

Answer Key

1. $\frac{19}{3}$
 $6 \times 3 + 1 = 19$
2. $\frac{65}{9}$
 $7 \times 9 + 2 = 65$
3. $\frac{35}{11}$
 $3 \times 11 + 2 = 35$
4. $\frac{22}{5}$
 $4 \times 5 + 2 = 22$
5. $\frac{37}{6}$
 $6 \times 6 + 1 = 37$
6. $\frac{30}{7}$
 $4 \times 7 + 2 = 30$
7. $\frac{35}{8}$
 $4 \times 8 + 3 = 35$
8. $\frac{34}{9}$
 $3 \times 9 + 7 = 34$
9. $\frac{13}{2}$
 $6 \times 10 + 5 = 65$
10. $\frac{37}{12}$
 $3 \times 12 + 1 = 37$
11. 8 R 2
12. 8 R 4
13. 5 R 1
14. 5 R 5
15. 8 R 1
16. 9
17. 7 R 1
18. 9 R 4
19. 9 R 3
20. 9
21. $5\frac{1}{6}$
 $31 \div 6 = 5 r 1$
22. $3\frac{2}{11}$
 $35 \div 11 = 3 r 2$
23. $3\frac{3}{7}$
 $24 \div 7 = 3 r 3$
24. $3\frac{3}{8}$
 $27 \div 8 = 3 r 3$
25. $4\frac{7}{8}$
 $39 \div 8 = 4 r 7$
26. $5\frac{1}{8}$
 $41 \div 8 = 5 r 1$
27. $4\frac{7}{9}$
 $43 \div 9 = 4 r 7$
28. $5\frac{2}{9}$
 $47 \div 9 = 5 r 2$
29. $3\frac{1}{11}$
 $34 \div 11 = 3 r 1$
30. $3\frac{1}{12}$
 $37 \div 12 = 3 r 1$
31. {1, 2, 41, 82}
32. {1, 3, 29, 87}
33. {1, 5, 17, 85}
34. {1, 2, 43, 86}
35. {1, 3, 9, 27, 81}
36. {1, 3, 5, 15, 25, 75}
37. {1, 2, 4, 19, 38, 76}
38. {1, 2, 3, 6, 13, 26, 39, 78}
39. {1, 2, 4, 5, 8, 10, 16, 20, 40, 80}
40. {31, 37, 41, 43, 47}
41. 12
42. 288
43. 5
44. 60
45. 90
46. 140
47. 2
48. 1000
49. 56
50. 50
51. 30
52. 3
53. 192
54. 10
55. 36
56. 60
57. 24
58. 48
59. 15

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60. 17
61. $\frac{3}{8}$
62. $\frac{3}{9}$
63. $\frac{3}{10}$
64. $\frac{4}{5}$
65. $\frac{4}{6}$
66. $1\frac{2}{3}$
67. $1\frac{2}{4}$
68. $1\frac{2}{5}$
69. $1\frac{2}{6}$
70. $1\frac{2}{7}$
71. B
Nancy: $\frac{1}{8} \times 40 = 5$
Justin: $\frac{1}{5} \times (35) = 7$
72. $7 \times 12 = 84$ inches
73. $\frac{3}{12} = \frac{1}{4} = 1/4$
74. .01 (Divide by 10.)
75. 125
76. (a) $3 \times 3 = 9$
(b) $3 \times 3 \times 12 = 108$
77. $17 \times 2 = 34$
 $34 \times 2 = 68$
78. $3 \times 6 = 18$
 $18 - (7 + 3) = 8$
79. 90 (Each number is $\frac{1}{3}$ of the previous one.)
80. 5
81. 4 (Multiply times 3.)
82. $1 \times 1 = 1$
 $2 \times 2 = 4$
 $3 \times 3 = 9$
...
 $7 \times 7 = 49$
 $8 \times 8 = 64$
83. 120
84. $8 + 10 = 18$
 $3 \times 12 = 36 = 18 \times 2$ cans
Ans = 2 cans
85. $36 + 9 = \underline{45}$
86. 28 days
87. $3 \times 12 = 36$ inches
88. $10 \times 2 - 8 = 12$
89. $4 \times 100 + 50 = 450$
 $450 \div 5 = 90$
90. $4 \times 1.00 + 3 \times 0.30 = 4.90$
 $4.90 \div 7 = \$0.70$

Answer Key

- | | |
|--------------------|-----------------------------------|
| 1. $\frac{5}{12}$ | 39. 5.2 |
| 2. $\frac{1}{42}$ | 40. 3.75 |
| 3. $\frac{10}{21}$ | 41. $\frac{49}{9} = 5\frac{4}{9}$ |
| 4. $\frac{11}{72}$ | 42. 0.9 |
| 5. $\frac{15}{56}$ | 43. 0.25 |
| 6. $\frac{3}{14}$ | 44. 0.02 |
| 7. $\frac{3}{8}$ | 45. 0.06 |
| 8. $\frac{5}{16}$ | 46. $\frac{2}{3}$ |
| 9. $\frac{5}{8}$ | 47. 0 |
| 10. $\frac{7}{36}$ | 48. 28% |
| 11. 0.54 | 49. 50% |
| 12. 0.42 | 50. 200% |
| 13. 0.24 | 51. 7.5 |
| 14. 1000 | 52. 40 |
| 15. 2400 | 53. 12 |
| 16. 15 | 54. 0.7 |
| 17. 10 | 55. 80 |
| 18. 50 | 56. 1000 |
| 19. 12 | 57. 100 |
| 20. 1.6 | 58. 10 |
| 21. 0.075 | 59. $48 = 2^4 \times 3$ |
| 22. 1.25 | 60. $\Delta = 3$ |
| 23. 0.375 | 61. D |
| 24. 0.72 | 62. 1000 (inches) = 20×50 |
| 25. 0.4 | 63. 10 (inches) |
| 26. 0.125 | 50 ÷ 2 = 25 |
| 27. 0.7 | 25 – 15 = 10 |
| 28. 0.9 | 64. 60÷15 = 4 |
| 29. 0.6 | 40÷10 = 4 |
| 30. 0.004 | 4×4 = 16 |
| 31. 7.9 | 65. A |
| 32. 5.5 | 66. C |
| 33. 4.25 | 67. D |
| 34. 10.25 | 68. C |
| 35. 6.2 | 69. C |
| 36. 6.125 | 70. B |
| 37. 2.75 | 71. B |
| 38. 8.25 | 72. A |
| | 73. B |
| | 8×6 = 48 < 54 |
| | 8×7 = 56 > 54 |
| | So, 7 boxes will be enough. |

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74. D
 $21.87 \div 22$
 $22 \times 7 = 154$
75. B
76. A
 $36 - 5 = 31$
 $24 + 5 = 29$
 $31 - 29 = 2$
77. C
78. A
79. D
80. 12
81. $60 \times (1 - 0.3) = 60 \times 0.7 = \42
82. D
83. C
84. $3 \times 5 = 15$ mi
85. $16\frac{1}{8} - 1\frac{3}{4} = 14\frac{3}{8}$
 $14\frac{3}{8} \div 7 = 2\frac{3}{56} = 2 \frac{3}{56}$
86. Method I)
 Let x be the number of students.
 $4x + 10 = 5(x - 2) - 10$
 $4x + 10 = 5x - 20$
 $x = 30$
 Method II)
 $2 \times 4 + 10 = 18$ (leftover books if 2 students take none)
 $18 \times (5 - 4) + 10 = 28$ (number of students who take 5 books)
 $28 + 2 = 30$ (total number of students)
87. $2 \times 20 = 40$ ft per minute
 $1000 \text{ yd} = 3000 \text{ ft}$
 $3000 \div 40 = 75 \text{ min} = 1\frac{1}{4} \text{ hr}$
88. $\text{LCM}(4, 6) = 12$
89. $T = D/S = 300/50 = 6$ (hr)
90. $191 \times 2 + 1 = 382 + 1 = 383$
91. .00005
92. $\frac{180}{45} \times (4 + 3.5) = 30$ hrs
93. $\frac{7}{16}$
94. $15 \div (3^2 - 2^2) = 3$
 $5 + 3 = 8$
 $8 \div 2 = 4$
95. $300 - 60 = 240$
 $240 \div 5 = \$48.00$
96. $10/80 = \frac{1}{8} = 0.125 = 12.5\%$
97. $5 \times 4 = \underline{20 \text{ words}}$
 Note that the order does matter in this problem.
 The first set has 10 words:
 AB, AC, AD, AE,
 BC, BD, BE,
 CD, CE,
 DE.
 The second set also has 10 words: BA, CA, DA,
 EA, CB, DB, EB, DC, EC, and, ED. (Each word in the second set is nothing but the reverse of a word from the first set.)
98. Let AB mean that Alex is the chair and Ben is the vice-chair. Ans = 20 possible outcomes
99. The order does not matter in this problem.
 Ans = 10 outcomes
 AB, AC, AD, AE, BC, BD, BE, CD, CE, and DE.
100. The order does not matter. Ans= 10 matches needed
 RY, RG, RB, RW, YG, YB, YW, GB, GW, and BW.

Answer Key

- | | |
|-----------------------|---|
| 1. $\frac{5}{18}$ | 38. 0.4 |
| 2. $\frac{1}{10}$ | 39. 0.075 |
| 3. $\frac{11}{24}$ | 40. 3600 |
| 4. $\frac{13}{20}$ | 41. 100 |
| 5. $\frac{17}{24}$ | 42. 4 |
| 6. $\frac{19}{72}$ | 43. 6 |
| 7. $\frac{29}{42}$ | 44. 4.8 |
| 8. $\frac{4}{5}$ | 45. 42.5 |
| 9. $\frac{7}{12}$ | 46. 100.8 |
| 10. $\frac{7}{8}$ | 47. 32 |
| 11. 405% | 48. 10% |
| 12. 702% | 49. 25% |
| 13. 122.5% | 50. 40% |
| 14. 208% | 51. 25% |
| 15. 384% | 52. 90% |
| 16. 207.5% | 53. 80% |
| 17. 217.5% | 54. 75% |
| 18. 306% | 55. 1.8 |
| 19. $0.0035 = 0.35\%$ | 56. 45 |
| 20. $5.5 = 550\%$ | 57. 15 |
| 21. 20 | 58. 60 |
| 22. 1.6 | 59. 108 |
| 23. 27 | 60. 120 |
| 24. 15 | 61. 4 |
| 25. 150 | 62. 8 |
| 26. 0.48 | 63. 3 |
| 27. 0.81 | 64. 9 |
| 28. 1.5 | 65. 2 |
| 29. 0.0875 | 66. 10 |
| 30. 2.25 | 67. 16 |
| 31. 0.15 | 68. 20 |
| 32. 0.04 | 69. 15 |
| 33. 0.8 | 70. 21 |
| 34. 0.3 | 71. $\frac{1}{2}(80 + 90) = 85$ |
| 35. 0.045 | 72. $125 \times 4 = 500$ people |
| 36. 0.12 | 73. $18 \div 2 = 9$ |
| 37. 1400 | 74. (a) $\frac{55+5}{2} = \$30$ (Alex) |
| | (b) $\frac{55-5}{2} = \$25$ (Brian) |
| | 75. $\frac{1}{2}(62 + 78) = 70$ |
| | 76. $14,000 \div 7 - 1800 = 200$ calories |

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77. $184 \div 8 = 23$ miles per gallon

78. $7 \times 300,000,000 = 2.1$ billion trees

79. $85 - 25 = 60$

$60 \div 2 = \$30$

80. $68 \times 3 = 204$

$204 - 56 - 78 = 70$

81. $200 + 220 = 420$

$420 \div 28 = 15$ gal

82. $\frac{150}{50} = 3$

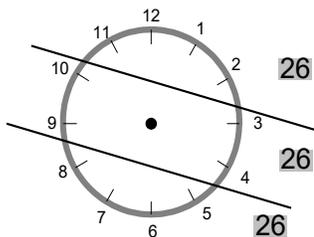
$3 \times 2 = 6$ hours

83. $13 - 6 = 7$ hours

84. They need to cut the travel time to 5 hours, thus, one way drive should take them 2.5 hours, and the speed should be $150 \div 2.5 = 60$ miles per hour.

85. $1 + 2 + 3 + \dots + 12 = 6 \times 13 = 78$

$78 \div 3 = 26$



86. $\frac{4}{16} = \frac{1}{4} = 1/4$

87. $35071 - 34746 = 325$ (distance)

$325 \div 5 = 65$ miles per hour

88. $120:144 = 10:12 = 5:6$

89. B

90. $\frac{\text{discount}}{\text{original price}} = \frac{250-200}{250} = 0.2 = 20\%$

91. B

A makes 28 arrows in 128 min

B makes 28 arrows in 105 min.

92. $\frac{12}{60} = \frac{1}{5}$

$75 \times \frac{1}{5} = 15$ pounds

93. $3 \times 7 = 21$ mi

94. $3 \div \frac{1}{8} = 24$

$21 + 3 = 24$ mi

95. 4

96. $17 - 5 = 12$

$12 \div 2 = 6$ wins

97. $70 \div 2\frac{1}{3} = 30$ mpg

98. $68 \div 2\frac{1}{8} = 32$ mpg

99. B

100. C

$45 \times 0.6 = 27$

$27 - 20 = 7$

Answer Key

1. ABCA: $3 \times 2 \times 1 = 6$

ACBA: $1 \times 2 \times 3 = 6$

$6 + 6 = 12$

2. B

3. A

4. C

The probability of getting queen card = $4/52$ The probability of getting club card = $13/52$ The club card contains already a queen card, therefore required probability is

$4/52 + 13/52 - 1/52 = 16/52 = 4/13$

5. D

6. C

$52 - 5 = 47$

7. A

	Daniel	Truth	Lie
Eric		$\frac{2}{5}$	$\frac{3}{5}$
Truth	$\frac{4}{7}$	X	Y
Lie	$\frac{3}{7}$	W	Z

8.

9. X: $\frac{2}{5} \times \frac{4}{7} = \frac{8}{35}$

Z: $\frac{3}{5} \times \frac{3}{7} = \frac{9}{35}$

$X + Z = \frac{8}{35} + \frac{9}{35} = \frac{17}{35}$

10. B

Y: $\frac{3}{5} \times \frac{4}{7} = \frac{12}{35}$

W: $\frac{2}{5} \times \frac{3}{7} = \frac{6}{35}$

$Y + W = \frac{12}{35} + \frac{6}{35} = \frac{18}{35}$

11. D

$\frac{4}{10} \times \frac{3}{9} = \frac{2}{15}$

12. A

$\frac{6}{10} \times \frac{5}{9} = \frac{5}{15}$

13. D

$\frac{6}{10} \times \frac{4}{9} = \frac{4}{15}$

$\frac{4}{10} \times \frac{6}{9} = \frac{4}{15}$

$\frac{4}{15} + \frac{4}{15} = \frac{8}{15}$

14. B

$(3/10)(10/25) = 2/10 = 1/5$

15. C

$6! = 720$

16. C

Let Alice be in any class.

$\Pr(\text{Ben in Alice's class}) = \frac{1}{3}$

$\Pr(\text{Chole in Alice's class}) = \frac{1}{3}$

$\Pr(\text{Daniel in Alice's class}) = \frac{1}{3}$

$\Pr(\text{A, B, C, and D in the same class}) = \left(\frac{1}{3}\right)^3 = \frac{1}{27}$

17. C

Method I)

The probability for a girl and a boy

BGB (3 cases)

BGG (3 case)

$\frac{3}{5} \times \frac{2}{4} \times \left(\frac{2}{3} + \frac{1}{3}\right) \times 3 = \frac{9}{10}$

Method II)

of outcomes with all boys: $3 \times 2 \times 1 = 6$

#total different outcomes = $5 \times 4 \times 3 = 60$

$60 - 6 = 54$

$P(\text{at least one girl and at least one boy}) = \frac{54}{60} = \frac{9}{10}$

18. D

The probability for a girl and a boy

BGB (3 cases)

BGG (3 case)

$\frac{6}{10} \times \frac{4}{9} \times \left(\frac{5}{8} + \frac{3}{8}\right) \times 3 = \frac{4}{5}$

Method II)

of outcomes with all boys: $6 \times 5 \times 4 = 120$

of outcomes with all girls: $4 \times 3 \times 2 = 24$

#total different outcomes = $10 \times 9 \times 8 = 720$

$720 - 144 = 576$

$\Pr(\text{at least one girl and at least one boy}) = \frac{576}{720} = \frac{4}{5}$

19. D

The probability for a girl and a boy

BGB (3 cases)

BGG (3 case)

$\frac{15}{25} \times \frac{10}{24} \times \left(\frac{14}{23} + \frac{9}{23}\right) \times 3 = \frac{3}{4}$

20. B

21. D

22. A

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23. B
24. C
25. D
26. D
27. A
28. D

$$(2/3)(1/4) + (1/3)(3/4) = 5/12$$

29. C
30. A

Method I)

$$E+E : \frac{1}{2} \times \frac{1}{2} = \frac{1}{4}$$

$$O+O : \frac{1}{2} \times \frac{1}{2} = \frac{1}{4}$$

$$\frac{1}{4} + \frac{1}{4} = \frac{1}{2}$$

Method II)

	1	2	3	4	5	6
1	2	3	4	5	6	7
2	3	4	5	6	7	8
3	4	5	6	7	8	9
4	5	6	7	8	9	10
5	6	7	8	9	10	11
6	7	8	9	10	11	12

31. C

$$O \times O : \frac{1}{2} \times \frac{1}{2} = \frac{1}{4}$$

32. D

$$O \times O : \frac{1}{2} \times \frac{1}{2} = \frac{1}{4}$$

$$1 - \frac{3}{4}$$

33. C

Method I)

$$\frac{1}{6} + \frac{1}{6} - \frac{1}{6} \times \frac{1}{6} = \frac{11}{36}$$

	1	2	3	4	5	6
1						
2						
3						
4						
5						
6						

Method II)

$$\Pr(\text{"Not 6"} \text{ and "Not 6"}) = \frac{5}{6} \times \frac{5}{6} = \frac{25}{36}$$

$$1 - \frac{25}{36} = \frac{11}{36}$$

34. A

35. B

Clearly $n(s) = 6 \times 6 = 36$. Let E be the event that the sum of the numbers on the 2 faces is divisible by either 3 or 5. Then $E = \{(1,2), (1,4), (1,5), (2,1), (2,3), (2,4), (3,2), (3,3), (3,6), (4,1), (4,2), (4,5), (4,6), (5,1), (5,4), (5,5), (6,3), (6,4), (6,6)\}$ $n(E) = 19$

36. B

$$40 - 15 = 25$$

$$14 + 16 - 25 = 5$$

$$5 \div 40 = 1/8$$

37. A

$$\left(\frac{3}{4}\right)^{10} = \left(\left(\frac{3}{4}\right)^5\right)^2 = \left(\frac{243}{1024}\right)^2 = 0.056 = 5.6\%$$

38. C

39. A

$$1 - \frac{6}{8} \times \frac{5}{7} = \frac{13}{28}$$

40. B

41. 1/8

42. 0.00032

43. 5.25

44. 102.01

45. 14641

46. 8/11

47. 0.4

$$48. \frac{16^4}{32^2} = \frac{256^2}{32^2} = \left(\frac{256}{32}\right)^2 = 64$$

$$49. 14/21 = 2/3$$

$$50. 3.5 + 4.333... + 5.25 = 13.08\bar{3}$$

51. .1111

52. 2021

53. 4221

$$54. 100 = 10 \times 10 = (2 \times 5)^2 = 2^2 \times 5^2$$

55. 52

$$56. 400 + 44 \times 4 = 576$$

$$\text{Ans} = 57$$

57. 14

$$58. x = 8$$

$$59. x = 9$$

$$60. \sqrt{10202-1} = 101$$

$$\sqrt{101-1} = 10$$

$$\sqrt{10-1} = 3$$

$$61. n - 3 = 1.5$$

$$n = 4.5$$

62. 28

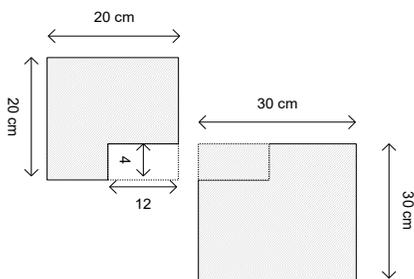
$$63. 1.25 \times 10^{11}$$

MAP 270 (T2) Issue 9

64. Method I)
 9 losses = 60% of 15
 20% = loss rate
 Total = 45 games played
 45 - 15 = 30 games (winning in a row)

Method II)
 $0.4 \times 15 = 6$ (games won so far)
 Let x be the number of games to play and win.
 $\frac{x+6}{x+15} = 0.8$
 $x + 6 = 0.8x + 12$
 $0.2x = 6$
 $x = 30$ games

65. $2 \times (9+6) = 30$ feet = 10 yards
 66. AD is the hypotenuse of $\triangle AOD$, also
 AO = 8
 OD = 6
 The Pythagorean triple, is $2 \times (3, 4, 5) = (6, 8, 10)$.
 So, the hypotenuse is 10. The perimeter is
 $10 \times 4 = 40$
 67. $\frac{1}{2}(12 \times 16) = 96$
 68. Let x be the measure of the base angle.
 $3x + x + x = 5x$
 $x = 36$
 69. $300 + 10 \times 100 = 1300$
 70. $400 + 900 = 1300 \text{ cm}^2$ (total)
 $1300 - 48 = 1252 \text{ cm}^2$

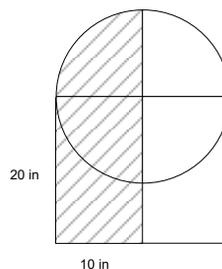


71. $12 \div \frac{1}{6} \times 1\frac{1}{2} = 108$ mi
 72. $4444 \div 5555 = 0.8$ mi
 73. 25%
 74. $\angle A + \angle B = 2(180^\circ - 140^\circ) = 80$
 $\angle C = 180 - 80 = 100^\circ$
 75. $\frac{3}{4} = 3/4$
 76. $72 \times (1 + \frac{1}{6}) = 84$
 or
 $84 \div \frac{7}{6} = 72$
 77. $84 \times (1 + \frac{1}{6}) = 98$
 78. $\frac{1}{2}(x)(20) = 300$
 $x = 30$ cm
 79. $75\% \times 28 = \frac{3}{4} \times 28 = 21$

80. Since the total length and width is 38, one is 9, the other is 10. Ans = 90 cm^2 (area)
 81. $(2.25 \times 4)^2 = 9^2 = 81$
 82. $\sqrt{15} \times \sqrt{35} \times \sqrt{21}$
 $= \sqrt{3 \times 5} \times \sqrt{5 \times 7} \times \sqrt{7 \times 3}$
 $= 3 \times 5 \times 7$
 $= 105$
 83. C
 84. $240 - 6 + 7 = 241$
 85. $460 \div 2^{30} = 2^{120} \div 2^{30} = 2^{90} = 8^{30}$
 $\square = 30$
 86. C
 87. $2(x + \frac{1}{4}) = x - \frac{1}{2}$
 $x = -1$
 88. $13 \div 65 = .2 = 20\%$
 89. $125.6 \div 3.14 = 40$ in (diameter)
 $40 \div 2 = 20$ in (radius)
 $3.14 \times 20^2 = 1256 \text{ in}^2$ (area)
 90. $80 \div 10 = 8$
 $8 \times 8 \times 4 = 256 \text{ cm}^2$
 91. bigger : smaller = 2 : 1
 $2 + 1 = 3$
 $\frac{2}{3}$: bigger one
 $\frac{1}{3}$: smaller one
 $\frac{2}{3} \times 48 = 32$ balls
 92. Method I)
 $\frac{2}{7} + \frac{1}{2}(\frac{2}{7}) = \frac{4.5}{7}$
 $126 \times \frac{4.5}{7} = 18 \times 4.5 = 81$

Method II)
 $126 \times \frac{2}{7} = 36$
 $126 - 36 = 90$
 $\frac{1}{2} \times 90 = 45$
 $45 + 36 = 81$

93. $250 + 150 \times 12 = 2050$ (total)
 $2050 - 1875 = \$175.00$
 94. Flip the lower quarter circle fill up the left side.
 $20 \times 10 = 200 \text{ in}^2$
 $\frac{1}{4}(10^2 \times 3.14) = 78.5$
 $200 + 78.5 = 278.5 \text{ in}^2$



95. B = (5, 13)
 96. C = (11, 13)
 97. D = (14, 5)

Answer Key

1. $(x + 1)(x + 2)$
2. $(x - 2)(x + 9)$
3. $(x + 1)(x + 8)$
4. $(x + 3)(x + 10)$
5. $(x - 8)(x - 4)$
6. $(x - 5)(x + 1)$
7. $(x + 2)(x - 10)$
8. $(2x - 9)(x - 3)$
9. $(x + 8)(3x + 4)$
10. $(2x + 3)(5x + 1)$
11. $x^2 - 4x - 21$
12. $x^2 - 6x - 7$
13. $x^2 - 11x + 28$
14. $x^2 - 12x + 35$
15. $x^2 - 5x - 14$
16. $x^2 - 2x - 35$
17. $3x^2 - 10x - 8$
18. $6x^2 + 7x + 2$
19. $9x^2 - 9x + 2$
20. $18x^2 + 51x + 8$
21. $(2x + 1)(8x + 2)$
22. $(3x - 6)(2x + 3)$
23. $(2x - 5)(x - 2)$
24. $(x - 3)(x - 2)$
25. $(x + 3)(x + 9)$
26. $(3x - 4)(2x + 3)$
27. $(x + 1)(7x + 2)$
28. $(x - 3)(x + 4)$
29. $(x + 4)(x + 6)$
30. $(2x + 1)(8x + 1)$
31. A
32. B
33. D
34. D
35. 60
36. D
 $36(16 - 10)$
37. C
 $4500 \div 750 = 450 \div 75 = 6$
38. B
39. C
 $3 \times 40^2 = 4800$
40. A
41. C
 $V = s^2h$
 $2s)^2(3h) = 12s^2h = 12V$
42. D
43. A
 $3 \times 4 = 12$
44. D
45. $\frac{1}{2} \times 6 \times h = 24$
 $h = 8$
46. 80
47. B
There are $4 \times 0.2 = 0.8$ cup of vinegar among the 5 cups. Therefore, the percentage is $0.8 \div 5 = 0.16 = 16\%$
48. D
 $3 \times 12 = 36$
 $36^2 = 1296$
49. D
50. D
 $\frac{65-50}{50} = 30\%$
51. A
52. B
 $\frac{3}{10} \times \frac{10}{15} = \frac{3}{15} = \frac{1}{5}$
53. B
 $\frac{10+8}{24} = \frac{18}{24} = \frac{3}{4}$
54. B
BG + GB
 $\frac{1}{4} + \frac{1}{4} = \frac{1}{2}$
55. B
 $1/8 + 1/8 = 1/4$
56. C
56, 56, 66
 $\frac{3}{36} = \frac{1}{12}$
57. D
58. A
 $\frac{3}{51} = \frac{1}{17}$
59. C
 $\frac{4+13-1}{52} = \frac{16}{52}$

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60. C

$$52 - 5 = 47$$

There are still two 3's and two 4's out there.

$$\frac{2+2}{47} = \frac{4}{47}$$

	Daniel	Truth	Lie
Eric		$\frac{2}{5}$	$\frac{3}{5}$
Truth	$\frac{4}{7}$	X	Y
Lie	$\frac{3}{7}$	W	Z

61.

62. X: $\frac{2}{5} \times \frac{4}{7} = \frac{8}{35}$

Z: $\frac{3}{5} \times \frac{3}{7} = \frac{9}{35}$

X + Z: $= \frac{8}{35} + \frac{9}{35} = \frac{17}{35}$

63. B

Y: $\frac{3}{5} \times \frac{4}{7} = \frac{12}{35}$

W: $\frac{2}{5} \times \frac{3}{7} = \frac{6}{35}$

Y + W = $\frac{12}{35} + \frac{6}{35} = \frac{18}{35}$

64. D

$$\frac{4}{10} \times \frac{3}{9} = \frac{2}{15}$$

65. A

$$\frac{6}{10} \times \frac{5}{9} = \frac{5}{15}$$

66. D

$$\frac{6}{10} \times \frac{4}{9} = \frac{4}{15}$$

$$\frac{4}{10} \times \frac{6}{9} = \frac{4}{15}$$

$$\frac{4}{15} + \frac{4}{15} = \frac{8}{15}$$

67. B

4, 8, 12, 16, 20

5, 10, 15, 20

The total is $5 + 4 - 1 = 8$

$$\frac{8}{20} = \frac{2}{5}$$

68. C

4, 6, 8, 9, 10, and 12 are the composite numbers.

$$\frac{6}{12} = \frac{1}{2}$$

69. C

There are 25 primes from 2 to 97.

70. ABCA: $3 \times 2 \times 1 = 6$

ACBA: $1 \times 2 \times 3 = 6$

$6 + 6 = 12$

71. C

$$6! = 720$$

72. C

Let Alice be in any class.

$$\Pr(\text{Ben in Alice's class}) = \frac{1}{3}$$

$$\Pr(\text{Chole in Alice's class}) = \frac{1}{3}$$

$$\Pr(\text{Daniel in Alice's class}) = \frac{1}{3}$$

$$\Pr(\text{A, B, C, and D in the same class}) = \left(\frac{1}{3}\right)^3 = \frac{1}{27}$$

73. C

Method I)

The probability for a girl and a boy

BGB (3 cases)

BGG (3 case)

$$\frac{3}{5} \times \frac{2}{4} \times 3 = \frac{9}{10}$$

Method II)

$$\text{All boys: } \frac{3}{5} \times \frac{2}{4} \times \frac{1}{3} = \frac{1}{10}$$

$$\Pr(\text{Not all boys}) = 1 - \frac{1}{10} = \frac{9}{10}$$

74. C

The probability for a girl and a boy

BGB (3 cases)

BGG (3 case)

$$\frac{6}{10} \times \frac{4}{9} \times 3 = \frac{4}{5}$$

Method II)

$$\Pr(\text{all boys}) = \frac{6 \times 5 \times 4}{10 \times 9 \times 8} = \frac{1}{6}$$

$$\Pr(\text{all girls}) = \frac{4 \times 3 \times 2}{10 \times 9 \times 8} = \frac{1}{30}$$

$$\Pr(\text{at least one girl}) = 1 - \frac{1}{6} - \frac{1}{30} = \frac{4}{5}$$

75. B

Method I)

The probability for a girl and a boy

BGB (3 cases)

BGG (3 case)

$$\frac{15}{25} \times \frac{10}{24} \times \left(\frac{14}{23} + \frac{9}{23}\right) \times 3 = \frac{3}{4}$$

Method II)

$$\Pr(\text{All boys}) = \frac{15 \times 14 \times 13}{25 \times 24 \times 23}$$

$$\Pr(\text{All girls}) = \frac{10 \times 9 \times 8}{25 \times 24 \times 23}$$

$$1 - \Pr(\text{all boys}) - \Pr(\text{all girls}) = \frac{3}{4}$$

76. 385

77. C

78. 9

79. $(x + \frac{1}{x})^2 = x^2 + 2 + \frac{1}{x^2} = 9$

$$x + \frac{1}{x} = \sqrt{7}$$

$$x^2 - 1 + \frac{1}{x^2} = 6$$

$$x^3 + \frac{1}{x^3} = \left(x + \frac{1}{x}\right)\left(x^2 - 1 + \frac{1}{x^2}\right) = 6\sqrt{7}$$

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80. Method I)

$$\text{Let } a = 2019$$

$$2021 = a + 2$$

$$(a + 2)^3 = a^3 + 6a^2 + 12a + 8$$

$$2021^3 - a^3 = 6a^2 + 12a + 8$$

$$(6a^2 + 12a + 8 - 2) \div 6 = a^2 + 2a + 1 = (a + 1)^2$$

$$\sqrt{\frac{x-2}{6}} = a + 1 = 2020$$

Method II)

$$\text{Let } a = 2021$$

$$b = 2019$$

$$x = a^3 - b^3 = (a-b)(a^2 + ab + b^2) = (a-b)^3 +$$

$$3ab(a-b)$$

$$a - b = 2$$

$$x - 2 = 8 + 3ab(2) - 2 = 6ab + 6 = 6(ab + 1)$$

$$\frac{x-2}{6} = ab + 1$$

$$a = 2020 + 1$$

$$b = 2020 - 1$$

$$ab + 1 = 2020^2 - 1 + 1 = 2020^2$$

$$\sqrt{\frac{x-2}{6}} = 2020$$

81. D

$$(\sqrt{7-\sqrt{13}} + \sqrt{7+\sqrt{13}})^2$$

$$= 14 + 12$$

$$= 26$$

$$82. \left(\frac{9}{10}\right)^7 \cdot \left(\frac{4}{3}\right)^9 \cdot \left(\frac{3}{5}\right)^6 \cdot \left(\frac{5}{6}\right)^{11}$$

$$= \frac{3^{14} \cdot 2^{18} \cdot 3^6 \cdot 5^{11}}{2^7 \cdot 5^7 \cdot 3^9 \cdot 5^6 \cdot 2^{11} \cdot 3^{11}}$$

$$= \frac{3^{20} \cdot 2^{18} \cdot 5^{11}}{2^{18} \cdot 3^{20} \cdot 5^{13}} = 1/25$$

$$83. \sqrt[5]{\frac{3^{23} + 3^{25}}{270}} = \sqrt[5]{\frac{10 \times 3^{23}}{270}} = 3^4 = 81$$

84. C

$$0.8 \times 1.2 = 0.96$$

$$85. (x^2 - 4)(x^2 - 9) = 0$$

$$x = -3 \text{ \& } -2 \text{ \& } 2 \text{ \& } 3$$

