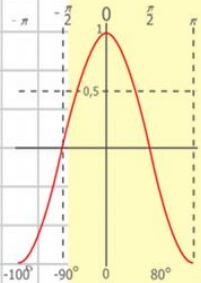
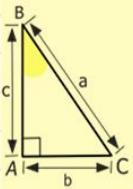
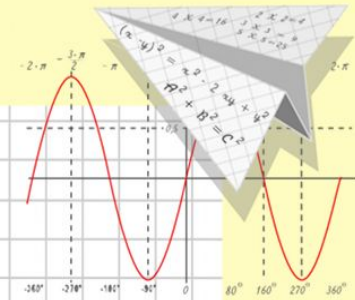
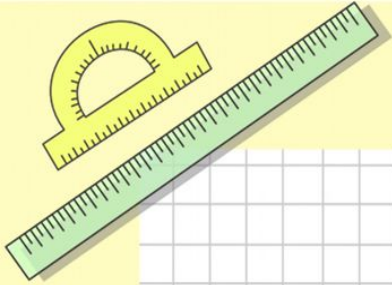


Математик

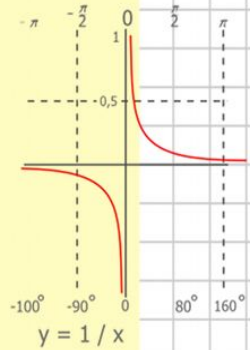
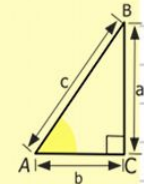
а

Решение показательных уравнений



$y = \cos x$

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



$$\begin{array}{r} 2500 \\ \times 42 \\ \hline 210 \\ + 84 \\ \hline 10500 \end{array}$$

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

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

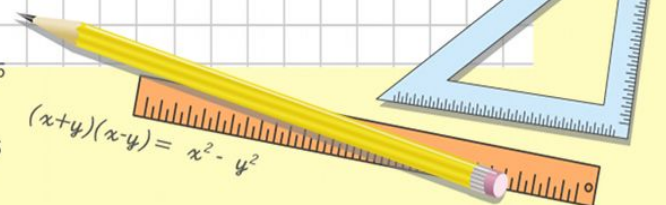
$$\sin 90^\circ = 1$$



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

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

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



Вычислите

1) 2^6

1) 64

2) 7^0

2) 1

3) 4^{-3}

3) 1/64

4) 3^{-4}

4) 1/81

5) $\left(\frac{1}{5}\right)^{-3}$

5) 125

6) $8^{\frac{2}{3}}$

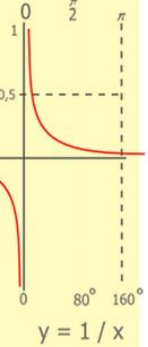
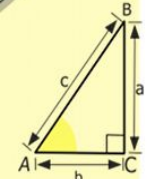
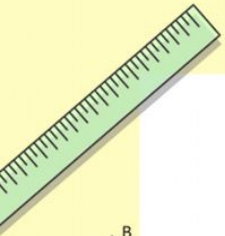
6) 4

7) $81^{\frac{3}{4}}$

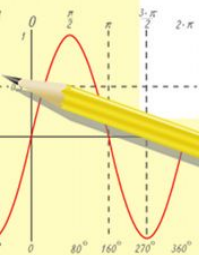
7) 27

8) 2^{-5}

8) 1/32



$$\begin{array}{r} 1 \\ 2500 \\ \times 42 \\ \hline 210 \\ + 84 \\ \hline 105000 \end{array}$$



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

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

$\sin 90^\circ = 1$

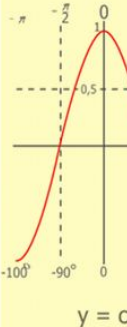
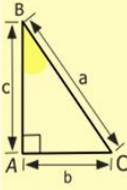
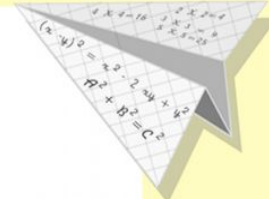


$$\begin{cases} y = \sin 90 \\ x = 25y + 45 \end{cases}$$

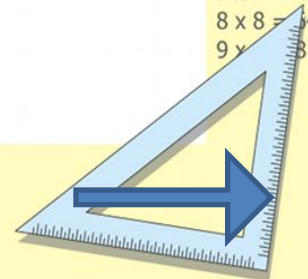
$$\begin{cases} y = 1 \\ x = 25 + 45 \end{cases}$$

$$x = 70$$

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



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



Определение

Уравнение, в котором переменная содержится в показателе степени, называется **показательным**.

Примеры

:

$$5^x = 1$$

$$49^{x+0,5} \cdot 7^{x-2} = 1$$

$$2^x$$

$$x = 3^{0,5x}$$

$$3^x + 3^{3-x} =$$

$$12$$

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

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

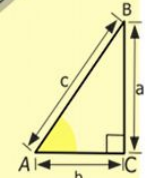
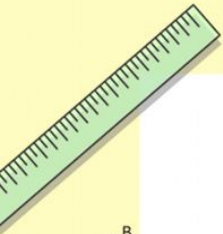
$$\sin 90^\circ = 1$$

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

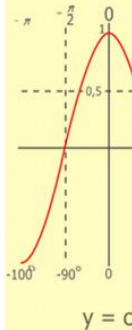
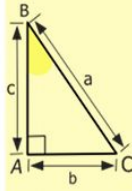
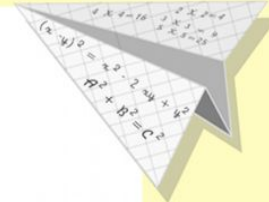
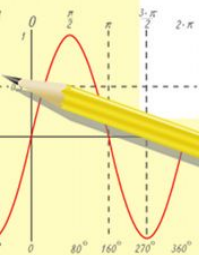
$$\begin{cases} y = 1 \\ x = 25 + 45 \end{cases}$$

$$x = 70$$

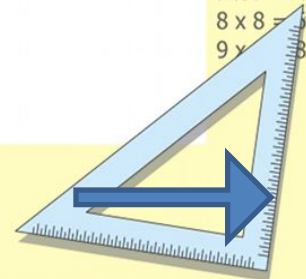
$$(x+y)(x-y) = x^2 - y^2$$



$$\begin{array}{r} 1 \\ 2500 \\ \times 42 \\ \hline 210 \\ + 84 \\ \hline 10500 \end{array}$$



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

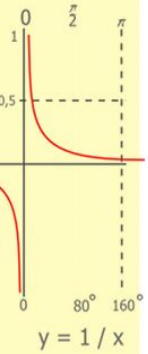
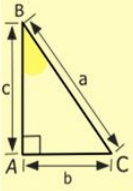
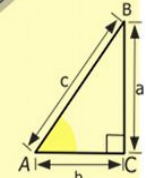
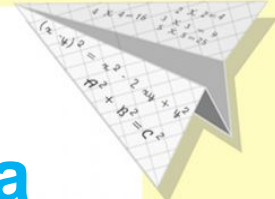
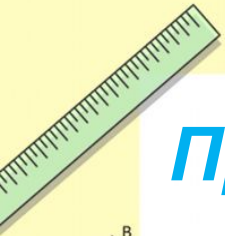


Простейшим показательным уравнением является уравнение вида

$$a^x = a^b, \text{ где } a > 0, a \neq 1.$$

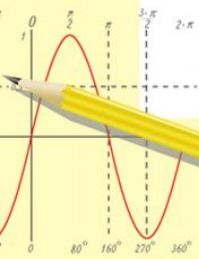
Простейшее показательное уравнение решается с использованием свойств степени.

$$a^x = a^b \iff x = b$$



$$\begin{array}{r} 2500 \\ \times 42 \\ \hline 210 \\ + 84 \\ \hline 10500 \end{array}$$

- 2 x 2 = 4
- 3 x 3 = 9
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- 8 x 8 = 64
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$$\frac{a}{A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

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

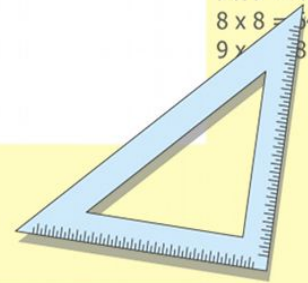
$$\sin 90^\circ = 1$$



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

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

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



$$1) a^0 = 1$$

$$2) a^1 = a$$

$$3) a^m \cdot a^n = a^{m+n}$$

$$4) \frac{a^m}{a^n} = a^{m-n}; \text{ zde } a \neq 0$$

$$5) (a^m)^n = a^{m \cdot n}$$

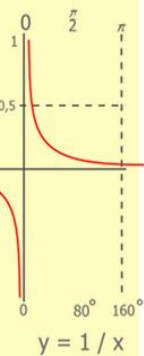
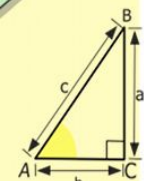
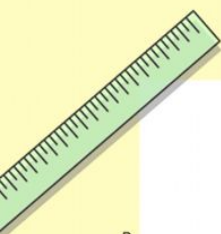
$$6) (ab)^n = a^n \cdot b^n$$

$$7) \left(\frac{a}{b}\right)^n = \frac{a^n}{b^n}; \text{ zde } b \neq 0$$

$$8) a^{-n} = \left(\frac{1}{a}\right)^n = \frac{1}{a^n}; \text{ zde } a \neq 0$$

$$9) \left(\frac{1}{a}\right)^{-n} = \frac{1}{a^{-n}} = a^n; \text{ zde } a \neq 0$$

$$10) \left(\frac{a}{b}\right)^{-n} = \left(\frac{b}{a}\right)^n = \frac{b^n}{a^n}; \text{ zde } a \neq 0 \text{ u } b \neq 0.$$



$$\begin{array}{r} 1 \\ 2500 \\ \times 42 \\ \hline 210 \\ + 84 \\ \hline 10500 \end{array}$$



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

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

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

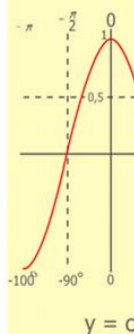
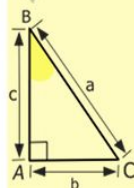
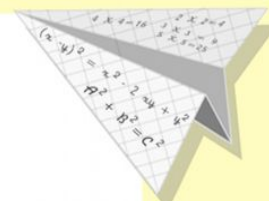


$$\begin{cases} y = \sin 90 \\ x = 25y + 45 \end{cases}$$

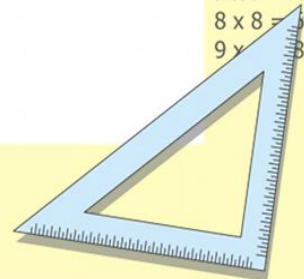
$$\begin{cases} y = 1 \\ x = 25 + 45 \end{cases}$$

$$x = 70$$

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



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



Решите уравнения

$$1) 3^x = 27$$

1) $x=3$

$$2) 2^x = 128$$

2) $x=7$

$$3) 2^x = \frac{1}{8}$$

3) $x= -3$

4) нет решений

$$4) 4^x = -64$$

$$5) \left(\frac{1}{5}\right)^x = \frac{1}{625}$$

5) $x=4$

$$6) 7^x = \frac{1}{343}$$

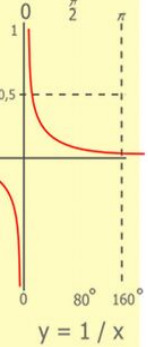
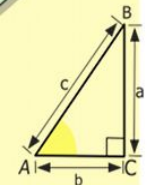
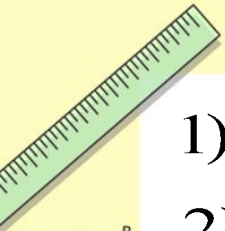
6) $x= -3$

$$7) \left(\frac{1}{9}\right)^x = 0$$

7) нет решений

$$8) \left(\frac{1}{6}\right)^x = 36$$

8) $x= -2$



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



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

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

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

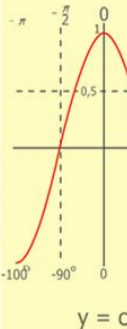
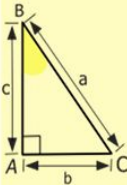
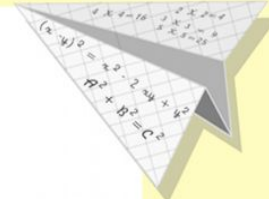


$$\begin{cases} y = \sin 90 \\ x = 25y + 45 \end{cases}$$

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

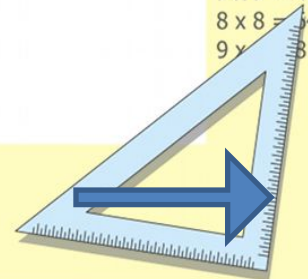
$$x = 70$$

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



$$y = \cos$$

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



Математический диктант «Крестики-НОЛИКИ»

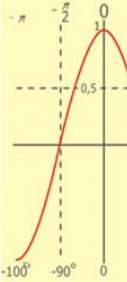
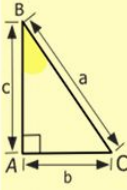
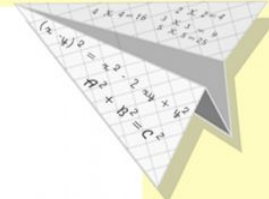
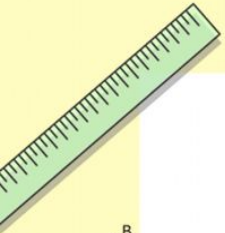
НОЛИКИ»

1	2	3
4	5	6
7	8	9

ДА – X, НЕТ – O

Вопросы:

- 1) Область определения показательной функции – множество всех действительных чисел?
- 2) При умножении степеней с одинаковым основанием – показатели умножают?
- 3) Показательная функция с основанием $a > 1$ является возрастающей?
- 4) При возведении степени в степень показатели складывают?
- 5) Любое действительное число в нулевой степени равно 1?
- 6) Область значений показательной функции – множество всех действительных чисел?
- 7) Показательная функция с основанием $0 < a < 1$ является убывающей?
- 8) $X=0$ – корень уравнения $7^x = 0$
- 9) Не имеет корней уравнение $15^x = -15$



$y = \cos$

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



$y = 1/2^x$

$$\begin{array}{r} 2500 \\ \times 42 \\ \hline 210 \\ + 84 \\ \hline 10500 \end{array}$$



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

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

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

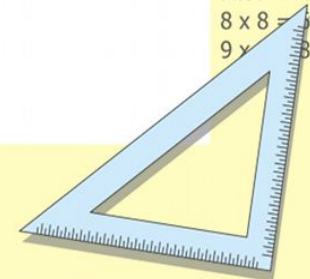


$$\begin{cases} y = \sin 90 \\ x = 25y + 45 \end{cases}$$

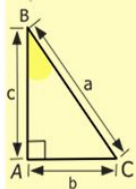
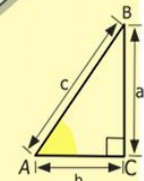
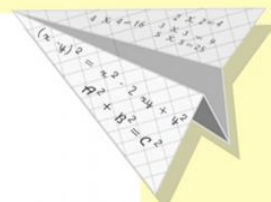
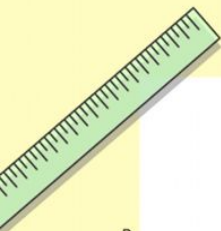
$$\begin{cases} y = 1 \\ x = 25 + 45 \end{cases}$$

$$x = 70$$

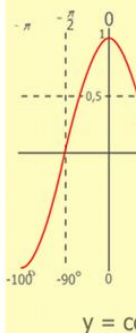
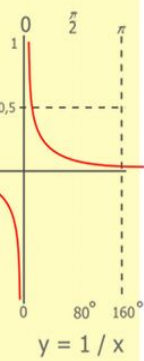
$$(x+y)(x-y) = x^2 - y^2$$



Проверка и подведение итогов

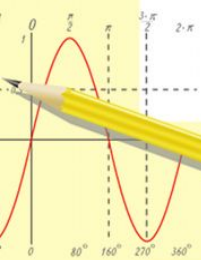


X	O	X
O	O	O
X	O	X



$$\begin{array}{r} 1 \\ 2500 \\ \times 42 \\ \hline 210 \\ + 84 \\ \hline 10500 \end{array}$$

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



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

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

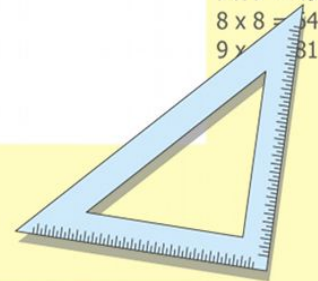
$$\sin 90^\circ = 1$$



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

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

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

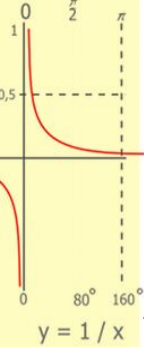
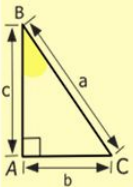
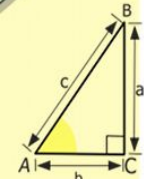
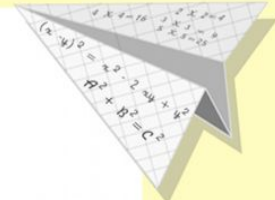
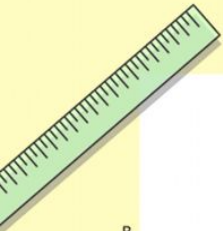


Метод замены переменной

Показательное уравнение сводится к решению квадратного.

Способы замены используют, если:

- 1) основания степеней одинаковы;
- 2) показатель одной из степеней в 2 раза больше, чем другой. Например: $9^x - 8 \cdot 3^x = 9$;
- 3) коэффициенты перед переменной противоположны. Например: $2^{2-x} - 2^{x-1} = 1$.



$$\begin{array}{r} 1 \\ \times 2500 \\ \hline 210 \\ + 84 \\ \hline 105000 \end{array}$$

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



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

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

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

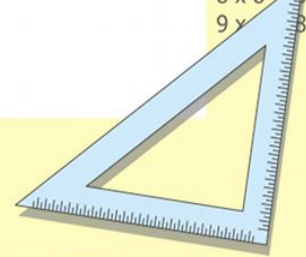


$$\begin{cases} y = \sin 90 \\ x = 25y + 45 \end{cases}$$

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

$$x = 70$$

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



Решим уравнения

$$9^x - 8 \cdot 3^x = 9$$

$$3^{2x} - 8 \cdot 3^x - 9 = 0$$

$$3^x = t, (t \neq 0)$$

$$t^2 - 8 \cdot t - 9 = 0$$

$$D = 64 + 36 = 100$$

$$t_1 = \frac{8 + 10}{2} = 9$$

$$t_2 = \frac{8 - 10}{2} = -1,$$

$$3^x = 9$$

$$3^x = 3^2$$

$$x = 2$$

Ответ : $x = 2$

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

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

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

$$2^{2-x} - 2^{x-1} = 1$$

$$2^2 \cdot 2^{-x} - 2^x \cdot 2^{-1} = 1$$

$$\frac{4}{2^x} - \frac{2^x}{2} - 1 = 0$$

$$2^x = t, (t \neq 0)$$

$$\frac{4}{t} - \frac{t}{2} - 1 = 0 / \cdot (-2t)$$

$$t^2 + 2t - 8 = 0$$

$$D = 4 + 32 = 36$$

$$t_1 = \frac{-2 + 6}{2} = 2$$

$$t_2 = \frac{-2 - 6}{2} = -4$$

$$2^x = 2$$

$$x = 1$$

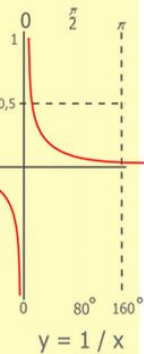
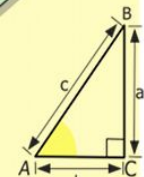
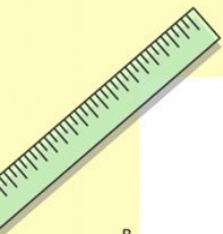
Ответ : $x = 1$

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

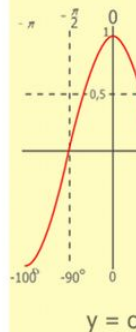
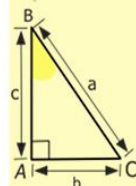
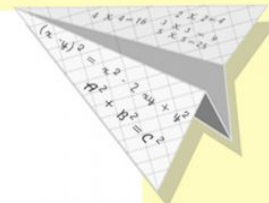
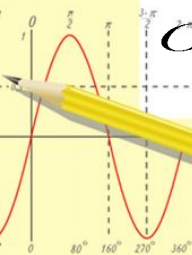
$$\begin{cases} y = 1 \\ x = 25 + 45 \end{cases}$$

$$x = 70$$

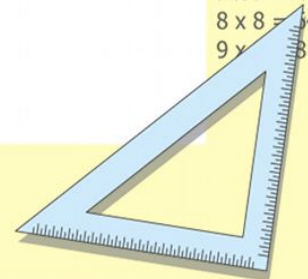
$$(x+y)(x-y) = x^2 - y^2$$



$$\begin{array}{r} 12500 \\ \times 42 \\ \hline 210 \\ + 84 \\ \hline 105000 \end{array}$$



- 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



Решить самостоятельно:

1 вариант

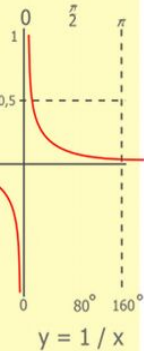
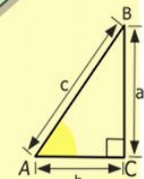
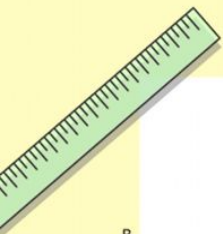
$$4^{2x} - 3 \cdot 4^x - 4 = 0$$

$$14 \cdot 7^x - 7^{-x} + 5 = 0$$

2 вариант

$$3^{x+1} - 2 \cdot 3^{-x} - 1 = 0$$

$$3^{2x} - 24 \cdot 3^x - 81 = 0$$



$$\begin{array}{r} 2500 \\ \times 42 \\ \hline 210 \\ + 84 \\ \hline 10500 \end{array}$$



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

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

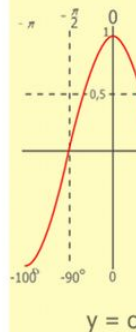
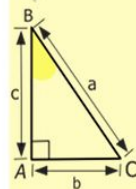
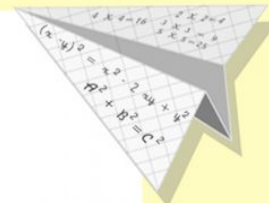
$$\sin 90^\circ = 1$$



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

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

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



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

