

中2数学B 2019年度1学期 宿題解答

§2 平方差

H2.1

$$(1) \quad x^2 - 144 = x^2 - 12^2 = \boxed{(x+12)(x-12)}$$

$$(2) \quad 16x^2 - 49y^2 = (4x)^2 - (7y)^2 = \boxed{(4x+7y)(4x-7y)}$$

H2.2

$$(1) \quad (\sqrt{7} - \sqrt{3})(\sqrt{7} + \sqrt{3}) = (\sqrt{7})^2 - (\sqrt{3})^2 = 7 - 3 = \boxed{4}$$

$$(2) \quad (2\sqrt{3} - \sqrt{5})(2\sqrt{3} + \sqrt{5}) = (2\sqrt{3})^2 - (\sqrt{5})^2 = 4 \times 3 - 5 = \boxed{7}$$

H2.3

$$(1) \quad \frac{4}{\sqrt{7} + \sqrt{3}} = \frac{4 \times (\sqrt{7} - \sqrt{3})}{\underbrace{(\sqrt{7} + \sqrt{3}) \times (\sqrt{7} - \sqrt{3})}_{(\sqrt{7})^2 - (\sqrt{3})^2 = 7 - 3 = 4}} = \frac{\cancel{4}^1 (\sqrt{7} - \sqrt{3})}{\cancel{4}_1} = \boxed{\sqrt{7} - \sqrt{3}}$$

$$(2) \quad \frac{7\sqrt{2}}{2\sqrt{2} - 1} = \frac{7\sqrt{2} \times (2\sqrt{2} + 1)}{\underbrace{(2\sqrt{2} - 1) \times (2\sqrt{2} + 1)}_{(2\sqrt{2})^2 - 1^2 = 4 \times 2 - 1 = 7}} = \frac{\cancel{7}^1 \sqrt{2} (2\sqrt{2} + 1)}{\cancel{7}_1} = 2 \times 2 + \sqrt{2} = \boxed{4 + \sqrt{2}}$$

$$\begin{aligned}
(3) \quad \frac{\sqrt{6}}{3-\sqrt{3}} &= \frac{\sqrt{6} \times (3+\sqrt{3})}{\underbrace{(3-\sqrt{3}) \times (3+\sqrt{3})}_{3^2 - (\sqrt{3})^2 = 9-3=6}} = \frac{\sqrt{6}(3+\sqrt{3})}{6} = \frac{3\sqrt{6}+3\sqrt{2}}{6} = \frac{\cancel{3}^1(\sqrt{6}+\sqrt{2})}{\cancel{6}_2} = \frac{\sqrt{6}+\sqrt{2}}{2} \\
\frac{2}{\sqrt{6}+\sqrt{2}} &= \frac{2 \times (\sqrt{6}-\sqrt{2})}{\underbrace{(\sqrt{6}+\sqrt{2}) \times (\sqrt{6}-\sqrt{2})}_{(\sqrt{6})^2 - (\sqrt{2})^2 = 6-2=4}} = \frac{\cancel{2}^1(\sqrt{6}-\sqrt{2})}{\cancel{4}_2} = \frac{\sqrt{6}-\sqrt{2}}{2} \\
\therefore \frac{\sqrt{6}}{3-\sqrt{3}} - \frac{2}{\sqrt{6}+\sqrt{2}} &= \frac{\sqrt{6}+\sqrt{2}}{2} - \frac{\sqrt{6}-\sqrt{2}}{2} = \frac{\sqrt{6}+\sqrt{2} - (\sqrt{6}-\sqrt{2})}{2} \\
&= \frac{\sqrt{6}+\sqrt{2}-\sqrt{6}+\sqrt{2}}{2} = \frac{2\sqrt{2}}{2} = \boxed{\sqrt{2}}
\end{aligned}$$

$$\begin{aligned}
(4) \quad \frac{1}{5+\sqrt{22}} &= \frac{1 \times (5-\sqrt{22})}{\underbrace{(5+\sqrt{22}) \times (5-\sqrt{22})}_{5^2 - (\sqrt{22})^2 = 25-22=3}} = \frac{5-\sqrt{22}}{3} \\
\frac{1}{\sqrt{22}+\sqrt{19}} &= \frac{1 \times (\sqrt{22}-\sqrt{19})}{\underbrace{(\sqrt{22}+\sqrt{19}) \times (\sqrt{22}-\sqrt{19})}_{(\sqrt{22})^2 - (\sqrt{19})^2 = 22-19=3}} = \frac{\sqrt{22}-\sqrt{19}}{3} \\
\frac{1}{\sqrt{19}+4} &= \frac{1 \times (\sqrt{19}-4)}{\underbrace{(\sqrt{19}+4) \times (\sqrt{19}-4)}_{(\sqrt{19})^2 - 4^2 = 19-16=3}} = \frac{\sqrt{19}-4}{3} \\
\therefore \frac{1}{5+\sqrt{22}} + \frac{1}{\sqrt{22}+\sqrt{19}} + \frac{1}{\sqrt{19}+4} &= \frac{5-\cancel{\sqrt{22}}}{3} + \frac{\cancel{\sqrt{22}}-\cancel{\sqrt{19}}}{3} + \frac{\cancel{\sqrt{19}}-4}{3} \\
&= \frac{5-4}{3} = \boxed{\frac{1}{3}}
\end{aligned}$$

H2.4

$$(1) \quad \frac{120^2 - 97^2}{91^2 - 70^2} = \frac{(120+97)(120-97)}{(91+70)(91-70)} = \frac{\overset{31}{\cancel{217}} \times \cancel{23}}{\cancel{161} \times 21} = \boxed{\frac{31}{21}}$$

$$(2) \quad n^2 - (n+1)^2 = \{n + (n+1)\} \{n - (n+1)\} = -\{n + (n+1)\} \text{ であるから、}$$

$$S = (1^2 - 2^2) + (3^2 - 4^2) + \cdots + (99^2 - 100^2)$$

$$= -(1+2) - (3+4) - \cdots - (99+100)$$

$$= -(1+2+3+4+\cdots+99+100)$$

$$= -(1+100) \times 100 \div 2 = \boxed{-5050}$$

H2.5

$\sqrt{n^2 + 92}$ が整数であるとし、それを m (もちろん正) とおくと、

$$n^2 + 92 = m^2$$

$$92 = m^2 - n^2$$

$$\therefore (m+n)(m-n) = 92 \cdots \cdots \text{①}$$

ここで、整数 $m+n$, $m-n$ について、以下が成り立つことに注意する。

$$\cdot \text{①より } m+n \text{ と } m-n \text{ は同符号であり、 } m, n \text{ は正だから } m+n > 0, m+n > m-n$$

$$\text{よって、 } m+n > m-n > 0$$

$$\cdot (m+n) + (m-n) = 2m \text{ は偶数だから、 } m+n, m-n \text{ の偶奇は一致}$$

したがって、①より、

$$\begin{cases} m+n \\ m-n \end{cases} = \begin{cases} \cancel{92} \\ \cancel{1} \end{cases}, \begin{cases} 46 \\ 2 \end{cases}, \begin{cases} \cancel{23} \\ \cancel{4} \end{cases}$$

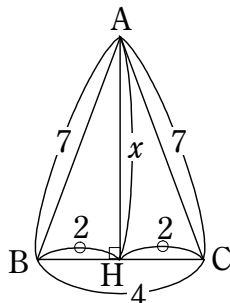
であるから、

$$(m, n) = (24, 22)$$

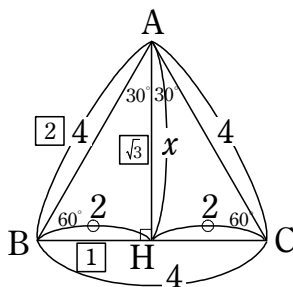
以上より、求める n は $\boxed{n=22}$ である。

(1), (2), (3)いずれの△ABCにおいても、点Aから底辺BCにおろした垂線の足をHとすると、 $AB=AC$ より $BH=CH$ となる。 $AH=x$ とおく。

- $$= \frac{1}{2} \times 4 \times 3\sqrt{5} = \boxed{6\sqrt{5}}$$



- $$= \frac{1}{2} \times 4 \times 2\sqrt{3} = \boxed{4\sqrt{3}}$$



- $$= \frac{1}{2} \times 12 \times 2\sqrt{3} = \boxed{12\sqrt{3}}$$

