EXPLANATIONS

58. **(D)** $x(x - 2y) = 9[9 - 2(-7)] = 9(9 + 14)$
$= 9(23) = 207$

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59. **(A)** $0.06 = \dfrac{6}{100}$. Simplify the fraction to find the answer: $\dfrac{6}{100} = \dfrac{3}{50}$, so $x = 3$.

---

60. There were **47** students surveyed, and **12** students like only soccer.

To determine how many students were surveyed, start with the total number of students who like basketball and soccer separately and subtract the number of students who were counted twice.

There were 25 students who like basketball, 19 students who like soccer, and 7 students who like both basketball and soccer.

So, the total number of students who like basketball or soccer is $(25 + 19) - 7 = 37$.

Then, add the students who don't like either basketball or soccer: 10 students don't like either sport.

Total students surveyed: $37 + 10 = 47$

To determine how many students like only soccer, subtract the number of students who like both basketball and soccer from the total number of students who like soccer.

Students who like only soccer: $19 - 7 = 12$

61. The three correct answers are:

$$\frac{18}{150} = \frac{x}{250}$$

$$\frac{150}{18} = \frac{250}{x}$$

$$\frac{x}{18} = \frac{250}{150}$$

Set up a proportion to compare the number of buns per customer. These are all equivalent:

$$\frac{18 \text{ dozen buns}}{150 \text{ customers}} = \frac{x \text{ dozen buns}}{250 \text{ customers}}$$

To check for equivalency, solve each proportion for x.

Each of the three correct proportions simplifies to $150x = 18(250)$.

Then solve for x to determine how many dozen buns are needed for 250 lunch customers:

$150x = 4,500$

$$x = \frac{4,500}{150}$$
$$x = 30$$

62. Step 1: Convert the zogs to minks.

Since 1 mink = 3 zogs, divide the number of zogs Maria has by 3: 60 ÷ 3 = 20.

So, 60 zogs = 20 minks.

Step 2: Convert the barts to minks.

Since 1 mink = $\frac{1}{4}$ bart, multiply the number of barts by 4 (because 1 bart is equal to 4 minks): 24 × 4 = 96.

So, 24 barts = 96 minks.

Step 3: Add the mink conversions.

Add the results from Steps 1 and 2 to find the total number of minks Maria will receive: 20 + 96 = 116.

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63. **(120)** There are 5 choices for the first digit, 4 choices for the second digit, 3 choices for the third digit, 2 choices for the fourth digit, and 1 choice for the final digit. The total number of possibilities is 5 × 4 × 3 × 2 × 1 = 120.

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64. **(A)** Find the missing angle, angle QPT, of triangle PQT: 180°−70°−50° = 60°

In parallelogram PQRS, angle QPT is congruent to angle QRS, so the measure of angle QRS is also 60°.

65. **(D)** Break the equations apart to each equal M:

$M = 3N$

$M = \dfrac{P}{4}$

$M = Q + 5$

$M = \dfrac{R}{7}$

Pick a number to substitute into the equations, and solve the equations to find the values of M, N, P, Q, and R.

Let $M = 2$. Since all the equations are equal to 2, substitute 2 to find each variable.

$M = 2N$

$2 = 3N$

$\dfrac{2}{3} = N$

$M = \dfrac{P}{4}$

$2 = \dfrac{P}{4}$

$8 = P$

$M = Q + 5$

$2 = Q + 5$

$^-3 = Q$

$M = \dfrac{R}{7}$

$2 = \dfrac{R}{7}$

$14 = R$

Variable R has the greatest value.

---

66. **(C)** Set up a proportion:

$\dfrac{x}{416} = \dfrac{3}{96}$

$96x = 1{,}248$

$x = 13$ bundles

67. **(C)** Set up an inequality to compare the costs:

$0.15x \leq 10.50$

$x \leq 70$

Therefore, 70 individual sheets of paper would cost $10.50, so 69 is the greatest number of individual sheets of paper that Macie can buy that would be less expensive than the package.

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68. **(B)** 7:00 p.m. is 6 hours after 1:00 p.m. Calculate the number of degrees the temperature dropped in 6 hours: $3 \times 6 = 18$ degrees. Subtract that from the starting point (8 degrees) to find the solution: $8 - 18 = {}^{-}10$ degrees.

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69. **(D)** The ratio of red to blue to green is 15:7:3. Find the proportion of blue marbles. Add the numbers of the ratio and use the total sum as the denominator: $\dfrac{7}{15 + 7 + 3} = \dfrac{7}{25}$. Find the proportion of green marbles: $\dfrac{3}{25}$.

Since there are a total of 75 marbles, the number of blue marbles is $\dfrac{7}{25} \times 75 = 21$. The number of green marbles is $\dfrac{3}{25} \times 75 = 9$.

The number of red marbles is $75 - 21 - 9 = 45$. If 2 blue marbles are removed and replaced with 2 green marbles, the number of blue marbles will be 19 and the number of green marbles will be 11. The ratio of red marbles to green marbles will be 45:11.

---

70. **(B)** The total number of desserts ordered is $42 + 23 + 47 + 48 = 160$.

The probability that ice cream was chosen is $\dfrac{48}{160} = \dfrac{3}{10} = 30\%$.

71. **(C)** Since 18 and 24 are both multiples of 6, find the least common multiple of **only** 18 and 24.

Multiples of 18: 18, 36, 54, 72, . . .

Multiples of 24: 24, 48, 72, . . .

The least common multiple of 6, 18, and 24 is 72.

---

72. The total number of fruits is:

3(apples) + 4(oranges) + 5(bananas) + 8(pears) = 20 fruits

The probability of picking a pear is:

$$\frac{8\,(\text{pears})}{20\,(\text{total})} = \frac{8}{20} \text{ or } 0.4$$

---

73. **(C)** The total number of bottles of juice in the cooler is $5 + 3 + 6 = 14$.

The number of bottles of juice that are **not** apple juice (grape juice and orange juice) is

$3 + 6 = 9$.

So the probability is $\frac{9}{14}$.

74. (D) The radius of the large plate is 20 cm. Use 20 cm to find the area of the large plate:

$$A = \pi r^2 = \pi(20^2) = 400\pi \text{ sq cm}$$

The circumference of the smaller plate is 20π cm. Use that to find the radius, and then the area, of the smaller plate:

$$C = 2\pi$$
$$20\pi = 2\pi r$$
$$r = 10$$
$$A = \pi r^2 = (10^2) = 100\pi \text{ sq cm}$$

Subtract the area of the small plate from the area of the large plate:

$$400\pi - 100\pi = 300\pi \text{ sq cm}$$

---

75. The two tables that represent a proportional relationship are tables A and C.

In table A, the total costs divided by the numbers of books for each set of quantities are:

$$\frac{40}{10} = 4 \; ; \frac{60}{15} = 4 \; ; \frac{80}{20} = 4 \; ; \frac{100}{25} = 4$$

These ratios are equivalent; therefore, these quantities are in a proportional relationship.

In table C, the total costs divided by the numbers of books for each set of quantities are:

$$\frac{80}{10} = 8 \; ; \frac{120}{15} = 8 \; ; \frac{160}{20} = 8 \; ; \frac{200}{25} = 8$$

These ratios are equivalent; therefore, these quantities are in a proportional relationship.

76. **(15)** Solve the inequality for x.

$x + 7 < 23$

$x < 16$

There are 15 positive integers that are less than 16.

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77. **(A)** Substitute 3 for y and solve for x:

$\dfrac{36}{y} = 4x$

$\dfrac{36}{3} = 4x$

$12 = 4x$

$3 = x$

---

78. **(D)** Since $\overline{XY} = 20$ cm, use that to find $\overline{YZ}$:

$\overline{YZ} = \dfrac{3}{5}\overline{XY} = \dfrac{3}{5}(20) = 12$ cm

$\overline{XZ} = \overline{XY} + \overline{YZ} = 20 + 12 = 32$ cm

79. **(C)** Calculate the cost of the cloth before tax:

$$1\frac{3}{4} \times 8 = \frac{7}{4} \times 8 = \$14$$

Find the tax for $14 worth of cloth:

$$14 \times 8\% = 14 \times \frac{8}{100} = \$1.12$$

Add the cost of the cloth and the tax:

$$\$14 + \$1.12 = \$15.12$$

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80. **(B)** To find M, subtract N⁻M and set it equal to the length:

$$1\frac{1}{3} - M = 5\frac{5}{6}$$
$$^-M = 5\frac{5}{6} - 1\frac{1}{3}$$
$$^-M = 5\frac{5}{6} - 1\frac{2}{6}$$
$$^-M = 4\frac{3}{6}$$
$$M = ^-4\frac{1}{2}$$

81. **(B)** Add the four values in the ratio $(177 + 12 + 7 + 4 = 200)$ and use the sum as the denominator. Use that to find the fraction of zinc in one of the coins. Then reduce the fraction:

$$\frac{12}{200} = \frac{3}{50}$$

Multiply this fraction by 8 to find the number of grams of zinc in decimal form:

$$\frac{3}{50} \times 8 = \frac{24}{50} = 0.48 \text{ g}$$

---

82. **(C)** Jack scored a mean of 15 points per game in each of the first 3 games, so he earned a total of 45 points for the first 3 games. Use that information to calculate the mean over the 4 games: $\frac{45 + 27}{4} = \frac{72}{4} = 18$

---

83. **(B)** Find the number of liters that need to be added. Since $\frac{1}{3}$ of the oil drum is full, $\frac{2}{3}$ of the drum remains empty:

$$\frac{2}{3} \times 4{,}320 = 2{,}880 \text{ liters.}$$

Use the conversion 1 kL = 1,000 L to find the number of kL: $\frac{2{,}880}{1{,}000} = 2.88 \text{ kL}$

84. **(B)** To find out how old Nicole was 5 years ago, find out how old Nicole and Carmen are now.

Let N = Nicole's age now.

Let C = Carmen's age now.

$C + 2 = 17$, so $C = 15$

$N = 3C$

$N = 3(15) = 45$ (Nicole's age now)

$N - 5 = 45 - 5 = 40$ (Nicole's age 5 years ago)

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85. **(C)** Let x be the original amount of the chemical. It loses 20% after each week, which means 80% of the chemical remains at the end of each week. End of first week: $0.80x$

At the end of the second week, 80% of the amount left at the end of the first week remains.

End of second week: $0.80(0.80x) = 0.64x$ or 64%

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86. **(C)** One more than an odd integer must be even.

One more than $w - 1$ is w, therefore w must be even. Two times an even integer must be even, therefore $2w$ is even. An even integer decreased by 2 must be even.

Therefore, $2w - 2$ must be even.

---

87. **(B)** Find the least common multiple of 2, 3, and 4, which is 12. So, it takes 12 minutes before all three are back at the starting line. Ann completes 1 lap every 2 minutes, so in 12 minutes she has completed 6 laps.

88. **(B)**

$4(7 - 3x) - (5 - x) = 28 - 12x - 5 + x$
$= 23 - 11x$

---

89. **(D)** Add the numbers of students for each category to find out how many total students were in the survey: $12 + 16 + 7 + 5 = 40$

The number of students who had at least 2 pets are the ones who have 2 pets (7) plus the ones who have 3 or more (5). The total number of students with at least 2 pets is $7 + 5 = 12$.

The probability of a student in the survey having at least two pets is $\dfrac{12}{40} = \dfrac{3}{10}$.

---

90. Solution:

25π

The area of a circle is its radius squared times π.

$A = \pi r^2$
$r = 5$
$A = \pi(5)^2$
$A = 25\pi$

91. **(B)**

$$5x^3 + 3x + 9 + \frac{1}{x^2}$$

$$= 5(10^3) + 3(10) + 9 + \frac{1}{10^2}$$

$$= 5,000 + 30 + 9 + \frac{1}{100} = 5,039.01$$

---

92. **(A)** The length of one side of the square is 6 cm. Since R, S, and T are midpoints, then $\overline{TM}$, $\overline{MR}$, $\overline{RN}$, and $\overline{NS}$ are all equal to 3 cm. Triangles TMR and RNS are both right triangles, so the area of one of the triangles is $\frac{1}{2} \times 3 \times 3 = \frac{9}{2}$. The triangles are congruent, so the sum of the areas is $\frac{9}{2} + \frac{9}{2} = 9$ sq cm.

---

93. **(D)** Let x be the amount spent on planned expenses in one year:

$$\frac{x}{29,600} = \frac{5}{8}$$

$$x = \frac{5}{8}(29,600) = 18,500$$

94. **(C)** Figure out how many different topping pairs are possible. Use 1, 2, 3, 4, 5, 6, 7 to represent the toppings, and create a list of possible pairs:

1,2; 1,3; 1,4; 1,5; 1,6; 1,7

2,3; 2,4; 2,5; 2,6; 2,7

3,4; 3,5; 3,6; 3,7

4,5; 4,6; 4,7

5,6; 5,7

6,7

So there are 21 different topping combinations for one pizza.

Since there are 3 pizza sizes, multiply the total number of combinations by 3 to get the total number of different pizzas Cody can create: $3 \times 21 = 63$.

---

95. **(C)** None of the 80 students $(800 - 720)$ who answered "no" to Question A could have answered "yes" to both questions. Therefore, the least possible number of students who could have answered "yes" to both questions can be found by subtracting the 80 who answered "no" to Question A from the 640 who answered "yes" to Question B, or $640 - 80 = 560$.

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96. **(D)** One side of the square base is 3 ft long. Since the height of the box is 3 times the length, then the height is $3 \times 3 = 9$ ft. The volume of a rectangular prism is length $\times$ height $\times$ width. The volume of the wooden box is $V = 3 \times 3 \times 9 = 81$ cu ft.
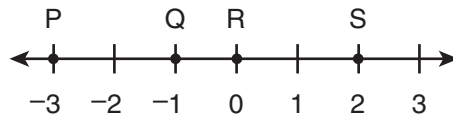
97. **(B)** Calculate each mean speed:

$$R = \frac{65}{5} = 13 \text{ kph}$$

$$S = \frac{72}{4} = 18 \text{ kph}$$

Then calculate the difference of both mean speeds:

$$S - R = 18 - 3 = 5 \text{ kph}$$

---

98. **(C)**

Find the midpoint of PQ and RS:

$$\text{Midpoint of PQ} = \frac{-1 - (-3)}{2} = \frac{2}{2} = 1 \text{ unit.}$$

The midpoint of PQ is located 1 unit from each endpoint, so the midpoint is at -2.

$$\text{Midpoint of RS} = \frac{2 - 0}{2} = \frac{2}{2} = 1 \text{ unit.}$$

The midpoint of RS is located 1 unit from each endpoint, so the midpoint is at 1. The distance between the two midpoints is $1 - (-2) = 3$ units.

99. (D) If 1 L=1,000 cu cm, then 1 L $=$ 1,000 mL. Set up a proportion, letting x $=$ the amount of cubic millimeters in 1,000 cubic centimeters.

$$\frac{1,000 \text{ cu cm}}{1 \text{ L}} = \frac{x \text{ cu mm}}{1,000 \text{ cu mm}}$$

Solve for x: 1,000,000 cubic millimeters are in 1,000 cubic centimeters.

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100. (A) Both $x + 1$ and $y + 2$ are radii (each is a radius). So, set them equal to each other and solve for y:

$y + 2 = x + 1$
$y = x - 1$

101. (C) There are 5 sections between M and T. To find the length of one of these sections, find the distance between M and T and divide by 5:

$$\left(\frac{5}{8} - \left(-\frac{1}{4}\right)\right) \div \frac{5}{1} =$$
$$\left(\frac{5}{8} + \frac{2}{8}\right) \div \frac{5}{1} =$$
$$\frac{7}{8} \div \frac{5}{1} = \frac{7}{8} \times \frac{1}{5} = \frac{7}{40}$$

R is 3 sections away from M, so add:

$$-\frac{1}{4} + 3\left(\frac{7}{40}\right) = -\frac{10}{40} + \frac{21}{40} = \frac{11}{40}$$

R is located at $\frac{11}{40}$.

---

102. (D) Let x be the number of minutes Phan used his Internet service in the month. Phan's monthly charges were $18 + 0.024x$. Since Deion's charges were the same as Phan's, set the expression equal to 30 and solve for x:

$18 + 0.024x = 30$

$0.024x = 12$

$x = 500$

Phan used his service for 500 minutes.

103. (B) Create a chart using the given information and use subtraction to figure out how many cars are **not** red **and** do **not** have a backup camera:

	Red	Not Red	TOTAL
Backup Camera	4	**6** **(10 − 4)**	10
No Backup Camera		**32** **(38 − 6)**	
TOTAL	12	**38** **(50 − 12)**	50

The probability of selecting a car that meet both conditions from the total of 50 cars at the dealership is $\dfrac{32}{50} = \dfrac{16}{25}$.

---

104. (3)

$$\frac{147 - x}{12} = 12$$
$$147 - x = 144$$
$$x = 3$$

---

105. (C) The height of the triangle is 4 units. The length of the base is $n - m$.

So, the area is $A = \dfrac{1}{2}(n - m)(4) = 2(n - m)$.

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106. (B) The total number of cards in the box is $8 + 6 + 5 + 4 + 1 = 24$. Set up a proportion to figure out which card has exactly a 1 in 4 chance of being picked at random: $\dfrac{x}{24} = \dfrac{1}{4}$ or $x = 6$. The dog card has a 1 in 4 chance of being randomly selected.

107. (C) Separate the compound inequality into two pieces:

$2x - 2 \leq y$ and $y \leq 4x + 10$

Substitute $y = 1$ into each inequality and solve for x:

$2x - 2 \leq 1$
$2x \leq 3$
$x \leq \dfrac{3}{2}$
$1 \leq 4x + 10$
$-9 \leq 4x$
$-\dfrac{9}{4} \leq x$

The solution is the number line that shows that x is greater than or equal to $-2\dfrac{1}{4}$ and less than or equal to $1\dfrac{1}{2}$.

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108. (C)

$\dfrac{14}{21} = \dfrac{p}{7}$
$21p = 7(14)$
$21p = 98$
$p = \dfrac{98}{21} = \dfrac{14}{3}$

---

109. (A) The total number of balls in the box is $7 + 14 + 21 = 42$.

The probability that the ball is black is $\dfrac{7}{42} = \dfrac{1}{6}$.

110. Solution: $y = 20x + 50$

An equation of the form $px + q = r$ can be used to represent the total amount Amiya will pay.

Using the information from the scenario, the onetime setup fee of \$50 is the constant term (q), and the \$20 per month of service is the coefficient (p) of the number of months (x).

So, the equation that can be used to determine the total amount Amiya will pay, y, for x months of service is $y = 20x + 50$.

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111. (A) Raoul is at least 3 years older than Vahn, which can be written as $r \geq v + 3$.

Rewrite this inequality to match the answer options:

$r - v \geq 3$.

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112. (B) Since 5.6 ricks and 12.88 dalts are both equal to 1 sind, then 5.6 ricks = 12.88 dalts. To calculate the number of dalts (d) in 1 rick, set up a proportion:

$$\frac{5.6}{12.88} = \frac{1}{d}$$
$$5.6d = 12.88$$
$$d = 2.3$$

---

113. (D) The shelf, when full, holds 36 cans. When the shelf is half full, it holds 18 cans.

$$x - 4 = 18$$
$$x = 22$$

114. (C) The probability of the cup landing on its side is 72%. Carlos tossed the cup a total of 200 times (50 + 150). The number of times the cup lands on its side is 72% of 200:

0.72 × 200 = 144