$13 - 9 = 4 \text{ (weight of the container)}$$

109. $(\frac{2}{3} + \frac{1}{2}) \div 2 = \frac{7}{12} = 7/12$

110. $\frac{98-50}{50} = 0.96 = 96\%$

111. $0.\overline{01}$

112. $0.\overline{18}$

113. $2.\overline{3}$

114. $0.\overline{5}$

115. 1

116. $1.\overline{1}$

117. $1.6\overline{8}$

118. $0.1\overline{6}$

119. $\frac{0.1\overline{6}}{2} = \frac{0.16\overline{6}}{2} = 0.08\overline{3}$

120. $0.\overline{1}$

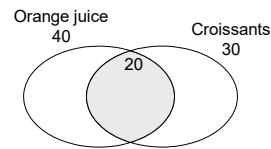
Answer Key

1. $\frac{2}{5}$
2. $\frac{3}{14}$
3. $\frac{4}{27}$
4. $\frac{5}{42}$
5. $\frac{6}{17}$
6. $\frac{7}{58}$
7. $\frac{8}{33}$
8. $\frac{9}{64}$
9. $\frac{9}{17}$
10. $\frac{7}{6}$
11. 4
12. $\frac{1}{2} \times \frac{1}{3} = \frac{1}{6}$
13. $6/5$
14. $27/140$
15. $2/5 \times 1/6 = 1/15$
16. $\left(\frac{15}{8}\right)\left(\frac{24}{5}\right) = 9$
17. $\left(\frac{10}{8}\right)\left(\frac{16}{5}\right) = 4$
18. $\left(\frac{12}{7}\right)\left(\frac{35}{6}\right) = 10$
19. $\left(\frac{6}{5}\right)\left(\frac{25}{2}\right) = 15$
20. 2
21. 25
22. 9
23. 10
24. 7
25. 19
26. 3^3
27. $2 \times 3 \times 7$
28. $2^4 \times 3$
29. 5×7
30. $2^2 \times 7$
31. 2^5
32. $2 \times 3 \times 5$
33. $2^3 \times 5$
34. $3^2 \times 5$
35. $2^2 \times 3^2$
36. $4x - 10$
37. $-8x^2 + 2x + 27$
38. $-20x^2 - 12x - 23$
39. $-10x^2 + 4x + 2$
40. $13x^2 - 19x - 21$
41. - 16
42. - 22
43. $19x^6 + 20x^3 + 12x^2 - 17x + 4$
44. $3x^2 - 20x - 35$
45. $16x^6 - 16x^4 + -14x^3 + 5x^2 - 15x$
46. $x^2 + 10x + 16$
47. $x^2 + 11x + 18$
48. $x^2 + 6x + 8$
49. $3x^2 + 22x + 24$
50. $x^2 + 9x + 14$
51. $x^2 + 8x + 12$
52. $x^2 + 8x + 15$
53. $x^2 + 12x + 27$
54. $2x^2 - 3x - 9$
55. $2x^2 + 7x + 6$
56. $x^2 + 4x + 3$
57. $x^2 + 5x + 6$
58. $2x^2 + 5x + 3$
59. $6x^2 + 11x + 3$
60. $6x^2 + 13x + 6$
61. $6x^2 + 5x - 6$
62. $6x^2 - 13x + 6$
63. $4x^2 + 16x + 15$
64. $4x^2 - 4x - 15$
65. $4x^2 + 4x - 15$
66. $120 \div 5 = 24$ mi/gal
67. D
68. 1.44
69. a) $75\% = \frac{3}{4}$
b) $58\frac{1}{3}\% = \frac{175}{300} = \frac{7}{12}$
70. 10 ft = 120 in
 $120 \div 3 = 40$ (tiles each side)
 $40 \times 4 - 4 = 156$ tiles (around)
Note: We need to deduct 4 tiles from corners.
71. $12 \div 3 = 4$
 $4 \times 4 = \$16$
72. $\frac{2}{3} = 66\frac{2}{3}\%$ (precise percent)

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73. $2 \times 10,000 = 20,000$
74. $144 \div 8 = 18$ goldfish
75. $144 \div 12 = 12$ catfish
76. $\text{LCM}(8, 12) = 24$, which mean every 24th customer received both a goldfish and a catfish.
 $144 \div 24 = 6$ customers
77. $300 \times (1 + 5\%) = 300 + 15 = \315
78. $20 \div 4 = \$5$ per hour
79. $130 \div 6.5 = 20$ mi/gal
80. $6 \times 2\frac{1}{4} \times 2 = 27$
81. $\frac{1}{3} \times 30 = 10$ (girls)
 $30 - 10 = 20$ (boys)
 $10 + 2 = 12$
 $20 - 2 = 18$ (boys)
 $\frac{18}{30} = \frac{3}{5} = 60\%$
82. D
 In the first 6 numbers, only two will stay: 1 and 5.
 $20 \div 6 = 3$ (rem 2)
 $3 \times 2 = 6$
 (1, 5) (7, 11) (13, 17) (19)
 (Don't forget 19)
 $6 + 1 = 7$

83. $30 + 40 = 70$
 $70 - 50 = 20$



84. 1 gallon = 16 cups
 $16 \div \frac{4}{3} = 16 \times \frac{3}{4} = 12$ pies
85. Let the middle length be x cm, so the longest one be $3x$.
 The shortest one then is $3x - 23$ (cm).
 The total length = $x + 3x + 3x - 23 = 40$
 $7x = 63$
 $x = 9$
 $3x - 23 = 4$ cm

Answer Key

1. 5
2. $10/7$
3. -5
4. 4
5. -2
6. -15
7. 1
8. $5a + 2 = 3a - 7$
 $2a + 2 = -7$
 $2a = -9$
 $a = -9/2$
9. 5
10. 3
11. 3
12. 8
13. 9
14. 2
15. 9
16. 1
17. 3
18. 9
19. $4/3$
20. -5
21. 22 right
 2 wrong
 1 omitted
22. $21 \times 5 = 105$
 $3 \times 2 = 6$
 $105 - 6 = 99$
 21 correct
 3 incorrect
 6 omitted
23. $81 + 2 \times 1.5 = 84$
 $84 \div 6 = 14$
 14 correct
 2 incorrect
 2 omitted
24. $41 \times 2 = 82$
 $7 \times 2 = 14$
 $82 - 14 = 68$
 41 correct
 7 incorrect
 2 omitted
25. 32 correct
 3 incorrect
 5 omitted
26. $20\% \times 40 = 8$ (losses)
 $8 \times 10 = 80$
 $80 - 40 = 40$ (wins)
27. $40\% \times 50 = 20$ (losses)
 $20 \div \frac{1}{4} = 80$
 $80 - 50 = 30$ (wins)
28. $24 \times 25\% = 6$ (losses)
 $6 \div 20\% = 30$
 $30 - 24 = 6$
29. $75\% \times 12 = 9$ (losses)
 $9 \div 50\% = 18$
 $18 - 12 = 6$ (wins)
30. $60 \times 30\% = 18$
 $18 \div 15\% = 120$
 $120 - 60 = 60$ (correct answers)
31. $x^2 - 5x - 24$
32. $5x^2 + 7x + 2$
33. $x^2 + 10x + 21$
34. $x^2 + 2x - 24$
35. $x^2 - 2x - 24$
36. $6x^2 + 17x + 12$
37. $2x^2 - 4x - 16$
38. $18x^2 + 13x + 2$
39. $6x^2 - 21x + 18$
40. $32x^2 + 12x + 1$
41. $(x - 4)(x + 1)$
42. $(x - 4)(x - 1)$
43. $(x + 1)(x + 5)$
44. $(x - 1)(x + 5)$
45. $(x - 5)(x + 1)$
46. $x = 5$ or $x = 1$
47. $x = -1$ or $x = -6$
48. $x = 1$ or $x = -6$
49. $x = 6$ or $x = -1$
50. $x = 6$ or $x = 1$
51. B
52. A
53. $0.\bar{3}$
54. $0.\bar{6}$
55. $0.\overline{01}$
56. $0.\overline{04}$
57. $0.\overline{23}$

MAP 279+ (T2) Issue 12

- | | |
|---|--------------------|
| 58. $0.\overline{466557}$ | 75. 70 |
| 59. $0.\overline{36}$ | 76. 50% |
| 60. $0.\overline{355446}$ | 77. 10 |
| 61. $0.\overline{01}$ | 78. 40 |
| 62. $0.\overline{09}$ | 79. $1\frac{1}{3}$ |
| 63. $2.\overline{3}$ | 80. $\frac{3}{4}$ |
| 64. $0.\overline{5}$ | 81. 25% |
| 65. 1 | 82. 51 |
| 66. $1.\overline{1}$ | 83. 0.0196 |
| 67. $1.6\overline{8}$ | 84. 5.45 |
| 68. $0.1\overline{6}$ | 85. 169 |
| 69. $\frac{0.1\overline{6}}{2} = \frac{0.16\overline{6}}{2} = 0.08\overline{3}$ | 86. 625 |
| 70. $0.\overline{1}$ | 87. 504 |
| 71. $\frac{2}{5}$ | 88. 1681 |
| 72. 30 | 89. 960 |
| 73. 5.4 | 90. 72400 |
| 74. 11 | |

Answer Key

1. ± 5 since $5^2 = 25$ and $(-5)^2 = 25$.
2. 2 since $2^3 = 8$ (-2 is not).
3. ± 3 since $3^4 = 81$ and $(-3)^4 = 81$.
4. 5 (-5 is a square of 25, but not the principal one.)
5. 2 is the principal cube root of 8
6. 3
7. $\frac{2}{3}$
8. -2
9. 3
10. 9
11. -3
12. -1
13. 1
14. -1
15. 10
16. $\frac{2}{3}$
17. 540
18. $\sqrt[3]{27} = 3$
19. $\sqrt{36} = 6$
20. $\sqrt[4]{\frac{1}{16}} = \frac{1}{2}$
21. $\frac{1}{y(x-2)}$
22. $\frac{(x+y)y}{(x+y)(x-y)} = \frac{y}{x-y}$
23. $\frac{(a-3)(x+2y)}{(a-3)(2x+y)} = \frac{x+2y}{2x+y}$
24. $\frac{9y}{(x+6)^2} \div \frac{12y}{x(x+6)}$
 $= \frac{9y}{(x+6)^2} \cdot \frac{x(x+6)}{12y}$
 $= \frac{3x}{4(x+6)}$
25. $\frac{x(4x+3)(16x^2-12x+9)}{3x(4x+3)(x-3)} = \frac{16x^2-12x+9}{3(x-3)}$
26. $\frac{(x-8)(x+4)}{(3x-2)(x-8)} = \frac{x+4}{3x-2}$
27. $\frac{(2x+7)(x-3)}{(2x+7)(5x-1)} = \frac{x-3}{5x-1}$
28. $\frac{(x+2)(y+3)}{(x+2)(y+4)} = \frac{y+3}{y+4}$
29. $\frac{(x-2)(x+a)}{(x-2)(x+3a)} = \frac{x+a}{x+3a}$
30. $\frac{(5x-4)(x+2)}{(5x-4)(x+2)} = \frac{x+2}{x+2}$
31. $\frac{(5x-4)(2x+1)}{(2x+5)(5x-2)} \cdot \frac{2(x+7)(x-4)}{2(x+7)(x-4)} = \frac{2}{2}$
32. $\frac{(3x-8)(x+6)}{(3x-8)(x+6)} \cdot \frac{2(4x+5)(x-1)}{2(4x+5)(x-1)} = \frac{2}{2}$
33. $\frac{5x(x+4)}{x^2(x-2)} \cdot \frac{(x-4)(x+3)}{(x-4)(x+4)} = \frac{5(x+3)}{x(x-2)}$
34. $\frac{-(3x-1)(x+5)}{-(x+1)(3x-1)} \cdot \frac{-(2x-9)(x+1)}{-(2x-9)(x+1)} = \frac{x+5}{x-3}$
35. $\frac{3(x+2)}{5y} \cdot \frac{x^2+4}{(x+2)(x+8)} = \frac{3(x^2+4)}{5y(x+8)}$
36. $\frac{(x+6y)(x-y)}{(x-y)y^2} \cdot \frac{(2x+3y)(x+6y)}{(x+4y)y}$
 $= \frac{(2x+3y)(x+6y)^2}{(x+4y)y^3}$
37. $\frac{(x-2y)^2}{7xy^2} \div \frac{(4x+5y)(x-2y)}{5xy(4x+5y)}$
 $= \frac{(x-2y)^2}{7xy^2} \cdot \frac{5xy(4x+5y)}{(4x+5y)(x-2y)}$
 $= \frac{5(x-2y)}{7y}$
38. $\frac{(6x-5)(x-5)}{(4x+9)(x-5)} \div \frac{(3x+4)(6x-5)}{(4x+9)(6x+5)}$
 $= \frac{(6x-5)(x-5)}{(4x+9)(x-5)} \cdot \frac{(4x+9)(6x+5)}{(3x+4)(6x-5)}$
 $= \frac{6x+5}{3x+4}$
39. $\frac{(3x+4)(7x-2)}{(5x+2)(x-9)} \div \frac{(4x-3)(3x+4)}{(5x+2)(4x-3)}$
 $= \frac{(3x+4)(7x-2)}{(5x+2)(x-9)} \cdot \frac{(5x+2)(4x-3)}{(4x-3)(3x+4)}$
 $= \frac{7x-2}{x-9}$
40. $\frac{3x+12}{3x^2-15x} \div \frac{x^2-16}{x^2-3x-10}$
 $= \frac{3(x+4)}{3(x-5)} \cdot \frac{(x-5)(x+2)}{(x-4)(x+4)}$
 $= \frac{x+2}{x(x-4)}$
41. (a) $x = 20\sin 65^\circ = 18.13$
 (b) $y = 20\cos 65^\circ = 8.45$
42. (a) $x = 20\cos 65^\circ = 8.45$
 (b) $y = 20\sin 65^\circ = 18.13$
43. (a) $x = 10\tan 20^\circ = 3.64$
 (b) $y = 10/\cos 20^\circ = 10.64$
44. (a) $x = 25\tan 35^\circ = 17.51$
 (b) $y = 25/\cos 35^\circ = 30.52$
45. (a) $x = 25\tan 35^\circ = 17.51$
 (b) $y = 25/\cos 35^\circ = 30.52$
46. (a) $x = 25/\sin 5^\circ = 286.84$
 (b) $y = 25/\tan 5^\circ = 285.75$
47. (a) $x = 100\cos 65^\circ = 42.26$
 (b) $y = 100\sin 65^\circ = 90.63$
48. (a) $x = 30\sin 70^\circ = 28.19$
 (b) $y = 30\cos 70^\circ = 10.26$
49. (a) $x = 10\tan 20^\circ = 3.64$
 (b) $y = 10/\cos 20^\circ = 10.64$
50. (a) $x = 90\tan 37^\circ = 67.82$
 (b) $y = 90/\cos 37^\circ = 112.69$
51. (a) $x = 70\sin 40^\circ = 45$
 (b) $y = 70\cos 40^\circ = 53.62$
52. (a) $x = 45/\cos 75^\circ = 173.87$
 (b) $y = 45\tan 75^\circ = 167.94$
53. $a^\circ = \sin^{-1}(70/120) = 35.69^\circ$
54. $a^\circ = \cos^{-1}(32/96) = 70.53^\circ$

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55. $a^\circ = \tan^{-1}(\sqrt{31}/3) = 61.68^\circ$

56. $30\sin 40^\circ = 19.28$

57. $\tan^{-1}(19.28/10) = 62.59^\circ$

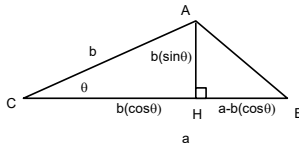
58. $10/\cos 62.59^\circ = 21.72$

59. $50\cos 70^\circ = 17.10$

60. $50\sin 70^\circ = 46.98$

61. Since the height of BC is $b\sin\theta$, $\text{area}(\triangle ABC) = \frac{1}{2}(\text{height}) \times (\text{base}) = \frac{1}{2}ab\sin\theta$.

62. Using the figure below, we have
 $c^2 = (b\sin\theta)^2 + (a - b\cos\theta)^2$
 $= a^2 + b^2(\cos^2\theta + \sin^2\theta) - 2ab\cos\theta$
 $= a^2 + b^2 - 2ab\cos\theta$.



63. Solve the previous equation in θ :

$$c^2 = a^2 + b^2 - 2ab\cos\theta$$

64. $\text{area}(\triangle ABC) = \frac{1}{2}ab\cos\theta = \frac{1}{2}ab\sqrt{1 - \cos^2\theta} =$

$$\frac{1}{2}ab\sqrt{1 - \left(\frac{a^2 + b^2 - c^2}{2ab}\right)^2}$$

$$= \frac{1}{4}2ab\sqrt{\left(1 - \frac{a^2 + b^2 - c^2}{2ab}\right)\left(1 + \frac{a^2 + b^2 - c^2}{2ab}\right)}$$

$$= \frac{1}{4}\sqrt{(2ab - (a^2 + b^2 - c^2))(2ab + (a^2 + b^2 - c^2))}$$

$$= \frac{1}{4}\sqrt{(c^2 - (a - b)^2)((a + b)^2 - c^2)}$$

$$= \frac{1}{4}\sqrt{(c - a + b)(c + a - b)(a + b + c)(a + b - c)}$$

$$= \sqrt{\frac{a+b+c}{2} \cdot \frac{(c-a+b)}{2} \cdot \frac{(c+a-b)}{2} \cdot \frac{a+b-c}{2}}$$

$$= \sqrt{s \cdot (s - a) \cdot (s - b) \cdot (s - c)}$$

65. See the answer to the previous problem.

66. A corollary from the previous theorem.

67. $\frac{1}{2}(\text{base}) \times (\text{height}) = \frac{1}{2}(8)(6\sin 60^\circ) = 20.78 \text{ cm}^2$.

68. $BC^2 = 6^2 + 8^2 - 2(6)(8)\cos 60^\circ = 52 \Rightarrow BC = 7.21 \text{ cm}$

69. i) $a^2 + b^2 - c^2 > 0 \Rightarrow$ acute triangle

ii) $a^2 + b^2 - c^2 = 0 \Rightarrow$ right triangle

iii) $a^2 + b^2 - c^2 < 0 \Rightarrow$ obtuse triangle

70. Invalid triple since it violates the triangular inequality, which says

$$a + b > c > a - b,$$

where a , b , and c are three sides of a triangle.

71. Invalid triple

72. Valid triple and it is an obtuse triangle since $8^2 = 64 > 4^2 + 5^2 = 41$, thus it is an obtuse triangle.

73. Valid triple and it is a right triangle since $26^2 = 10^2 + 24^2$

74. Valid triple and it is an acute triangle since $12^2 < 10^2 + 11^2$

75. $\frac{1}{2}AB \times AC \times \sin 40^\circ \approx 11.57$

76. 8

$$AD = \frac{1}{2}AB = 7$$

By the converse theorem of law of cosine, we have

$$\cos A = \frac{14^2 + 7^2 - 9^2}{2(14)(7)} \text{ (Don't calculate!)}$$

BC^2

$$= AC^2 + AB^2 - 2AB \cdot AC \cdot \cos A$$

$$= 14^2 + 14^2 - 2 \times 14 \times 14 \times \frac{14^2 + 7^2 - 9^2}{2(14)(7)}$$

$$= 2 \times 14^2 - 2(14^2 + 7^2 - 9^2)$$

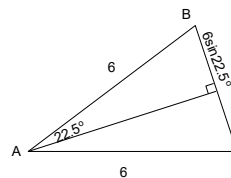
$$= 2(9^2 - 7^2)$$

$$= 64$$

$$BC = 8$$

77. The polygon is composed of 8 isosceles triangle with the vertex angle $= 360^\circ/8 = 45^\circ$. Thus, the area of the polygon is $8 \times \frac{1}{2} \times 36 \times \sin 45^\circ \approx 101.823 \text{ cm}^2$.

78. The polygon is composed of 8 isosceles triangle with the vertex angle $= 360^\circ/8 = 45^\circ$. The base $= 2 \times 6 \sin(\frac{1}{2} \times 45^\circ) \approx 4.59 \text{ cm}$.



79. Thus, the perimeter of the octagon is

$$2 \times 6 \sin(\frac{1}{2} \times 45^\circ) \times 8 = 36.74 \text{ cm}.$$

80. $12\pi \approx 37.69 \text{ cm}$, which is greater than 36.74 cm.