

## Линейные и сводящиеся к ним уравнения

## ▪ Примеры

Решите уравнения:

№1.

$$\frac{5}{7}x = 4\frac{2}{7}$$

№2.

$$\frac{8}{9}x = 18\frac{2}{3}$$

№3.

$$-\frac{5}{8}x = -3\frac{3}{4}$$

№4.

$$\frac{3}{4}x = -19\frac{1}{2}$$

№5.

$$(x-4)^2 = (x+1)^2$$

№6.

$$(6x+11)^2 = (6x+13)^2$$

№7.

$$x^2 - 13 = (x-13)^2$$

№8.

$$(x+8)^5 = 243$$

▪ **Решение (примеры)**

№1.

$$\frac{5}{7}x = 4\frac{2}{7}$$

$$\frac{5}{7}x = \frac{30}{7} \quad \left| \cdot \frac{7}{5} \right.$$

$$\underline{x = 6}$$

№2.

$$\frac{8}{9}x = 18\frac{2}{3}$$

$$\frac{8}{9}x = \frac{56}{3} \quad \left| \cdot \frac{9}{8} \right.$$

$$x = 7 \cdot 3$$

$$\underline{x = 21}$$

№3.

$$-\frac{5}{8}x = -3\frac{3}{4}$$

$$-\frac{5}{8}x = -\frac{15}{4} \quad \left| \cdot \left(-\frac{8}{5}\right) \right.$$

$$x = 3 \cdot 2$$

$$\underline{x = 6}$$

№4.

$$\frac{3}{4}x = -19\frac{1}{2}$$

$$\frac{3}{4}x = -\frac{39}{2} \quad \left| \cdot \frac{4}{3} \right.$$

$$x = -13 \cdot 2$$

$$\underline{x = -26}$$

№5.

$$(x-4)^2 = (x+1)^2$$

$$(x-4)^2 - (x+1)^2 = 0$$

$$(x-4-(x+1))(x-4+x+1) = 0$$

$$(x-4-x-1)(2x-3) = 0$$

$$-5 \cdot (2x-3) = 0$$

$$2x-3 = 0$$

$$2x = 3$$

$$\underline{x = 1,5}$$

№6.

$$(6x+11)^2 = (6x+13)^2$$

$$(6x+11)^2 - (6x+13)^2 = 0$$

$$(6x+11-(6x+13))(6x+11+6x+13) = 0$$

$$(6x+11-6x-13)(12x+24) = 0$$

$$-2 \cdot (12x+24) = 0$$

$$12x+24 = 0$$

$$12x = -24$$

$$\underline{x = -2}$$

№7.

$$x^2 - 13 = (x-13)^2$$

$$x^2 - 13 = x^2 - 26x + 13^2$$

$$26x = 13 + 13^2$$

$$2 \cdot 13x = 13(1+13)$$

$$2x = 14$$

$$\underline{x = 7}$$

№8.

$$(x+8)^5 = 243$$

$$(x+8)^5 = 3^5$$

$$x+8 = 3$$

$$x = -8+3$$

$$\underline{x = -5}$$

### Вариант 1

Решите уравнения:

|                                       |                                        |                                         |                                        |
|---------------------------------------|----------------------------------------|-----------------------------------------|----------------------------------------|
| №1.<br>$\frac{5}{9}x = 14\frac{4}{9}$ | №2.<br>$-\frac{4}{7}x = -6\frac{6}{7}$ | №3.<br>$-\frac{7}{8}x = -12\frac{1}{4}$ | №4.<br>$-\frac{8}{9}x = 21\frac{1}{3}$ |
| №5.<br>$(x-10)^2 = (x+4)^2$           | №6.<br>$(2x-11)^2 = (2x-9)^2$          | №7.<br>$(6x-7)^2 = (6x+1)^2$            | №8.<br>$(x-9)^2 = x^2 - 9$             |
| №9.<br>$x^2 + 11 = (x-1)^2$           | №10.<br>$(x+9)^3 = 125$                | №11.<br>$(x-8)^9 = 1$                   | №12.<br>$(x-5)^5 = 32$                 |

### Вариант 2

Решите уравнения:

|                                       |                                        |                                       |                                        |
|---------------------------------------|----------------------------------------|---------------------------------------|----------------------------------------|
| №1.<br>$\frac{7}{8}x = 21\frac{7}{8}$ | №2.<br>$-\frac{3}{5}x = -8\frac{2}{5}$ | №3.<br>$\frac{5}{6}x = 17\frac{1}{2}$ | №4.<br>$-\frac{5}{6}x = 18\frac{1}{3}$ |
| №5.<br>$(x-1)^2 = (x+6)^2$            | №6.<br>$(5x-3)^2 = (5x+13)^2$          | №7.<br>$(5x-6)^2 = (5x-4)^2$          | №8.<br>$x^2 + 1 = (x+1)^2$             |
| №9.<br>$x^2 - 8 = (x+4)^2$            | №10.<br>$(x-3)^3 = 343$                | №11.<br>$(x-2)^9 = 1$                 | №12.<br>$(x+5)^9 = 512$                |

|       | №1 | №2 | №3 | №4  | №5   | №6 | №7  | №8 | №9 | №10 | №11 | №12 |
|-------|----|----|----|-----|------|----|-----|----|----|-----|-----|-----|
| Вар.1 | 26 | 12 | 14 | -24 | 3    | 5  | 0,5 | 5  | -5 | -4  | 9   | 7   |
| Вар.2 | 25 | 14 | 21 | -22 | -2,5 | -1 | 1   | 0  | -3 | 10  | 3   | -3  |

Вариант 1

|                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                               |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <div>№1.</div> <div><math display="block">\frac{5}{9}x = 14\frac{4}{9}</math><math display="block">\frac{5}{9}x = \frac{130}{9} \quad \left  \cdot \frac{9}{5} \right.</math><math display="block">\underline{x = 26}</math></div>                                                                                                                               | <div>№2.</div> <div><math display="block">-\frac{4}{7}x = -6\frac{6}{7}</math><math display="block">-\frac{4}{7}x = -\frac{48}{7} \quad \left  \cdot \left(-\frac{7}{4}\right) \right.</math><math display="block">\underline{x = 12}</math></div> | <div>№3.</div> <div><math display="block">-\frac{7}{8}x = -12\frac{1}{4}</math><math display="block">-\frac{7}{8}x = -\frac{49}{4} \quad \left  \cdot \left(-\frac{8}{7}\right) \right.</math><math display="block">x = 7 \cdot 2</math><math display="block">\underline{x = 14}</math></div>                                                                      | <div>№4.</div> <div><math display="block">-\frac{8}{9}x = 21\frac{1}{3}</math><math display="block">-\frac{8}{9}x = \frac{64}{3} \quad \left  \cdot \left(-\frac{9}{8}\right) \right.</math><math display="block">x = -8 \cdot 3</math><math display="block">\underline{x = -24}</math></div> |
| <div>№5.</div> <div><math display="block">(x-10)^2 = (x+4)^2</math><math display="block">(x-10)^2 - (x+4)^2 = 0</math><math display="block">(x-10-x-4)(x-10+x+4) = 0</math><math display="block">-14 \cdot (2x-6) = 0</math><math display="block">2x-6 = 0</math><math display="block">2x = 6</math><math display="block">\underline{x = 3}</math></div>         |                                                                                                                                                                                                                                                    | <div>№6.</div> <div><math display="block">(2x-11)^2 = (2x-9)^2</math><math display="block">(2x-11)^2 - (2x-9)^2 = 0</math><math display="block">(2x-11-2x+9)(2x-11+2x-9) = 0</math><math display="block">-2 \cdot (4x-20) = 0</math><math display="block">4x-20 = 0</math><math display="block">4x = 20</math><math display="block">\underline{x = 5}</math></div> |                                                                                                                                                                                                                                                                                               |
| <div>№7.</div> <div><math display="block">(6x-7)^2 = (6x+1)^2</math><math display="block">(6x-7)^2 - (6x+1)^2 = 0</math><math display="block">(6x-7-6x-1)(6x-7+6x+1) = 0</math><math display="block">-8 \cdot (12x-6) = 0</math><math display="block">12x-6 = 0</math><math display="block">12x = 6</math><math display="block">\underline{x = 0,5}</math></div> |                                                                                                                                                                                                                                                    | <div>№8.</div> <div><math display="block">(x-9)^2 = x^2 - 9</math><math display="block">x^2 - 18x + 81 = x^2 - 9</math><math display="block">-18x = -90</math><math display="block">\underline{x = 5}</math></div>                                                                                                                                                 |                                                                                                                                                                                                                                                                                               |
| <div>№9.</div> <div><math display="block">x^2 + 11 = (x-1)^2</math><math display="block">x^2 + 11 = x^2 - 2x + 1</math><math display="block">2x = -10</math><math display="block">\underline{x = -5}</math></div>                                                                                                                                                | <div>№10.</div> <div><math display="block">(x+9)^3 = 125</math><math display="block">(x+9)^3 = 5^3</math><math display="block">x+9 = 5</math><math display="block">\underline{x = -4}</math></div>                                                 | <div>№11.</div> <div><math display="block">(x-8)^9 = 1</math><math display="block">(x-8)^9 = 1^9</math><math display="block">x-8 = 1</math><math display="block">\underline{x = 9}</math></div>                                                                                                                                                                    | <div>№12.</div> <div><math display="block">(x-5)^5 = 32</math><math display="block">(x-5)^5 = 2^5</math><math display="block">x-5 = 2</math><math display="block">\underline{x = 7}</math></div>                                                                                              |

## Вариант 2

|                                                                                                                                                                                         |                                                                                                                                                             |                                                                                                                                                                                               |                                                                                                                                                                                                                   |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>№1.</b></p> $\frac{7}{8}x = 21\frac{7}{8}$ $\frac{7}{8}x = \frac{21 \cdot 8 + 7}{8} \quad \left  \cdot \frac{8}{7} \right.$ $x = \frac{7(3 \cdot 8 + 1)}{7}$ $\underline{x = 25}$ | <p><b>№2.</b></p> $-\frac{3}{5}x = -8\frac{2}{5}$ $-\frac{3}{5}x = -\frac{42}{5} \quad \left  \cdot \left(-\frac{5}{3}\right) \right.$ $\underline{x = 14}$ | <p><b>№3.</b></p> $\frac{5}{6}x = 17\frac{1}{2}$ $\frac{5}{6}x = \frac{35}{2} \quad \left  \cdot \frac{6}{5} \right.$ $x = \frac{35 \cdot 6}{2 \cdot 5}$ $x = 7 \cdot 3$ $\underline{x = 21}$ | <p><b>№4.</b></p> $-\frac{5}{6}x = 18\frac{1}{3}$ $-\frac{5}{6}x = \frac{55}{3} \quad \left  \cdot \left(-\frac{6}{5}\right) \right.$ $x = -\frac{55 \cdot 6}{3 \cdot 5}$ $x = -11 \cdot 2$ $\underline{x = -22}$ |
| <p><b>№5.</b></p> $(x-1)^2 = (x+6)^2$ $(x-1)^2 - (x+6)^2 = 0$ $(x-1-x-6)(x-1+x+6) = 0$ $-7 \cdot (2x+5) = 0$ $2x+5 = 0$ $2x = -5$ $\underline{x = -2,5}$                                |                                                                                                                                                             | <p><b>№6.</b></p> $(5x-3)^2 = (5x+13)^2$ $(5x-3)^2 - (5x+13)^2 = 0$ $(5x-3-5x-13)(5x-3+5x+13) = 0$ $-16 \cdot (10x+10) = 0$ $10x+10 = 0$ $10x = -10$ $\underline{x = -1}$                     |                                                                                                                                                                                                                   |
| <p><b>№7.</b></p> $(5x-6)^2 = (5x-4)^2$ $\begin{cases} 5x-6 = 5x-4 \\ 5x-6 = -5x+4 \end{cases}$ $\begin{cases} 0 \cdot x = 2 \\ 10x = 10 \end{cases}$ $\underline{x = 1}$               |                                                                                                                                                             | <p><b>№8.</b></p> $x^2 + 1 = (x+1)^2$ $x^2 + 1 = x^2 + 2x + 1$ $0 = 2x$ $\underline{x = 0}$                                                                                                   |                                                                                                                                                                                                                   |
| <p><b>№9.</b></p> $x^2 - 8 = (x+4)^2$ $x^2 - 8 = x^2 + 8x + 16$ $-8 - 16 = 8x$ $8x = -24$ $\underline{x = -3}$                                                                          | <p><b>№10.</b></p> $(x-3)^3 = 343$ $(x-3)^3 = 7^3$ $x-3 = 7$ $\underline{x = 10}$                                                                           | <p><b>№11.</b></p> $(x-2)^9 = 1$ $(x-2)^9 = 1^9$ $x-2 = 1$ $\underline{x = 3}$                                                                                                                | <p><b>№12.</b></p> $(x+5)^9 = 512$ $(x+5)^9 = 2^9$ $x+5 = 2$ $x = -5 + 2$ $\underline{x = -3}$                                                                                                                    |