Answer Key

1. N/A
2. N/A
3. N/A
4. N/A
5. N/A
6. N/A
7. N/A
8. N/A
9. N/A
10. N/A
11. 1/8
12. 1/4
13. 1/8
14. 1/8
15. 3/8
16. 1/4
17. 5/8
18. 1/2
19. 3/8
20. 1/8
21. $\frac{4}{6}$
22. $\frac{3}{5}$
23. $\frac{2}{4}$
24. $\frac{5}{7}$
25. $\frac{6}{7}$
26. $\frac{5}{6}$
27. $\frac{5}{6}$
28. $\frac{5}{6}$
29. $\frac{4}{5}$
30. $\frac{5}{6}$
31. 19
32. 20
33. 27
34. 28
35. 22
36. 24
37. 37
38. 43
39. 30
40. 46
41. 4.1
42. 4.4
43. 5.4
44. 2.6
45. 2.3
46. 2.3
47. -
48. 9
49. -
50. 9.7
51. 28
52. 25
53. 28
54. 23
55. 8
56. 25
57. 10
58. 17
59. 19
60. 19
61. 21
62. 25
63. 5
64. 16
65. 33
66. 28
67. 29
68. 22
69. 17
70. 5
71. A=3, B=0, C=4
    Ans=3 (for A) & 0 (for B) & 4 (for C)
72. A=3, B=5, C=5
    Ans=3 (for A) & 5 (for B) & 5 (for C)
73. A=8, B=4, C=9
    Ans=8 (for A) & 4 (for B) & 9 (for C)
74. A=5, B=4, C=8
    Ans=5 (for A) & 4 (for B) & 8 (for C)
75. A=3, B=1, C=5
    Ans=3 (for A) & 1 (for B) & 5 (for C)
76. A=5, B=0, C=4
    Ans=5 (for A) & 0 (for B) & 4 (for C)
77. A=1, B=5, C=3
    Ans=1 (for A) & 5 (for B) & 3 (for C)
78. A=7, B=9, C=1
    Ans=7 (for A) & 9 (for B) & 1 (for C)

79. A=9, B=8, C=4
    Ans=9 (for A) & 8 (for B) & 4 (for C)
80. A=2, B=5, C=8
    Ans=2 (for A) & 5 (for B) & 8 (for C)
81. 2
82. 8
83. 4
84. 5
85. 9
86. 7
87. 8
88. 12
89. 7
90. 30
91. 38
92. 70
93. 133
94. 126
95. 40
96. 83
97. 138
98. 103
99. 117
100. 87
101. A
102. D
103. 10:50 am
104. 5 + 14 = 19
105. 30×5 = 150¢
106. 5×40 = 200
107. 4 + 3 + 7 = 14
108. 240×2 = 480
109. B
110. C
111. 56 animals
112. 21÷3 = 7
113. A
114. B
115. B
116. C
117. 120 - 80 = 40
118. 120×3 = 360
119. 75 + 37 = 112
120. 108 - 92 = 16

Answer Key

1. 5
2. 48
3. 8
4. 21
5. 25
6. 18
7. 6
8. 28
9. 21
10. 16
11. 28
12. 35
13. 25
14. 20
15. 48
16. 12
17. 28
18. 36
19. 28
20. 72
21. 7/8
    GCF = 2
22. 5/6
    GCF = 3
23. 2/3
    GCF = 4
24. 5/8
    GCF = 6
25. 3/5
    GCF = 8
26. 6/7
    GCF = 8
27. 2/7
    GCF = 10
28. 3/8
    GCF = 10
29. 8/9
    GCF = 12
30. 4/7
    GCF = 20
31. 0.3
32. 0.4
33. 0.5
34. 0.6
35. 0.7
36. 0.8
37. 0.9
38. 0.05
39. 0.1
40. 0.15
41. $\frac{1}{5}$
42. $\frac{1}{4}$
43. $\frac{3}{10}$
44. $\frac{7}{20}$
45. $\frac{2}{5}$
46. $\frac{9}{20}$
47. $\frac{1}{2}$
48. $\frac{11}{20}$
49. $\frac{3}{5}$
50. $\frac{13}{20}$
51.
52. 5 (GCF) & 30 (LCM)
53. 2 (GCF) & 24 (LCM)
54. 2 (GCF) & 144 (LCM)
55. 5 (GCF) & 180 (LCM)
56. 4 (GCF) & 80 (LCM)
57. 9 (GCF) & 90 (LCM)
58. 3 (GCF) & 36 (LCM)
59. 7 (GCF) & 42 (LCM)
60. 7 (GCF) & 70 (LCM)
61. $24 \times \frac{1}{4} = 6$ hr
62. $1\frac{1}{8} - \frac{5}{8} = (33 - 20)/24 = 13/24$
63. 7/8
64. 9 turns
65. 1/5
66. $36 \div 2 = 18$ pounds
67. $6\frac{1}{4} + 4\frac{1}{3} = = 10\frac{7}{12}$ dozen = 127 roses
68. $\frac{1}{4}+\frac{1}{2}+\frac{3}{4} = 1\frac{1}{2} = 1\ 1/2$ (pounds)
69. $140 \div \frac{4}{5} = 175$
70. $150 \times 2 - 50 = 250$
    Check: $250 - 50 = 200$
    $250 - 150 = 100$

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71. 3 ¼ + 2 ¾ = 5 + 1 = 6

72. 1 – 1/6 – ⅓ = ½
¼ × ½ = ⅛
96×(⅛) = 12

73. 1 – ¾ = 1/4
300× ¼ = 75
1 – ⅓ = ⅔
75×⅔ = 50

74. 7

75. 33 sq. meters

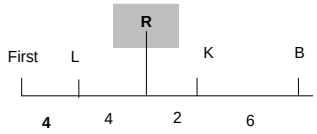
76. $16 \times \frac{1}{4} = 4$ oz

77. 30÷3 = 10
30 - 10 = $20

78. 5×2½ = 12½ = 12 1/2 mi

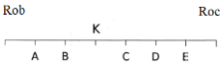
79. $38 - 31\frac{1}{7} = 7 - \frac{1}{7} = 6\frac{6}{7}$ = 6 6/7 pounds.

80. 18¼ - 1¾ = 16.5
16.5÷5 = <u>3.3 pounds</u>

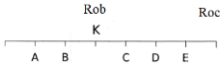


81. B: 8 + 1 + 8 = 17

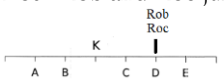
82. D
Rob jumps 3 hours and Roc jumps 4 hours.



Rob jumps backward for 3 hours while Roc is still resting.



Both Rob and Roc jumps toward each other.



83. 1+2+3=6
1+2+3+4=10
1+2+3+4+5=15
Ans = 5 vaults at least

84. 4.5÷1.5 = 3
4×3 = 12 kg

85. 4×4×4 = 64

123456789 <u>stair</u>
123
4567
8901
2345

86. Retractions are in bold.
3 + 4×3 = <u>15</u>

87. If there is 1 girl, #boys without counting Tom is 2, and #boy = 3.
If there is 2 girls, #boys without counting Tom is 4, and #boy = 5.
If there is 3 girls, #boys without counting Tom is 6, and #boy = 7.
If there is 4 girls, #boys without counting Tom is 8, and #boy = 9.
If there are 4 girls, #girls without counting Jenny is 3, which is ⅓ of 9.
#girl + #boys = 4 + 9 = 13

#all girls	#boys \ Tom	#girls \ Jenny	#all boys
1	2	0	3
2	4	1	5
3	6	2	7
4	8	3	9
5	10	4	11

88. ½×12 = 6
6 + 2×6 = 18
½×18 = 9
9 + 2×9 = 27

89. ½×12 = 6

90. ½×14 = 7
7 + 8 = 15
⅔(15) = 10
10 + 10 = <u>20 robins</u>

Answer Key

1. 81
2. 350
3. 28
4. 4.8
5. 12
6. 40
7. 630
8. 18
9. 1.6
10. 36
11. 5
12. 3.75
13. 5
14. 24
15. 0.0005
16. 150
17. 3750
18. 0.375
19. 15
20. 25
21. 64
22. 68
23. 63
24. 69
25. 62
26. 70
27. 76
28. 80
29. 75
30. 81
31. 361
32. 280
33. 315
34. 352
35. 391
36. 432
37. 300
38. 338
39. 378
40. 420
41. 32 (A) & 8 (B) & 6 (C) & 4 (D)
42. 72 (A) & 6 (B) & 4 (C) & 6 (D)
43. 64 (A) & 4 (B) & 5 (C) & 8 (D)
44. 72 (A) & 8 (B) & 3 (C) & 3 (D)
45. 180 (A) & 9 (B) & 4 (C) & 4 (D)
46. $\frac{57}{280}$
GCF = 4, LCM = 280
47. $\frac{11}{50}$
GCF = 5, LCM = 50
48. $\frac{11}{60}$
GCF = 5, LCM = 60
49. $\frac{5}{24}$
GCF = 4, LCM = 24
50. $\frac{65}{84}$
GCF = 3, LCM = 84
51. $\frac{19}{56}$
GCF = 4, LCM = 56
52. $\frac{1}{42}$
GCF = 4, LCM = 84
53. $\frac{7}{60}$
GCF = 3, LCM = 60
54. $\frac{1}{14}$
GCF = 3, LCM = 42
55. $\frac{41}{112}$
GCF = 2, LCM = 112
56. 60
57. 4900
58. 900
59. 3
60. 4
61. 216000
62. 40
63. 40
64. 2500
65. 125000
66. 3 in (A) & 5 in (B) & 5 in (C) & 8 in (D)
67. 2 in (A) & 7 in (B) & 7 in (C) & 6 in (D)
68. 3 in (A) & 6 in (B) & 5 in (C) & 6 in (D)
69. 5 in (A) & 3 in (B) & 4 in (C) & 5 in (D)
70. 4 in (A) & 8 in (B) & 2 in (C) & 3 in (D)
71. $\frac{25}{10} \times 3 = 7.5$ lbs

72. 6×43 = 258
    8×51 = 408
    408 - 258 = 150
    150÷2 = 75

73. C
    $\frac{1}{6}-\frac{1}{12}=\frac{1}{12}$
    $\frac{1}{12}\div 3=\frac{1}{36}$
    $\frac{1}{12}+\frac{1}{36}=\frac{4}{36}=\frac{1}{9}$

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

75. 42.67+50 - 15 - 21 +16.25 + 25 = $97.92

76. 4 A & 1 B & 4 C

	4	3	1	2
		4	5	4
+	4	1	2	7
	8	8	9	3

77. a unit = 3
    length = 3×3 = 9
    width = 2×3 = 6
    9×6 = 54

78. 140÷20 = 7

79. 25×7 = 175

80. 385÷7 = 55 min

81. 120÷1600 = 0.075 = 7.5%

82. B

83. Since the average of B, C and D is 14, the total of the four boys is
    10+14×3 = 52,
    thus the average of the four boys is
    52÷4 = 13

84. 3 meters

85. 20×8% = 20×0.08 = 2×0.8 = $1.60

Answer Key

1. -13
2. -20
3. -12
4. -10
5. -6
6. -1
7. -4
8. 3
9. 1
10. 2
11. 40
12. -6
13. 32
14. -8
15. 19
16. -10
17. 6
18. 51
19. -9
20. 6
21. $-2x + 6$
22. $38x + 2$
23. $8x - 2$
24. $8x - 19$
25. $-8x + 3$
26. $-13x - 8$
27. $-2x - 4$
28. $-10x - 6$
29. $22x - 27$
30. $9x - 12$
31. $x = -4.2$
32. –4
33. $x = -5$
34. $x = 4$
35. $x = -2$
36. $x = -1$
37. $x = 1$
38. $x = -3$
39. $x = -\frac{13}{2} = -6.5$
40. 2
41. 2401
42. 2500
43. 2601
44. 2704
45. 2809
46. 2916
47. 3025
48. 3136
49. 3249
50. 3364
51. 16
52. 40
53. 130
54. 19
55. 56
56. 35
57. 32
58. 52
59. 85
60. 119
61. $600 \div 50 = 12$
    $600 \div 60 = 10$
    $10 + 12 = 22$ hr
62. $1\frac{1}{2} \times 10 = 15$ (miles)
    $15/4 = 3\frac{3}{4}$ hours
    $1\frac{1}{2} + 3\frac{3}{4} = 5\frac{1}{4}$ hours = 5 hr & 15 min
63. 3 hr 24 min = $3\frac{2}{5}$ hr
    $35 \times 3\frac{2}{5} = 119$ (miles)
64. 3 hr 20 min = $3\frac{1}{3}$ hr
    $\frac{10}{3\frac{1}{3}} = 3$ mph
65. 1 hr 20 min = $1\frac{1}{3}$ hours
    $\frac{120}{1\frac{1}{3}} = \frac{120}{\frac{4}{3}} = 90$ mph
66. $48 + 60 = 108$ mi
    $2 + 3 = 5$ hr
    $108 \div 5 = 216 \div 10 = 21.6$ mph
67. 25 min = $\frac{25}{60}$hr
    $\frac{175}{\frac{25}{60}} = \frac{175 \cdot 60}{25} = 7 \times 60 = 420$ mph
68. 20 min = ⅓ hour
    $\frac{1}{3} \times 45 = 15$ mi
69. 3 hr 20 min = $3\frac{1}{3}$ hr
    $2\frac{1}{3} \times 60 = 140$ mi

70. 11: 00 - 7: 00 = 4 hr
53÷4 = $13\frac{1}{4}$ = 13 1/4 mph

71. $\frac{5-4}{5} = \frac{1}{4}$ = 0.25 = 25%

72. $\frac{60-48}{60}$= 0.2 = 20%

73. 12:18 = 2:3
So, the increase is 50%.

74. 800:600 = 4:3
$\frac{1}{4}$ = 25%

75. 80:64 = 5:4
$\frac{1}{5}$ = 0.2 = 20%

76. 12÷30% = 12÷0.3 = 40

77. 40 - 12 = 28
12×$\frac{7}{3}$= 28

78. $\frac{2}{5}$ = 0.4 = 40%

79. 2,000×0.8 = $1,600

80. 1 + 20% = 1.2
20×1.2 = $24.00 (new price)
or
20×20% = 20×0.2 = 4
20 + 4 = $24.00

81. 15%×20 = 0.15×20 = 1.5×2 = $3

82. 1 + $\frac{1}{4} = \frac{5}{4}$
20×$\frac{5}{4}$ = 25
or
20×$\frac{1}{4}$ = 5
20 + 5 = 25

83. $\frac{discount}{original\ price}$=$\frac{10}{25}$ = 40%

84. 35÷5 = 7
7×7 = 49

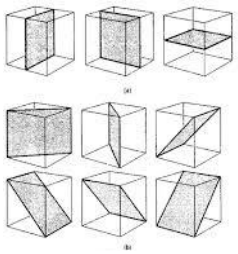
85. 35÷7 = 5
5×5 = 25

86. 5 + 7 = 12
60 ÷12 = 5
5×5 = 25 (black)
5×7 = 35 (red)

87. C
Alex:$\frac{36}{12}$ = 3 pages per min
Ben: $\frac{45}{15}$ = 3 pages per min

88. 10-12: 84 + 73 + 118 = 275
7 – 9: 70 + 101 + 29 = 200
275:200 = 11:8

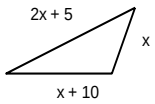
89. B
3 midpoints
3×2 diagonals



90. B
□□□□□
10×10×10 = 1000

91. Assume she has x nickels. Then, she has x + 5 dimes and 3x + 4 quarters. Since the total number of coins is 69, we have
$x + (x + 5) + (3x + 4) = 69$
$5x + 9 = 69$
$x = 12$
Ans = 12 (nickels) & 17 (dimes) & 40 (quarters)

92. Assume the shortest side is x yards. The sides are shown in the following diagram.

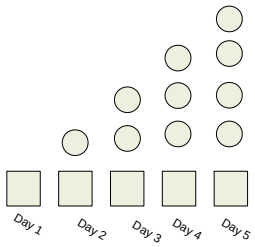


Since the perimeter of the triangle is 135, we have
$2x+5)+(x+10)+x = 135$
$4x + 15 = 135$
$x = 30$
The remaining two sides are 65 yards and 40 yards.
Ans = { 30, 40, 65} yards

93. Let x be the daughter's age, hence 50-x be the mother's age. In 5 years, mother will become 55-x and daughter will become x+5. The second statement can be rephrased using a succinct equation:
$55-x = 3(x+5)$
$\Rightarrow x = 10$ (the daughter's present age) and thus,
$50-x = 40$ (the mother's present age).

94. A
A) $3^5\times2 = 486$
B) $2^4\times3^3 = 432$
C) $3^4\times5 = 405$
D) $2^8\times1 = 256$

95. Use the following diagram.



A square stands for the number of rats eaten on the first day. Since there are 6 rats in a circle, the number of increase each day, there are 10 circles, so there are 60 rats in these circles.
100 – 60 = 40
40 ÷ 5 = 8
Ans = { 8, 14, 20, 26, 32} rats

96. C
Method I) (Optimal)
Divide the coins into 3 piles (with 80 in each pile).
240 = 80 + 80 + 80

Place two piles on the scale.
If one is heavier, then pick this one.
If not, pick the third pile.

Divide 80 into 3 piles, with 27, 27, and 26.
80 = 27 + 27 + 26
Repeat the same comparison and selection as before.

27 = 9 + 9 + 9, or
26 = 9 + 9 + 8

9 = 3 + 3 + 3, or
8 = 3 + 3 + 2

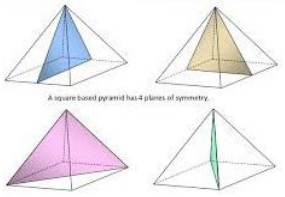
3 = 1 + 1 + 1, or
2 = 1 + 1

The scale will be used 5 times at minimum.

Method II) (Needs improvement)
240 = 120 + 120
① Select the heavier half
120 = 60 + 60
② Select the heavier half
60 = 30 + 30
③ Select the heavier half
30 = 15 + 15
④ Select the heavier half
15 = 7 + 7 + 1 (if both 7 in the same weight, ⑤ then 1 is the heavier one.)
7 = 3 + 3 + 1 (if both 3 in the same weight, ⑥ then 1 is the heavier one.)
3 = 1 + 1 + 1 ⑦
Ans = 7 times (at most)

97. B
5×7×8×9 = 7×360 = 2520

98. C



Answer Key

1. $(-2)^2 = 4$
2. $-2(-x^5)^3 = -2(-x^{15}) = 2x^{15}$
3. $(x^{-1})^2 = (\frac{1}{x})^2 = \frac{1}{x^2}$
4. $\frac{x^4}{x^6} = \frac{1}{x^2}$
5. 3^3
6. $\frac{8}{125}$
7. $\frac{-x^5}{32}$
8. $\frac{1}{16x^4}$
9. $\frac{16}{x^4}$
10. $\frac{-1}{32x^5}$
11. $-32x^5$
12. -1
13. 1
14. 1/64
15. $\frac{1}{(-2x)^3} = \frac{1}{-8x^3}$
16. 1
17. $\frac{4}{9}$
18. $\frac{-1}{t^6}$
19. $\frac{1}{(-2x)^4} = \frac{1}{16x^4}$
20. $n = 3$
21. $(x - 6)(x + 3)$
22. $(x - 8)(x + 2)$
23. $(x - 2)(x + 1)$
24. $(x - 3)(x + 2)$
25. $(x - 4)(x + 2)$
26. $(x - 7)(x - 1)$
27. $(x - 7)(x + 4)$
28. $(x - 8)(x + 1)$
29. $(x - 6)(x + 4)$
30. $(x - 8)(x + 5)$
31. $2(2x + 3)(4x - 3) = 0$
    $x = -3/2$ or $3/4$
32. $3(2x - 1)(4x - 9) = 0$
    $x = 1/2$ or $9/4$
33. $6(8x + 3)(x + 3) = 0$
    $x = -3/8$ or -3
34. $8(8x + 9)(x - 1) = 0$
    $x = -9/8$ or 1
35. $(2x + 1)(4x + 15) = 0$
    $x = -1/2$ or $-15/4$
36. $(x - 5)^2$
37. $(6x - 1)^2$
38. $(5x + 1)^2$
39. $(7x - 2)^2$
40. $(7x + 0.6)^2$
41. $(6x + 1)^2$
42. $(6x + 2)^2$
43. $(7x + 5)^2$
44. $(8x + 5)^2$
45. $(x + 5)^2$
46. 27
47. 32
48. 32
49. 32
50. 2
51. 64
52. 64
53. 81
54. 128
55. 128
56. 2
57. $1\frac{3}{5}$
58. $4\frac{1}{2}$
59. 3
60. $2\frac{1}{4}$
61. $1\frac{4}{5}$
62. $2\frac{1}{3}$
63. $1\frac{1}{2}$
64. 5
65. $3\frac{1}{3}$
66. 2.5
67. 1.5
68. 1.4
69. 0.2
70. 0.2

71. 0.2
72. 0.3
73. 0.3
74. 0.4
75. 0.4
76. $\frac{1}{3}+\frac{3}{1} = 3\frac{1}{3}$
77. $\frac{9}{7}+\frac{1}{2} = 1\frac{11}{14}$
78. $\frac{3}{1}+\frac{1}{3} = 3\frac{1}{3}$
79. $\frac{10}{7}+\frac{1}{2}+\frac{2}{3} = 2\frac{25}{42}$
80. $\frac{7}{3}+\frac{1}{3}+\frac{1}{3} = 3$
81. $12x^2y^4z^4$
82. $48x^2y^3z^5$
83. $24x^4y^3z^3$
84. $12xy^3z^4$
85. $\frac{5}{9}\frac{1}{z^2}$
86. $\frac{1}{12}\frac{x}{y^4}$
87. $1\frac{3}{5}y$
88. $\frac{1}{4}\frac{x}{y^4z^4}$
89. $3\frac{x}{y^2z}$
90. $2\frac{2}{5}\frac{y^2z^4}{x^2}$