

Основные формулы тригонометрии

1. $\cos^2 \alpha + \sin^2 \alpha = 1$
2. $\operatorname{tg} \alpha = \frac{\sin \alpha}{\cos \alpha}$
3. $\operatorname{ctg} \alpha = \frac{\cos \alpha}{\sin \alpha}$
4. $\operatorname{tg} \alpha \cdot \operatorname{ctg} \alpha = 1$
5. $\operatorname{tg} \alpha = \frac{1}{\operatorname{ctg} \alpha}$
6. $\operatorname{ctg} \alpha = \frac{1}{\operatorname{tg} \alpha}$
7. $1 + \operatorname{tg}^2 \alpha = \frac{1}{\cos^2 \alpha}$
8. $1 + \operatorname{ctg}^2 \alpha = \frac{1}{\sin^2 \alpha}$
9. $\sin(\alpha + \beta) = \sin \alpha \cdot \cos \beta + \cos \alpha \cdot \sin \beta$
10. $\sin(\alpha - \beta) = \sin \alpha \cdot \cos \beta - \cos \alpha \cdot \sin \beta$
11. $\cos(\alpha + \beta) = \cos \alpha \cdot \cos \beta - \sin \alpha \cdot \sin \beta$
12. $\cos(\alpha - \beta) = \cos \alpha \cdot \cos \beta + \sin \alpha \cdot \sin \beta$
13. $\operatorname{tg}(\alpha + \beta) = \frac{\operatorname{tg} \alpha + \operatorname{tg} \beta}{1 - \operatorname{tg} \alpha \cdot \operatorname{tg} \beta}$
14. $\operatorname{tg}(\alpha - \beta) = \frac{\operatorname{tg} \alpha - \operatorname{tg} \beta}{1 + \operatorname{tg} \alpha \cdot \operatorname{tg} \beta}$
15. $\operatorname{ctg}(\alpha + \beta) = \frac{\operatorname{ctg} \alpha \cdot \operatorname{ctg} \beta - 1}{\operatorname{ctg} \beta + \operatorname{ctg} \alpha}$
16. $\operatorname{ctg}(\alpha - \beta) = \frac{\operatorname{ctg} \alpha \cdot \operatorname{ctg} \beta + 1}{\operatorname{ctg} \beta - \operatorname{ctg} \alpha}$
17. $\sin 2\alpha = 2 \sin \alpha \cdot \cos \alpha$
18. $\cos 2\alpha = \cos^2 \alpha - \sin^2 \alpha$
19. $\cos 2\alpha = 2 \cos^2 \alpha - 1$
20. $\cos 2\alpha = 1 - 2 \sin^2 \alpha$
21. $\operatorname{tg} 2\alpha = \frac{2 \operatorname{tg} \alpha}{1 - \operatorname{tg}^2 \alpha}$
22. $\operatorname{ctg} 2\alpha = \frac{\operatorname{ctg}^2 \alpha - 1}{2 \operatorname{ctg} \alpha}$
23. $\left| \sin \frac{\alpha}{2} \right| = \sqrt{\frac{1 - \cos \alpha}{2}}$
24. $\left| \cos \frac{\alpha}{2} \right| = \sqrt{\frac{1 + \cos \alpha}{2}}$
25. $\operatorname{tg} \frac{\alpha}{2} = \frac{\sin \alpha}{1 + \cos \alpha} = \frac{1 - \cos \alpha}{\sin \alpha}$
26. $\operatorname{ctg} \frac{\alpha}{2} = \frac{\sin \alpha}{1 - \cos \alpha} = \frac{1 + \cos \alpha}{\sin \alpha}$
27. $\sin \alpha + \sin \beta = 2 \sin \frac{\alpha + \beta}{2} \cdot \cos \frac{\alpha - \beta}{2}$
28. $\sin \alpha - \sin \beta = 2 \sin \frac{\alpha - \beta}{2} \cdot \cos \frac{\alpha + \beta}{2}$
29. $\cos \alpha + \cos \beta = 2 \cos \frac{\alpha + \beta}{2} \cdot \cos \frac{\alpha - \beta}{2}$
30. $\cos \alpha - \cos \beta = -2 \sin \frac{\alpha + \beta}{2} \cdot \sin \frac{\alpha - \beta}{2}$
31. $\operatorname{tg} \alpha + \operatorname{tg} \beta = \frac{\sin(\alpha + \beta)}{\cos \alpha \cdot \cos \beta}$
32. $\operatorname{tg} \alpha - \operatorname{tg} \beta = \frac{\sin(\alpha - \beta)}{\cos \alpha \cdot \cos \beta}$
33. $\sin^2 \alpha = \frac{1}{2}(1 - \cos 2\alpha)$
34. $\cos^2 \alpha = \frac{1}{2}(1 + \cos 2\alpha)$
35. $\sin \alpha \cdot \cos \alpha = \frac{1}{2} \sin 2\alpha$
36. $(\sin \alpha + \cos \alpha)^2 = 1 + \sin 2\alpha$
37. $\sin \alpha \cdot \cos \beta = \frac{1}{2}(\sin(\alpha + \beta) + \sin(\alpha - \beta))$
38. $\cos \alpha \cdot \cos \beta = \frac{1}{2}(\cos(\alpha + \beta) + \cos(\alpha - \beta))$
39. $\sin \alpha \cdot \sin \beta = \frac{1}{2}(\cos(\alpha - \beta) - \cos(\alpha + \beta))$
40. $\sin x = a; |a| \leq 1$
 $x = (-1)^n \arcsin a + \pi n, n \in \mathbb{Z}$
41. $\cos x = a; |a| \leq 1$
 $x = \pm \arccos a + 2\pi n, n \in \mathbb{Z}$
42. $\operatorname{tg} x = a$
 $x = \operatorname{arctg} a + \pi n, n \in \mathbb{Z}$
43. $\operatorname{ctg} x = a$
 $x = \operatorname{arcctg} a + \pi n, n \in \mathbb{Z}$
44. $\sin x = 0$
 $x = \pi n, n \in \mathbb{Z}$
 $\cos x = 0$
45. $x = \frac{\pi}{2} + \pi n, n \in \mathbb{Z}$
 $\sin x = 1$
46. $x = \frac{\pi}{2} + 2\pi n, n \in \mathbb{Z}$
 $\cos x = 1$
47. $x = 2\pi n, n \in \mathbb{Z}$
 $\sin x = -1$
48. $x = -\frac{\pi}{2} + 2\pi n, n \in \mathbb{Z}$
 $\cos x = -1$
49. $x = \pi + 2\pi n, n \in \mathbb{Z}$
 $\cos(-x) = \cos x \quad \operatorname{tg}(-x) = -\operatorname{tg} x$
 $\sin(-x) = -\sin x \quad \operatorname{ctg}(-x) = -\operatorname{ctg} x$