

정답 & 해설

1. 정답 ①

$$f(k) = 3k - 1 = 5$$

$$\therefore k = 2$$

$$(g \circ f)(2) = 2 \Rightarrow g(5) = 2$$

2. 정답 ④

$$f(x) = (x-1)Q(x) + 3$$

$$Q(-1) = -2 \text{ 이므로}$$

$$\begin{aligned} f(-1) &= (-2) \cdot Q(-1) + 3 \\ &= 4 + 3 = 7 \end{aligned}$$

3. 정답 ②

(6번째 모의시험에서 받아야 하는 최소한의 점수를 x 라 하면)

$$\frac{83 \times 5 + x}{6} = 85$$

$$\therefore x = 95$$

4. 정답 ①

$$\frac{2x + \sqrt{y}}{2} = \frac{5}{2} \geq \sqrt{2xy} \text{ 이므로}$$

$$\begin{aligned} (\sqrt{2x} + \sqrt{y})^2 &= 2x + y + 2\sqrt{2xy} \\ &= 5 + 2\sqrt{2xy} \leq 5 + 5 = 10 \end{aligned}$$

$$\therefore \sqrt{2x} + \sqrt{y} \text{의 최댓값은 } \sqrt{10}$$

5. 정답 ①

$$\omega^3 = 1 \text{ 이므로 } \omega^2 + \omega + 1 = 0$$

$$1 + \omega + \omega^2 + \omega^3 + \omega^4 + \dots + \omega^{2015}$$

$$= (1 + \omega + \omega^2) \times 672 = 0$$

6. 정답 ③

$$\alpha + \beta + \gamma = 6, \alpha\beta + \beta\gamma + \gamma\alpha = 11, \alpha\beta\gamma = 6$$

$$\frac{(\alpha + \beta)(\beta + \gamma)(\gamma + \alpha)}{\alpha + \beta + \gamma}$$

$$= \frac{(6 - \alpha)(6 - \beta)(6 - \gamma)}{6}$$

$$= \frac{6^3 - (\alpha + \beta + \gamma)6^2 + (\alpha\beta + \beta\gamma + \gamma\alpha)6 - \alpha\beta\gamma}{6}$$

$$= \frac{66 - 6}{6} = 10$$

7. 정답 ①

$$x = \log_{10} \sqrt{4 - 2\sqrt{3}} = \log_{10} (\sqrt{3} - 1)$$

$$10^x + 10^{-x} = \sqrt{3} - 1 + \frac{1}{\sqrt{3} - 1} = \sqrt{3} - 1 + \frac{\sqrt{3} + 1}{2} = \frac{3\sqrt{3} - 1}{2}$$

8. 정답 ③

$$\log_3 x + \log_3 y = \log_3 xy = 2$$

$$\therefore xy = 3^2 = 9$$

$$x^2 + y^2 \geq 2\sqrt{x^2 y^2} = 2xy = 18$$

9. 정답 ④

ㄱ. 거짓

$$\text{반례 } A = \begin{pmatrix} 1 & 0 \\ 0 & 0 \end{pmatrix}, B = \begin{pmatrix} 0 & 0 \\ 0 & 1 \end{pmatrix}, C = \begin{pmatrix} 0 & 0 \\ 1 & 0 \end{pmatrix}$$

ㄴ. 참

대우 명제 $A = E$ 이면 $(A - E)^2 = 0$ 이 참이므로

ㄷ. 참

$$AB = A \cdot (KA + E) = (KA + E)A = BA$$

10. 정답 ③

$$S_n = n^2 + 3n + 2 \text{ 이므로 } S_1 = 6$$

$$\therefore a_1 = 6$$

$$a_7 = S_7 - S_6 = 7^2 + 3 \cdot 7 + 2 - (6^2 + 3 \cdot 6 + 2) = 16$$

$$\therefore a_1 + a_7 = 22$$

11. 정답 ④

$$a_{n+1} = \frac{a_n}{a_{n-1}} \text{ 이므로}$$

$$a_1 = 1, a_2 = 2,$$

$$a_3 = \frac{a_2}{a_1} = 2$$

$$a_4 = \frac{a_3}{a_2} = \frac{2}{2} = 1$$

$$a_5 = \frac{a_4}{a_3} = \frac{1}{2}$$

$$a_6 = \frac{a_5}{a_4} = \frac{1}{2}$$

$$a_7 = \frac{a_6}{a_5} = 1$$

$$a_8 = \frac{a_7}{a_6} = 2$$

$$a_9 = \frac{a_8}{a_7} = 2$$

⋮

$$a_1 + a - 2 + \cdots a_{18} = (1 + 2 + 2 + 1 + \frac{1}{2} + \frac{1}{2}) \times 3 = 21$$

12. 정답 ③

$$\alpha + \beta = 3, \alpha\beta = -5$$

$$\begin{aligned} \sum_{k=1}^{15} (k + \alpha)(k + \beta) &= \sum_{k=1}^{15} (k^2 + (\alpha + \beta)k + \alpha\beta) \\ &= \sum_{k=1}^{15} k^2 + (\alpha + \beta) \sum_{k=1}^{15} k + \sum_{k=1}^{15} \alpha\beta \\ &= \frac{15 \cdot 16 \cdot 31}{6} + 3 \frac{15 \cdot 16}{2} + 15 \times (-5) \\ &= 1525 \end{aligned}$$

13. 정답 ②

$$\begin{aligned} \lim_{n \rightarrow \infty} (\sqrt{4n^2 + 3n + 2} - 2n) &= \lim_{n \rightarrow \infty} \frac{4n^2 + 3n + 2 - 4n^2}{\sqrt{4n^2 + 3n + 2} + 2n} \\ &= \frac{3}{4} \end{aligned}$$

14. 정답 ③

$\lim_{x \rightarrow 1} \frac{x-1}{x^2-a}$ 이 0이 아닌 극한값을 가지므로 $a = 1$

ㄱ. $\lim_{x \rightarrow 1} \frac{x^2-1}{x-1} = \lim_{x \rightarrow 1} (x+1) = 2$

ㄴ. $\lim_{x \rightarrow 1} \frac{x-1}{x^3-1} = \lim_{x \rightarrow 1} \frac{1}{x^2+x+1} = \frac{1}{3}$

ㄷ. $\lim_{x \rightarrow 1} \frac{x+1}{x^2-1}$ 발산

15. 정답 ④

$$\begin{aligned} \lim_{n \rightarrow 0} \frac{f(5+n) - f(5)}{5n} &= \frac{1}{5} \cdot f'(5) = 15 \\ \therefore f'(5) &= 75 \end{aligned}$$

16. 정답 ②

$$\int_0^2 (3x^2 + 3)dx = [x^3 + 3x]_0^2 = 8 + 6 = 14$$

17. 정답 ④

$$\begin{aligned} \lim_{n \rightarrow \infty} \sum_{k=1}^{\infty} \left\{ (n+2k)^3 \frac{2}{n^4} \right\} &= \lim_{n \rightarrow \infty} \sum_{k=1}^{\infty} \left(1 + \frac{2k}{n} \right)^3 \cdot \frac{2}{n} \\ \int_1^3 x^3 dx &= \left[\frac{x^4}{4} \right]_1^3 = \frac{81}{4} - \frac{1}{4} = 20 \end{aligned}$$

18. 정답 ②

$$\begin{aligned} \lim_{x \rightarrow 3} \frac{1}{\sqrt{x} - \sqrt{3}} \int_3^x f(t)dt \\ &= \lim_{x \rightarrow 3} (\sqrt{x} + \sqrt{3}) \frac{1}{x-3} \int_3^x f(t)dt \\ &= 2\sqrt{3} \cdot f(3) = 112\sqrt{3} \end{aligned}$$

19. 정답 ③

합격자의 수를 x , 불합격자의 수를 y 라 하면

$$\frac{75x + 50y}{x + y} = 65$$

$$75x + 50y = 65x + 65y$$

$$\Rightarrow 10x = 15y$$

$$\Rightarrow y = \frac{2}{3}x$$

$$\text{합격률} = \frac{x}{x+y} = \frac{x}{x + \frac{2}{3}x} = \frac{3}{5}$$

20. 정답 ②

표본의 크기가 클수록, 신뢰도가 낮을수록 신뢰구간의 길이는 짧아 지므로 ②이 가장 짧다.