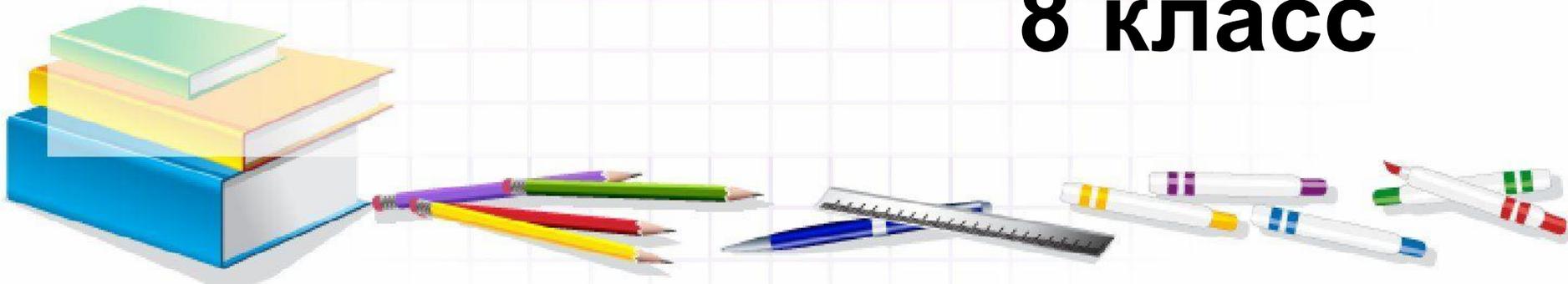
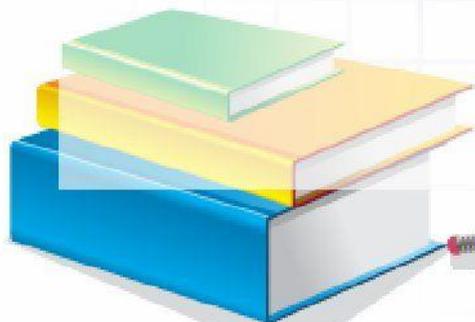
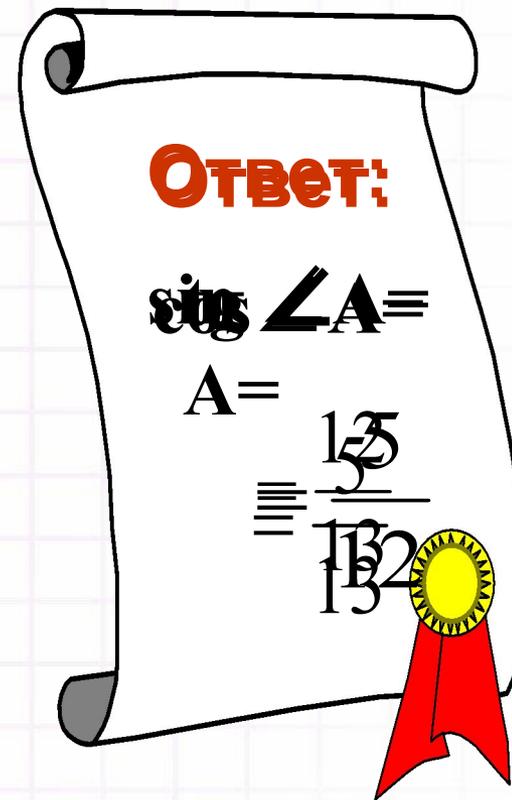
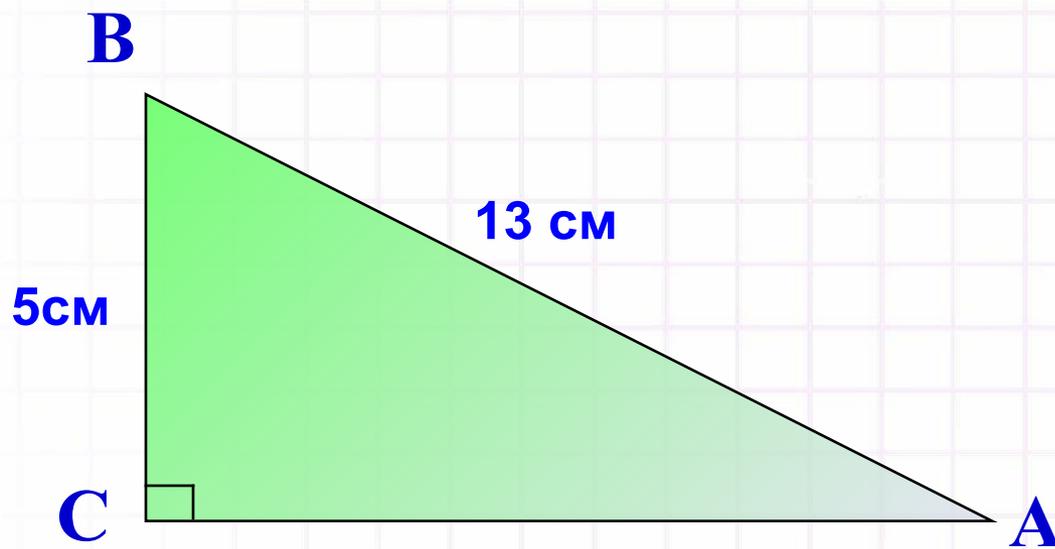


**Соотношения между  
сторонами и углами  
прямоугольного  
треугольника**

**8 класс**



Найти: 1)  $\sin \angle A$ , 2)  $\cos \angle A$ , 3)  $\operatorname{tg} \angle A$

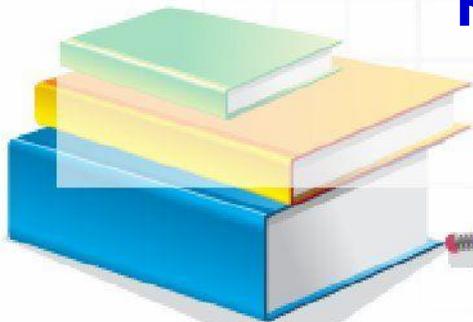


Дано:  $ABCD$  – трапеция,  $AB = 16$  см,  
 $\angle BAD = 30^\circ$ ,  $\angle CDA = 45^\circ$

Найти:  $BK$  и  $MD$ .



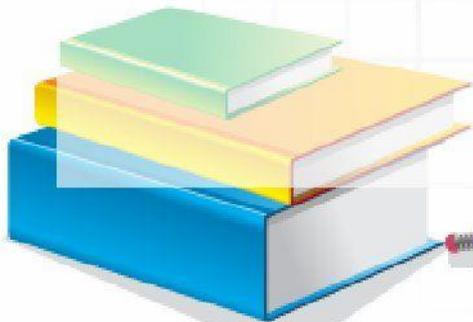
Ответ:  
 $BK=MD=8$  см



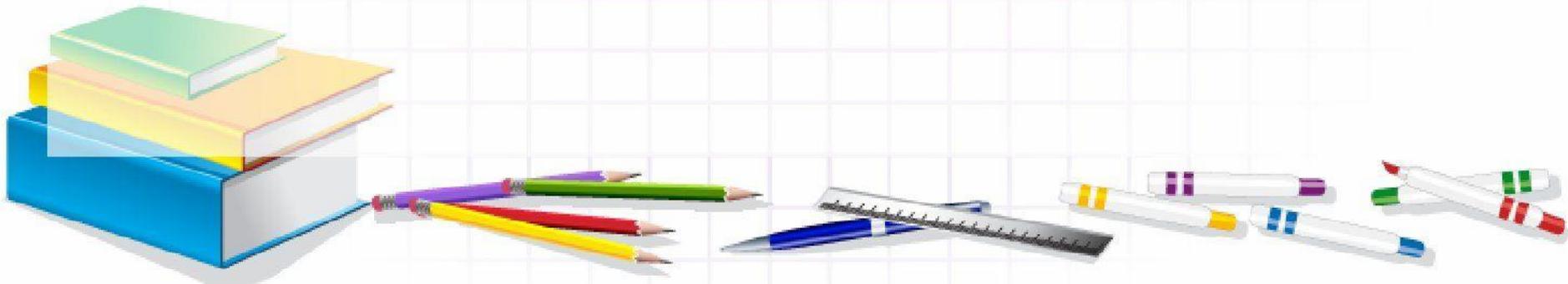
$$\sin^2 \alpha + \cos^2 \alpha = 1$$

$$\sin \alpha = \sqrt{1 - \cos^2 \alpha}$$

$$\cos \alpha = \sqrt{1 - \sin^2 \alpha}$$

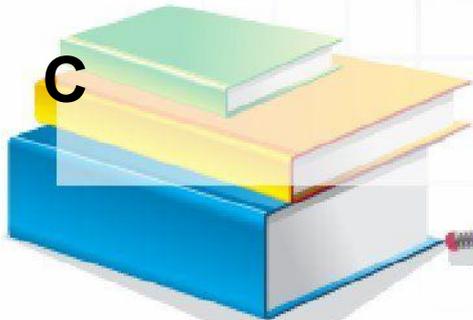
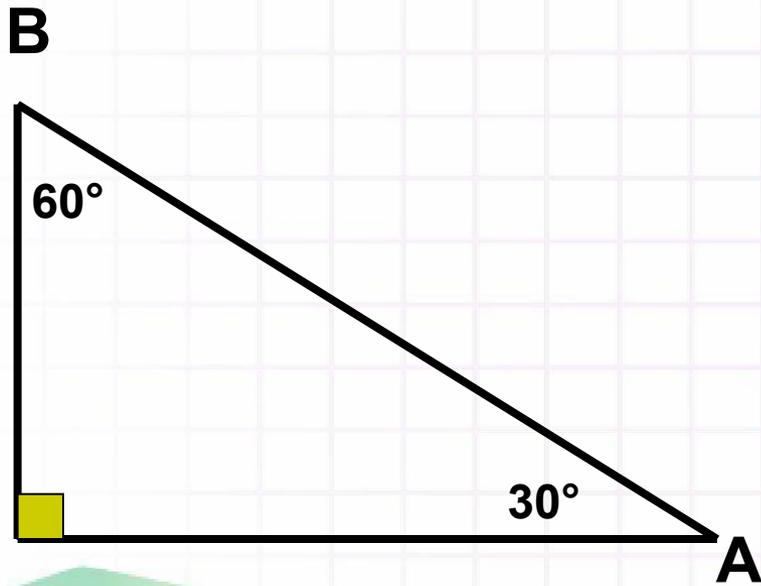


# ЗНАЧЕНИЕ СИНУСА, КОСИНУСА И ТАНГЕНСА ДЛЯ УГЛОВ $30^\circ$ , $45^\circ$ И $60^\circ$



# Значения синуса, косинуса и тангенса угла $30^\circ$ .

Рассмотрим прямоугольный  
треугольник ABC:  
 $\angle A = 30^\circ$ ,  $\angle B = 60^\circ$



Так как катет, лежащий против угла  $30^\circ$ , равен половине гипотенузы, то

$$\frac{BC}{AB} = \frac{1}{2}$$

Но  $\frac{BC}{AB} = \sin A = \frac{1}{2}$

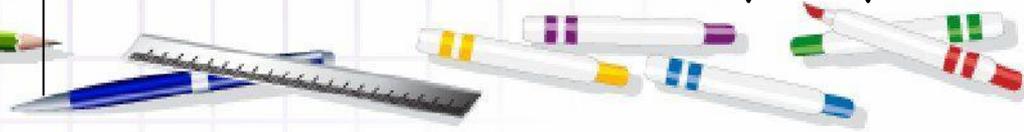
Значит,  $\sin 30^\circ = \frac{1}{2}$ .

Из основного тригонометрического тождества получаем

$$\cos 30^\circ = \sqrt{1 - \sin^2 30^\circ} = \sqrt{1 - \frac{1}{4}} = \frac{\sqrt{3}}{2}$$

По 2-му тождеству находим

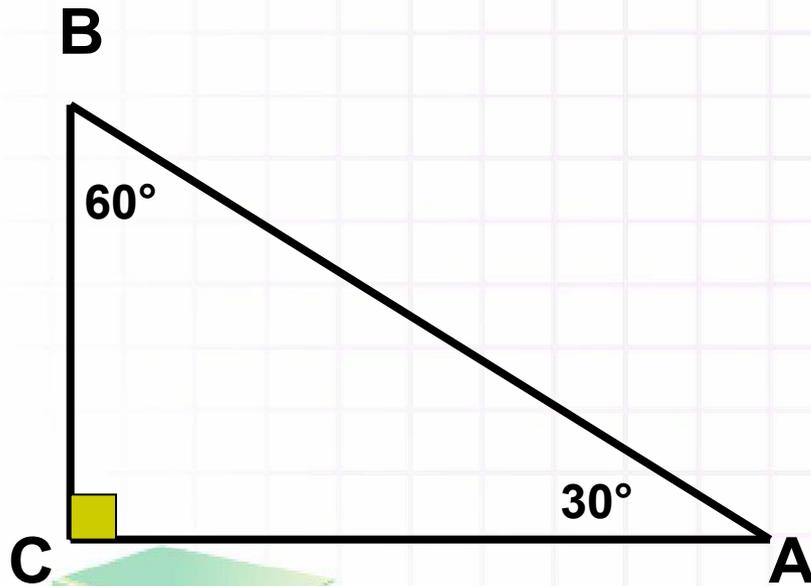
$$\operatorname{tg} 30^\circ = \frac{\sin 30^\circ}{\cos 30^\circ} = \frac{1}{2} \cdot \frac{\sqrt{3}}{2} = \frac{1 \cdot \sqrt{3}}{2 \cdot 2} = \frac{\sqrt{3}}{4}$$



# Значения синуса, косинуса и тангенса угла $60^\circ$ .

Рассмотрим прямоугольный треугольник ABC:

$$\angle A = 30^\circ, \angle B = 60^\circ$$



Так как катет, лежащий против угла  $30^\circ$ , равен половине гипотенузы, то

$$\frac{BC}{AB} = \frac{1}{2}$$

Или 
$$\frac{BC}{AB} = \cos B = \frac{1}{2}$$

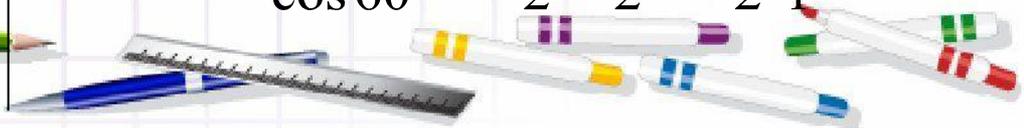
Значит, 
$$\cos 60^\circ = \frac{1}{2}$$

Из основного тригонометрического тождества получаем

$$\sin 60^\circ = \sqrt{1 - \cos^2 60^\circ} = \sqrt{1 - \frac{1}{4}} = \frac{\sqrt{3}}{2}$$

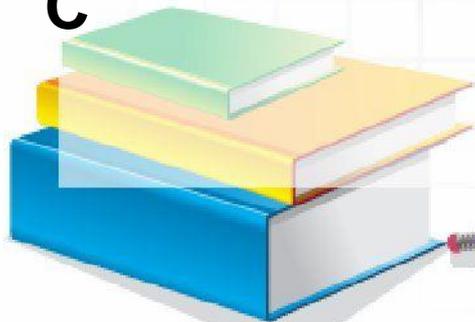
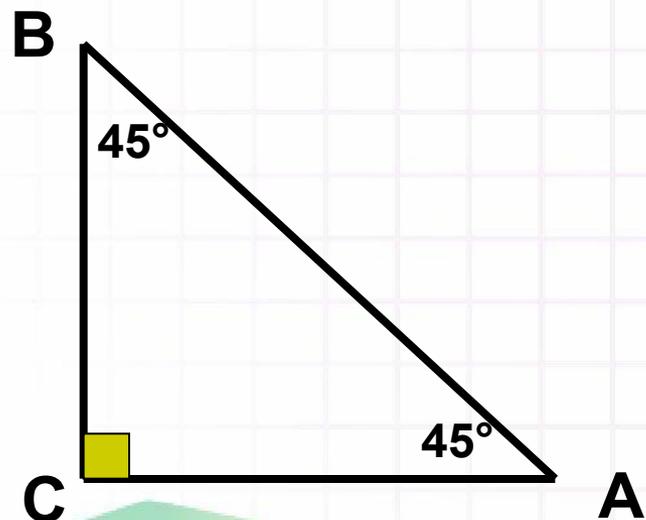
По 2-му тождеству находим

$$\operatorname{tg} 60^\circ = \frac{\sin 60^\circ}{\cos 60^\circ} = \frac{\frac{\sqrt{3}}{2}}{\frac{1}{2}} = \frac{\sqrt{3} \cdot 2}{2 \cdot 1} = \sqrt{3}$$



## Значения синуса, косинуса и тангенса угла $45^\circ$ .

Рассмотрим  
равнобедренный  
прямоугольный треугольник  
ABC:  $AC=BC$ ,  
 $\angle A=45^\circ$ ,  $\angle B=45^\circ$



По теореме Пифагора  
 $AB^2 = AC^2 + BC^2 = 2 AC^2 = 2 BC^2$ ,

откуда  $AC = BC = \frac{AB}{\sqrt{2}}$

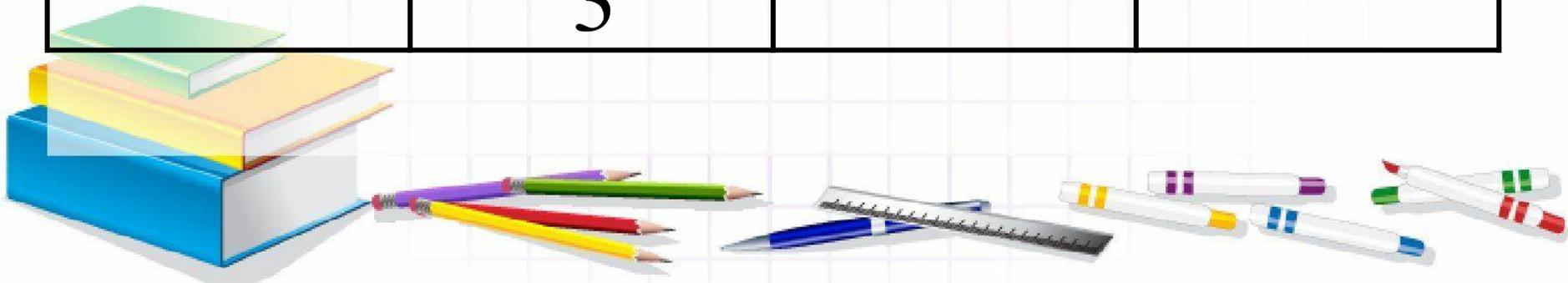
Следовательно,

$$\sin 45^\circ = \sin A = \frac{BC}{AB} = \frac{AB}{AB\sqrt{2}} = \frac{1}{\sqrt{2}} = \frac{\sqrt{2}}{2}$$

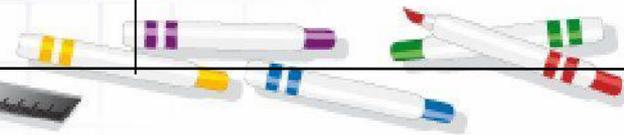
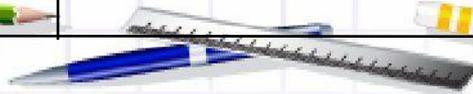
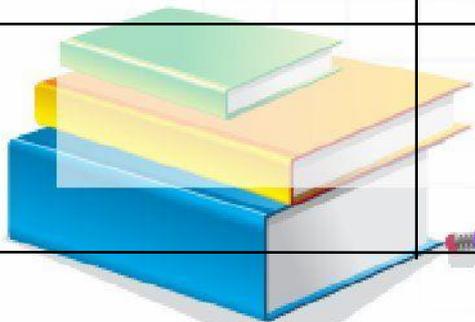
$$\cos 45^\circ = \cos A = \frac{AC}{AB} = \frac{AB}{AB\sqrt{2}} = \frac{1}{\sqrt{2}} = \frac{\sqrt{2}}{2}$$

$$\operatorname{tg} 45^\circ = \operatorname{tg} A = \frac{BC}{AC} = 1$$

$\alpha$	$30^\circ$	$45^\circ$	$60^\circ$
$\sin \alpha$	$\frac{1}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{\sqrt{3}}{2}$
$\cos \alpha$	$\frac{\sqrt{3}}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{1}{2}$
$\operatorname{tg} \alpha$	$\frac{\sqrt{3}}{3}$	1	$\sqrt{3}$



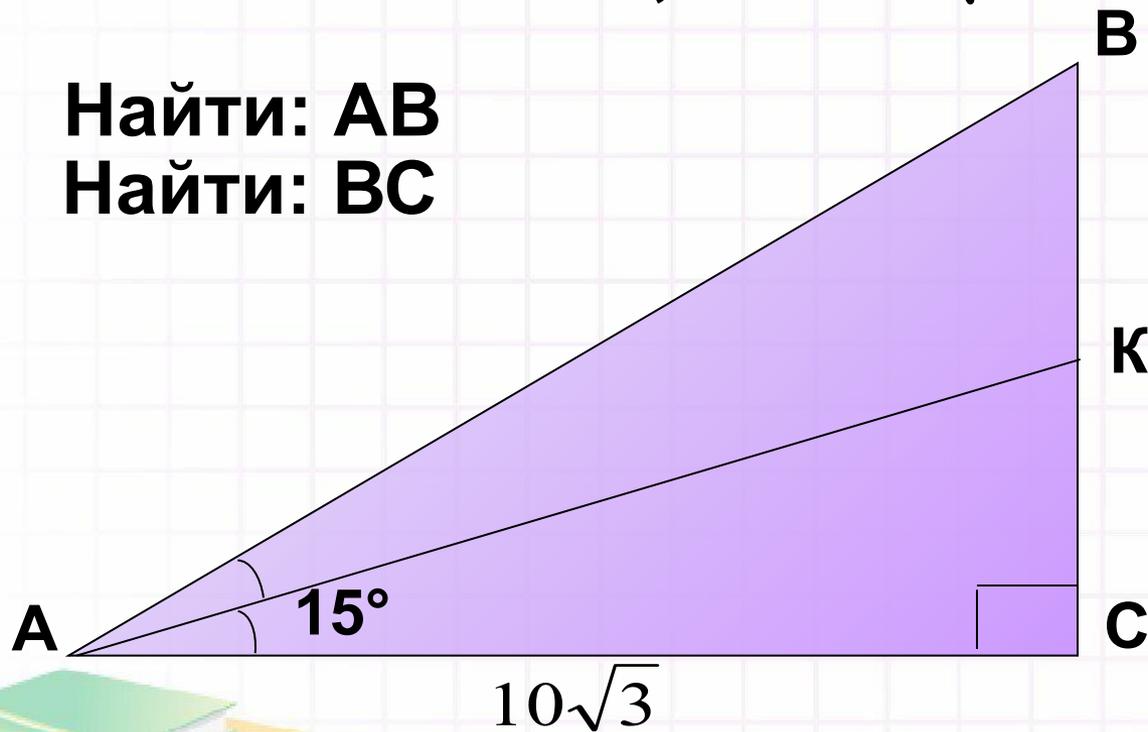
	30°	45°	60°
sin α	$\frac{\sqrt{1}}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{\sqrt{3}}{2}$
cos α	$\frac{\sqrt{3}}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{1}{2}$
tg α	$\frac{\sqrt{3}}{3}$	1	$\sqrt{3}$



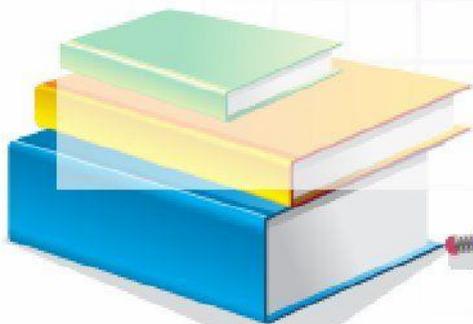
## Задача № 1.

Дано:  $\triangle ABC$  ( $\angle C=90^\circ$ ),  $AK$ - биссектриса  $\angle A$ ,  
 $\angle CAK=15^\circ$ ,  $AC=10\sqrt{3}$

Найти:  $AB$   
Найти:  $BC$



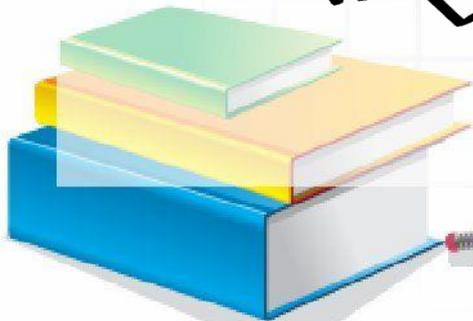
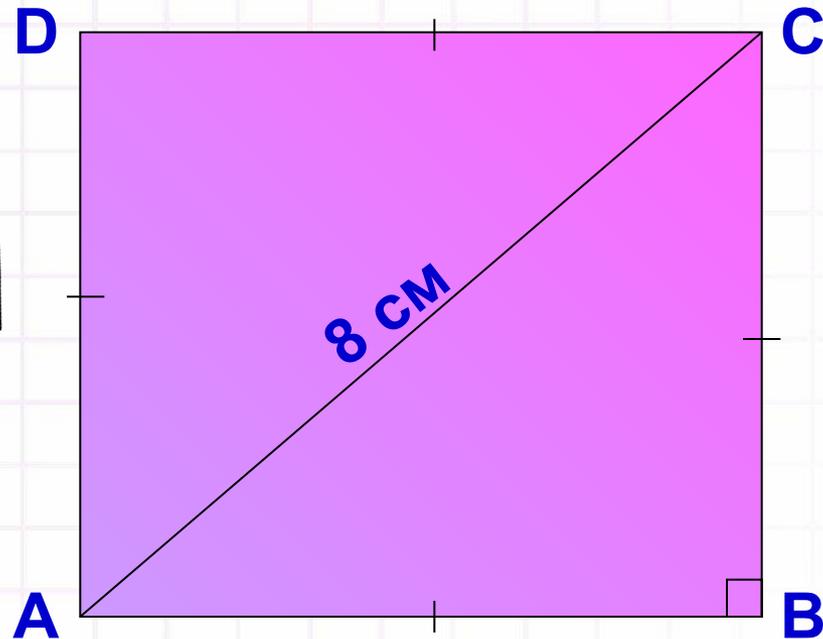
Ответ:  $BC=10$  см



## Задача № 2.

Дано: ABCD- квадрат, AC = 8 см

Найти: АВ

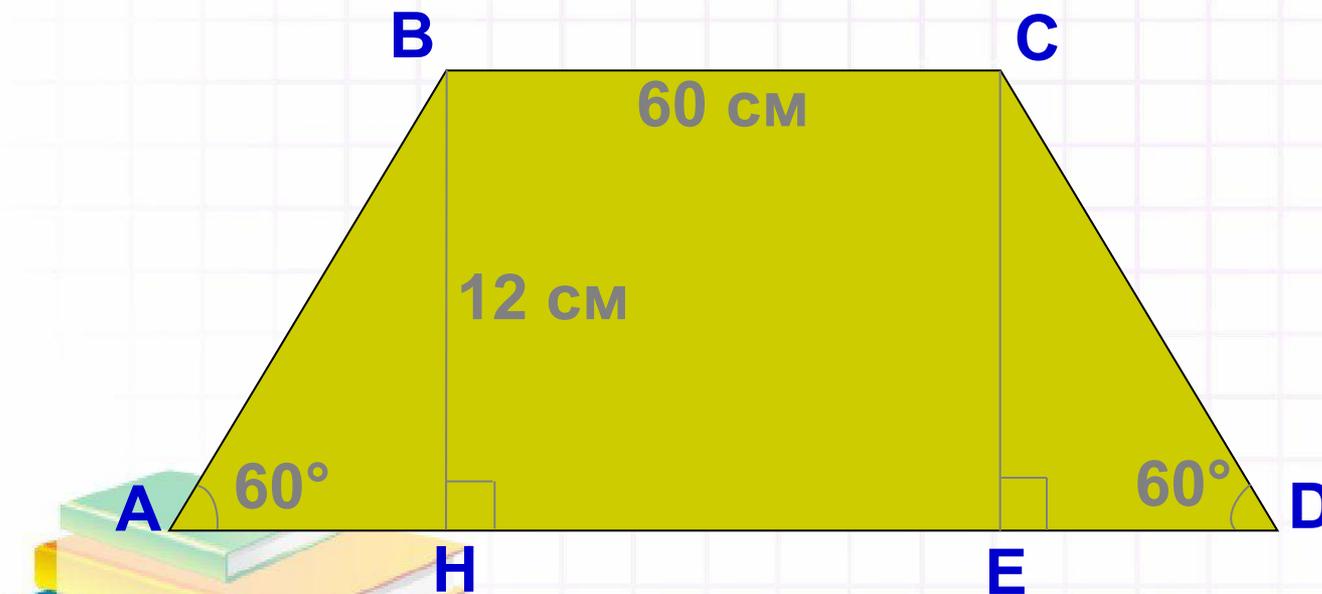


### Задача № 3.

Дано: ABCD-трапеция,

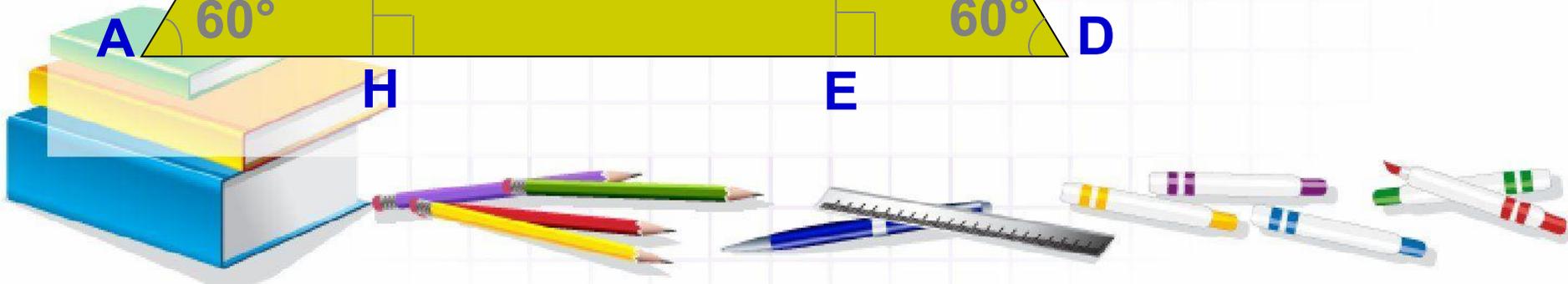
BC = 60 см, BH = 12 см,  $\angle A = \angle D = 60^\circ$

Найти: AD



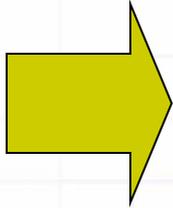
Ответ:

$$AD = 8\sqrt{3} + 60$$



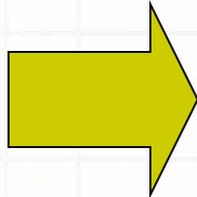
# Домашнее задание:

«4»  
или  
«5»

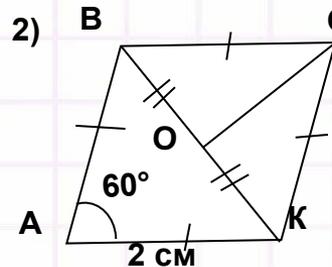
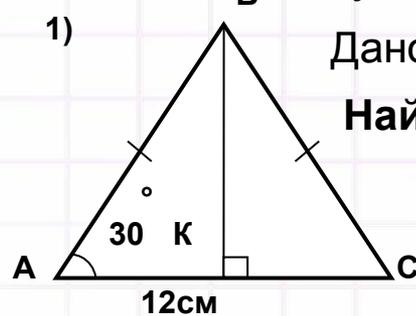


- 1) Изучить материал пункта 67.
- 2) Выучить табличные значения для углов  $30^\circ$ ,  $45^\circ$ ,  $60^\circ$ .
- 3) Решить из учебника № 599, № 601, № 602.

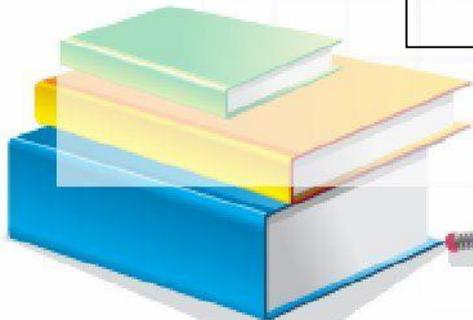
«3»  
или  
«2»



1. Повторить § 4 пункт 66, изучить материал пункта 67.
2. Выучить табличные значения для углов  $30^\circ$ ,  $45^\circ$ ,  $60^\circ$ .
3. Решить следующие задачи:

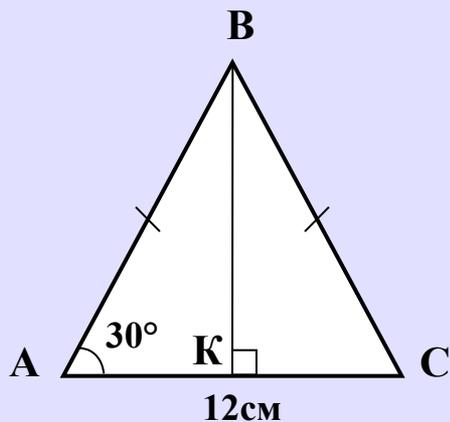


- 3) Решить из учебника № 601, № 602.





1 2 3



Дано:  
AC=12 см

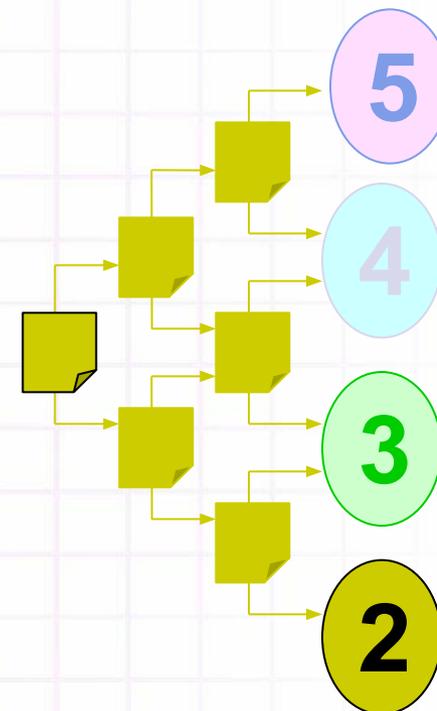
Найти: AB

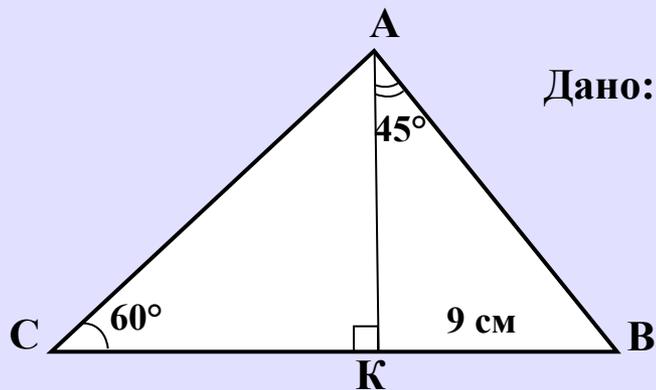
$$\frac{12}{\sqrt{3}} = 4\sqrt{3}$$

$$6\sqrt{2}$$

$$12\sqrt{3}$$

$$\frac{\sqrt{3}}{2}$$





Дано:  $BK=9$  см

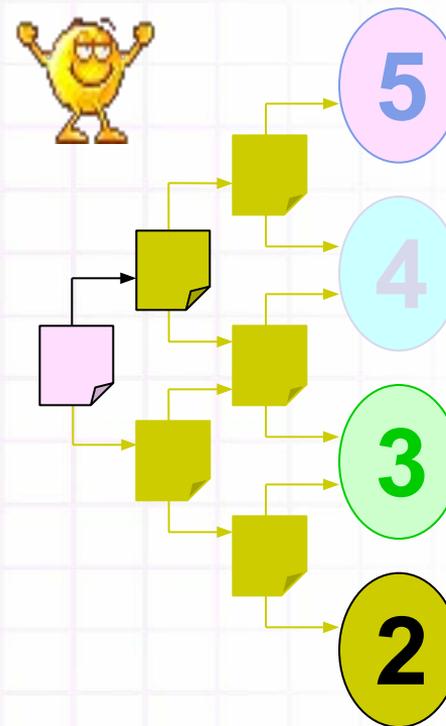
Найти:  $AC$

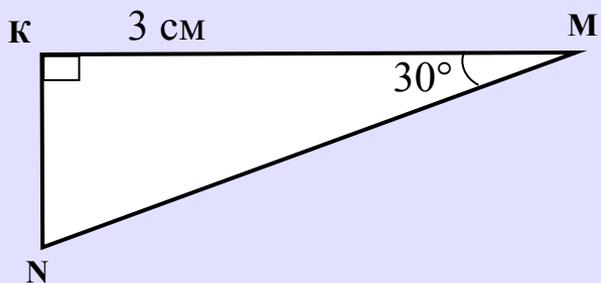
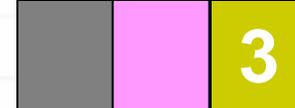
$$\frac{\sqrt{3}}{4}$$

$$\frac{10\sqrt{2}}{3}$$

$$\frac{18\sqrt{3}}{3} = 6\sqrt{3}$$

18





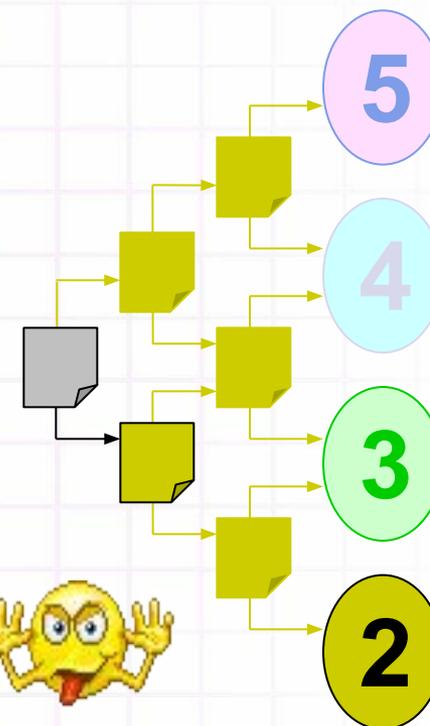
Найти: MN

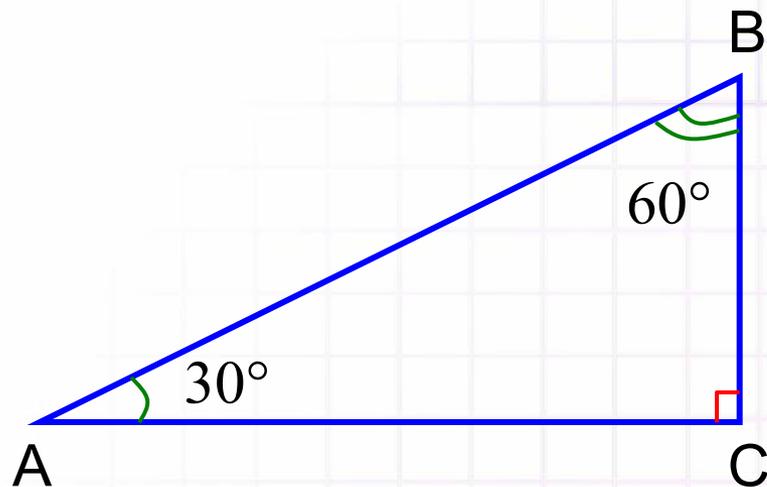
$$\frac{2}{\sqrt{3}} = \frac{2\sqrt{3}}{3}$$

$$\frac{6}{\sqrt{3}} = 2\sqrt{3}$$

$$3\sqrt{3}$$

$$6$$





$$\angle A = 30^\circ \quad \angle B = 60^\circ$$

$$\frac{BC}{AB} = \frac{1}{2}$$

$$\frac{BC}{AB} = \sin A = \sin 30^\circ$$

$$\frac{BC}{AB} = \cos B = \cos 60^\circ$$

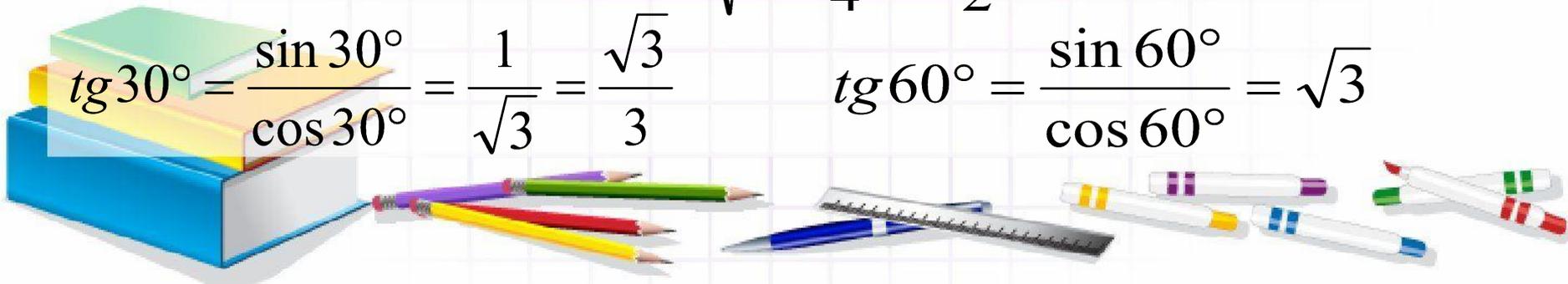
$$\sin 30^\circ = \frac{1}{2}, \quad \cos 60^\circ = \frac{1}{2}$$

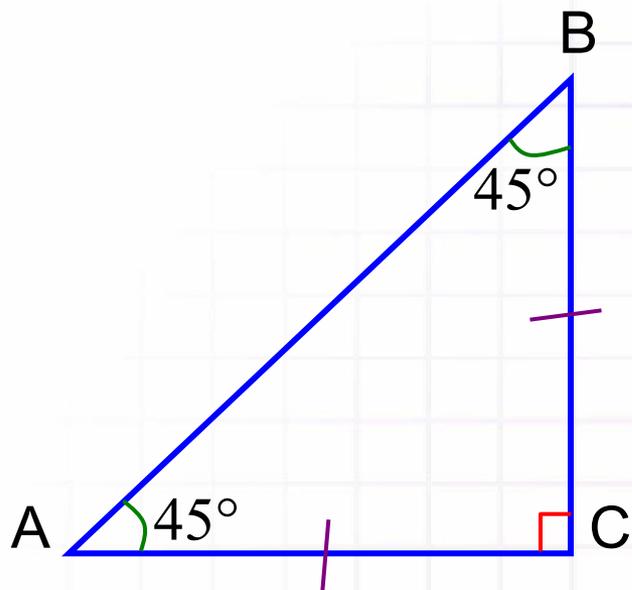
$$\cos 30^\circ = \sqrt{1 - \sin^2 30^\circ} = \sqrt{1 - \frac{1}{4}} = \frac{\sqrt{3}}{2}$$

$$\sin 60^\circ = \sqrt{1 - \cos^2 60^\circ} = \sqrt{1 - \frac{1}{4}} = \frac{\sqrt{3}}{2}$$

$$tg 30^\circ = \frac{\sin 30^\circ}{\cos 30^\circ} = \frac{1}{\sqrt{3}} = \frac{\sqrt{3}}{3}$$

$$tg 60^\circ = \frac{\sin 60^\circ}{\cos 60^\circ} = \sqrt{3}$$





$$AC = BC$$

$$\angle A = \angle B = 45^\circ$$

$$AB^2 = AC^2 + BC^2 = 2AC^2 = 2BC^2$$

$$AC = BC = \frac{AB}{\sqrt{2}}$$

$$\sin 45^\circ = \sin A = \frac{BC}{AB} = \frac{1}{\sqrt{2}} = \frac{\sqrt{2}}{2}$$

$$\cos 45^\circ = \cos A = \frac{AC}{AB} = \frac{1}{\sqrt{2}} = \frac{\sqrt{2}}{2}$$

$$\operatorname{tg} 45^\circ = \operatorname{tg} A = \frac{BC}{AC} = 1$$

