1. $6\sqrt{6}-4\sqrt{3}+2\sqrt{6}-3\sqrt{3}$ 을 간단히 하면?

① $2\sqrt{6}+1\sqrt{3}$ ② $3\sqrt{6}-2\sqrt{3}$ ③ $7\sqrt{6}+8\sqrt{3}$

④ $8\sqrt{6}-7\sqrt{3}$ ⑤ $4\sqrt{6}+2\sqrt{3}$

해설

$6\sqrt{6}-4\sqrt{3}-3\sqrt{3}+2\sqrt{6}$
$=(6\sqrt{6}+2\sqrt{6})-(4\sqrt{3}+3\sqrt{3})$
$=8\sqrt{6}-7\sqrt{3}$

2. $\frac{\sqrt{3}}{3}+\frac{\sqrt{5}}{6}-\frac{\sqrt{3}}{4}-\frac{\sqrt{5}}{2}$ 을 간단히 나타내면?

① $-\frac{\sqrt{3}}{12}-\frac{\sqrt{5}}{12}$ ② $\frac{\sqrt{3}}{12}+\frac{\sqrt{5}}{3}$ ③ $\frac{\sqrt{3}}{12}-\frac{\sqrt{5}}{3}$

④ $\frac{\sqrt{3}}{6}-\frac{\sqrt{5}}{6}$ ⑤ $\frac{\sqrt{3}}{3}+\frac{\sqrt{5}}{3}$

해설

$$\begin{aligned}&\frac{\sqrt{3}}{3}+\frac{\sqrt{5}}{6}-\frac{\sqrt{3}}{4}-\frac{\sqrt{5}}{2}\\&=\frac{4\sqrt{3}-3\sqrt{3}}{12}+\frac{\sqrt{5}-3\sqrt{5}}{6}\\&=\frac{\sqrt{3}}{12}-\frac{\sqrt{5}}{3}\end{aligned}$$

3. $\sqrt{48}-4\sqrt{32}+3\sqrt{12}+\sqrt{50}$ 을 $a\sqrt{3}+b\sqrt{2}$ 의 꼴로 고칠 때, $a+b$ 의 값은?

① -21 ② -1 ③ 4 ④ 9 ⑤ 21

해설

$\sqrt{48}-4\sqrt{32}+3\sqrt{12}+\sqrt{50}$
$=4\sqrt{3}-16\sqrt{2}+6\sqrt{3}+5\sqrt{2}$
$=10\sqrt{3}-11\sqrt{2}$
$a=10,\ b=-11$
$\therefore a+b=-1$

4. 다음 식을 간단히 하면?

$\sqrt{12}+\sqrt{3}-\sqrt{48}$

① $-\sqrt{3}$ ② $\sqrt{3}$ ③ $2\sqrt{3}$
④ $-2\sqrt{3}$ ⑤ $7\sqrt{3}$

해설

$\sqrt{12}+\sqrt{3}-\sqrt{48}=2\sqrt{3}+\sqrt{3}-4\sqrt{3}$
$=-\sqrt{3}$

5. $\sqrt{48}-4\sqrt{32}+3\sqrt{12}+\sqrt{50}$ 을 $a\sqrt{3}+b\sqrt{2}$ 의 꼴로 고칠 때, $a+b$ 의 값은?

① -21 ② -1 ③ 4 ④ 9 ⑤ 21

해설

$\sqrt{48}-4\sqrt{32}+3\sqrt{12}+\sqrt{50}$
$=4\sqrt{3}-16\sqrt{2}+6\sqrt{3}+5\sqrt{2}$
$=10\sqrt{3}-11\sqrt{2}$ 에서
$a=10,\ b=-11$
$\therefore a+b=-1$

6. $-3\sqrt{2}-\frac{11}{4}\sqrt{5}+5\sqrt{2}+\frac{3}{4}\sqrt{5}=a\sqrt{2}+b\sqrt{5}$가 성립할 때, $2a+b$의 값은? (단, a , b 는 유리수)

① -4　② -2　③ 0　④ 2　⑤ 4

해설

$-3\sqrt{2}-\frac{11}{4}\sqrt{5}+5\sqrt{2}+\frac{3}{4}\sqrt{5}$

$=(-3+5)\sqrt{2}+\frac{-11+3}{4}\sqrt{5}$

$=2\sqrt{2}-2\sqrt{5}$

$a=2,\ b=-2$이므로 $2a+b=2$

7. $\sqrt{(3-2\sqrt{2})^2}-\sqrt{(2\sqrt{2}-3)^2}$ 을 간단히 하면?

① $6-4\sqrt{2}$ ② $-4\sqrt{2}$ ③ 6

④ 0 ⑤ $-6+4\sqrt{2}$

해설

$3>2\sqrt{2}$ 이므로

$$\begin{aligned}&\sqrt{(3-2\sqrt{2})^2}-\sqrt{(2\sqrt{2}-3)^2}\\&=|3-2\sqrt{2}|-|2\sqrt{2}-3|\\&=3-2\sqrt{2}+2\sqrt{2}-3\\&=0\end{aligned}$$

8. $\sqrt{(5-2\sqrt{5})^2}+\sqrt{(2\sqrt{5}-5)^2}$ 을 간단히 하면 $a+b\sqrt{5}$ 이다. 유리수 a 와 b 의 합은?

① -4 ② 0 ③ 3 ④ 6 ⑤ 11

해설

$5>2\sqrt{5}$ 이므로

$\sqrt{(5-2\sqrt{5})^2}+\sqrt{(2\sqrt{5}-5)^2}$

$=|5-2\sqrt{5}|+|2\sqrt{5}-5|$

$=5-2\sqrt{5}-(2\sqrt{5}-5)$

$=5-2\sqrt{5}-2\sqrt{5}+5$

$=10-4\sqrt{5}$

$\therefore\ a+b=10-4=6$

9. $f(x)=\sqrt{x+1}-\sqrt{x}$이고, $S(x)=f(1)+f(2)+f(3)+\cdots+f(x)$이라고 한다. 100 이하의 자연수 n에 대하여 $S(n)$의 값이 자연수가 되는 n을 모두 고르면?

① 8　② 15　③ 35　④ 50　⑤ 99

해설

$$S(n) = \left(\sqrt{2}-1\right)+\left(\sqrt{3}-\sqrt{2}\right)+\left(\sqrt{4}-\sqrt{3}\right)+\cdots+\left(\sqrt{n+1}-\sqrt{n}\right)=\sqrt{n+1}-1$$

① $n=8$일 때, $S(n)=3-1=2$
② $n=15$일 때, $S(n)=4-1=3$
③ $n=35$일 때, $S(n)=6-1=5$
④ $n=50$일 때, $S(n)=\sqrt{51}-1$
⑤ $n=99$일 때, $S(n)=10-1=9$
따라서 ①, ②, ③, ⑤가 답이다.

10. $\sqrt{18}+\sqrt{48}-2\sqrt{27}+3\sqrt{50}$ 을 간단히 하면?

① $14\sqrt{2}+4\sqrt{3}$ ② $14\sqrt{2}-4\sqrt{3}$ ③ $18\sqrt{2}-2\sqrt{3}$

④ $18\sqrt{2}+2\sqrt{3}$ ⑤ $24\sqrt{2}+4\sqrt{3}$

해설

$$\begin{aligned}&\sqrt{18}+\sqrt{48}-2\sqrt{27}+3\sqrt{50}\\&=3\sqrt{2}+4\sqrt{3}-6\sqrt{3}+15\sqrt{2}\\&=\left(3\sqrt{2}+15\sqrt{2}\right)+\left(4\sqrt{3}-6\sqrt{3}\right)\\&=18\sqrt{2}-2\sqrt{3}\end{aligned}$$

11. $\sqrt{108}-\sqrt{48}-\sqrt{27}+\sqrt{24}$ 를 $a\sqrt{3}+b\sqrt{6}$ 의 꼴로 고칠 때, $a-b$ 의 값은?

① -3 ② -1 ③ 0 ④ 1 ⑤ 3

해설

$\sqrt{108}-\sqrt{48}-\sqrt{27}+\sqrt{24}$

$=6\sqrt{3}-4\sqrt{3}-3\sqrt{3}+2\sqrt{6}$

$=-\sqrt{3}+2\sqrt{6}$

$\therefore\ a-b=-1-2=-3$

12. $\sqrt{192}-\sqrt{54}-\sqrt{108}+\sqrt{24}$ 를 $a\sqrt{3}+b\sqrt{6}$ 의 꼴로 고칠 때, $a-b$ 의 값을 구하면?

① 1 ② 2 ③ 3 ④ 4 ⑤ 5

해설

$\sqrt{192}-\sqrt{54}-\sqrt{108}+\sqrt{24}$

$=8\sqrt{3}-3\sqrt{6}-6\sqrt{3}+2\sqrt{6}$

$=2\sqrt{3}-\sqrt{6}$

$\therefore\ a=2,\ b=-1$

$\therefore\ a-b=2-(-1)=3$

13. $a=\sqrt{2},\ b=\sqrt{3}$ 일 때, $\sqrt{216}+\dfrac{\sqrt{24}}{\sqrt{2}}$ 를 $a,\ b$ 로 나타내면?

① $6a+2b$　② $6a+2ab$　③ $6ab+2b$

④ $2ab+6b$　⑤ $2a+6ab$

해설

$\sqrt{216}=\sqrt{2^3\times 3^3}=2\sqrt{2}\times 3\sqrt{3}=2a\times 3b=6ab$

$\dfrac{\sqrt{24}}{\sqrt{2}}=\dfrac{\sqrt{24}\times\sqrt{2}}{\sqrt{2}\times\sqrt{2}}=\dfrac{\sqrt{48}}{2}=\dfrac{4\sqrt{3}}{2}=2\sqrt{3}=2b$

$\therefore\ \sqrt{216}+\left(\dfrac{\sqrt{24}}{\sqrt{2}}\right)=6ab+2b$

14. 다음 보기 중에서 옳은 것을 모두 고르면?

보기

㉠ $\frac{\sqrt{6}}{3}+\frac{\sqrt{6}}{2}-2\sqrt{6}=-\frac{7\sqrt{6}}{6}$

㉡ $\frac{3\sqrt{2}}{2}+\frac{5\sqrt{2}}{2}-2\sqrt{2}-2\sqrt{3}=2\sqrt{2}-\sqrt{3}$

㉢ $\frac{3\sqrt{2}}{4}-3\sqrt{2}+\sqrt{32}=\frac{7\sqrt{2}}{4}$

㉣ $\sqrt{192}-\sqrt{54}-\sqrt{108}+\sqrt{24}=2\sqrt{3}-\sqrt{6}$

① ㉠, ㉡ ② ㉠, ㉡, ㉢ ③ ㉠, ㉢

④ ㉠, ㉢, ㉣ ⑤ ㉠, ㉡, ㉢, ㉣

해설

㉠ $\frac{\sqrt{6}}{3}+\frac{\sqrt{6}}{2}-2\sqrt{6}=\frac{5\sqrt{6}}{6}-2\sqrt{6}=-\frac{7\sqrt{6}}{6}$

㉡ $\frac{3\sqrt{2}}{2}+\frac{5\sqrt{2}}{2}-2\sqrt{2}-2\sqrt{3}$
$=4\sqrt{2}-2\sqrt{2}-2\sqrt{3}$
$=2\sqrt{2}-2\sqrt{3}$

㉢ $\frac{3\sqrt{2}}{4}-3\sqrt{2}+\sqrt{32}=\frac{3\sqrt{2}}{4}+\sqrt{2}=\frac{7\sqrt{2}}{4}$

㉣ $\sqrt{192}-\sqrt{54}-\sqrt{108}+\sqrt{24}$
$=8\sqrt{3}-3\sqrt{6}-6\sqrt{3}+2\sqrt{6}$
$=2\sqrt{3}-\sqrt{6}$

15. 다음 보기 중에서 옳은 것을 모두 고르면?

보기

㉠ $\sqrt{10}-\sqrt{45}+\sqrt{40}=-\sqrt{5}+3\sqrt{10}$

㉡ $\sqrt{24}+\sqrt{54}+\sqrt{27}-\sqrt{12}=5\sqrt{6}+\sqrt{3}$

㉢ $\sqrt{18}-\sqrt{8}+\sqrt{48}-\sqrt{12}=\sqrt{2}+2\sqrt{3}$

㉣ $\frac{3}{\sqrt{3}}-\frac{28}{\sqrt{28}}=\sqrt{3}-\sqrt{7}$

㉤ $\sqrt{80}-\sqrt{20}-\frac{10}{\sqrt{5}}=\sqrt{5}$

① ㉠, ㉡ ② ㉠, ㉢ ③ ㉡, ㉢ ④ ㉡, ㉣ ⑤ ㉢, ㉣

해설

㉠ $\sqrt{10}-\sqrt{45}+\sqrt{40}$
$=\sqrt{10}-3\sqrt{5}+2\sqrt{10}$
$=3\sqrt{10}-3\sqrt{5}$

㉡ $\sqrt{24}+\sqrt{54}+\sqrt{27}-\sqrt{12}$
$=2\sqrt{6}+3\sqrt{6}+3\sqrt{3}-2\sqrt{3}$
$=5\sqrt{6}+\sqrt{3}$

㉢ $\sqrt{18}-\sqrt{8}+\sqrt{48}-\sqrt{12}$
$=3\sqrt{2}-2\sqrt{2}+4\sqrt{3}-2\sqrt{3}$
$=\sqrt{2}+2\sqrt{3}$

㉣ $\frac{3}{\sqrt{3}}-\frac{28}{\sqrt{28}}$
$=\sqrt{3}-\sqrt{28}$
$=\sqrt{3}-2\sqrt{7}$

㉤ $\sqrt{80}-\sqrt{20}-\frac{10}{\sqrt{5}}$
$=4\sqrt{5}-2\sqrt{5}-2\sqrt{5}$
$=0$

16. $\sqrt{32}+\dfrac{8}{\sqrt{2}}-\sqrt{50}=a\sqrt{2}$, $\sqrt{0.2}\times\sqrt{\dfrac{4}{5}}\times\sqrt{125}=b\sqrt{5}$ 일 때, $a-b$ 의 값은?

① -2 ② -1 ③ 1 ④ 2 ⑤ 3

해설

$4\sqrt{2}+4\sqrt{2}-5\sqrt{2}=3\sqrt{2}$ $\therefore\ a=3$

$$\sqrt{\frac{20}{100}}\times\frac{2\sqrt{5}}{5}\times5\sqrt{5}=\frac{\sqrt{5}}{5}\times\frac{2\sqrt{5}}{5}\times5\sqrt{5}$$
$$=2\sqrt{5}$$

$\therefore\ b=2$

$\therefore\ a-b=1$

17. $\sqrt{20}+\sqrt{0.2}+\dfrac{4}{\sqrt{5}}=a\sqrt{5}$, $\sqrt{2.5}\times\sqrt{\dfrac{6}{5}}\times\sqrt{18}=b\sqrt{6}$ 일 때, $a\times b$ 의 값은?

① 4 ② 9 ③ 16 ④ 25 ⑤ 36

해설

$2\sqrt{5}+\dfrac{\sqrt{5}}{5}+\dfrac{4\sqrt{5}}{5}=\dfrac{10\sqrt{5}+\sqrt{5}+4\sqrt{5}}{5}=\dfrac{15\sqrt{5}}{5}=3\sqrt{5}$

$\therefore a=3$

$\sqrt{2.5}\times\sqrt{\dfrac{6}{5}}\times\sqrt{18}=\sqrt{\dfrac{25}{10}\times\dfrac{6}{5}\times18}=3\sqrt{6}$

$\therefore b=3$

$\therefore a\times b=9$

18. $a=\dfrac{\sqrt{2}+\sqrt{5}}{\sqrt{2}}$, $b=\dfrac{-\sqrt{2}+\sqrt{5}}{\sqrt{2}}$ 일 때, $\dfrac{a+b}{a-b}$ 의 값은?

① $\sqrt{5}$ ② $\dfrac{\sqrt{6}}{2}$ ③ $\dfrac{\sqrt{7}}{2}$ ④ $\dfrac{\sqrt{10}}{2}$ ⑤ $\sqrt{6}$

해설

$a=1+\dfrac{\sqrt{10}}{2}$, $b=-1+\dfrac{\sqrt{10}}{2}$ 이므로

$a+b=\sqrt{10}$, $a-b=2$ 이다.

$\therefore \dfrac{a+b}{a-b}=\dfrac{\sqrt{10}}{2}$

19. $2\left(\dfrac{\sqrt{6}-2\sqrt{2}}{\sqrt{3}}\right)-(4\sqrt{3}-6)\div\sqrt{6}$ 을 간단히 한 것으로 옳은 것은?

① $-\dfrac{\sqrt{6}}{3}$ ② $-\dfrac{\sqrt{6}}{2}$ ③ $\dfrac{\sqrt{6}}{3}$ ④ $\dfrac{\sqrt{6}}{2}$ ⑤ $2\sqrt{6}$

해설

$$2\left(\frac{\sqrt{6}-2\sqrt{2}}{\sqrt{3}}\right)-(4\sqrt{3}-6)\div\sqrt{6}$$

$$=2\times\frac{3\sqrt{2}-2\sqrt{6}}{3}-\frac{4\sqrt{3}-6}{\sqrt{6}}$$

$$=\frac{6\sqrt{2}-4\sqrt{6}}{3}-\frac{12\sqrt{2}-6\sqrt{6}}{6}$$

$$=2\sqrt{2}-\frac{4\sqrt{6}}{3}-2\sqrt{2}+\sqrt{6}$$

$$=-\frac{\sqrt{6}}{3}$$

20. 다음 식을 간단히 하면?

$$\sqrt{2}\left(\frac{2}{\sqrt{6}}-\frac{10}{\sqrt{12}}\right)+\sqrt{3}\left(\frac{6}{\sqrt{18}}-3\right)$$

① $\frac{7\sqrt{3}+2\sqrt{6}}{3}$ ② $\frac{7\sqrt{3}-2\sqrt{6}}{3}$ ③ $\frac{-7\sqrt{3}+2\sqrt{6}}{3}$

④ $\frac{-7\sqrt{3}-2\sqrt{6}}{3}$ ⑤ $\frac{7\sqrt{3}-\sqrt{6}}{3}$

해설

$$\sqrt{2}\left(\frac{2}{\sqrt{6}}-\frac{10}{\sqrt{12}}\right)+\sqrt{3}\left(\frac{6}{\sqrt{18}}-3\right)$$

$$=\frac{2}{\sqrt{3}}-\frac{10}{\sqrt{6}}+\frac{6}{\sqrt{6}}-3\sqrt{3}$$

$$=\frac{2\sqrt{3}}{3}-\frac{2\sqrt{6}}{3}-3\sqrt{3}=-\frac{7\sqrt{3}}{3}-\frac{2\sqrt{6}}{3}$$

21. $\frac{1}{\sqrt{2}} - \frac{3}{\sqrt{32}}$ 을 계산하면?

① $\frac{1}{2}$ ② $-\frac{1}{2}$ ③ $\frac{\sqrt{2}}{8}$ ④ $-\frac{\sqrt{3}}{8}$ ⑤ $\frac{\sqrt{3}}{8}$

해설

$$\begin{aligned}\frac{1}{\sqrt{2}} - \frac{3}{4\sqrt{2}} &= \frac{\sqrt{2}}{\sqrt{2}\sqrt{2}} - \frac{3\sqrt{2}}{4\sqrt{2}\sqrt{2}} \\ &= \frac{\sqrt{2}}{2} - \frac{3\sqrt{2}}{8} \\ &= \frac{4\sqrt{2}}{8} - \frac{3\sqrt{2}}{8} \\ &= \frac{\sqrt{2}}{8}\end{aligned}$$

22. $A = \frac{2}{\sqrt{3}} + \frac{4\sqrt{2}}{3}$, $B = \frac{2}{\sqrt{3}} + \frac{\sqrt{2}}{4}$ 일 때, $\sqrt{3}A + 4\sqrt{2}B$ 의 값을 구하면?

① $2 + 4\sqrt{6}$ ② $4 + 4\sqrt{6}$ ③ $4 + 6\sqrt{6}$
④ $6 + 6\sqrt{6}$ ⑤ $6 + 8\sqrt{6}$

해설

$$A = \frac{2}{\sqrt{3}} + \frac{4\sqrt{2}}{3} = \frac{4\sqrt{2}}{3} + \frac{2\sqrt{3}}{3}$$

$$B = \frac{2}{\sqrt{3}} + \frac{\sqrt{2}}{4} = \frac{2\sqrt{3}}{3} + \frac{\sqrt{2}}{4}$$

$$\sqrt{3}A + 4\sqrt{2}B$$

$$= \sqrt{3}\left(\frac{4\sqrt{2}}{3} + \frac{2\sqrt{3}}{3}\right) + 4\sqrt{2}\left(\frac{2\sqrt{3}}{3} + \frac{\sqrt{2}}{4}\right)$$

$$= \frac{4\sqrt{6}}{3} + \frac{6}{3} + \frac{8\sqrt{6}}{3} + 2$$

$$= \frac{12\sqrt{6}}{3} + 4$$

$$= 4 + 4\sqrt{6}$$

23. $a>0,\ b>0,\ \sqrt{ab}=2$ 일 때, $a\sqrt{\dfrac{2b}{a}}+b\sqrt{\dfrac{a}{b}}$ 를 구하면?

① 2 ② $2+\sqrt{2}$ ③ $2+2\sqrt{2}$

④ $2+3\sqrt{2}$ ⑤ $2+4\sqrt{2}$

해설

$$\begin{aligned}(\text{준식}) &= \sqrt{a^2\times\frac{2b}{a}}+\sqrt{b^2\times\frac{a}{b}}\\ &= \sqrt{2ab}+\sqrt{ab}\\ &= 2\sqrt{2}+2\end{aligned}$$

24. $a = (\sqrt{2} + \sqrt{3})$, $b = (\sqrt{2} - \sqrt{3})$ 일 때, $a^2 - b^2$ 의 값은?

① $2\sqrt{3}$ ② $4\sqrt{6}$ ③ $4\sqrt{3}$ ④ $2\sqrt{6}$ ⑤ 10

해설

$a^2 - b^2$
$= (\sqrt{2} + \sqrt{3})^2 - (\sqrt{2} - \sqrt{3})^2$
$= (\sqrt{2} + \sqrt{3})(\sqrt{2} + \sqrt{3}) - (\sqrt{2} - \sqrt{3})(\sqrt{2} - \sqrt{3})$
$= (2 + \sqrt{6} + \sqrt{6} + 3) - (2 - \sqrt{6} - \sqrt{6} + 3)$
$= 4\sqrt{6}$

25. 연립방정식 $\begin{cases} \sqrt{2}x+\sqrt{3}y=5\sqrt{6} \\ \sqrt{3}x-2\sqrt{2}y=-2 \end{cases}$ 를 풀면?

① $x=\frac{17}{7}\sqrt{3}, y=\frac{18}{7}\sqrt{2}$ ② $x=\frac{18}{7}\sqrt{2}, y=\frac{17}{7}\sqrt{3}$

③ $x=\frac{17}{7}\sqrt{2}, y=\frac{18}{7}\sqrt{3}$ ④ $x=\frac{18}{7}\sqrt{3}, y=\frac{17}{7}\sqrt{2}$

⑤ $x=\frac{17}{7}\sqrt{3}, y=\frac{18}{7}\sqrt{3}$

해설

$\begin{cases} \sqrt{2}x+\sqrt{3}y=5\sqrt{6}\cdots㉠ \\ \sqrt{3}x-2\sqrt{2}y=-2\cdots㉡ \end{cases}$

㉠$\times 2\sqrt{2}+$㉡$\times\sqrt{3}$ 을 하면

$$\begin{array}{rr} 4x+2\sqrt{6}y=20\sqrt{3} \\ +)\ 3x-2\sqrt{6}y=-2\sqrt{3} \\ \hline 7x\qquad\quad =18\sqrt{3} \end{array}$$

$\therefore x=\frac{18}{7}\sqrt{3}$

㉡에 $x=\frac{18}{7}\sqrt{3}$ 을 대입하면

$\frac{54}{7}-2\sqrt{2}y=-2,\ \sqrt{2}y=\frac{34}{7}$

$y=\frac{17}{7}\sqrt{2}$