

$$1. \quad \frac{\sqrt{-x} - \sqrt{-3y}}{x + 3y + 2\sqrt{3xy}}.$$

$$\cdot \frac{1}{\sqrt{-3y} - \sqrt{-x}}.$$

$$\cdot \quad -x = u, \quad -y = v, \quad u \geq 0, \quad v \geq 0.$$

$$\frac{\sqrt{u} - \sqrt{3v}}{-u - 3v + 2\sqrt{3uv}} = \frac{\sqrt{u} - \sqrt{3v}}{-(\sqrt{u} - \sqrt{3v})^2} = \frac{1}{\sqrt{3v} - \sqrt{u}} = \frac{1}{\sqrt{-3y} - \sqrt{-x}}.$$

2.

$$\cdot \quad , \quad 5 \quad 2. \quad , \quad , \quad ,$$

4:3.

$$\cdot 2\sqrt{23}.$$

$$\cdot \quad O - \quad 3R, Q - \quad 4R; AB -$$

$$; AB \cap OQ = N.$$

$$AN \perp OQ, \quad AN^2 = 9R^2 - 4 = 16R^2 - 25, \quad , \quad R^2 = 3. \quad , \quad AN^2 = 23,$$

$$AB = 2 \cdot AN = 2\sqrt{23}.$$

3.

$$\cdot \quad 22. \quad n \quad 70. \quad n \quad 14 \quad 1, \quad n \quad 35$$

$$\cdot 57.$$

$$\cdot \quad n = 14l + 1, \quad l \in \mathbf{Z} \quad n = 35m + 22, \quad m \in \mathbf{Z}. \quad ,$$

$$14l + 1 = 35m + 22, \quad 2l = 5m + 3.$$

$$2, \quad m - \quad , \quad \dots \quad m = 2q + 1, \quad q \in \mathbf{Z}.$$

$$n = 35(2q + 1) + 22 = 70q + 57, \quad n \quad 70 \quad 57.$$

4.

$$\frac{|x - 4| + |2 - x|}{x + 2017} < 1.$$

$$\cdot x \in (-\infty; -2017) \cup \left(-\frac{2011}{2}; \frac{2023}{2}\right).$$

$$\cdot \quad x + 2017 < 0, \quad , \quad , \quad \dots$$

$$x \in (-\infty; -2017) - \quad . \quad x + 2017 > 0, \quad x + 2017$$

$$|x - 4| + |x - 2| < 2017. \quad .$$

$$1) \quad x \geq 4. \quad x - 4 + x - 2 < 2017 \Leftrightarrow x < \frac{2023}{2}.$$

$$x \in \left[4; \frac{2023}{2}\right).$$

$$2) \quad x \leq 2. \quad -x + 4 - x + 2 < 2017 \Leftrightarrow x > -\frac{2011}{2}.$$

$$x \in \left(-\frac{2011}{2}; 2\right].$$

$$3) \quad 2 < x < 4. \quad -x + 4 + x - 2 < 2017 \Leftrightarrow x \in \mathbf{R}. \quad x \in (2; 4).$$

$$, \quad x \in (-\infty; -2017) \cup \left(-\frac{2011}{2}; \frac{2023}{2}\right).$$

5.

$$-70%, \quad -59%. \quad 80%, \quad ,$$

?

$$\cdot 18.$$

$M_{ij} - M_i - M_j; M_{123} -$

$$\begin{cases} M_1 + M_{12} + M_{13} + M_{123} = 160, \\ M_2 + M_{12} + M_{23} + M_{123} = 140, \\ M_3 + M_{23} + M_{13} + M_{123} = 118. \end{cases}$$

$$M_1 + M_2 + M_3 + 2(M_{12} + M_{13} + M_{23}) + 3M_{123} = 418. \quad (1)$$

$$M_1 + M_2 + M_3 + M_{12} + M_{13} + M_{23} + M_{123} \leq 200 \quad (2)$$

$$M_{12} + M_{13} + M_{23} + 2M_{123} \geq 218 \Leftrightarrow (M_{12} + M_{13} + M_{23}) \geq 218 - 2M_{123}. \quad (3)$$

$$M_{23} \leq 200 - 160 = 40, \quad M_{13} \leq 200 - 140 = 60, \quad M_{12} \leq 200 - 118 = 82, \quad M_{12} + M_{13} + M_{23} \leq 182.$$

$$(3) \quad 182 \geq 218 - 2M_{123}, \quad M_{123} \geq 18.$$

$$M_{123} = 18, \quad M_{12} = 82, \quad M_{13} = 60, \quad M_{23} = 40, \quad M_1 = M_2 = M_3 = 0.$$

6. 66 198

.99.

$$u - v, \quad L - \frac{L}{u+v} \cdot u$$

$$\frac{L}{u-v}, \quad \frac{L}{u-v} \cdot u$$

$$Lu = 66u + 66v, \quad Lu = 198u - 198v, \quad 66u + 66v = 198u - 198v, \quad u = 2v. \quad Lu = 66u + 33u, \quad L = 99.$$

7. 12. 13.

$$\frac{1014}{5}$$

ABCD - , AB || CD, BD = 13, BH 12. BM || AC. ABMC - CM = AB.

ABD BCM (BDM . AC ⊥ BD AC || BM ,

$$BM \perp BD. \quad BDM \quad DH = \sqrt{BD^2 - BH^2} = 5,$$

$$MH = \frac{BH^2}{DH} = \frac{144}{5}, \quad DM = DH + HM = \frac{169}{5}, \quad S_{\Delta BDM} = \frac{1}{2} \cdot 12 \cdot \frac{169}{5} = \frac{1014}{5}.$$

8. $\frac{x^4}{2x+1} + x^2 = 6(2x+1).$

$$x = -3 \pm \sqrt{6}, \quad x = 2 \pm \sqrt{6}.$$

$$(2x+1), \quad \left(\frac{x^2}{2x+1}\right)^2 + \frac{x^2}{2x+1} - 6 = 0,$$

$$\frac{x^2}{2x+1} = 2 \quad \frac{x^2}{2x+1} = -3. \quad x^2 - 4x - 2 = 0, \quad x = 2 \pm \sqrt{6},$$

$$x^2 + 6x + 3 = 0, \quad x = -3 \pm \sqrt{6}.$$

1.
$$\frac{5x + y - 2\sqrt{5xy}}{\sqrt{-5x} + \sqrt{-y}}.$$

$$\cdot -\sqrt{-5x} - \sqrt{-y}.$$

$$\cdot -x = u, \quad -y = v, \quad u \geq 0, \quad v \geq 0.$$

$$\frac{-5u - v - 2\sqrt{5uv}}{\sqrt{5u} + \sqrt{v}} = \frac{-(\sqrt{5u} + \sqrt{v})^2}{\sqrt{5u} + \sqrt{v}} = -(\sqrt{5u} + \sqrt{v}) = -\sqrt{-5x} - \sqrt{-y}.$$

2.
$$\cdot 2\sqrt{11}.$$

$$\cdot O - \quad 2R, Q - \quad 3R; AB -$$

$$\cdot ; AB \cap OQ = N.$$

$$\cdot AN \perp OQ, \quad AN^2 = 4R^2 - 1 = 9R^2 - 16, \quad R^2 = 3, \quad AN^2 = 11,$$

$$\cdot AB = 2 \cdot AN = 2\sqrt{11}.$$

3.
$$\cdot 18. \quad n = 66. \quad n = 22 \quad 7, \quad n = 33$$

$$\cdot 51. \quad n = 22l + 7, \quad l \in \mathbf{Z} \quad n = 33m + 18, \quad m \in \mathbf{Z},$$

$$\cdot 22l + 7 = 33m + 18, \quad 2l = 3m + 1.$$

$$\cdot 2, \quad m - \quad \dots m = 2q + 1, \quad q \in \mathbf{Z}.$$

$$\cdot n = 33(2q + 1) + 18 = 66q + 51, \quad n = 70 \quad 57.$$

4.
$$\frac{|x + 3| + |1 - x|}{x + 2016} < 1.$$

$$\cdot x \in (-\infty; -2016) \cup (-1009; 1007).$$

$$\cdot x + 2016 < 0, \quad x + 2016 > 0,$$

$$\cdot x \in (-\infty; -2016) - \quad x + 2016 > 0, \quad x + 2016$$

$$\cdot |x + 3| + |x - 1| < 2016.$$

1) $x \geq 1. \quad x + 3 + x - 1 < 2016 \Leftrightarrow x < 1007. \quad x \in [1; 1007).$

2) $x \leq -3. \quad -x - 3 - x + 1 < 2016 \Leftrightarrow x > -1009. \quad x \in (-1009; -3].$

3) $-3 < x < 1. \quad -x - 3 + x - 1 < 2016 \Leftrightarrow x \in \mathbf{R}. \quad x \in (-3; 1).$

$$\cdot x \in (-\infty; -2016) \cup (-1009; 1007).$$

5.
$$\cdot 77\%, \quad - 71\%, \quad - 61\%.$$

$$\cdot ?$$

27.
$$\cdot M_i - \quad i - ;$$

$$\cdot M_{ij} - \quad i \quad j; M_{123} -$$

$$\cdot \begin{cases} M_1 + M_{12} + M_{13} + M_{123} = 231, \\ M_2 + M_{12} + M_{23} + M_{123} = 213, \\ M_3 + M_{23} + M_{13} + M_{123} = 183. \end{cases}$$

$$\cdot M_1 + M_2 + M_3 + 2(M_{12} + M_{13} + M_{23}) + 3M_{123} = 627. \quad (1)$$

$$M_1 + M_2 + M_3 + M_{12} + M_{13} + M_{23} + M_{123} \leq 300 \quad (2)$$

$$M_{12} + M_{13} + M_{23} + 2M_{123} \geq 327 \Leftrightarrow (M_{12} + M_{13} + M_{23}) \geq 327 - 2M_{123}. \quad (3)$$

$$M_{23} \leq 300 - 231 = 69, \quad M_{13} \leq 300 - 213 = 87, \quad M_{12} \leq 300 - 183 = 117, \quad M_{12} + M_{13} + M_{23} \leq 273.$$

$$(3) \quad , \quad 273 \geq 327 - 2M_{123}, \quad M_{123} \geq 27.$$

$$M_{123} = 27 \quad . \quad M_{12} = 117,$$

$$M_{13} = 87, \quad M_{23} = 69, \quad M_1 = M_2 = M_3 = 0.$$

6.

55

1155

. 105.

$$u - \quad , \quad v - \quad ($$

$$\frac{L}{u+v} \quad , \quad \frac{L}{u+v} \cdot u$$

$$\frac{L}{u-v} \quad , \quad \frac{L}{u-v} \cdot u$$

$$Lu = 55u + 55v, \quad Lu = 1155u - 1155v, \quad 55u + 55v = 1155u - 1155v, \quad 10u = 11v. \quad Lu = 55u + 50u, \quad L = 105.$$

7.

15.

17.

$$\cdot \frac{4335}{16}.$$

ABCD - , AB || CD, BD = 17, BH 15.
 CD M , BM || AC. ABMC - CM = AB.
 ABD BCM ().
 ABCD BDM . AC ⊥ BD AC || BM ,

$$BM \perp BD. \quad , \quad BDM \quad . \quad DH = \sqrt{BD^2 - BH^2} = 8,$$

$$MH = \frac{BH^2}{DH} = \frac{225}{8}, \quad DM = DH + HM = \frac{289}{8}, \quad S_{\Delta BDM} = \frac{1}{2} \cdot 15 \cdot \frac{289}{8} = \frac{4335}{16}.$$

8.

$$\frac{x^4}{2x-1} - x^2 = 2(2x-1).$$

$$\cdot x = 1 \pm \sqrt{2}, \quad x = -2 \pm \sqrt{2}.$$

$$(2x-1), \quad \left(\frac{x^2}{2x-1}\right)^2 - \frac{x^2}{2x-1} - 2 = 0, \quad \frac{x^2}{2x+1} = 1$$

$$\frac{x^2}{2x+1} = -2.$$

$$x^2 - 2x - 1 = 0, \quad x = 1 \pm \sqrt{2},$$

$$x^2 + 4x + 2 = 0, \quad x = -2 \pm \sqrt{2}.$$