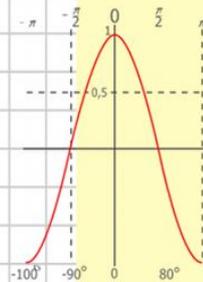
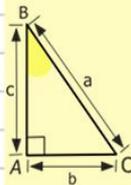
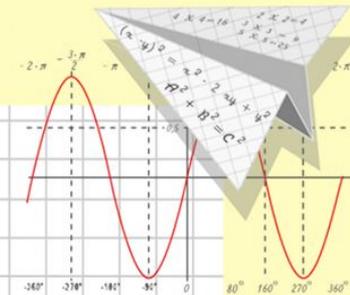
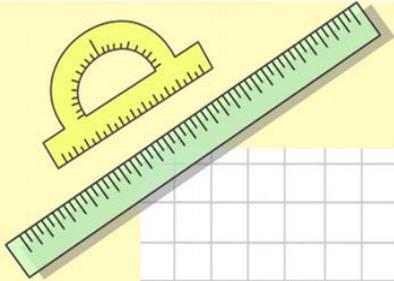


Математик

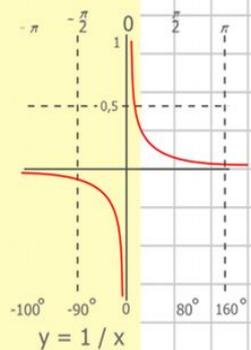
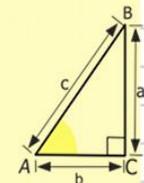
а

Занятие 44. Формулы сложения.



$y = \cos x$

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



$$\begin{array}{r} 2500 \\ \times 42 \\ \hline 2100 \\ + 8400 \\ \hline 105000 \end{array}$$

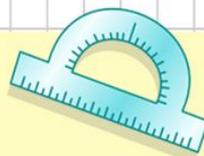


$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

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

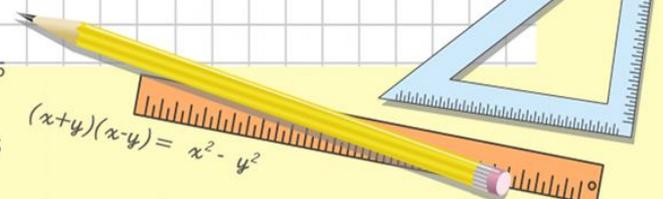


$$\sin 90^\circ = 1$$



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

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



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

Формулы сложения

$$\sin(\alpha + \beta) = \sin \alpha \cos \beta + \cos \alpha \sin \beta$$

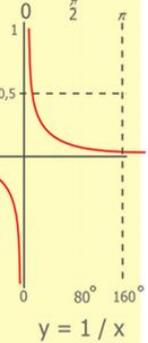
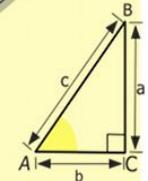
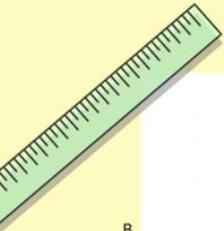
$$\sin(\alpha - \beta) = \sin \alpha \cos \beta - \cos \alpha \sin \beta$$

$$\cos(\alpha + \beta) = \cos \alpha \cos \beta - \sin \alpha \sin \beta$$

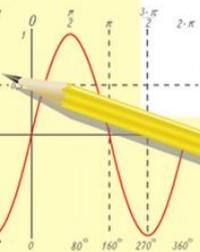
$$\cos(\alpha - \beta) = \cos \alpha \cos \beta + \sin \alpha \sin \beta$$

$$\operatorname{tg}(\alpha + \beta) = \frac{\operatorname{tg}\alpha + \operatorname{tg}\beta}{1 - \operatorname{tg}\alpha \cdot \operatorname{tg}\beta}$$

$$\operatorname{tg}(\alpha - \beta) = \frac{\operatorname{tg}\alpha - \operatorname{tg}\beta}{1 + \operatorname{tg}\alpha \cdot \operatorname{tg}\beta}$$



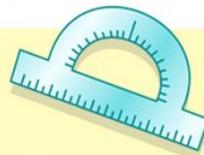
$$\begin{array}{r} 1 \\ 2500 \\ \times 42 \\ \hline 210 \\ + 84 \\ \hline 10500 \end{array}$$



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

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

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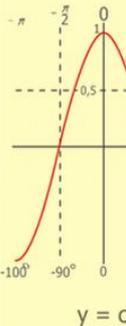
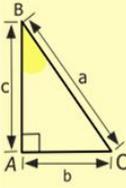
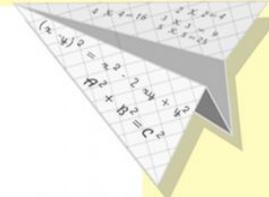


$$\begin{cases} y = \sin 90 \\ x = 25y + 45 \end{cases}$$

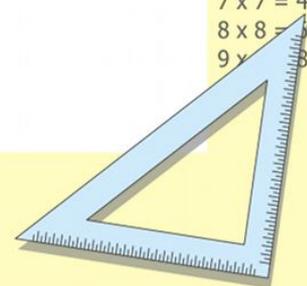
$$\begin{cases} y = 1 \\ x = 25 + 45 \end{cases}$$

$$x = 70$$

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



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



Формулы сложения

$$\sin(\alpha + \beta) = \sin \alpha \cos \beta + \cos \alpha \sin \beta$$

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$$\cos(\alpha - \beta) = \cos \alpha \cos \beta + \sin \alpha \sin \beta$$

$$\operatorname{tg}(\alpha - \beta) = \frac{\operatorname{tg} \alpha - \operatorname{tg} \beta}{1 + \operatorname{tg} \alpha \cdot \operatorname{tg} \beta}$$

$$\sin 4\alpha = \sin(3\alpha + \alpha) = \sin 3\alpha \cos \alpha + \cos 3\alpha \sin \alpha$$

$$\sin 4\alpha = \sin(5\alpha - \alpha) = \sin 5\alpha \cos \alpha - \cos 5\alpha \sin \alpha$$

$$\cos 3x = \cos(2x + x) = \cos 2x \cos x - \sin 2x \sin x$$

$$\cos 3x = \cos(5x - 2x) = \cos 5x \cos 2x + \sin 5x \sin 2x$$

$$\operatorname{tg} 7y = \operatorname{tg}(5y + 2y) = \frac{\operatorname{tg} 5y + \operatorname{tg} 2y}{1 - \operatorname{tg} 5y \cdot \operatorname{tg} 2y}$$

$$\operatorname{tg} 7y = \operatorname{tg}(10y - 3y) = \frac{\operatorname{tg} 10y - \operatorname{tg} 3y}{1 + \operatorname{tg} 10y \cdot \operatorname{tg} 3y}$$

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

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

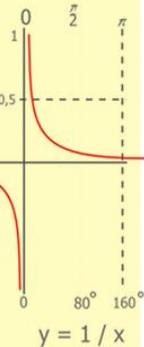
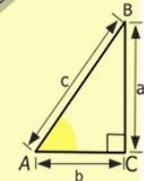
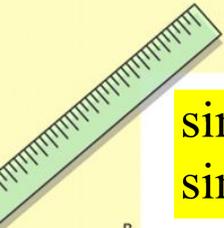
$$\sin 90^\circ = 1$$

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

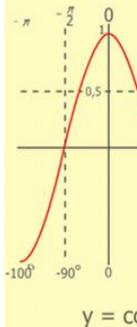
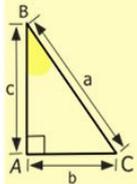
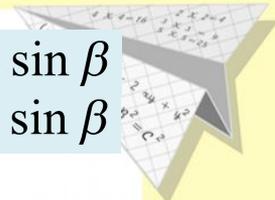
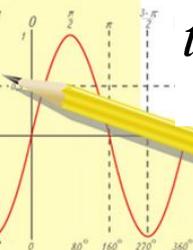
$$\begin{cases} y = 1 \\ x = 25 + 45 \end{cases}$$

$$x = 70$$

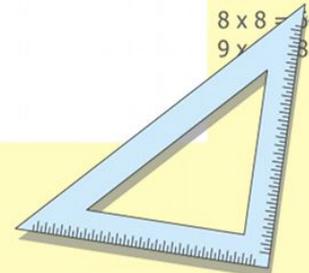
$$(x+y)(x-y) = x^2 - y^2$$



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



- 2 x 2 = 4
- 3 x 3 = 9
- 4 x 4 = 16
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- 6 x 6 = 36
- 7 x 7 = 49
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Формулы сложения

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$$\cos(\alpha + \beta) = \cos \alpha \cos \beta - \sin \alpha \sin \beta$$

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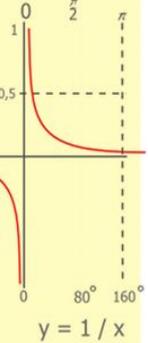
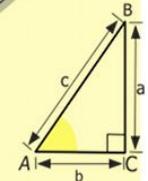
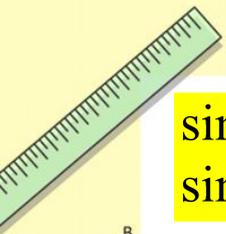
$$\sin 2\alpha \cos 3\alpha + \cos 2\alpha \sin 3\alpha = \sin(2\alpha + 3\alpha) = \sin 5\alpha$$

$$\cos 5x \cos 4x + \sin 5x \sin 4x = \cos(5x - 4x) = \cos x$$

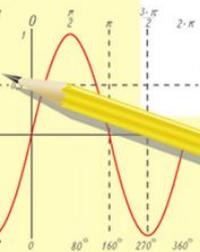
$$\cos 50^\circ \cos 20^\circ - \sin 50^\circ \sin 20^\circ = \cos(50^\circ + 20^\circ) = \cos 70^\circ$$

$$\begin{aligned} \sin(\alpha + 10^\circ) \cos(\alpha - 10^\circ) - \cos(\alpha + 10^\circ) \sin(\alpha - 10^\circ) &= \\ = \sin[(\alpha + 10^\circ) - (\alpha - 10^\circ)] &= \sin(\alpha + 10^\circ - \alpha + 10^\circ) = \sin 20^\circ \end{aligned}$$

$$\frac{\operatorname{tg} 55^\circ - \operatorname{tg} 10^\circ}{1 + \operatorname{tg} 55^\circ \cdot \operatorname{tg} 10^\circ} = \operatorname{tg}(55^\circ - 10^\circ) = \operatorname{tg} 45^\circ = 1$$



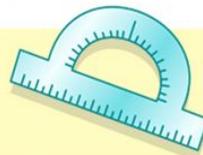
$$\begin{array}{r} 1 \\ \times 2500 \\ \hline 210 \\ + 84 \\ \hline 105000 \end{array}$$



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

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

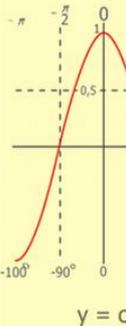
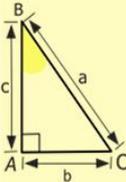
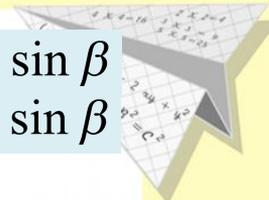


$$\begin{cases} y = \sin 90 \\ x = 25y + 45 \end{cases}$$

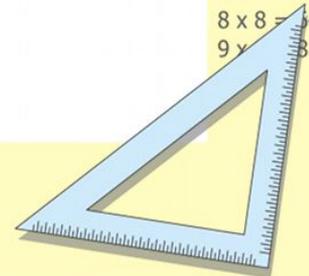
$$\begin{cases} y = 1 \\ x = 25 + 45 \end{cases}$$

$$x = 70$$

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



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



Формулы сложения

$$\sin(\alpha + \beta) = \sin \alpha \cos \beta + \cos \alpha \sin \beta$$

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$$\cos(\alpha + \beta) = \cos \alpha \cos \beta - \sin \alpha \sin \beta$$

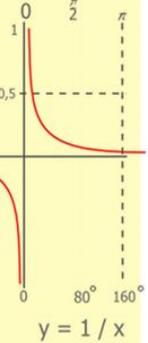
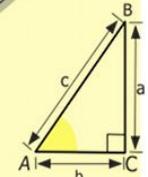
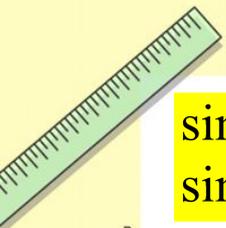
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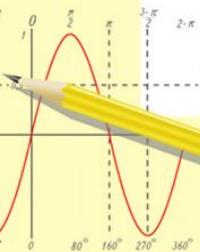
$$\cos \frac{7\pi}{12} \cos \frac{\pi}{4} + \sin \frac{7\pi}{12} \sin \frac{\pi}{4} = \cos \left(\frac{7\pi}{12} - \frac{\pi}{4} \right) = \cos \frac{4\pi}{12} = \cos \frac{\pi}{3} = \frac{1}{2}$$

$$\sin 0,8\pi \cos 0,7\pi + \cos 0,8\pi \sin 0,7\pi = \sin(0,8\pi + 0,7\pi) = \sin 1,5\pi = -1$$

$$\frac{\operatorname{tg} \frac{2\pi}{15} + \operatorname{tg} \frac{\pi}{5}}{1 - \operatorname{tg} \frac{2\pi}{15} \cdot \operatorname{tg} \frac{\pi}{5}} = \operatorname{tg} \left(\frac{2\pi}{15} + \frac{\pi}{5} \right) = \operatorname{tg} \frac{5\pi}{15} = \operatorname{tg} \frac{\pi}{3} = \sqrt{3}$$



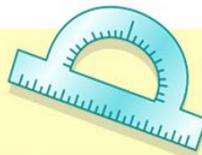
$$\begin{array}{r} 1 \\ 2500 \\ \times 42 \\ \hline 210 \\ + 84 \\ \hline 10500 \end{array}$$



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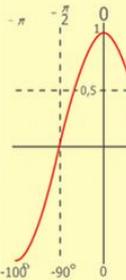
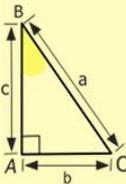
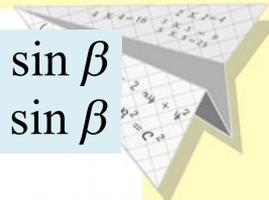


$$\begin{cases} y = \sin 90 \\ x = 25y + 45 \end{cases}$$

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

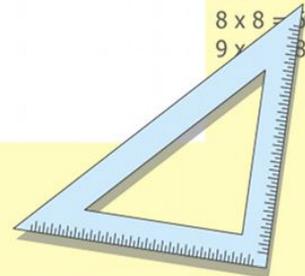
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$$y = \cos$$

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Формулы сложения

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$$\operatorname{tg}(\alpha - \beta) = \frac{\operatorname{tg} \alpha - \operatorname{tg} \beta}{1 + \operatorname{tg} \alpha \cdot \operatorname{tg} \beta}$$

Вычислить:

$$\cos 75^\circ = \text{?????}$$

$$\text{?????}$$

$$\text{?????}$$

$$\text{?????}$$

$$\operatorname{tg} 15^\circ = \text{?????}$$

$$\text{?????}$$

$$\text{?????}$$

$$\text{?????}$$

$$\text{?????}$$

$$\text{?????}$$

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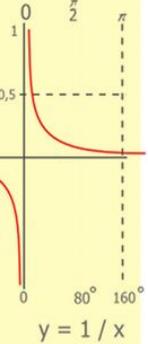
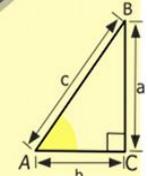
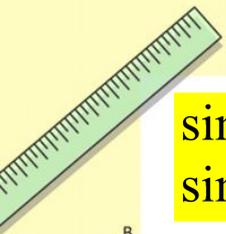
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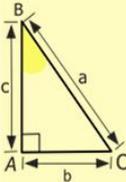
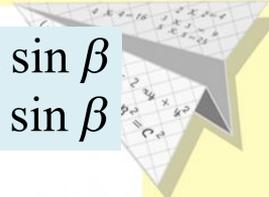
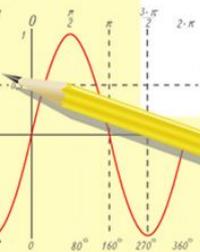
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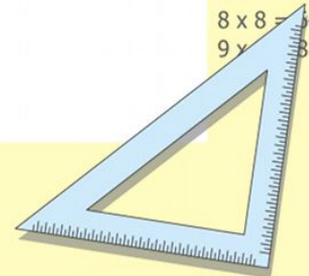
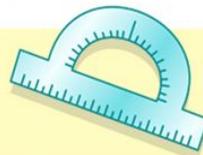


$$\begin{array}{r} 12500 \\ \times 42 \\ \hline 210 \\ + 84 \\ \hline 105000 \end{array}$$



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Упростить:

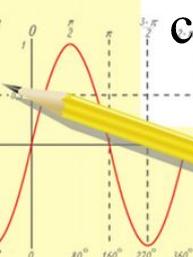
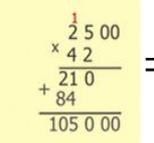
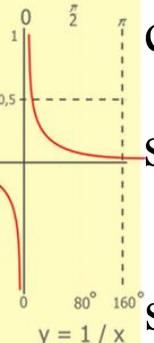
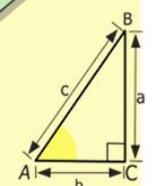
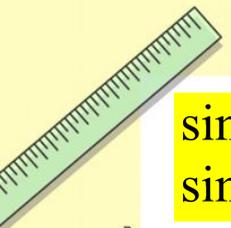
$$\cos 40^\circ \sin 20^\circ - \cos 20^\circ \sin 40^\circ = \sin(20^\circ - 40^\circ) = \sin(-20^\circ) = -\sin 20^\circ$$

$$\sin 38^\circ \sin 22^\circ - \cos 38^\circ \cos 22^\circ = -\cos(38^\circ + 22^\circ) = -\cos 60^\circ = -\frac{1}{2}$$

$$\sin 40^\circ \sin 20^\circ + \sin 70^\circ \sin 50^\circ = \begin{cases} \sin 70^\circ = \cos(90^\circ - 70^\circ) = \cos 20^\circ \\ \sin 50^\circ = \cos(90^\circ - 50^\circ) = \cos 40^\circ \end{cases} =$$

$$= \sin 40^\circ \sin 20^\circ + \cos 20^\circ \cos 40^\circ = \cos(20^\circ - 40^\circ) = \cos(-20^\circ) = \cos 20^\circ$$

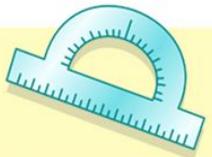
$$\frac{\sin 52^\circ \cos 18^\circ + \cos 52^\circ \sin 18^\circ}{\cos 36^\circ \cos 34^\circ - \sin 36^\circ \sin 34^\circ} = \frac{\sin(52^\circ + 18^\circ)}{\cos(36^\circ + 34^\circ)} = \frac{\sin 70^\circ}{\cos 70^\circ} = \operatorname{tg} 70^\circ$$



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

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

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

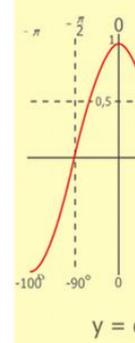
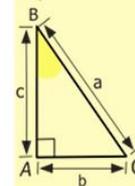
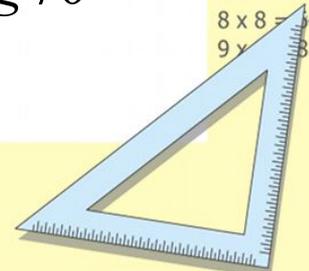


$$\begin{cases} y = \sin 90 \\ x = 25y + 45 \end{cases}$$

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

$$\frac{x}{x} = \frac{70}{70}$$

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



- 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

Формулы сложения

$$\sin(\alpha + \beta) = \sin \alpha \cos \beta + \cos \alpha \sin \beta$$

$$\sin(\alpha - \beta) = \sin \alpha \cos \beta - \cos \alpha \sin \beta$$

$$\operatorname{tg}(\alpha + \beta) = \frac{\operatorname{tg} \alpha + \operatorname{tg} \beta}{1 - \operatorname{tg} \alpha \cdot \operatorname{tg} \beta}$$

$$\cos(\alpha + \beta) = \cos \alpha \cos \beta - \sin \alpha \sin \beta$$

$$\cos(\alpha - \beta) = \cos \alpha \cos \beta + \sin \alpha \sin \beta$$

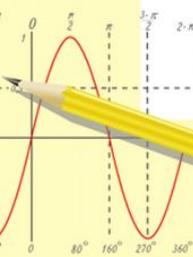
$$\operatorname{tg}(\alpha - \beta) = \frac{\operatorname{tg} \alpha - \operatorname{tg} \beta}{1 + \operatorname{tg} \alpha \cdot \operatorname{tg} \beta}$$

Упростить:

$$\frac{\sin 72^\circ \sin 28^\circ - \cos 72^\circ \sin 62^\circ}{\cos 35^\circ \cos 25^\circ + \sin 25^\circ \cos 55^\circ} = \left| \frac{\sin 28^\circ = \cos(90^\circ - 28^\circ) = \cos 62^\circ}{\cos 35^\circ = \sin(90^\circ - 35^\circ) = \sin 55^\circ} \right| =$$

$$= \frac{\sin 72^\circ \cos 62^\circ - \cos 72^\circ \sin 62^\circ}{\sin 55^\circ \cos 25^\circ + \sin 25^\circ \cos 55^\circ} = \frac{\sin(72^\circ - 62^\circ)}{\sin(55^\circ + 25^\circ)} = \frac{\sin 10^\circ}{\sin 80^\circ}$$

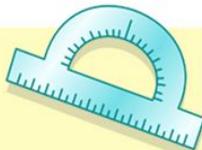
$$\frac{\frac{1}{2} \frac{5}{00}}{\frac{21}{0} + \frac{84}{10500}} = \frac{\sin 10^\circ}{\cos 10^\circ} = \operatorname{tg} 10^\circ$$



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

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

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

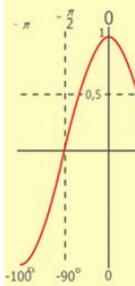
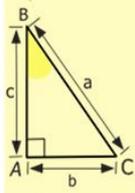


$$\begin{cases} y = \sin 90 \\ x = 25y + 45 \end{cases}$$

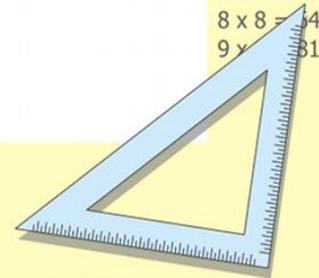
$$\begin{cases} y = 1 \\ x = 25 + 45 \end{cases}$$

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

$$x = 70$$

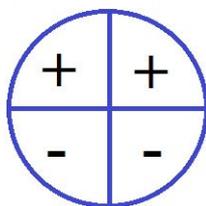


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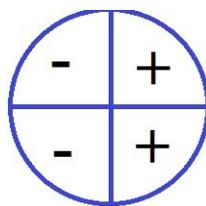


Справочные материалы

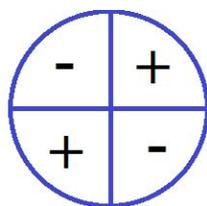
α	0°	30°	45°	60°	90°	180°	270°	360°
	0	$\frac{\pi}{6}$	$\frac{\pi}{4}$	$\frac{\pi}{3}$	$\frac{\pi}{2}$	π	$\frac{3\pi}{2}$	2π
$\sin \alpha$	0	$\frac{1}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{\sqrt{3}}{2}$	1	0	-1	0
$\cos \alpha$	1	$\frac{\sqrt{3}}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{1}{2}$	0	-1	0	1
$\operatorname{tg} \alpha$	0	$\frac{1}{\sqrt{3}}$	1	$\sqrt{3}$	—	0	—	0
$\operatorname{ctg} \alpha$	—	$\sqrt{3}$	1	$\frac{\sqrt{3}}{3}$	0	—	0	—



$\sin \alpha$



$\cos \alpha$



$\operatorname{tg} \alpha \quad \operatorname{ctg} \alpha$

$$\sin(-\alpha) = -\sin \alpha$$

$$\cos(-\alpha) = \cos \alpha$$

$$\operatorname{tg}(-\alpha) = -\operatorname{tg} \alpha$$

$$\operatorname{ctg}(-\alpha) = -\operatorname{ctg} \alpha$$

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

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

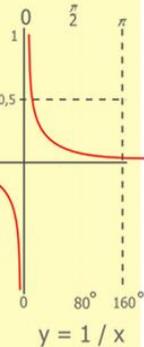
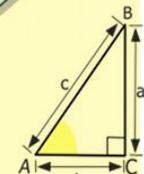
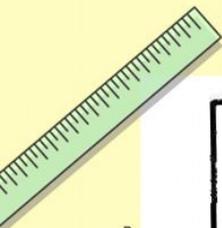
$$\sin 90^\circ = 1$$

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

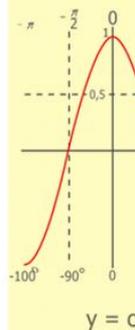
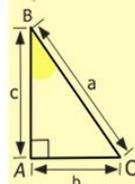
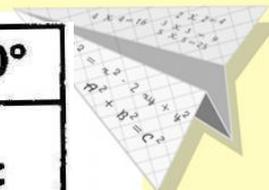
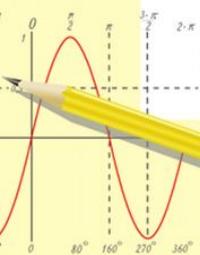
$$\begin{cases} y = 1 \\ x = 25 + 45 \end{cases}$$

$$x = 70$$

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

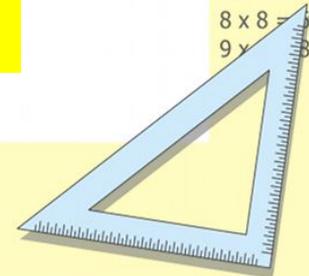


$$\begin{array}{r} 2500 \\ \times 42 \\ \hline 210 \\ + 84 \\ \hline 10500 \end{array}$$

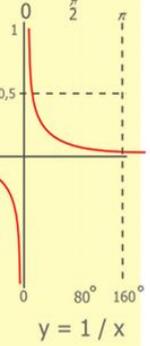
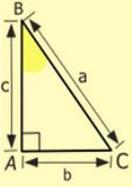
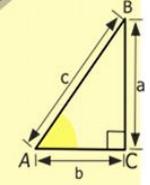
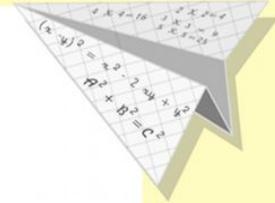
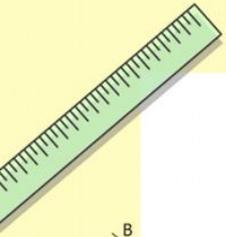


$$y = \cos$$

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

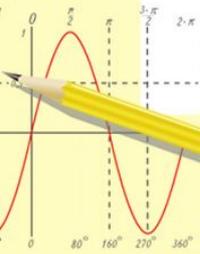


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Юрьевич
преподаватель математики
ГБПОУ ЗКНО
Москва, 2020г.



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

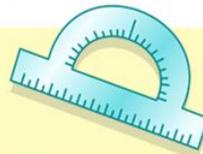
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