Category 7 Algebra Set 7-2

<High Level Questions>

1. **Three musical tones have frequencies x, y, and z, respectively. If x, y, and z are positive, $\frac{x}{y} = \frac{y}{z}$, and $2x = z$, what is y in terms of x?**

answer

(A) $2x$

(B) $(\sqrt{2})x$

(C) $\frac{1}{\sqrt{2}}x$

(D) $\frac{1}{2}x$

(E) $\frac{\sqrt{2}}{3}x$

2. **A certain fraction is equivalent to $\frac{2}{5}$. If the numerator of the fraction is increased by 4 and the denominator is doubled, the new fraction is equivalent to $\frac{1}{3}$. What is the sum of the numerator and denominator of the original fraction?**

answer

(A) 49

(B) 35

(C) 28

(D) 26

(E) 21

3. **If a total of x identical disks can be arranged in 8 stacks of equal height or in 12 stacks of equal height, the least possible value of x is**

answer

(A) 96

(B) 48

(C) 36

(D) 24

(E) 12

4. **The total price of $n(n>1)$ equally priced copies of a certain book is \$50. In terms of n, which of the following gives the total price of $n-1$ of these copies?**

answer

(A) $50(n-1)$ **(B)** $\frac{50}{n-1}$ **(C)** $\frac{50(n-1)}{n}$

(D) $\frac{50n}{n-1}$ **(E)** $\frac{50}{n(n-1)}$

5. **A plane was originally flying at an altitude of x feet when it ascended 2,000 feet and then descended 5,000 feet. If the plane's altitude after these two changes was $\frac{1}{3}$ its original altitude, then the solution of which of the following equations gives the plane's original altitude, in feet?**

answer

(A) $x+2{,}000=\frac{1}{3}(x-3{,}000)$

(B) $\frac{1}{3}(x-3{,}000)=x$

(C) $x+3{,}000=\frac{1}{3}x$

(D) $x-7{,}000=\frac{1}{3}x$

(E) $x-3{,}000=\frac{1}{3}x$

6. **There are how many hours between x minutes past 12 noon and 8:10 p.m. of the same day, where $x<60$?**

answer

(A) $\frac{490-x}{60}$

(B) $\frac{480-x}{60}$

(C) $\frac{470-x}{60}$

(D) $60(60-x+7)$

(E) $60(60-x+17)$

7. **There are how many <u>seconds</u> between x minutes past 3 p.m. and y minutes past 4 p.m. of the same day? ($0 < x < 60$ and $0 < y < 60$)**

answer

(A) $3{,}600 + 60(y - x)$

(B) $3{,}600 + 60(x - y)$

(C) $60 + 60(x - y)$

(D) $60 + (y - x)$

(E) $60(x - y)^2$

8. **A certain theater has 100 balcony seats. For every $2 increase in the price of a balcony seat above $10, 5 fewer seats will be sold. If all the balcony seats are sold when the price of each seat is $10, which of the following could be the price of a balcony seat if the revenue from the sale of balcony seats is $1,360?**

answer

(A) **$12**

(B) **$14**

(C) **$16**

(D) **$17**

(E) **$18**

9. **A certain used-book dealer sells paperback books at 3 times dealer's cost and hardback books at 4 times dealer's cost. Last week the dealer sold a total of 120 books, each of which had cost the dealer $1. If the gross profit (sales revenue minus dealer's cost) on the sale of all of these books was $300, how many of the books sold were paperbacks?**

answer

(A) **40**

(B) **60**

(C) **75**

(D) **90**

(E) **100**

10. On a legislative committee, the number of males is 3 fewer than twice the number of females. If one male were replaced by a female, there would be an equal number of males and females on the committee. How many members are on the committee?

answer

(A) 14
(B) 12
(C) 10
(D) 9
(E) 7

11. An investor has stocks, bonds, and government securities currently worth a total of $100,000, as well as a real estate investment. If the stocks and the bonds are worth a total of $2,500 more than the value of the real estate investment, and if the government securities are worth $7,500 more than twice the value of the real estate investment, how much are the government securities worth?

answer

(A) $67,500
(B) $62,500
(C) $37,500
(D) $32,500
(E) $30,000

12. Kim bought a total of $2.65 worth of postage stamps in four denominations. If she bought an equal number of 5-cent and 25-cent stamps and twice as many 10-cent stamps as 5-cent stamps, what is the least number of 1-cent stamps she could have bought?

answer

(A) 5
(B) 10
(C) 15
(D) 20
(E) 25

13. **A certain truck traveling at 55 miles per hour gets 4.5 miles per gallon of diesel fuel consumed. Traveling at 60 miles per hour, the truck gets only 3.5 miles per gallon. On a 500-mile trip, if the truck used a total of 120 gallons of diesel fuel and traveled part of the trip at 55 miles per hour and the rest at 60 miles per hour, how many miles did it travel at 55 miles per hour?**

answer

(A) 140

(B) 200

(C) 250

(D) 300

(E) 360

14. **The cost of registration at a professional association meeting was $50 per person; a lunch for registrants only was available for an additional $22 per person. If the number of registrants who paid for lunch was 100 more than the number who did not, and if receipts for registration and lunch totaled $92,600, how many people paid just for registration at the meeting?**

answer

(A) 700

(B) 800

(C) 1,300

(D) 1,500

(E) 1,800

15. **In a certain sequence, the first term is 1, and each successive term is 1 more than the reciprocal of the term that immediately precedes it. What is the fifth term of the sequence?**

answer

(A) $\frac{3}{5}$

(B) $\frac{5}{8}$

(C) $\frac{8}{5}$

(D) $\frac{3}{5}$

(E) $\frac{9}{2}$

16. A kennel sold 3 puppies of breed X and 2 puppies of breed Y for a total of \$690. If each breed Y puppy was sold for 20 percent less than each breed X puppy, how much did each breed X puppy sell for?

answer

(A) \$120.00

(B) \$127.70

(C) \$138.00

(D) \$150.00

(E) \$156.70

17. In a certain brick wall, each row of bricks above the bottom row contains one less brick than the row just below it. If there are 5 rows in all and a total of 75 bricks in the wall, how many bricks does the bottom row contain?

answer

(A) 14

(B) 15

(C) 16

(D) 17

(E) 18

STOP

수학해설 Category 7 Algebra

1. Three musical tones have frequencies x, y, and z, respectively. If x, y, and z are positive, $\frac{x}{y} = \frac{y}{z}$, and $2x = z$, what is y in terms of x?

(A) $2x$ **(B)** $(\sqrt{2})x$ **(C)** $\frac{1}{\sqrt{2}}x$ **(D)** $\frac{1}{2}x$ **(E)** $\frac{\sqrt{2}}{3}x$

$\frac{x}{y} = \frac{y}{z}$ 는 $xz = y^2$ 입니다. $2x = z$ 을 대입하면 $2x^2 = y^2$ 입니다. x, y 는 양수이기 때문에 $y = \sqrt{2}x$ 입니다.

⏭⏭ 답은 (B)입니다. ⏭⏭

2. A certain fraction is equivalent to $\frac{2}{5}$. If the numerator of the fraction is increased by 4 and the denominator is doubled, the new fraction is equivalent to $\frac{1}{3}$. What is the sum of the numerator and denominator of the original fraction?

(A) 49 **(B)** 35 **(C)** 28 **(D)** 26 **(E)** 21

분자가 4만큼 증가하고 분모가 두 배가 되었을 때, 새로운 분수 값이 $\frac{1}{3}$ 이라고 합니다. 변화를 주기 전 분수의 분자와 분모를 합하면 그 값이 얼마인지 물어 보고 있습니다. 다음의 두 식을 연립하여 계산하면 됩니다.

i) $\frac{n}{d} = \frac{2}{5}$ ii) $\frac{n+4}{2d} = \frac{1}{3}$

⏭⏭ 답은 (E)입니다. ⏭⏭

3. If a total of x identical disks can be arranged in 8 stacks of equal height or in 12 stacks of equal height, the least possible value of x is

(A) 96
(B) 48
(C) 36
(D) 24
(E) 12

x 개의 디스크를 높이가 동일한 8개 더미 또는 높이가 동일한 12개 더미로 쌓을 수 있을 때, x 의 최소 값을 물어 보고 있습니다. x 는 8과 12로 나누어 떨어지는 숫자입니다. 문제에서 x 의 최소 값을 물어 보고 있기 때문에 결국 8과 12의 최소공배수를 물어 보는 것과 같습니다.

⏭⏭ 답은 (D)입니다. ⏭⏭

4. The total price of $n(n > 1)$ equally priced copies of a certain book is \$50. In terms of n, which of the following gives the total price of $n-1$ of these copies?

(A) $50(n-1)$
(B) $\frac{50}{n-1}$
(C) $\frac{50(n-1)}{n}$
(D) $\frac{50n}{n-1}$
(E) $\frac{50}{n(n-1)}$

매 권의 가격이 동일한 n 권의 책 가격이 \$50일 때, $n-1$ 권의 가격을 물어 보고 있습니다. 권별 책 가격이 동일하다고 했으므로 한 권의 책 가격은 $\$\frac{50}{n}$ 입니다. 따라서 $n-1$ 권의 책 가격은 $\$\frac{50(n-1)}{n}$ 입니다.

⏭⏭ 답은 (C)입니다. ⏭⏭

5. **A plane was originally flying at an altitude of x feet when it ascended 2,000 feet and then descended 5,000 feet. If the plane's altitude after these two changes was $\frac{1}{3}$ its original altitude, then the solution of which of the following equations gives the plane's original altitude, in feet?**

(A) $x + 2{,}000 = \frac{1}{3}(x - 3{,}000)$

(B) $\frac{1}{3}(x - 3{,}000) = x$

(C) $x + 3{,}000 = \frac{1}{3}x$

(D) $x - 7{,}000 = \frac{1}{3}x$

(E) $x - 3{,}000 = \frac{1}{3}x$

x feet의 고도에서 2,000 feet를 상승했다가(x feet + 2,000 feet) 5,000 feet를 하강했을 때(x feet + 2,000 feet - 5,000 feet) 처음 고도의 $\frac{1}{3}$ 지점에($\frac{1}{3}x$) 있다고 합니다.

⏭⏭ 답은 (E)입니다. ⏭⏭

6. **There are how many hours between x minutes past 12 noon and 8:10 p.m. of the same day, where $x < 60$?**

(A) $\frac{490 - x}{60}$

(B) $\frac{480 - x}{60}$

(C) $\frac{470 - x}{60}$

(D) $60(60 - x + 7)$

(E) $60(60 - x + 17)$

정오12시에서 오후8시까지는 8시간의 간격이 있습니다. 12시에서 x 분 만큼이 지났으므로 x 만큼 빼주어야 되며 오후 8시에서 10분만큼 초과되었으므로 더해주어야 합니다.

⏭⏭ 답은 (A)입니다. ⏭⏭

7. There are how many <u>seconds</u> between x minutes past 3 p.m. and y minutes past 4 p.m. of the same day? ($0 < x < 60$ and $0 < y < 60$)

(A) $3{,}600 + 60(y - x)$

(B) $3{,}600 + 60(x - y)$

(C) $60 + 60(x - y)$

(D) $60 + (y - x)$

(E) $60(x - y)^2$

15시 x분으로부터 16시 y분까지의 사이가 몇 초 차이인지 물어 보고 있습니다.

1시간에 y분 만큼 더하고 x분 만큼 빼주어야 합니다.

⏭⏭ 답은 (A)입니다. ⏭⏭

8. A certain theater has 100 balcony seats. For every $2 increase in the price of a balcony seat above $10, 5 fewer seats will be sold. If all the balcony seats are sold when the price of each seat is $10, which of the following could be the price of a balcony seat if the revenue from the sale of balcony seats is $1,360?

(A) $12

(B) $14

(C) $16

(D) $17

(E) $18

100개의 발코니 좌석이 있고 발코니 좌석의 가격이 $10보다 높을 때 좌석의 가격이 $2인상되면 판매되는 좌석의 수는 5개씩 줄어 든다고 합니다. 좌석의 가격이 $10일 때 모든 좌석이 판매 된다고 하면 좌석 판매수익이 $1,360일 때 판매된 좌석의 개수를 물어 보고 있죠. 좌석의 가격이 $2씩 인상될 때 판매되는 좌석의 수가 5개씩 줄어 들므로 다음의 식을 세울 수 있습니다.

$$(10 + 2n)(100 - 5n) = 1{,}360$$

⏭⏭ 답은 (C)입니다. ⏭⏭

9. A certain used-book dealer sells paperback books at 3 times dealer's cost and hardback books at 4 times dealer's cost. Last week the dealer sold a total of 120 books, each of which had cost the dealer $1. If the gross profit (sales revenue minus dealer's cost) on the sale of all of these books was $300, how many of the books sold were paperbacks?

(A) 40

(B) 60

(C) 75

(D) 90

(E) 100

dealer's cost가 $1이며 paperback book의 가격이 dealer cost의 3배라고 했기 때문에 paperback book을 한 권 판매했을 때 profit은 $2입니다. Hardback book은 $3의 profit이 발생합니다. 다음의 두 식을 가지고 문제에 대한 답을 찾을 수 있습니다.

i) $P+H=120$ ii) $2P+3H=300$

⏭⏭ 답은 (B)입니다 ⏭⏭

10. On a legislative committee, the number of males is 3 fewer than twice the number of females. If one male were replaced by a female, there would be an equal number of males and females on the committee. How many members are on the committee?

(A) 14 (B) 12 (C) 10 (D) 9 (E) 7

입법위원회에 소속되어 있는 남성의 수는 여성 수의 2배에 3만큼이 작다고 합니다.$(m=2f-3)$ 남성 한 명이 여성으로 대체되면($m-1=f+1$; 대체되는 것은 남성의 숫자는 한 명이 줄어드는 것이며 여성의 숫자는 한 명이 늘어나는 것 입니다.) 위원회에 남성과 여성의 숫자가 같아 진다고 합니다.

두 식을($m=2f-3$, $m-1=f+1$) 연립하여 계산하면 됩니다. 위원회의 의원수를 알 수 있습니다.

⏭⏭ 답은 (B)입니다. ⏭⏭

11. An investor has stocks, bonds, and government securities currently worth a total of $100,000, as well as a real estate investment. If the stocks and the bonds are worth a total of $2,500 more than the value of the real estate investment, and if the government securities are worth $7,500 more than twice the value of the real estate investment, how much are the government securities worth?

(A) $67,500

(B) $62,500

(C) $37,500

(D) $32,500

(E) $30,000

i) stock + bond + government security = $ 100,000

ii) "stock & bond"의 가치- $2,500 = 부동산의 가치

iii) "government security"의 가치- $7,500 = 2(부동산의 가치)

⏭⏭ 답은 (A)입니다. ⏭⏭

12. Kim bought a total of $2.65 worth of postage stamps in four denominations. If she bought an equal number of 5-cent and 25-cent stamps and twice as many 10-cent stamps as 5-cent stamps, what is the least number of 1-cent stamps she could have bought?

(A) 5 (B) 10 (C) 15 (D) 20 (E) 25

우표를 구입한 총 금액은 $2.65이며 5 cent, 25cent 우표는 같은 개수를 10 cent 우표는 5 cent 우표보다 2배 많이 구입했다고 합니다. 이 때 구입할 수 있는 1cent짜리 우표의 가격을 물어보고 있습니다.

구입한 5 cent 우표의 개수를 n이라 하면 위의 내용을 다음 식으로 정리할 수 있습니다.

$(\$0.01 \times x) + (\$0.05 \times n) + (\$0.10 \times 2n) + (\$0.25 \times n) = \$2.65$

$\Rightarrow \quad 0.01x + 0.5n = 2.65$

n이 5일 때 x는 최소값을 가지게 됩니다.

⏭⏭ 답은 (C)입니다. ⏭⏭

13. A certain truck traveling at 55 miles per hour gets 4.5 miles per gallon of diesel fuel consumed. Traveling at 60 miles per hour, the truck gets only 3.5 miles per gallon. On a 500-mile trip, if the truck used a total of 120 gallons of diesel fuel and traveled part of the trip at 55 miles per hour and the rest at 60 miles per hour, how many miles did it travel at 55 miles per hour?

(A) 140 (B) 200 (C) 250 (D) 300 (E) 360

55 mile의 속도로 운행 할 때는 1 갤런 당 4.5mile, 60 mile의 속도로 운행 할 때는 1갤런 당 3.5mile을 가는 트럭이 500mile의 거리를 때로는 55mile, 60mile의 속도로 가면서120gallon의 연료를 소비했다고 합니다.이 때 55mile로 운행한 거리를 물어 보고 있습니다.

55mile로 운행한 거리를 d 라 하면 다음의 식을 만들 수 있습니다.

$$\frac{d}{4.5}+\frac{500-d}{3.5}=120$$

⏭⏭ 답은 (E)입니다. ⏭⏭

14. The cost of registration at a professional association meeting was $50 per person; a lunch for registrants only was available for an additional $22 per person. If the number of registrants who paid for lunch was 100 more than the number who did not, and if receipts for registration and lunch totaled $92,600, how many people paid just for registration at the meeting?

(A) 700 (B) 800 (C) 1,300 (D) 1,500 (E) 1,800

등록비는 $50, 식사값은 $22 일 때 식사값을 지불한 사람이 내지 않은 사람보다 100명이 많다고 합니다. 이 때 등록비만을 낸 사람이 몇 명인지 물어 보고 있습니다.

등록한 전체 인원을 T 라 하면 식사값을 지불한 사람은 $\frac{T}{2}-50$ 입니다. 따라서 다음의 식이 성립합니다.

$$50T+22\times\left(\frac{T}{2}-50\right)=92{,}600$$

⏭⏭ 답은 (A)입니다. ⏭⏭

15. In a certain sequence, the first term is 1, and each successive term is 1 more than the reciprocal of the term that immediately precedes it. What is the fifth term of the sequence?

(A) $\frac{3}{5}$ **(B)** $\frac{5}{8}$ **(C)** $\frac{8}{5}$ **(D)** $\frac{3}{5}$ **(E)** $\frac{9}{2}$

숫자의 연속에서 첫 번째 숫자가 1이며 그 다음의 수들은 바로 앞의 숫자의 역수에 1을 더한 값이라고 할 때, 다섯번째 수를 물어 보고 있습니다.

주어진 조건에 따라 숫자를 나열해 보면 다음과 같습니다.

$$1, 2, \frac{1}{2}+1, \frac{2}{3}+1, \frac{3}{5}+1$$

⏭⏭ 답은 (C)입니다. ⏭⏭

16. A kennel sold 3 puppies of breed X and 2 puppies of breed Y for a total of $690. If each breed Y puppy was sold for 20 percent less than each breed X puppy, how much did each breed X puppy sell for?

(A) **$120.00**

(B) **$127.70**

(C) **$138.00**

(D) **$150.00**

(E) **$156.70**

X 종자 강아지 3마리와 Y 종자 강아지 2마리를 $690에 팔았다고 했으므로 이를 식으로 나타내면 $3X + 2Y = 690$ 입니다. Y 종자 강아지의 가격이 X 종자 강아지의 가격보다 20%가 작다고 했으므로 이를 식으로 나타내면 $Y = 0.8X$ 입니다.

⏭⏭ 답은 (D)입니다. ⏭⏭

17. In a certain brick wall, each row of bricks above the bottom row contains one less brick than the row just below it. If there are 5 rows in all and a total of 75 bricks in the wall, how many bricks does the bottom row contain?

(A) 14

(B) 15

(C) 16

(D) 17

(E) 18

벽의 제일 아래쪽 줄에서부터 위로 한 줄 씩 올라가면서 벽돌의 개수가 한 개씩 줄어 든다고 합니다. 총5줄에 75개의 벽돌로 만들어진 벽에서 제일 아래쪽 줄의 벽돌 개수를 물어 보고 있습니다. 제일 아래쪽에 위치한 벽돌의 개수를 b 라 하면 $5n-10=75$ 입니다.

⏭⏭ 답은 (D)입니다. ⏭⏭