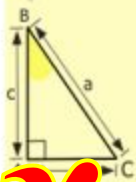
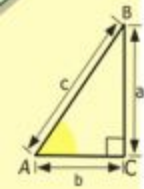
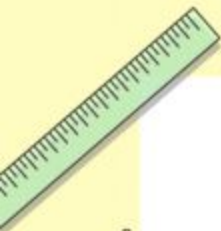


Математик

а

Решение логарифмических уравнений



$$\begin{array}{r} \frac{1}{2} 500 \\ \times 42 \\ \hline 2100 \\ + 84 \\ \hline 105000 \end{array}$$

- 2 x 2 = 4
- 3 x 3 = 9
- 4 x 4 = 16
- 5 x 5 = 25
- 6 x 6 = 36
- 7 x 7 = 49
- 8 x 8 = 64
- 9 x 9 = 81



$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$\frac{a}{c} + \frac{b}{c} = \frac{a+b}{c}$$

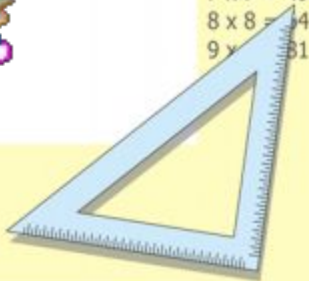
$$\sin 90^\circ = 1$$



$$\begin{cases} y = \sin 90 \\ x = 25y + 45 \end{cases}$$

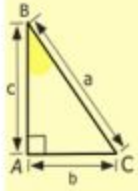
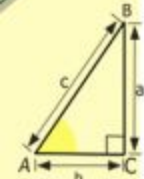
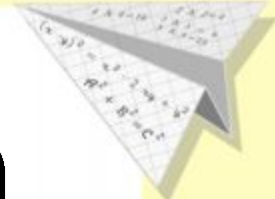
$$\begin{cases} y = 1 \\ x = 25 + 45 \\ \hline x = 70 \end{cases}$$

$$(x+y)(x-y) = x^2 - y^2$$



Определение логарифма

$$\log_a b = x \left\{ \begin{array}{l} b > 0 \\ a > 0 \\ a \neq 1 \\ b = a^x \end{array} \right.$$



$$\begin{array}{r} \frac{1}{2} 500 \\ \times 42 \\ \hline 2100 \\ + 8400 \\ \hline 105000 \end{array}$$

- 2 x 2 = 4
- 3 x 3 = 9
- 4 x 4 = 16
- 5 x 5 = 25
- 6 x 6 = 36
- 7 x 7 = 49
- 8 x 8 = 64
- 9 x 9 = 81



$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

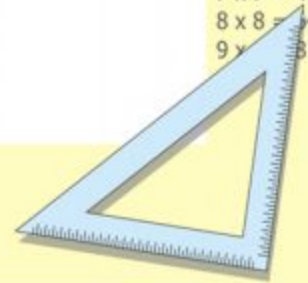
$$\frac{a}{c} + \frac{b}{c} = \frac{a+b}{c}$$

$$\sin 90^\circ = 1$$



$$\begin{array}{l} y = \sin 90 \\ x = 25y + 45 \\ \hline y = 1 \\ x = 25 + 45 \\ \hline x = 70 \end{array}$$

$$(x+y)(x-y) = x^2 - y^2$$

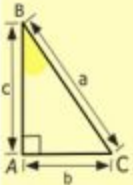
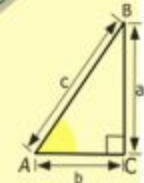
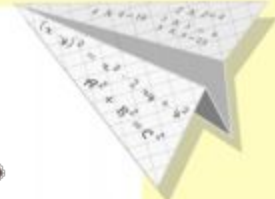


Основное логарифмическое тождество

$$a^{\log_a b} = b$$

$$a^{n \log_a b} = b^n$$

$$(a^{\log_a b})^n = b^n$$



$\begin{array}{r} 1 \\ \times 42 \\ \hline 210 \\ + 84 \\ \hline 10500 \end{array}$

$y = \cos$
 $2 \times 2 = 4$
 $3 \times 3 = 9$
 $4 \times 4 = 16$
 $5 \times 5 = 25$
 $6 \times 6 = 36$
 $7 \times 7 = 49$
 $8 \times 8 = 64$
 $9 \times 9 = 81$



$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$\frac{a}{c} + \frac{b}{c} = \frac{a+b}{c}$$

$$\sin 90^\circ = 1$$

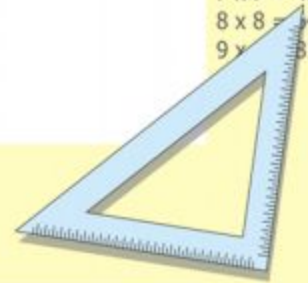


$$\begin{cases} y = \sin 90 \\ x = 25y + 45 \end{cases}$$

$$\begin{cases} y = 1 \\ x = 25 + 45 \end{cases}$$

$$x = 70$$

$$(x+y)(x-y) = x^2 - y^2$$

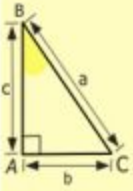
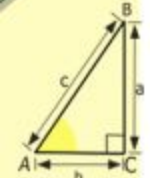
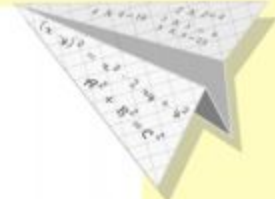


Основные формулы

$$\log_a a = 1$$

$$\log_a 1 = 0$$

$$\log_a a^c = c$$



$$\begin{array}{r} \frac{1}{2} 500 \\ \times 42 \\ \hline 210 \\ + 84 \\ \hline 105000 \end{array}$$

- 2 x 2 = 4
- 3 x 3 = 9
- 4 x 4 = 16
- 5 x 5 = 25
- 6 x 6 = 36
- 7 x 7 = 49
- 8 x 8 = 64
- 9 x 9 = 81



$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$\frac{a}{c} + \frac{b}{c} = \frac{a+b}{c}$$

$$\sin 90^\circ = 1$$

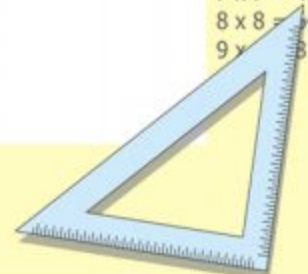


$$\begin{cases} y = \sin 90 \\ x = 25y + 45 \end{cases}$$

$$\begin{cases} y = 1 \\ x = 25 + 45 \end{cases}$$

$$x = 70$$

$$(x+y)(x-y) = x^2 - y^2$$



Свойства логарифмов

$a > 0, b > 0, c > 0, c \neq 1, n \neq 1$

Основные

Дополнительные

$$\log_c c = 1$$
$$\log_c 1 = 0$$

$$\log_c a + \log_c b = \log_c (ab)$$

$$\log_c a - \log_c b = \log_c \left(\frac{a}{b} \right)$$

$$n \log_c a = \log_c a^n$$

$$\log_{c^n} a = \frac{1}{n} \log_c a,$$

$$\log_{c^n} a^m = \frac{m}{n} \log_c a,$$

$$\log_{c^n} a^n = \log_c a$$

$$\log_c a = \frac{\log_b a}{\log_b c}, b \neq 1$$

$$\log_c b \cdot \log_b a = \log_c a$$

$$\log_c a = \frac{1}{\log_a c}, a \neq 1$$

$m > 0, m \neq 1$

$$\log_c b \cdot \log_b a = \log_c m \cdot \log_m a$$

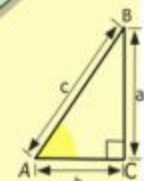
$$a^{\log_c b} = b^{\log_c a}$$

- Что значит «решить уравнение»?
- Что такое корень уравнения?
- Какие уравнения называют логарифмическим?

• Решить уравнение – это значит найти все его корни (решения) или установить, что их нет.

• Корнем (решением) уравнения называется число, которое при подстановке в уравнение превращает его в верное равенство.

• Логарифмические уравнения – уравнения, содержащие неизвестное под знаком логарифма.



$$\begin{array}{r} 2500 \\ \times 42 \\ \hline 2100 \\ + 840 \\ \hline 105000 \end{array}$$



$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$\frac{a}{c} + \frac{b}{c} = \frac{a+b}{c}$$

$$\sin 90^\circ = 1$$

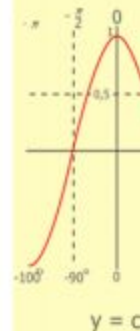
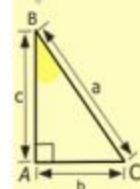
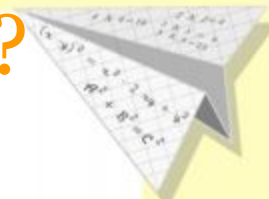


$$\begin{cases} y = \sin 90 \\ x = 25y + 45 \end{cases}$$

$$\begin{cases} y = 1 \\ x = 25 + 45 \end{cases}$$

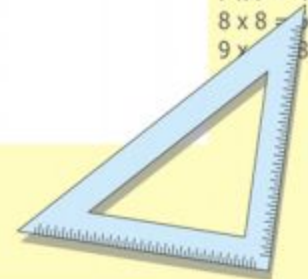
$$x = 70$$

$$(x+y)(x-y) = x^2 - y^2$$



$$y = \cos$$

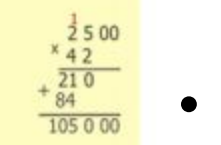
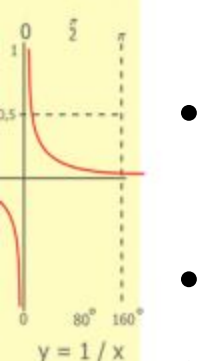
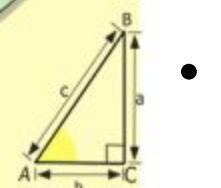
$$\begin{array}{l} 2 \times 2 = 4 \\ 3 \times 3 = 9 \\ 4 \times 4 = 16 \\ 5 \times 5 = 25 \\ 6 \times 6 = 36 \\ 7 \times 7 = 49 \\ 8 \times 8 = 64 \\ 9 \times 9 = 81 \end{array}$$



При решении логарифмических уравнений часто используются следующие методы:

- Решение уравнений на основании определения логарифма, например, уравнение $a^x = b$ ($a > 0, a \neq 1, b > 0$) имеет решение $x = \log_a b$.
- Метод потенцирования, т.е. переход от уравнения $\log_a f(x) = \log_a \varphi(x)$ к уравнению следствию $f(x) = \varphi(x)$;
- Метод введения новых переменных;
- Метод логарифмирования, т.е. переход от уравнения $f(x) = \varphi(x)$ к уравнению $\log_a f(x) = \log_a \varphi(x)$;
- Применение основного логарифмического тождества
- Метод приведения логарифмов к одному и тому же основанию.

a^b



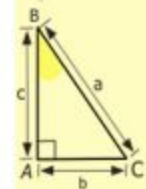
$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$
$$\frac{a}{c} + \frac{b}{c} = \frac{a+b}{c}$$

$$\sin 90^\circ = 1$$

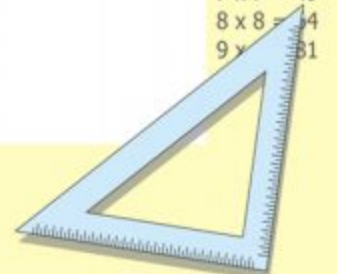


$$\begin{cases} y = \sin 90 \\ x = 25y + 45 \end{cases}$$
$$\begin{cases} y = 1 \\ x = 25 + 45 \end{cases}$$
$$\frac{x}{70}$$

$$(x+y)(x-y) = x^2 - y^2$$



2 x 2 =	4
3 x 3 =	9
4 x 4 =	16
5 x 5 =	25
6 x 6 =	36
7 x 7 =	49
8 x 8 =	64
9 x 9 =	81



1. Метод решения с помощью определения

$$\log_4 x = 2$$

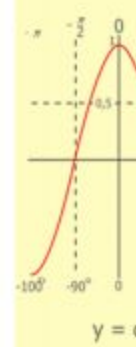
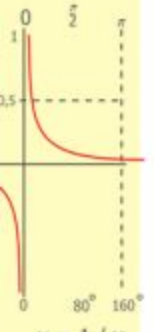
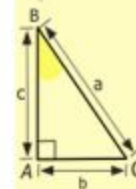
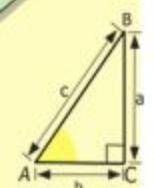
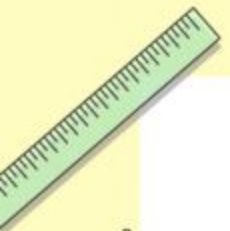
$$\log_x 4 = 2$$

$$\log_{0,5} x = 2$$

$$\log_5 x = -2$$

$$\log_x 5 = 1$$

$$\log_x (-4) = (-4)$$



$\frac{1}{2} \begin{array}{r} 500 \\ \times 42 \\ \hline 210 \\ + 84 \\ \hline 10500 \end{array}$

- 2 x 2 = 4
- 3 x 3 = 9
- 4 x 4 = 16
- 5 x 5 = 25
- 6 x 6 = 36
- 7 x 7 = 49
- 8 x 8 = 64
- 9 x 9 = 81



$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$\frac{a}{c} + \frac{b}{c} = \frac{a+b}{c}$$

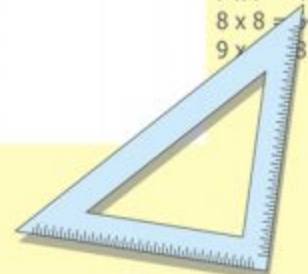
$$\sin 90^\circ = 1$$



$$\begin{cases} y = \sin 90 \\ x = 25y + 45 \end{cases}$$

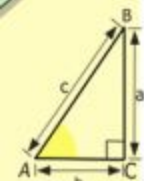
$$\begin{cases} y = 1 \\ x = 25 + 45 \\ \hline x = 70 \end{cases}$$

$$(x+y)(x-y) = x^2 - y^2$$



2. Решите уравнения методом потенцирования:

- а) $\log_2 (3x - 6) = \log_2 (2x - 3)$;
- б) $\log_6 (14 - 4x) = \log_6 (2x + 2)$;
- в) $\log_{0,5} (7x - 9) = \log_{0,5} (x - 3)$;
- г) $\log_{0,2} (12x + 8) = \log_{0,2} (11x + 7)$.



$$\begin{array}{r} 1\ 2\ 5\ 00 \\ \times 42 \\ \hline 210 \\ + 84 \\ \hline 105\ 000 \end{array}$$



$$\frac{a}{A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$\frac{a}{c} + \frac{b}{c} = \frac{a+b}{c}$$

$$\sin 90^\circ = 1$$

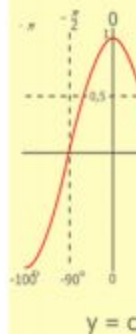
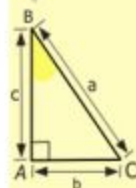


$$\begin{cases} y = \sin 90 \\ x = 25y + 45 \end{cases}$$

$$\begin{cases} y = 1 \\ x = 25 + 45 \end{cases}$$

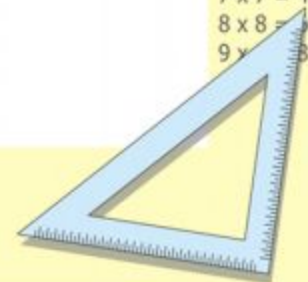
$$x = 70$$

$$(x+y)(x-y) = x^2 - y^2$$



$$y = \cos$$

$$\begin{array}{l} 2 \times 2 = 4 \\ 3 \times 3 = 9 \\ 4 \times 4 = 16 \\ 5 \times 5 = 25 \\ 6 \times 6 = 36 \\ 7 \times 7 = 49 \\ 8 \times 8 = 64 \\ 9 \times 9 = 81 \end{array}$$



$$\lg^2 x^3 - 10 \lg x + 1 = 0$$

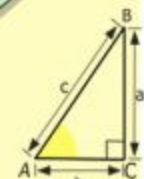
3. Решите уравнения методом введения вспомогательной переменной:

$$\lg^2 x^3 - 10 \lg x + 1 = 0$$

$$\log_2^2 x - 4 \log_2 x + 3 = 0;$$

$$3 \log_{0,5}^2 x + 5 \log_{0,5} x - 2 = 0;$$

$$2 \log_{0,3}^2 x - 7 \log_{0,3} x - 4 = 0.$$



$$\begin{array}{r} \frac{1}{2} 500 \\ \times 42 \\ \hline 210 \\ + 84 \\ \hline 105000 \end{array}$$



$$\frac{a}{A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$\frac{a}{c} + \frac{b}{c} = \frac{a+b}{c}$$

$$\sin 90^\circ = 1$$

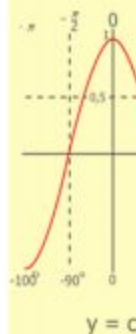
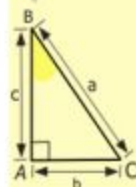
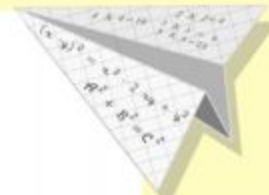


$$\begin{cases} y = \sin 90 \\ x = 25y + 45 \end{cases}$$

$$\begin{cases} y = 1 \\ x = 25 + 45 \end{cases}$$

$$x = 70$$

$$(x+y)(x-y) = x^2 - y^2$$



$$y = \cos$$

$$\begin{array}{l} 2 \times 2 = 4 \\ 3 \times 3 = 9 \\ 4 \times 4 = 16 \\ 5 \times 5 = 25 \\ 6 \times 6 = 36 \\ 7 \times 7 = 49 \\ 8 \times 8 = 64 \\ 9 \times 9 = 81 \end{array}$$

