

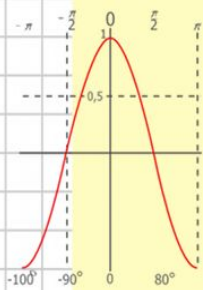
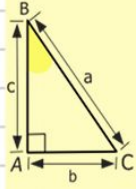
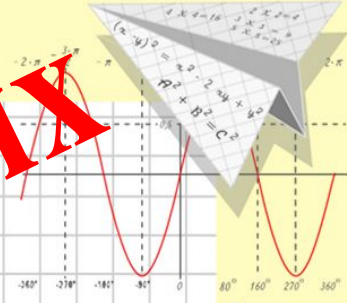
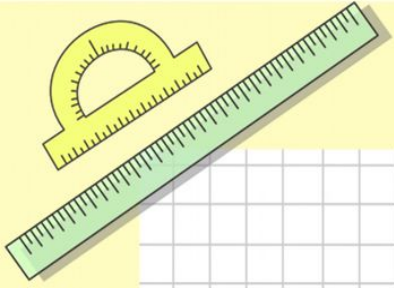
# Математик

а

**Решение показательных уравнений**

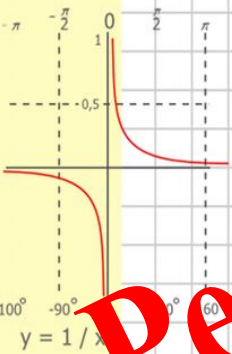
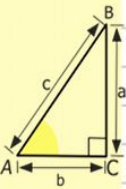
**11 класс**

**Фардиева Л. Р.**



$y = \cos x$

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



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

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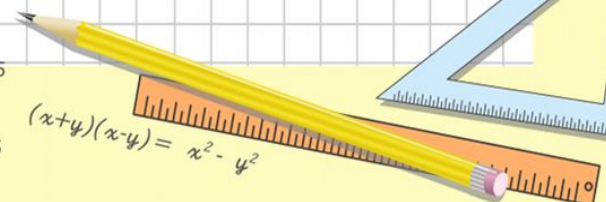
$$\sin 90^\circ = 1$$

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

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

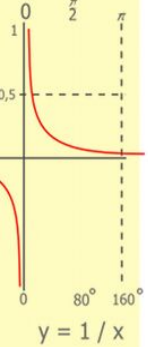
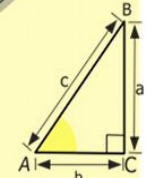
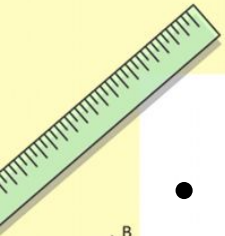
$$x = 70$$

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

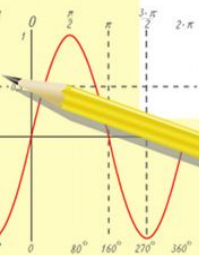


# Цели урока

- 1. Ввести понятие показательных уравнений и показать способы их решения, умение применять их при решении нестандартных задач; проверка знаний обучающихся по решению показательных уравнений;
- 2. Выработать умение мыслить, делать выводы, применять теоретические знания для решения задач; развивать самостоятельность, мышление, познавательный интерес;
- 3. Воспитание устойчивого интереса к математике, культуры поведения и общения, трудолюбия, аккуратности, положительного отношения к окружающим.



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



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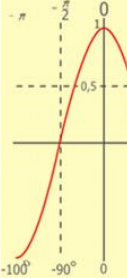
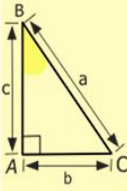
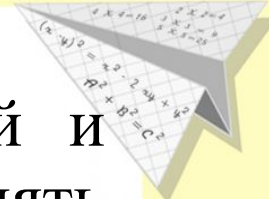


$$\begin{cases} y = \sin 90 \\ x = 25y + 45 \end{cases}$$

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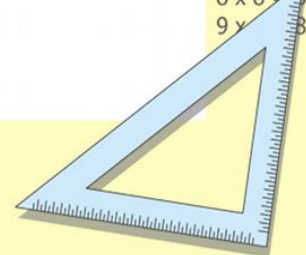
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$$y = \cos$$

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# Устная работа

Укажите, какая из данных функций является возрастающей, какая убывающей:

а)

$$y = 2^x + 3$$

б)

$$y = \left(\frac{1}{2}\right)^x - 2$$

в)

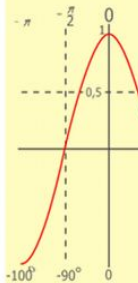
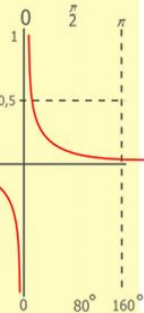
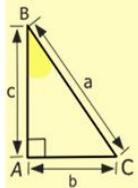
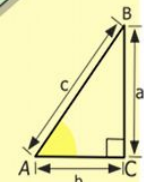
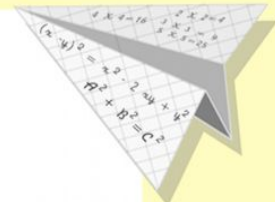
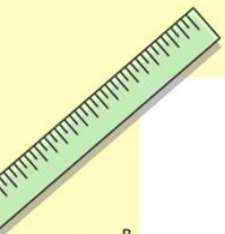
$$y = 3^x + 5$$

г)

$$y = \left(\frac{1}{7}\right)^x + 7$$

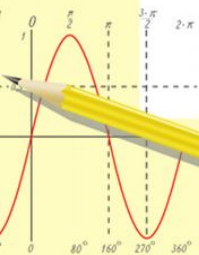
д)

$$y = 0,2^x - 4$$



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

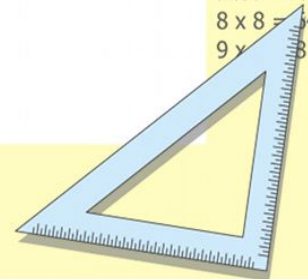


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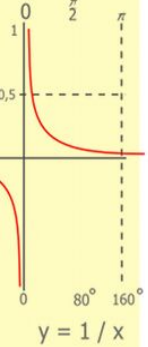
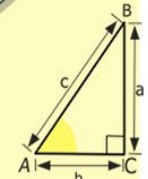
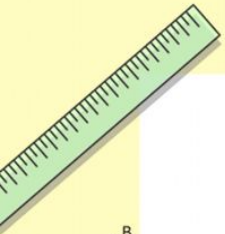
$$(x+y)(x-y) = x^2 - y^2$$



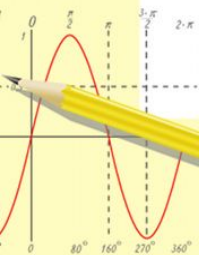
# Верно ли, что показательная функция

$$f(x) = a^x :$$

- а) имеет экстремумы;
- б) принимает наибольшее значение в некоторой точке  $x_0$ ;
- в) принимает в некоторой точке значение, равное нулю;
- г) является четной (нечетной)?



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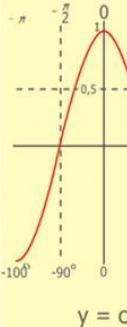
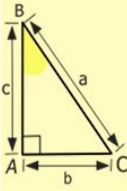
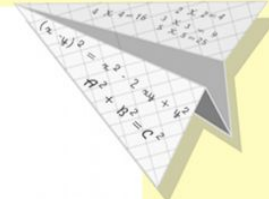
$$\sin 90^\circ = 1$$



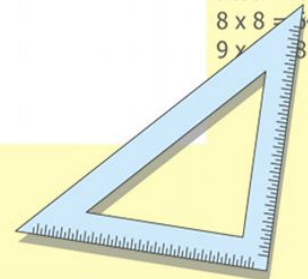
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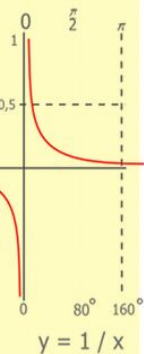
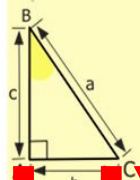
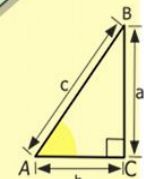
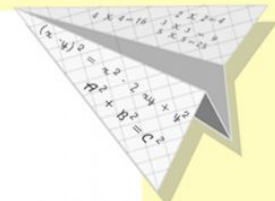
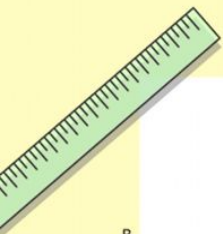


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# Тема урока

# Решение показательных уравнений



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

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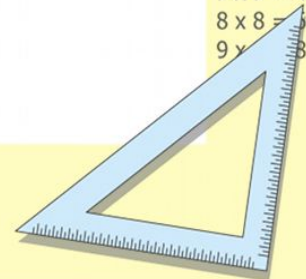
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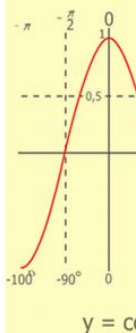
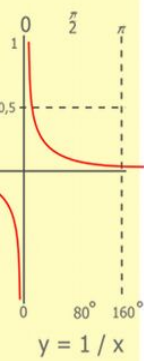
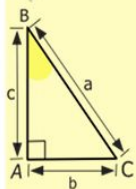
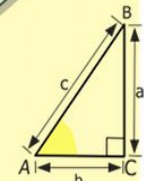
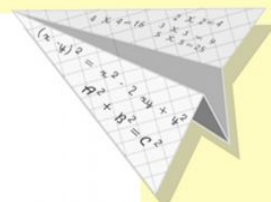
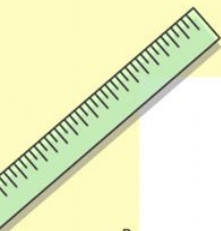


# Определение

Это уравнение, в котором неизвестные (иксы) и выражения с ними находятся в показателях каких-то степеней.

$$5^x = 25$$

$$3^{x+1} = 9$$



$\frac{1}{2} 500$   
 $\times 42$   
 $\frac{210}{+ 84}$   
 $\frac{105000}{}$

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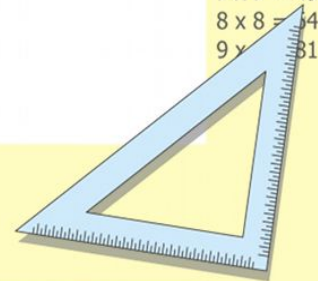
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$$\begin{cases} y = \sin 90 \\ x = 25y + 45 \end{cases}$$

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



# Методы решения показательных уравнений:

а) Приведение к стандартному виду:

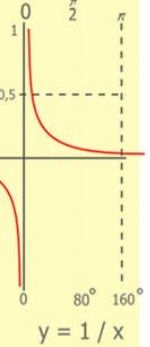
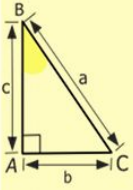
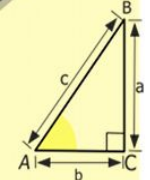
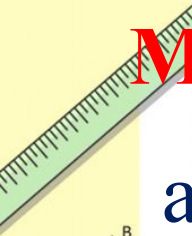
$$2^{x+3} = 16,$$

$$2^{x+3} = 2^4,$$

$$x + 3 = 4,$$

$$x = 1.$$

Ответ: 1.



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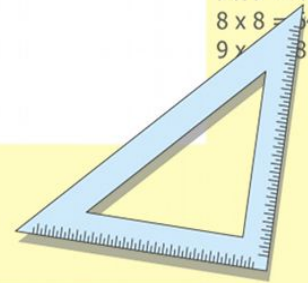
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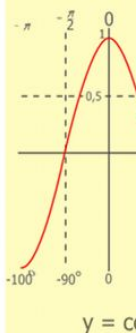
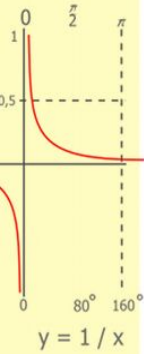
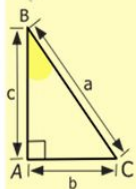
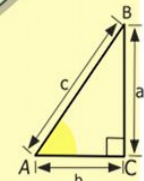
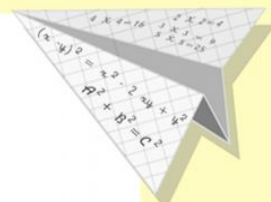
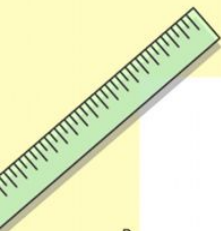


б)

$$3^x = -9$$

Так как показательная функция принимает только положительные значения, то данное уравнение не имеет решений.

Ответ: нет решений.



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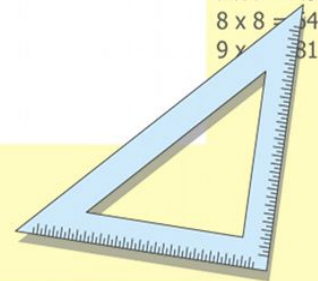
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$$(x+y)(x-y) = x^2 - y^2$$





в) Уравнения, решаемые с помощью вынесения общего множителя за скобки.

$$3^{x+1} - 5 \cdot 3^x + 18 = 0,$$

$$3^x \cdot 3^1 - 5 \cdot 3^x + 18 = 0,$$

$$3^x (3 - 5) + 18 = 0,$$

$$3^x (-2) + 18 = 0,$$

$$3^x = 9,$$

$$x = 2.$$

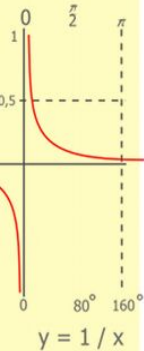
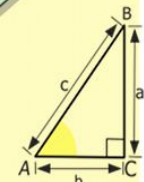
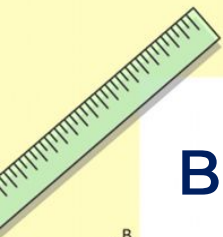
Ответ: 2

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

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

$$x = 70$$

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



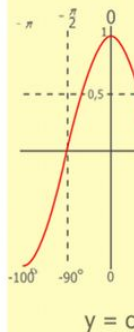
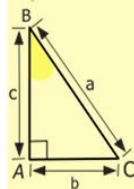
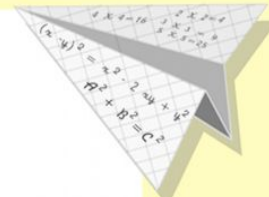
$$\begin{array}{r} 1 \\ 2500 \\ \times 42 \\ \hline 210 \\ + 84 \\ \hline 10500 \end{array}$$



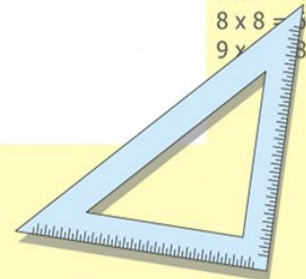
$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

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

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



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



г) Уравнения, решаемые с помощью введения новой переменной.

$$4^x - 5 \cdot 2^x + 4 = 0,$$

$$2^{2x} - 5 \cdot 2^x + 4 = 0, \quad \text{Пусть } 2^x = y$$

$$y^2 - 5y + 4 = 0,$$

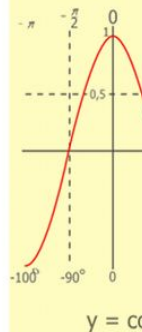
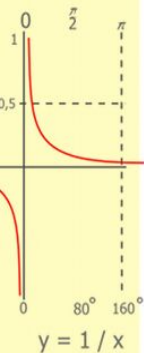
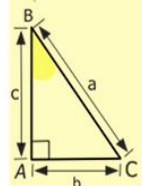
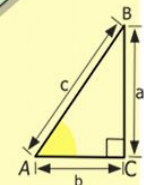
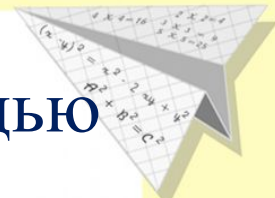
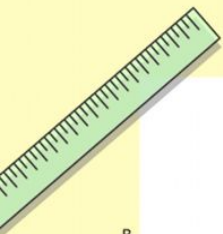
$$y_1 = 4, y_2 = 1$$

$$2^x = 4 \quad \text{или} \quad 2^x = 1$$

$$x = 2$$

$$x = 0$$

Ответ: 2; 0.



$$\begin{array}{r} 1 \ 2 \ 5 \ 00 \\ \times 42 \\ \hline 210 \\ + 84 \\ \hline 105000 \end{array}$$

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



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

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

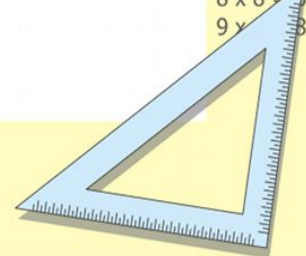
$$\sin 90^\circ = 1$$



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

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

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



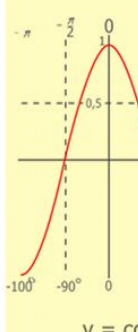
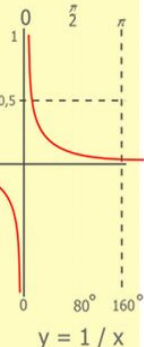
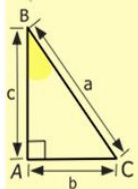
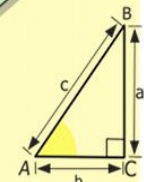
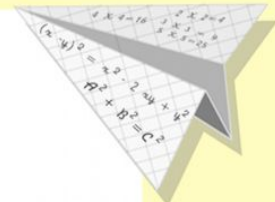
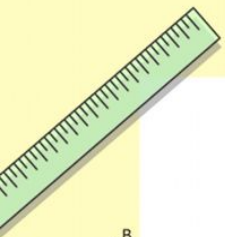
# Устная работа

Какие из следующих уравнений являются показательными:

а)  $x^2 + 4x = 0$       б)  $5^x - 25x = 0$

в)  $\sqrt{x^4} = 64$

г)  $6^y - 36^y + 216 = 0$



|   |          |
|---|----------|
| 1 | 2 5 00   |
| x | 4 2      |
|   | 21 0     |
| + | 8 4      |
|   | 105 0 00 |

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



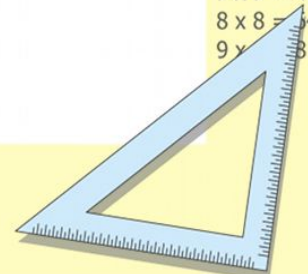
$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$
$$\frac{a}{c} + \frac{b}{c} = \frac{a+b}{c}$$

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



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

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



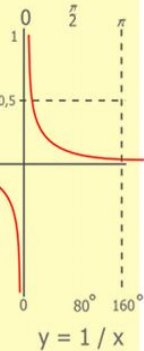
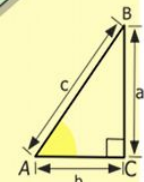
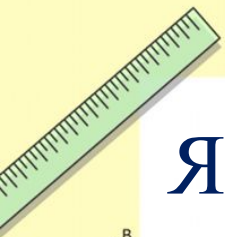
Является ли число  $x$  корнем уравнения:

а)  $2^x = 64, x = 5$

б)  $3^{x+1} = 9, x = 1$

в)  $2^x = 5^x, x = 0$

г)  $7^x = -49, x = -2$



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



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

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

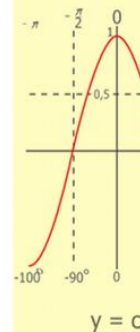
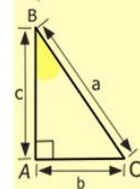
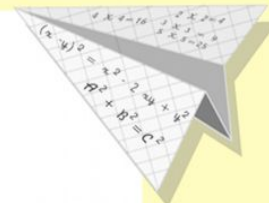
$$\sin 90^\circ = 1$$



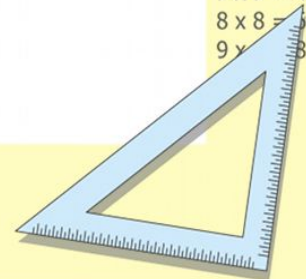
$$\begin{cases} y = \sin 90 \\ x = 25y + 45 \end{cases}$$

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

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



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

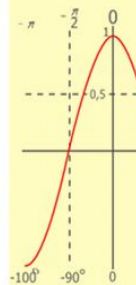
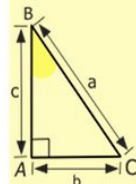
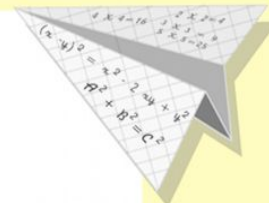
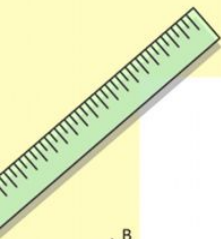


# Решение упражнений

№460 (а, в)

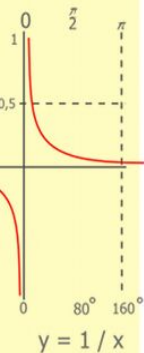
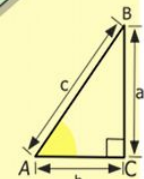
№463 (а, г)

№464 (в)



$y = \cos$

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



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



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

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

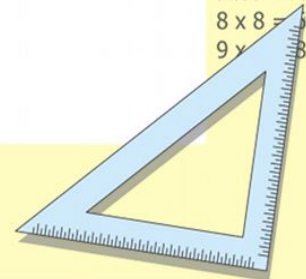
$\sin 90^\circ = 1$



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

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

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

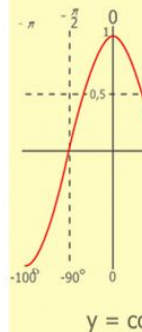
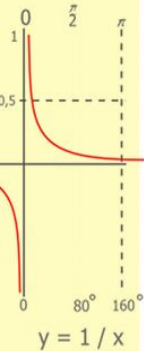
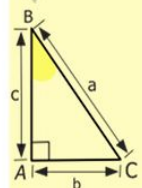
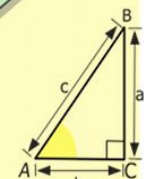
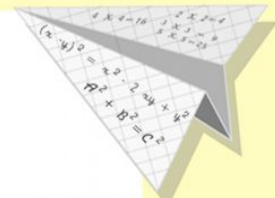
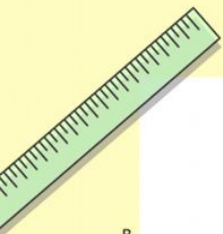


# ДОМАШНЕЕ ЗАДАНИЕ

П.36, №463(в), №464(г)

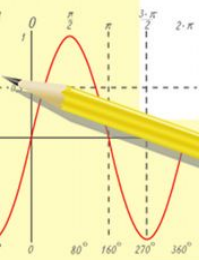
Определить, какими степенями  
и каких чисел являются числа:

2; 8; 16; 27; 32; 64; 81; 100; 125;  
128; 216; 243; 256; 343; 512; 625;  
729, 1024.



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

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



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

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

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

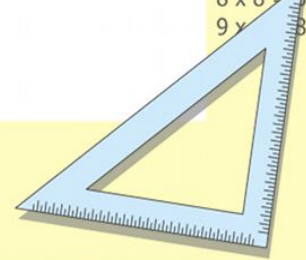


$$\begin{cases} y = \sin 90 \\ x = 25y + 45 \end{cases}$$

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

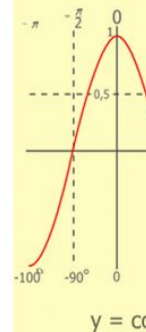
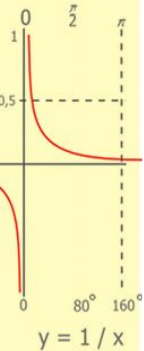
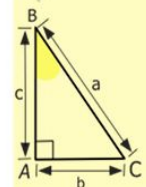
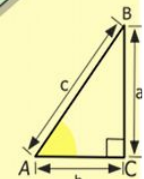
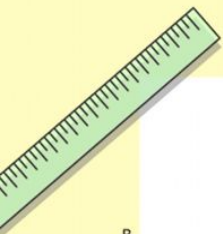
$$(x+y)(x-y) = x^2 - y^2$$

$$x = 70$$



# Ответы теста:

| № | 1 вариант | 2 вариант |
|---|-----------|-----------|
| 1 | б)        | г)        |
| 2 | в)        | а)        |
| 3 | г)        | б)        |
| 4 | а)        | а)        |
| 5 | в)        | в)        |



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

- 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



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

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

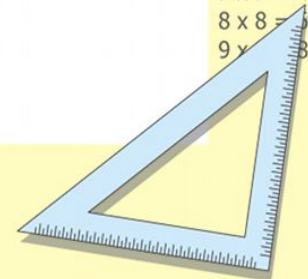
$$\sin 90^\circ = 1$$



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

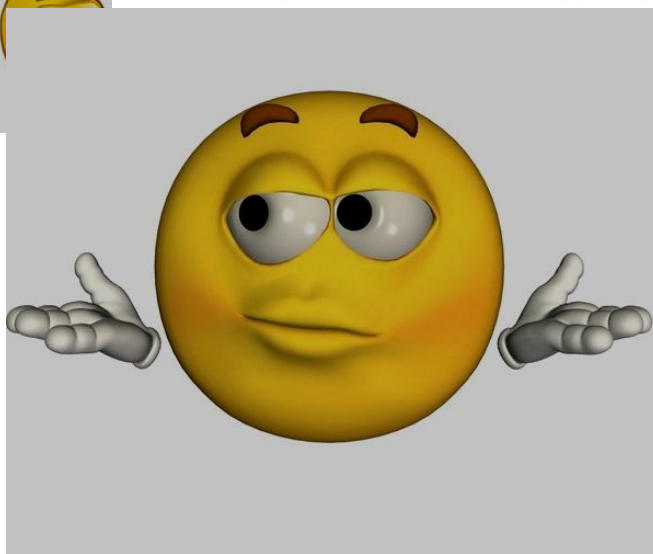
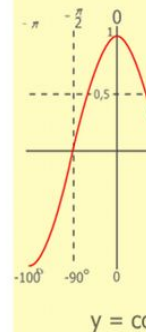
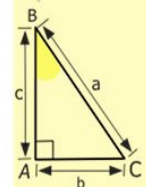
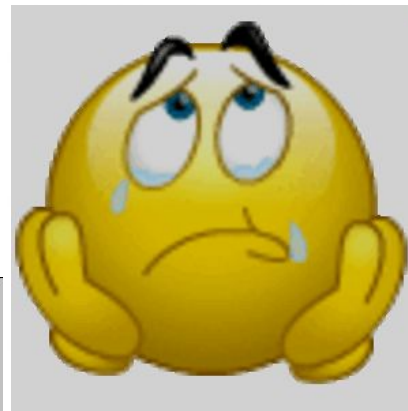
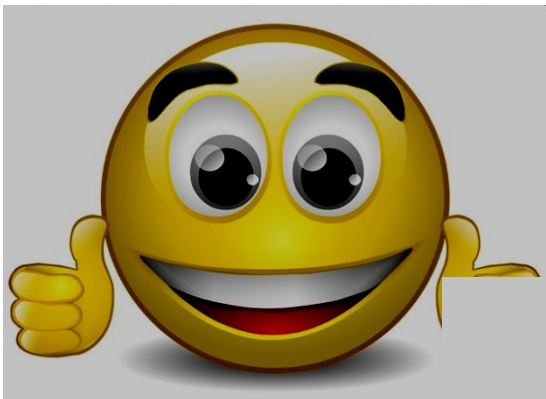
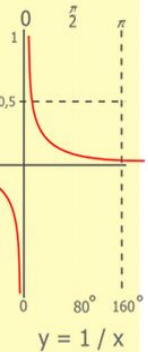
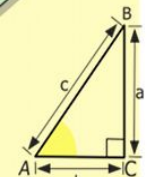
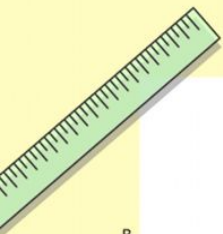
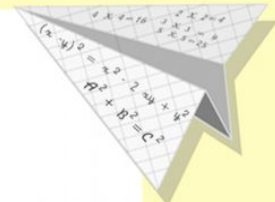
$$\begin{cases} y = 1 \\ x = 25 + 45 \\ \hline x = 70 \end{cases}$$

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



# Рефлексия

## Ваше настроение



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

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

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

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



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

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

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