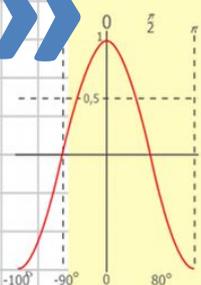
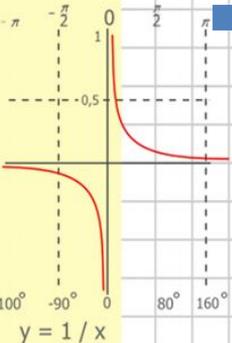
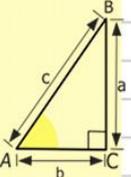
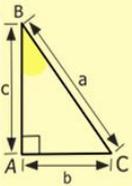
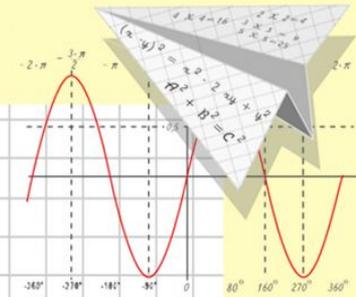
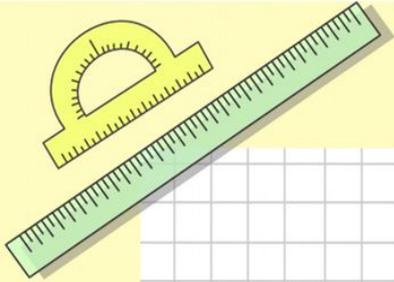


Математик

а

Тема: «Графы»



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

$y = \cos x$

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

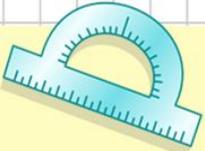


$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

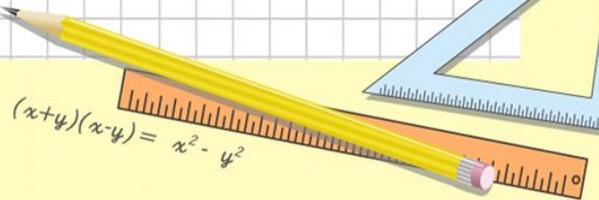
$$\frac{a}{c} + \frac{b}{c} = \frac{a+b}{c}$$



$\sin 90^\circ = 1$



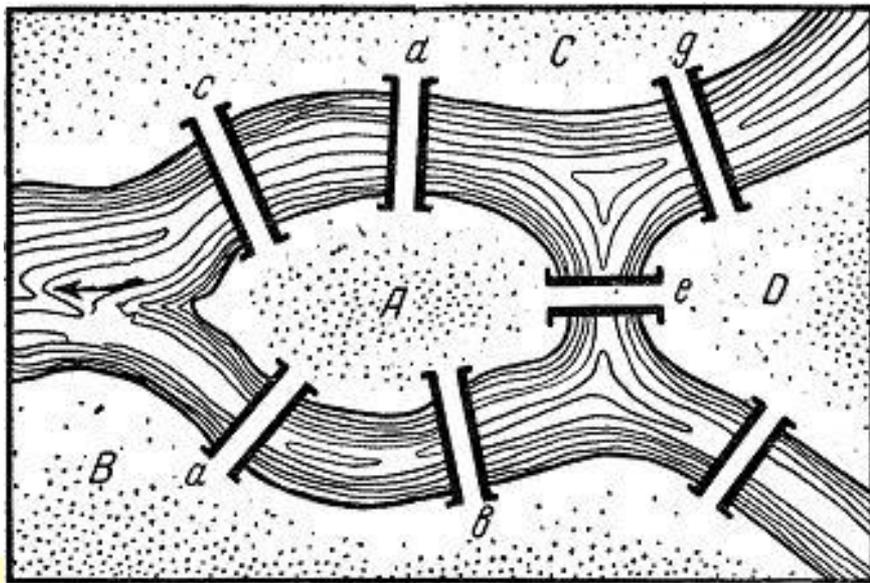
$$\begin{cases} y = \sin 90 \\ x = 25y + 45 \\ y = 1 \\ x = 25 + 45 \\ \hline x = 70 \end{cases}$$



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

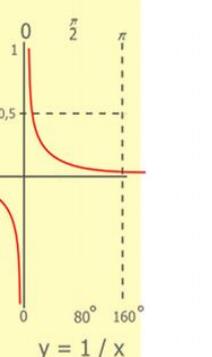
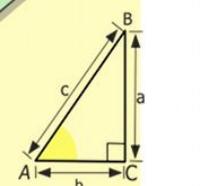
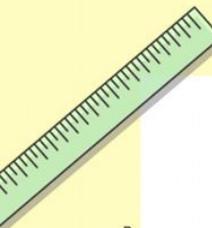
Задача Эйлера (1736 г.):

«В Кенигсберге река, омывающая два острова, делится на два рукава, через которые перекинута семь мостов. Можно ли обойти все эти мосты, не побывав ни на одном из них более раза?»

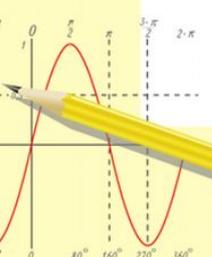


• Леонард
Эйлер

• (1707-1783)



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

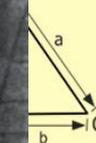


$$\sin A = \sin B = \sin C$$
$$\frac{a}{c} + \frac{b}{c} = \frac{a+b}{c}$$

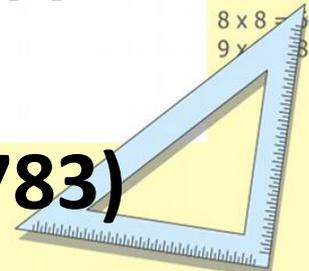


$$\begin{array}{l} y = \sin 90 \\ x = 25y + 45 \\ y = 1 \\ x = 25 + 45 \\ \hline x = 70 \end{array}$$

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



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



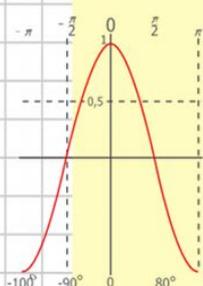
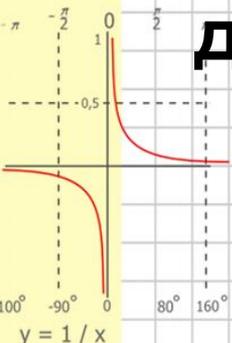
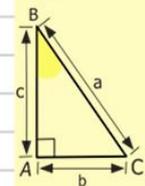
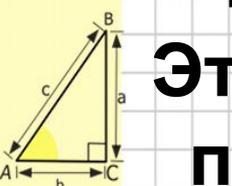
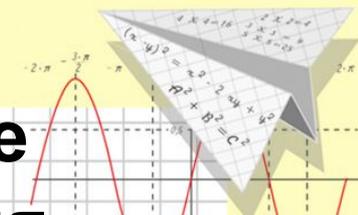
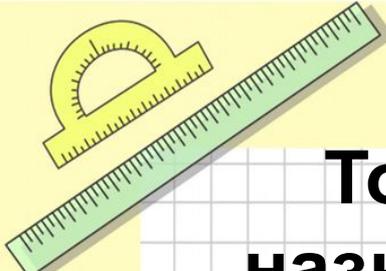
Математик

Топология — наука, которая раньше называлась «геометрией положения».

Эта отрасль геометрии занимается только порядком расположения частей фигуры друг относительно друга, отвлекаясь от их размеров

Разделы топологии:

- 1) комбинаторная топология;
- 2) алгебраическая топология;
- 3) теоретико-множественная топология, изучающую множества как скопления точек.



$$\begin{array}{r} 1\ 2\ 5\ 00 \\ \times 42 \\ \hline 210 \\ + 84 \\ \hline 105\ 000 \end{array}$$

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



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

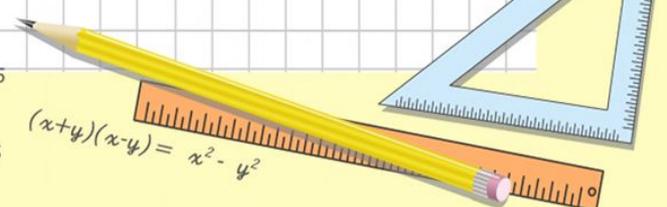
$$\frac{a}{c} + \frac{b}{c} = \frac{a+b}{c}$$



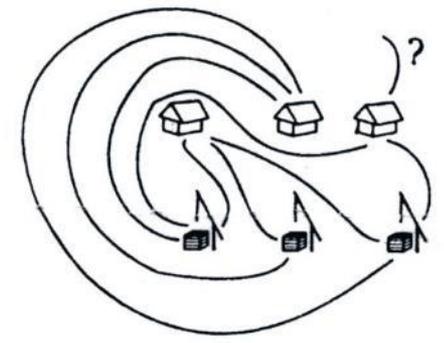
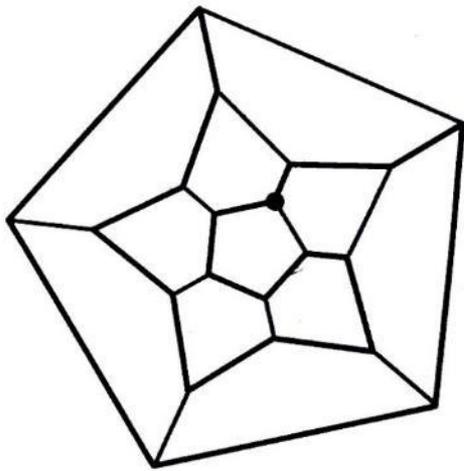
$$\sin 90^\circ = 1$$



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



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

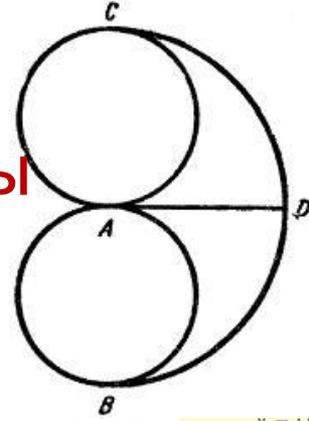


Графом называется ...

... множество точек и линий, связывающих эти точки, некоторые пары из которых соединены линиями.

вершины графа – это точки, рёбрами графа- линии, которые соединяют вершины

Степень вершины - число рёбер, выходящих из вершины.

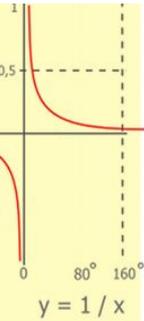


$y = \dots$

$2 \times 2 = 4$

$3 \times 3 = 9$

$4 \times 4 = 16$

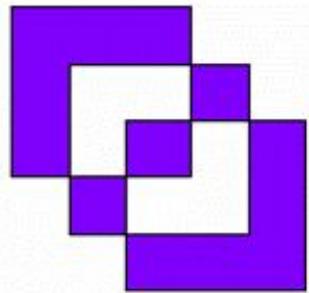


$\frac{1}{2} 500$

$\times 42$

$\frac{210}{+ 84}$

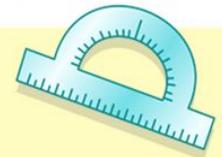
$\frac{105000}{}$



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

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

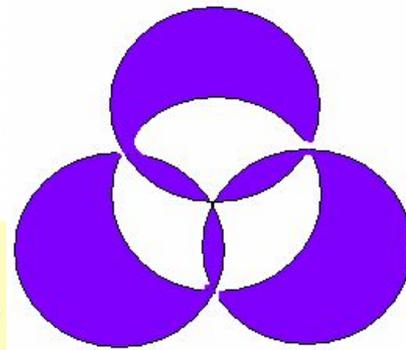
$\sin 90^\circ = 1$



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

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

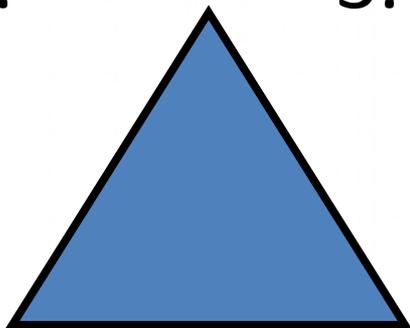
$(x+y)(x-y) = x^2 - y^2$



Начертите, не отрывая карандаш от бумаги и не проводя два раза по одной линии:

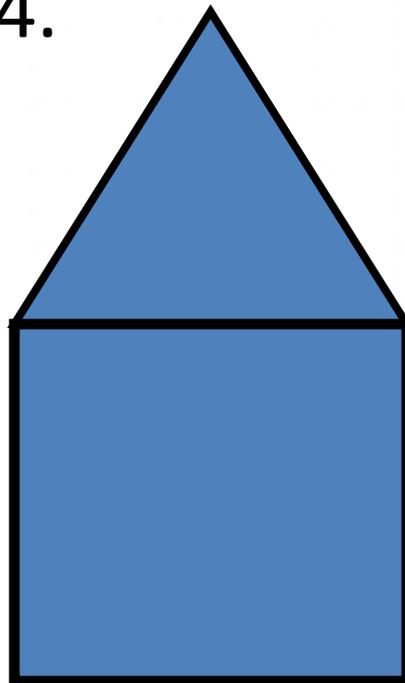
по одной линии:

1.

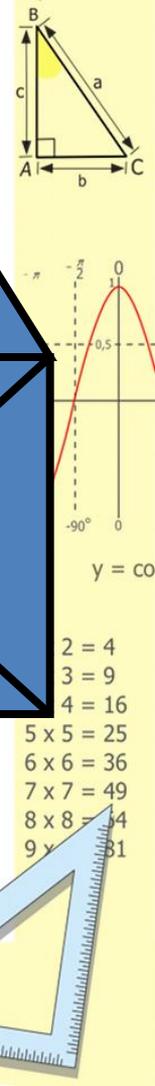
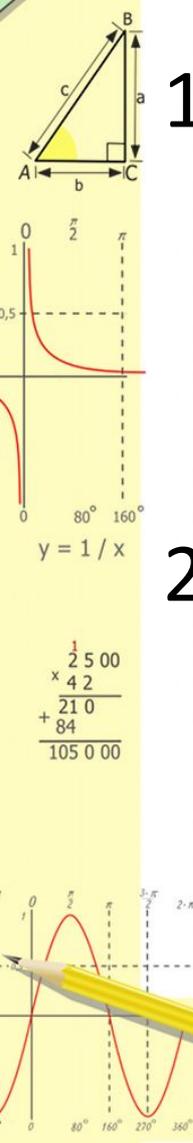


3.

4.



2.



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

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

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

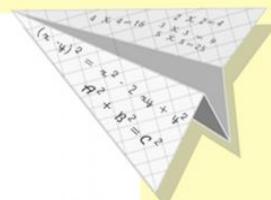
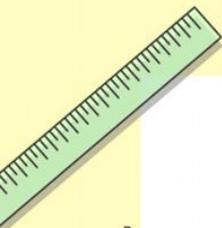


$$\begin{cases} y = \sin 90 \\ x = 25y + 45 \end{cases}$$

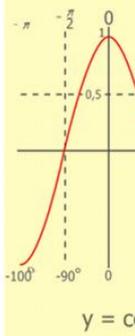
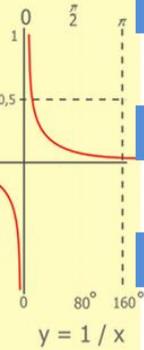
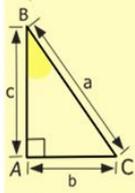
$$\begin{cases} y = 1 \\ x = 25 + 45 \\ \hline x = 70 \end{cases}$$

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

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

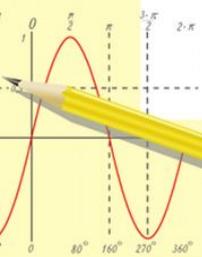


Фигура, которую можно нарисовать не отрывая карандаша от бумаги и не проводя одну и ту же линию дважды, называется уникарсальной.



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

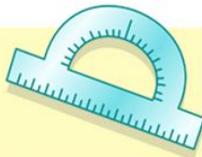
- 2 x 2 = 4
- 3 x 3 = 9
- 4 x 4 = 16
- 5 x 5 = 25
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- 8 x 8 = 64
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$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

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

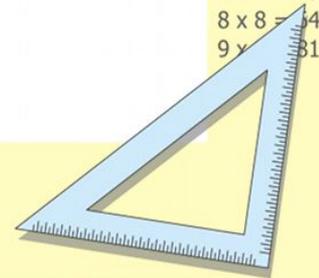
$$\sin 90^\circ = 1$$



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

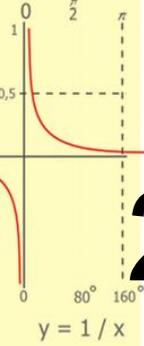
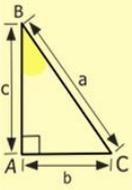
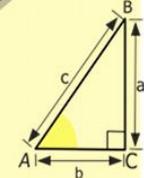
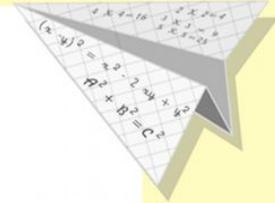
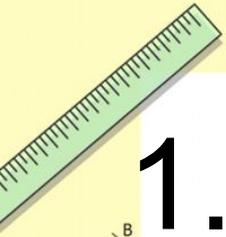
$$\begin{cases} y = 1 \\ x = 25 + 45 \\ \hline x = 70 \end{cases}$$

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



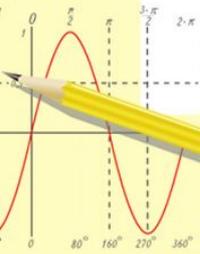
План:

1. Выяснить признаки фигуры, которую можно нарисовать;
2. Найти начальную точку;
3. Нарисовать всю фигуру



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

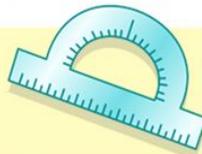
$$\begin{array}{l} 2 \times 2 = 4 \\ 3 \times 3 = 9 \\ 4 \times 4 = 16 \\ 5 \times 5 = 25 \\ 6 \times 6 = 36 \\ 7 \times 7 = 49 \\ 8 \times 8 = 64 \\ 9 \times 9 = 81 \end{array}$$



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

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

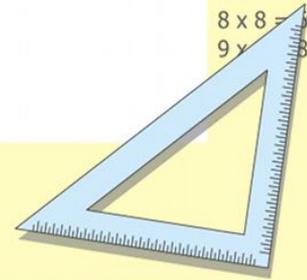
$$\sin 90^\circ = 1$$



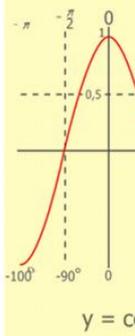
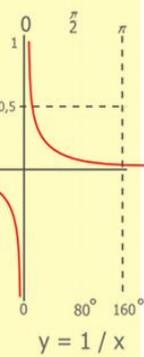
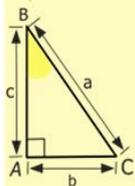
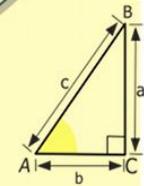
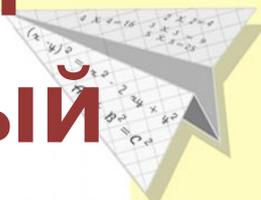
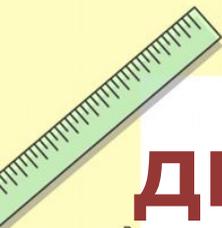
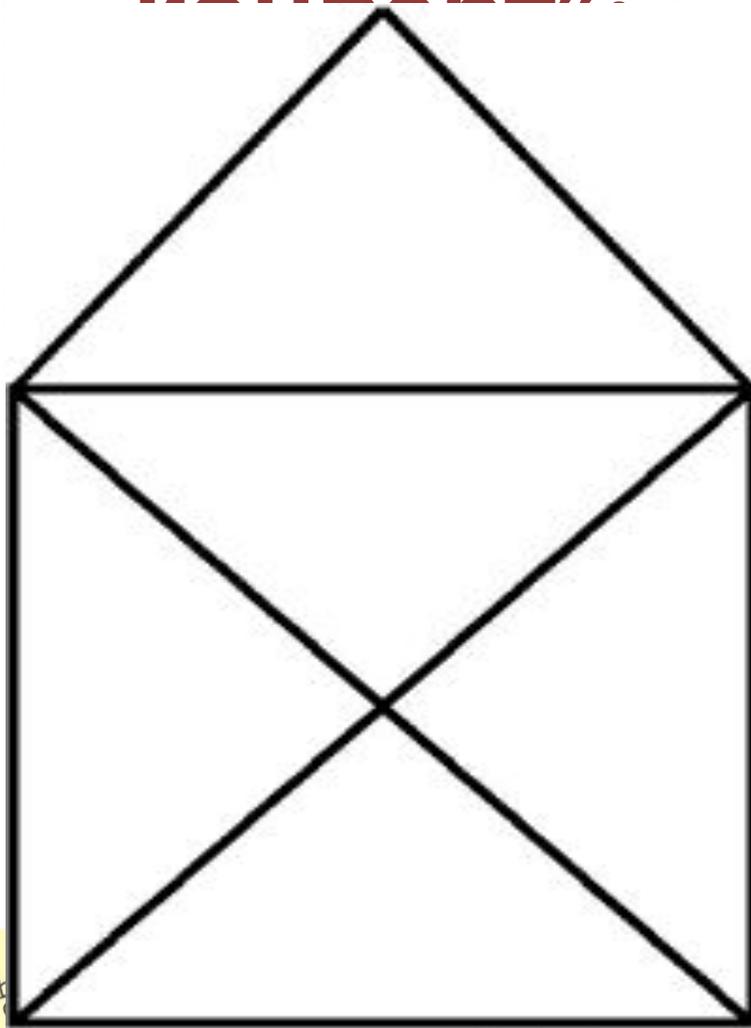
$$\begin{cases} y = \sin 90 \\ x = 25y + 45 \end{cases}$$

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

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



не проводя по одной линии дважды, начертить "открытый

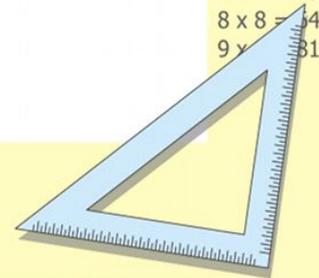
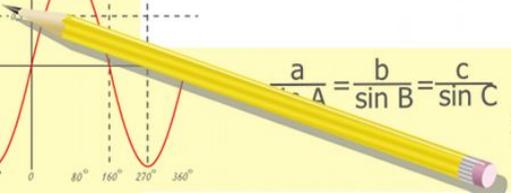


$$\begin{array}{r} 1 \\ 2500 \\ \times 42 \\ \hline 210 \\ + 84 \\ \hline 105000 \end{array}$$

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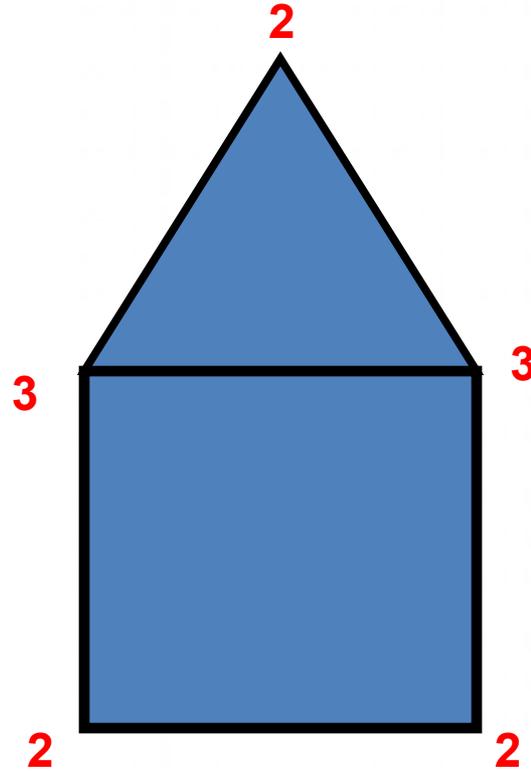
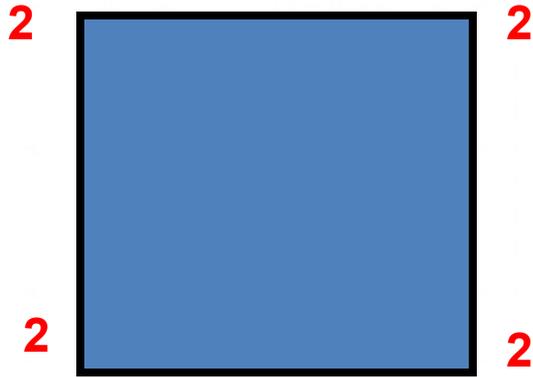
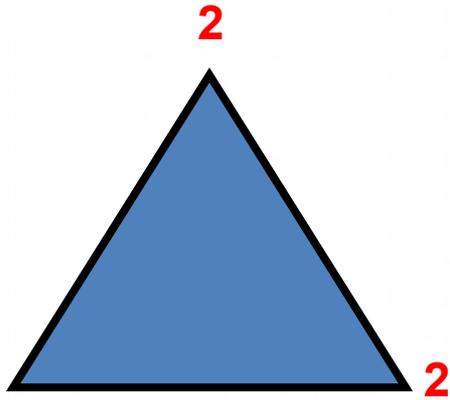
$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

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



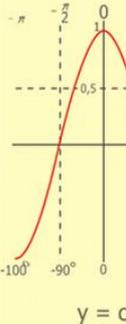
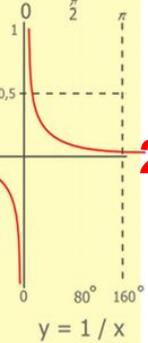
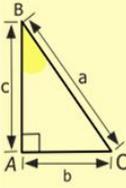
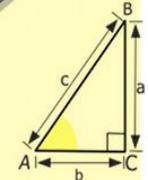
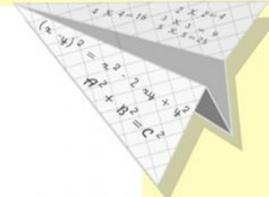
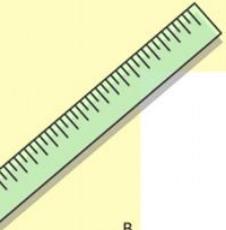
x = 70

С чем мы справились?



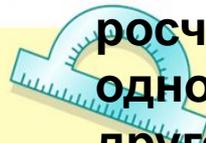
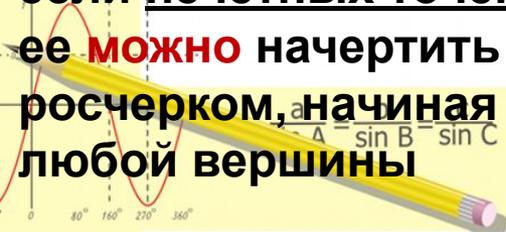
если нечетных точек в фигуре нет, то ее **МОЖНО** начертить одним росчерком, начиная вычерчивать с любой вершины

если в фигуре две нечетные точки, то ее **МОЖНО** начертить одним росчерком, начиная вычерчивать в одной из нечетных точек и закончив в другой



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

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



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

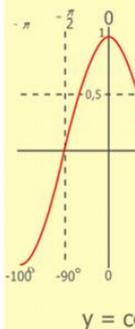
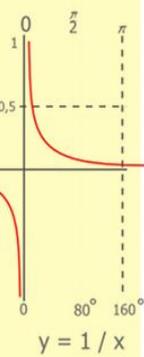
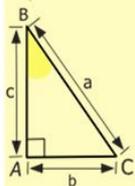
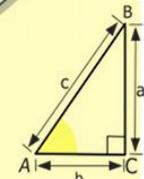
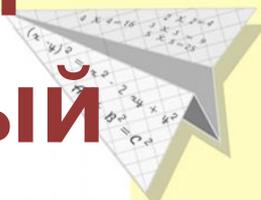
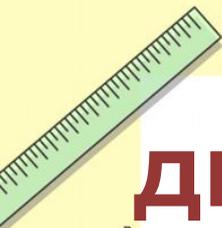
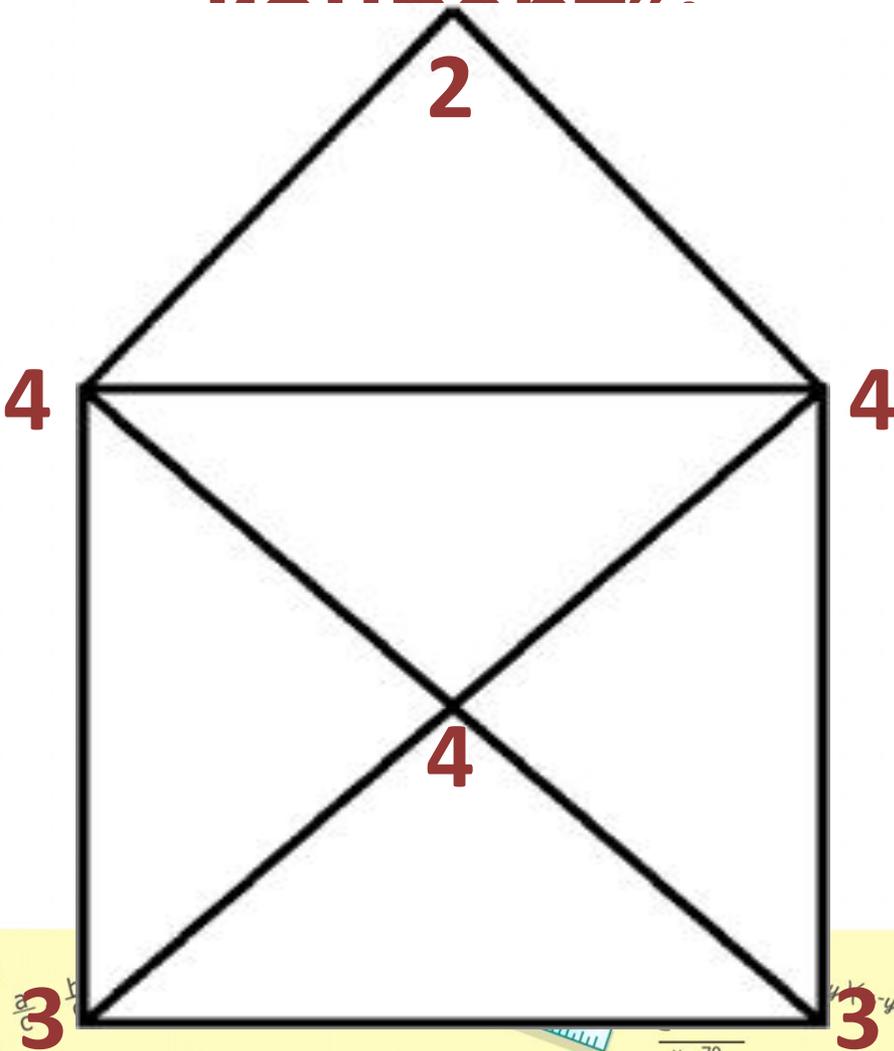
$$\begin{cases} y = \sin 90 \\ x = 25 + 45 \end{cases}$$

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

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

$$x = 70$$

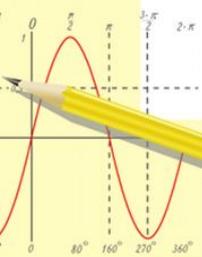
не проводя по одной линии
дважды, начертить "открытый



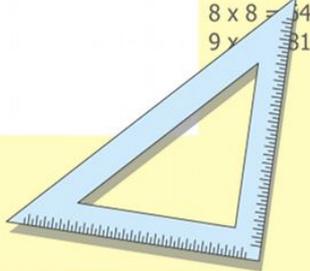
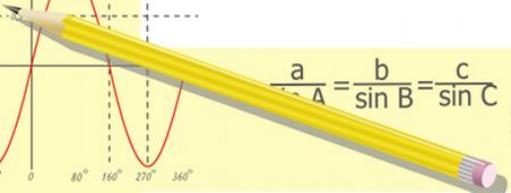
$$\begin{array}{r} 1 \\ 2500 \\ \times 42 \\ \hline 210 \\ + 84 \\ \hline 105000 \end{array}$$

- 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

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



$$(x-4)^2 = x^2 - 4^2$$



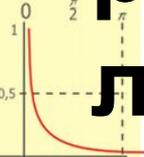
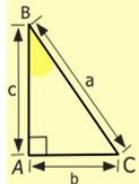
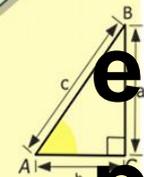
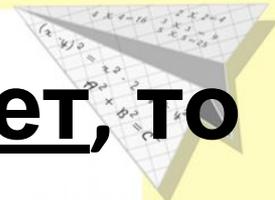
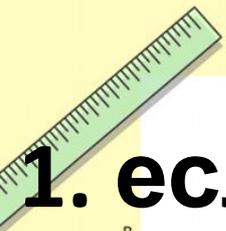
$$\overline{x=70}$$

Выводы:

1. если нечетных точек в фигуре нет, то ее можно начертить одним росчерком, начиная вычерчивать с любой вершины.

2. если в фигуре две нечетные точки, то ее можно начертить одним росчерком, начиная вычерчивать в одной из нечетных точек и закончив в другой.

3. если в фигуре больше двух нечетных точек то ?



$y = 1$

$y = \cos$

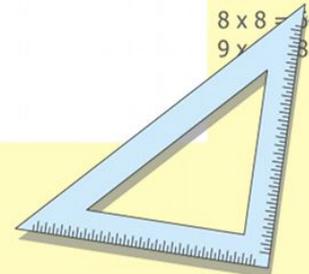
$$\begin{array}{r} 1 \\ \times 42 \\ \hline 210 \\ + 84 \\ \hline 10500 \end{array}$$

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

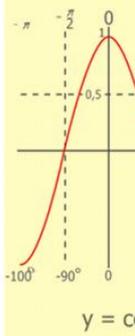
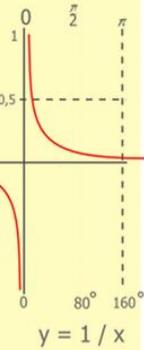
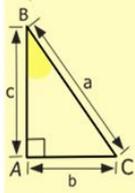
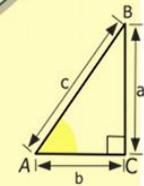
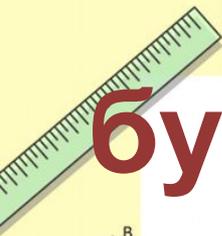
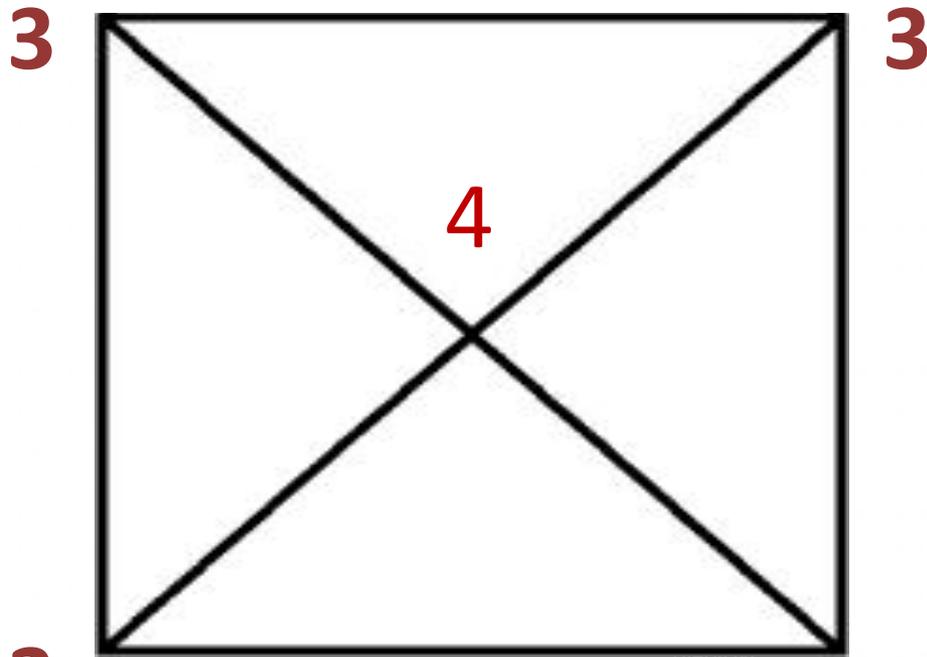


$$\begin{cases} y = \sin 90 \\ x = 25y + 45 \\ x = 25 + 45 \\ x = 70 \end{cases}$$

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

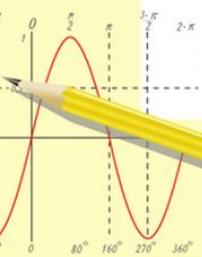


Не отрывая карандаша от бумаги и не проводя по одной линии дважды, начертить “закр́тый конверт”:



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

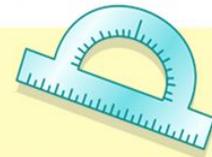
- 2 x 2 = 4
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$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

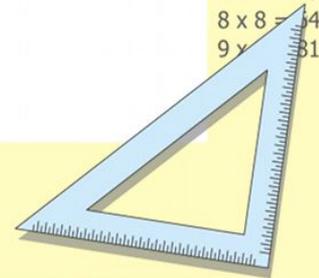
$$\frac{a}{c} + \frac{b}{c} = \frac{a+b}{c}$$

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



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

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



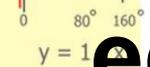
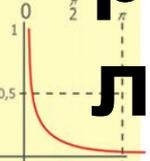
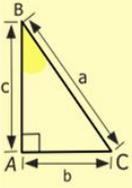
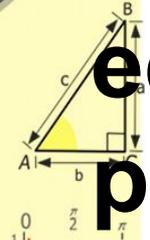
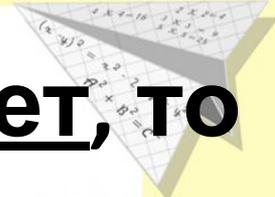
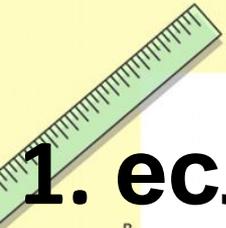
Выводы:

1. если нечетных точек в фигуре нет, то ее **можно** начертить одним росчерком, начиная вычерчивать с любой вершины.

2. если в фигуре две нечетные точки, то ее **можно** начертить одним росчерком, начиная вычерчивать в одной из нечетных точек и закончив в другой.

3. если в фигуре больше двух

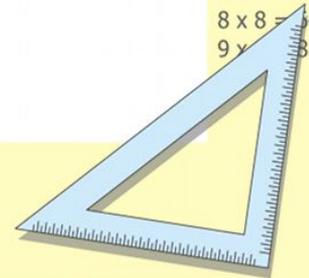
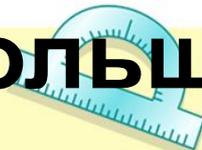
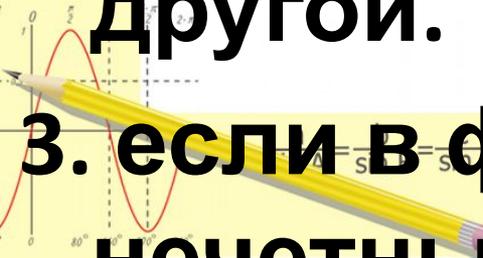
нечетных точек, то ее **нельзя**



y = cos

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

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

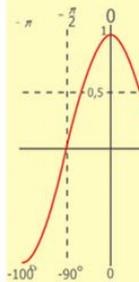
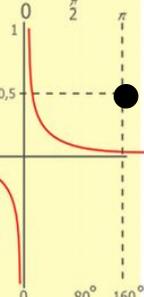
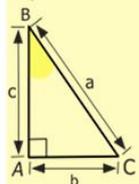
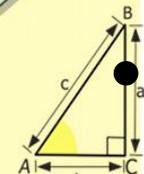
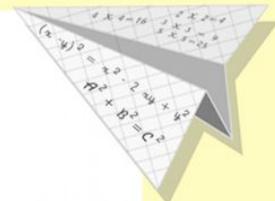
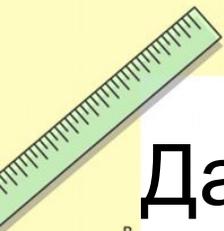


$$\begin{cases} y = \sin 90 \\ x = 25y + 45 \\ x = 25 + 45 \end{cases} \quad (x-y)^2 = x^2 - y^2$$

Физкультминутка

Давайте немного передохнем.

- Поднимает руки класс – это «раз».
- Повернулась голова – это «два».
- Руки вниз, вперед смотри – это «три».
- Руки в стороны пошире развернули на «четыре»,
- С силой их к плечам прижать – это «пять».
- Всем ребятам надо сесть – это «шесть».

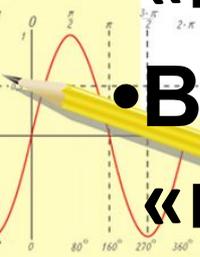


$$y = 1/x$$

$$y = \cos$$

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

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



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

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

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

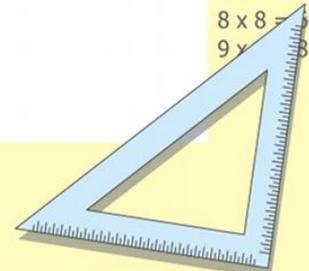


$$\begin{cases} y = \sin 90^\circ \\ x = 25y + 45 \end{cases}$$

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

$$x = 70$$

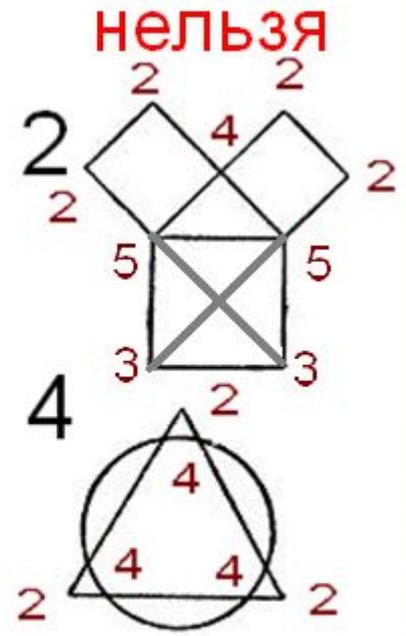
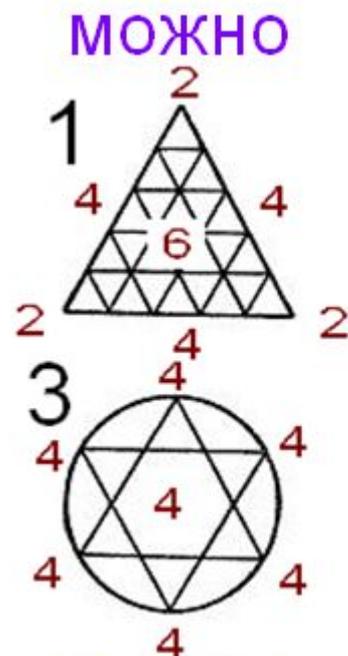
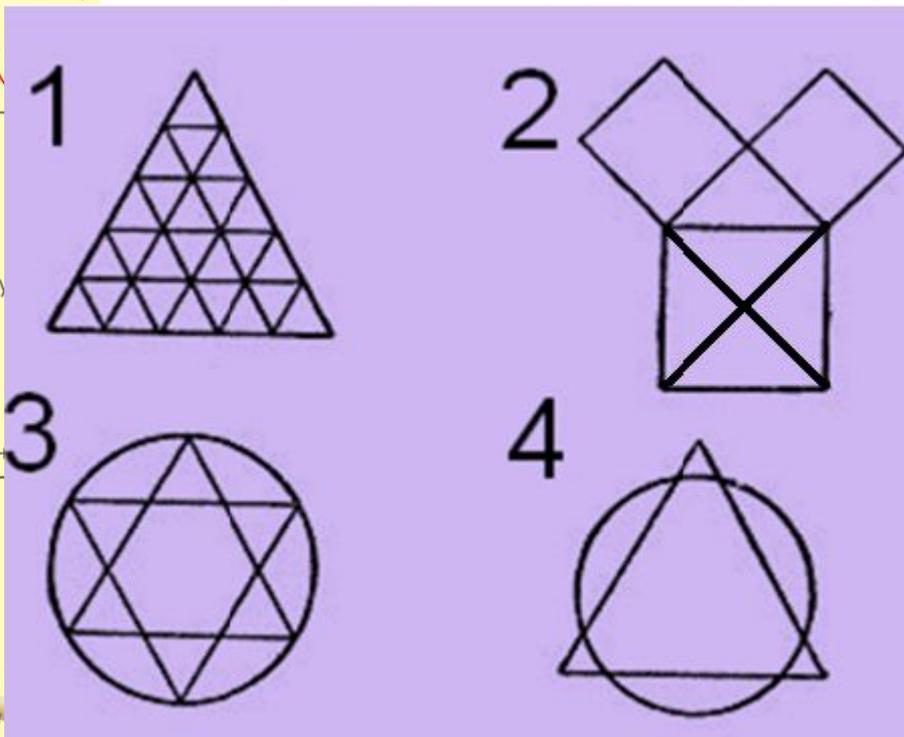
$$(x+y)(x-y) = x^2 - y^2$$



Самостоятельная работа:

Какие фигуры можно нарисовать одним росчерком?

Образец:



МОЖНО

МОЖНО

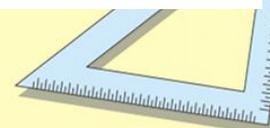
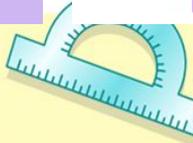
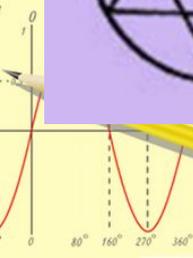
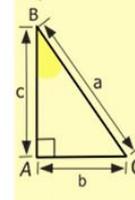
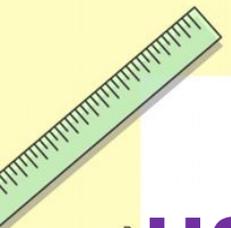
$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

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

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

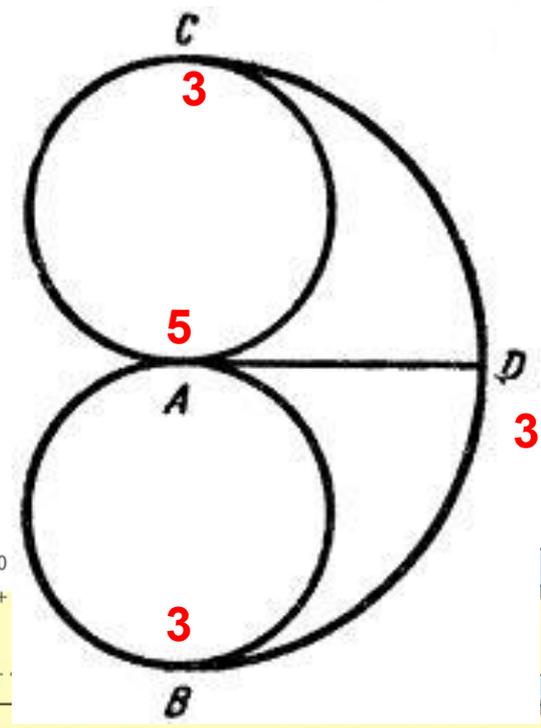
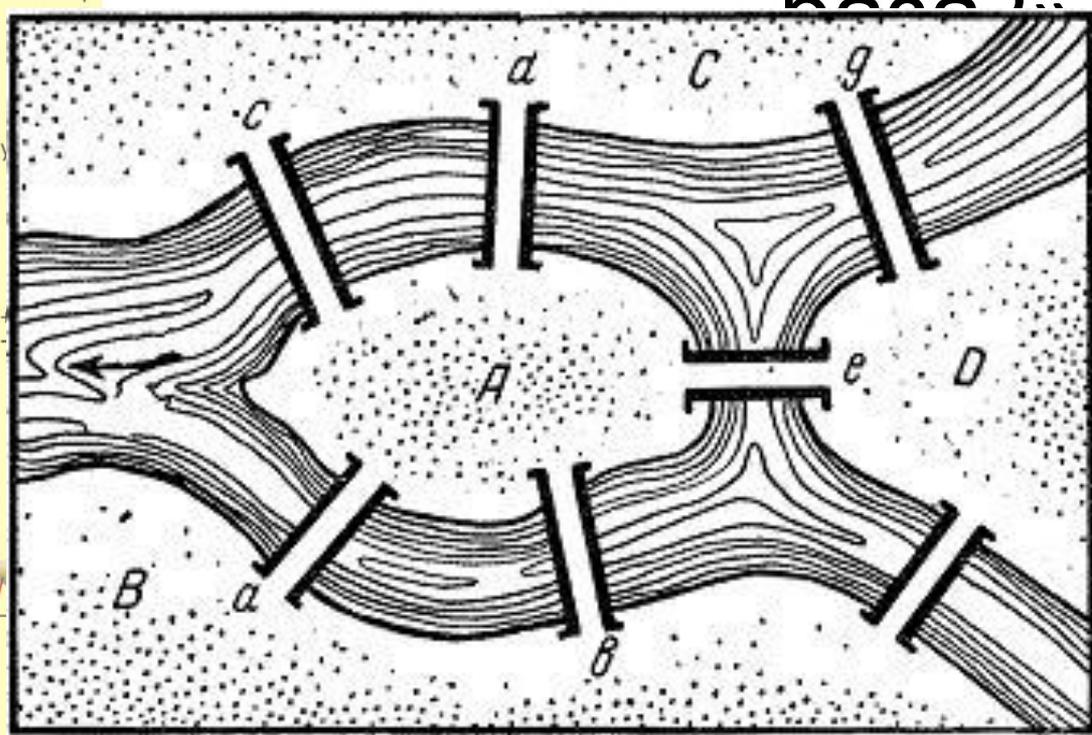
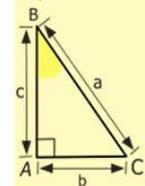
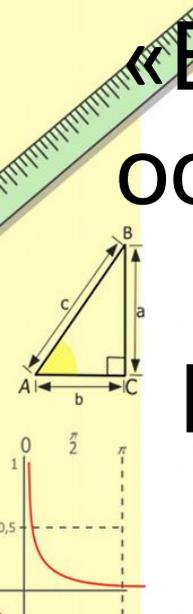
$$\begin{cases} y = 1 \\ x = 25 + 45 \\ x = 70 \end{cases}$$

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



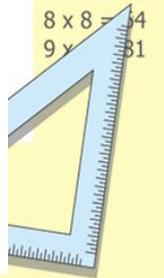
Задача Эйлера:

« В Кенигсберге река, омывающая два острова, делится на два рукава, через которые перекинута семь мостов. Можно ли обойти все эти мосты, не побывав ни на одном из них более



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

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



«Мышление начинается с удивления», -
заметил 2500 лет назад Аристотель.

Спасибо за
Внимание!

«Чувство удивления – могучий
источник желания знать: от удивления
к знаниям – один шаг»

Сухомлинский

Математика замечательный предмет для удивления!

