MaratonaCIn

SELETIVA 2020

GEOMETRIA

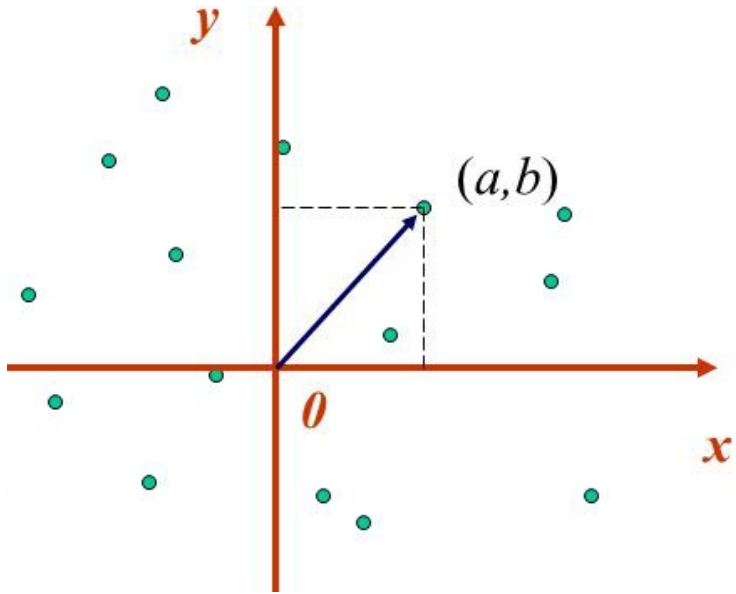
Aula 10

GEOMETRIA

MaratonaCIn

Vetor

- Coordenadas
  - (a, b)
  - (x, y, z)
  - vector<tipo> X



GEOMETRIA

MaratonaCIn

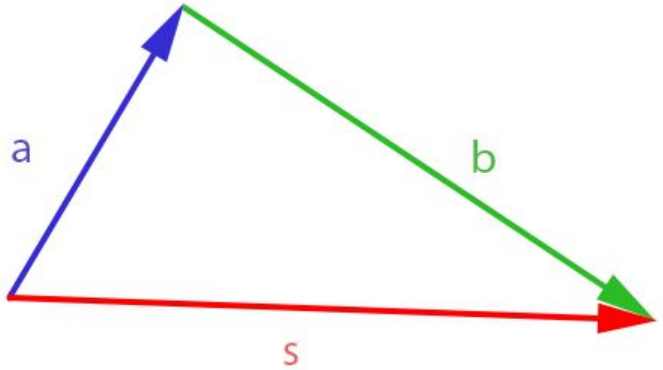
Vetor

- Soma de vetores

$a + b = (a.x + b.x, a.y + b.y)$

- Subtração de vetores

$a - b = (a.x - b.x, a.y - b.y)$



GEOMETRIA

MaratonaCIn

Vetor

- Multiplicação por escalar

a * k = (a.x * k, a.y * k)

- Divisão por escalar

a / k = (a.x / k, a.y / k)

GEOMETRIA

Vetor

- Magnitude

$$\sqrt{x^2+y^2} \qquad \text{// Vetores 2D}$$

$$\sqrt{x^2+y^2+z^2} \qquad \text{// Vetores 3D}$$

GEOMETRIA

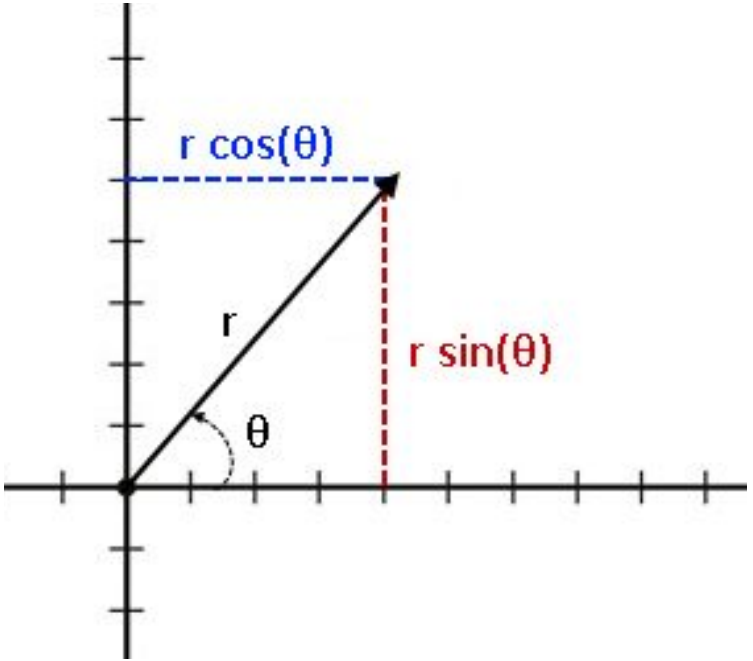
MaratonaCIn

Vetor

- Ângulo

Θ = atan2(y, x)

// Retorna de -π a π



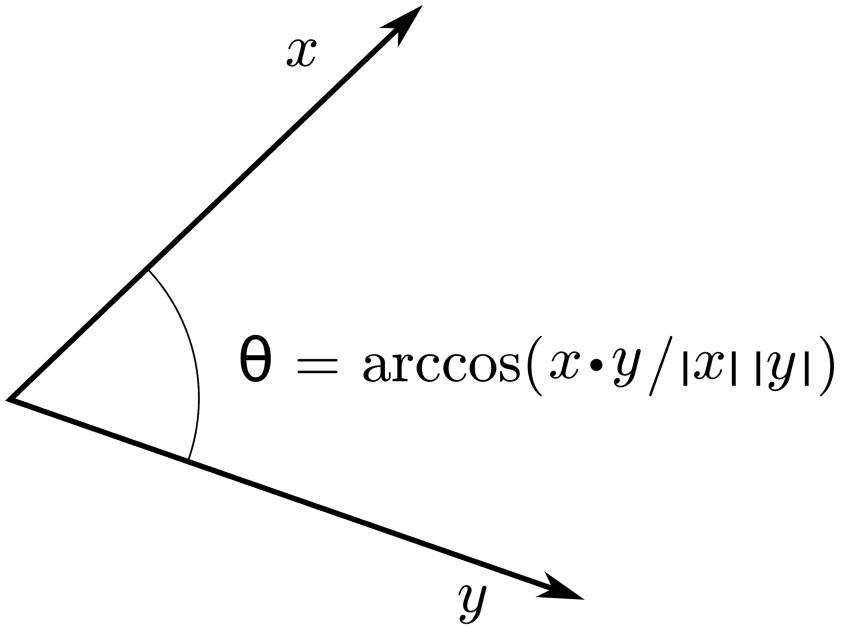
GEOMETRIA

MaratonaCIn

Vetor

- Produto Escalar

a • b = (a.x * b.x) + (a.y * b.y)



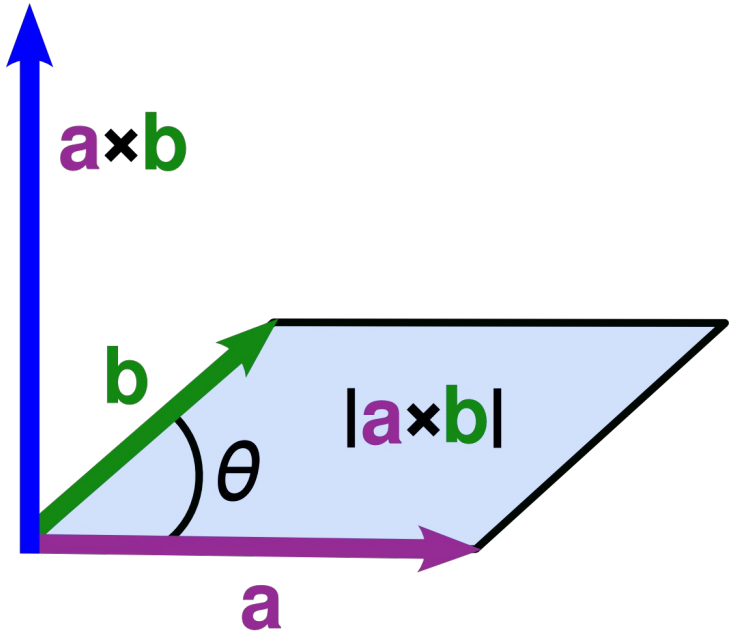
GEOMETRIA

MaratonaCIn

Vetor

- Produto Vetorial

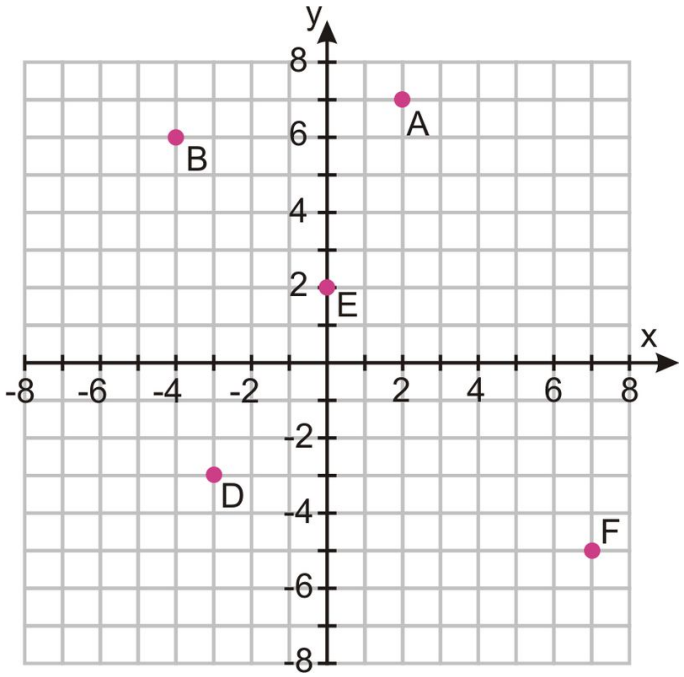
a x b = (a.x * b.y) - (a.y * b.x)



GEOMETRIA

MaratonaCIn

Ponto



GEOMETRIA

MaratonaCIn

Ponto

```
ld x, y;
PT(ld x = 0, ld y = 0): x(x), y(y) {}

PT operator + (const PT P){
    return PT(x + P.x, y + P.y);}
PT operator - (const PT P){
    return PT(x-P.x, y-P.y);}
```

GEOMETRIA

MaratonaCIn

Ponto

```
PT operator * (const ld d){
    return PT(x*d, y*d);}
PT operator / (const ld d){
    return PT(x/d, y/d);}

ld operator * (const PT P){
    return x*P.x + y*P.y;}
ld operator ^ (const PT P){
    return x*P.y - y*P.x;}
```

GEOMETRIA

MaratonaCIn

Ponto

```
ld dist(){
    return sqrt(x*x+y*y);}
ld angle(){
    ld a = atan2l(y, x);
    if(a<0) a += 2*PI;
    return a;}
```

GEOMETRIA

Ponto

- Distância euclidiana entre P e Q

(P-Q).dist()

GEOMETRIA

Ponto

- Distância de Manhattan entre P e Q

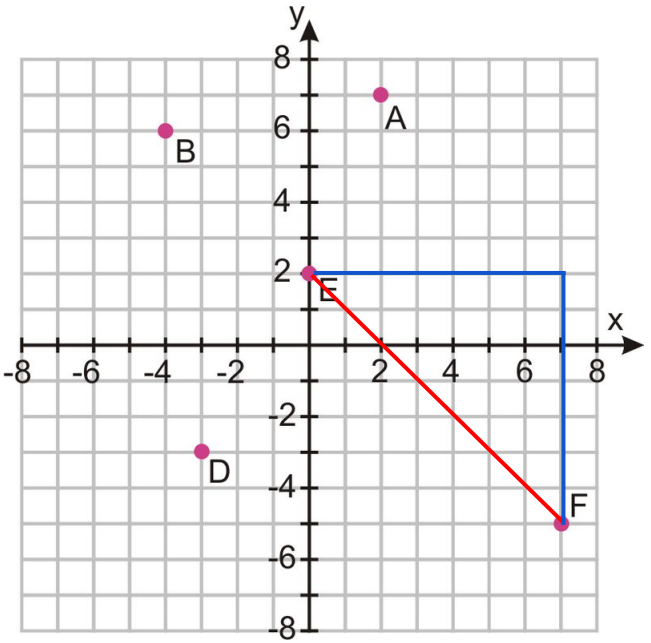
abs(P.x-Q.x) + abs(P.y-Q.y)

GEOMETRIA

MaratonaCIn

Ponto

- Distância euclidiana
- Distância de Manhattan

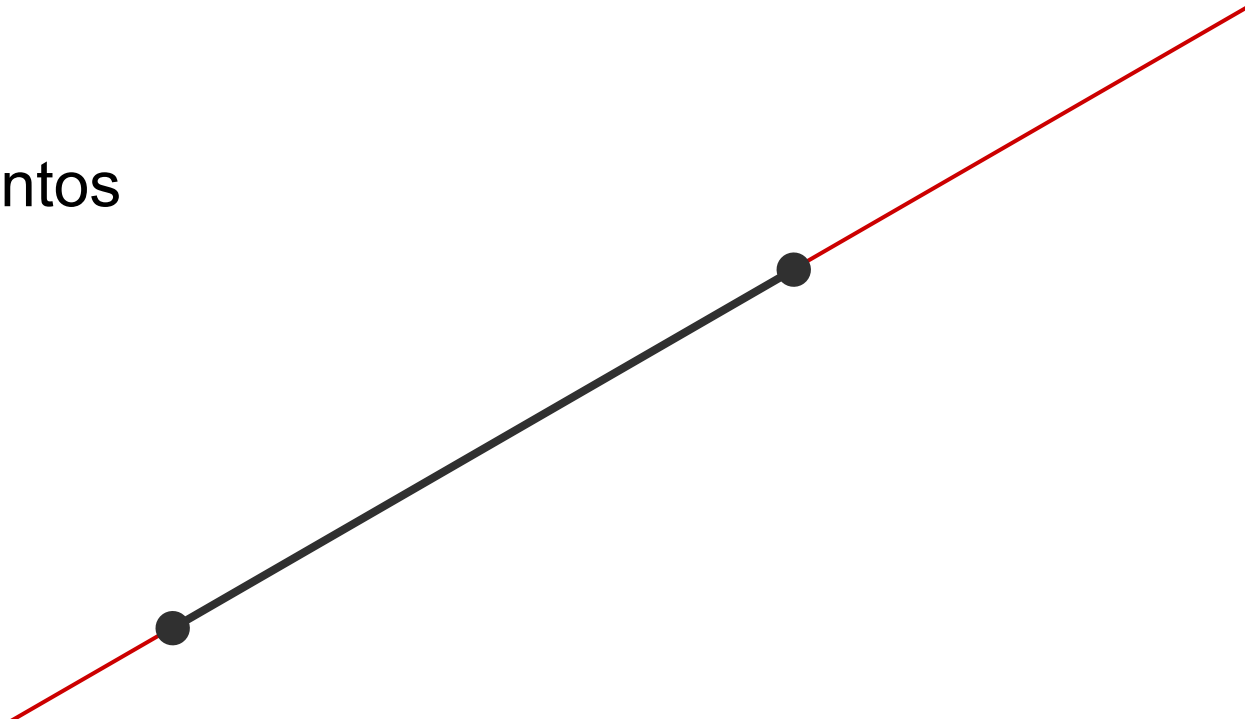


GEOMETRIA

MaratonaCIn

Reta

- Dois pontos distintos
  - A
  - B



GEOMETRIA

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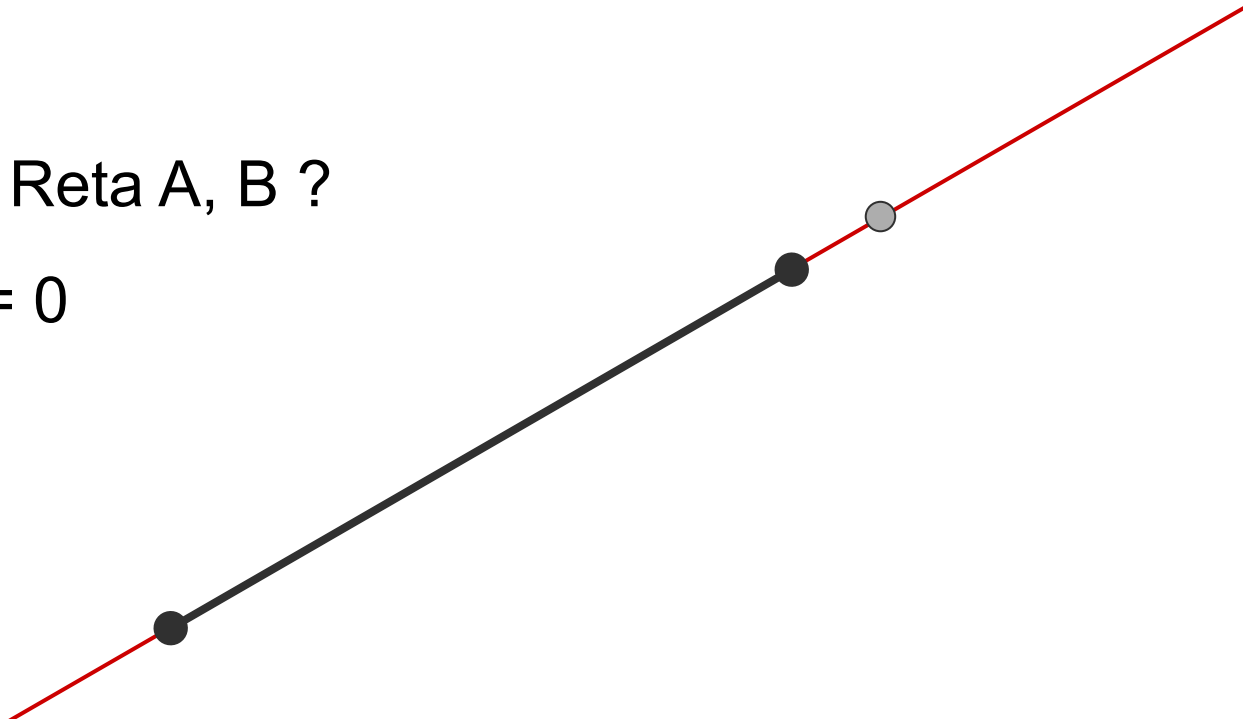
Reta

- Ponto C sobre a Reta A, B ?

  (C - A) ^ (B - A) = 0



GEOMETRIA

MaratonaCIn

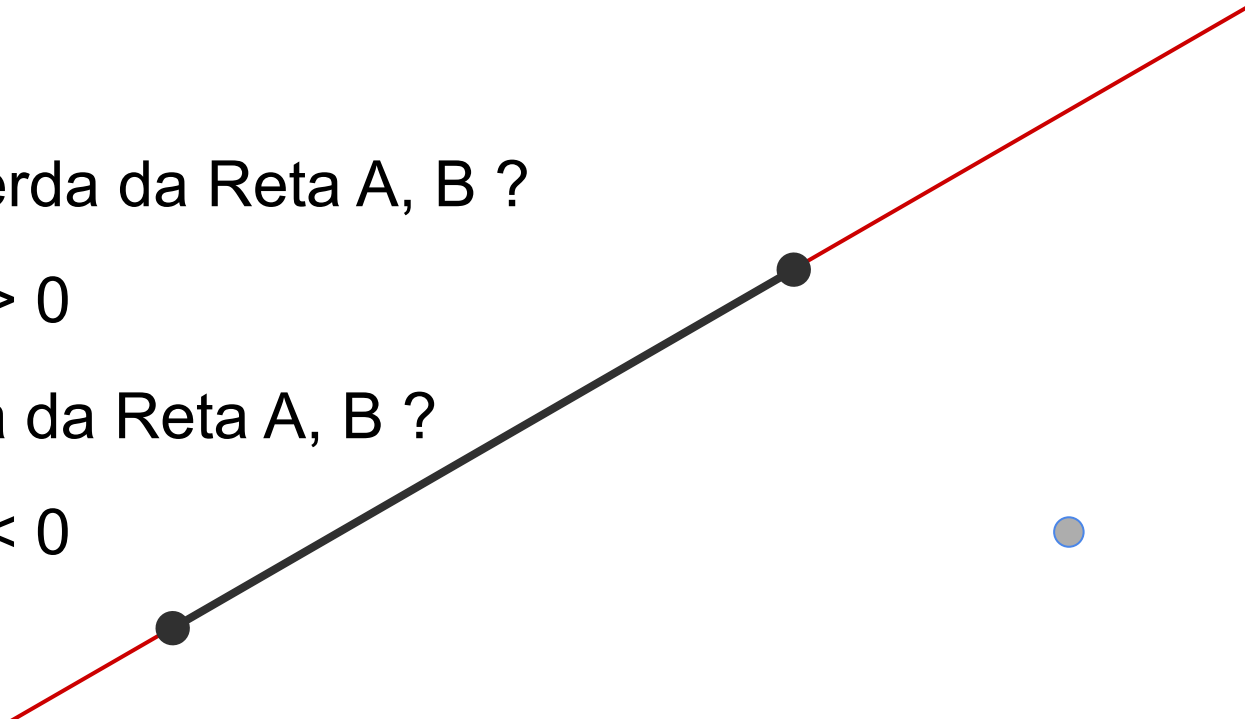
Reta

- Ponto C à esquerda da Reta A, B ?

  (C - A) ^ (B - A) > 0

- Ponto C à direita da Reta A, B ?

  (C - A) ^ (B - A) < 0



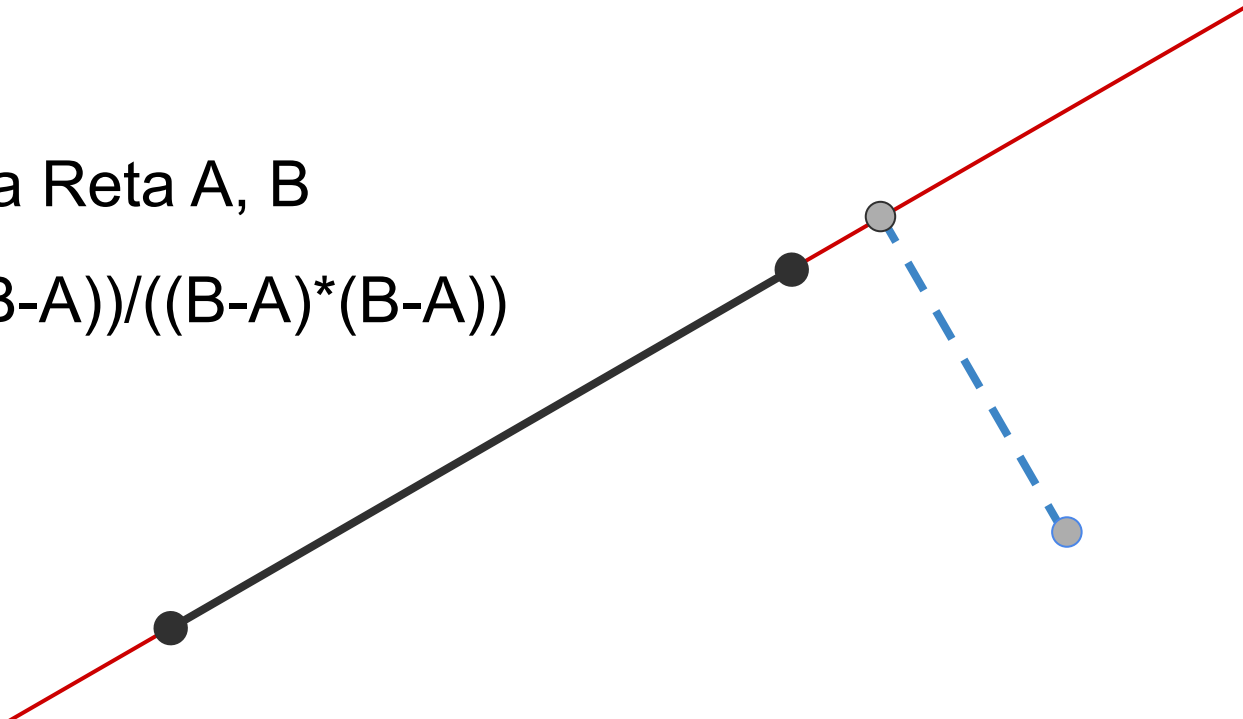
GEOMETRIA

MaratonaCIn

Reta

- Projeção de C na Reta A, B

A + (B-A) * ((C-A)*(B-A))/((B-A)*(B-A))



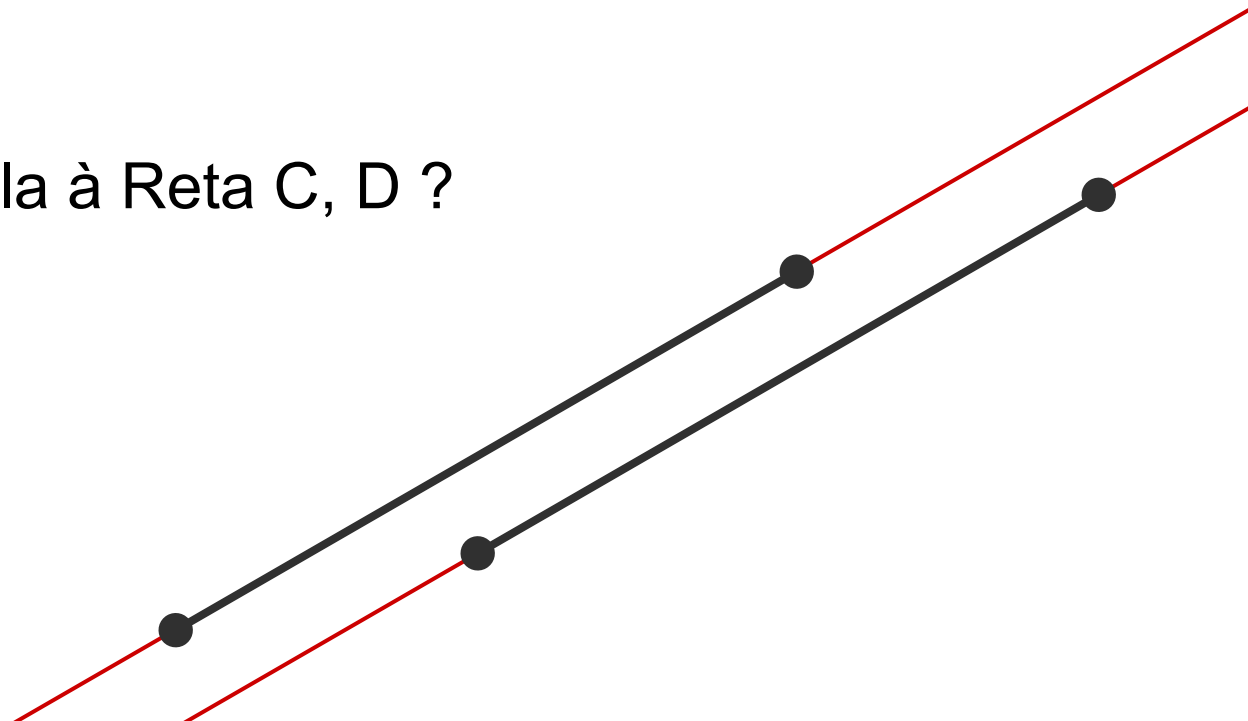
GEOMETRIA

MaratonaCIn

Reta

- Reta A, B paralela à Reta C, D ?

  (B-A)^(C-D) = 0



GEOMETRIA

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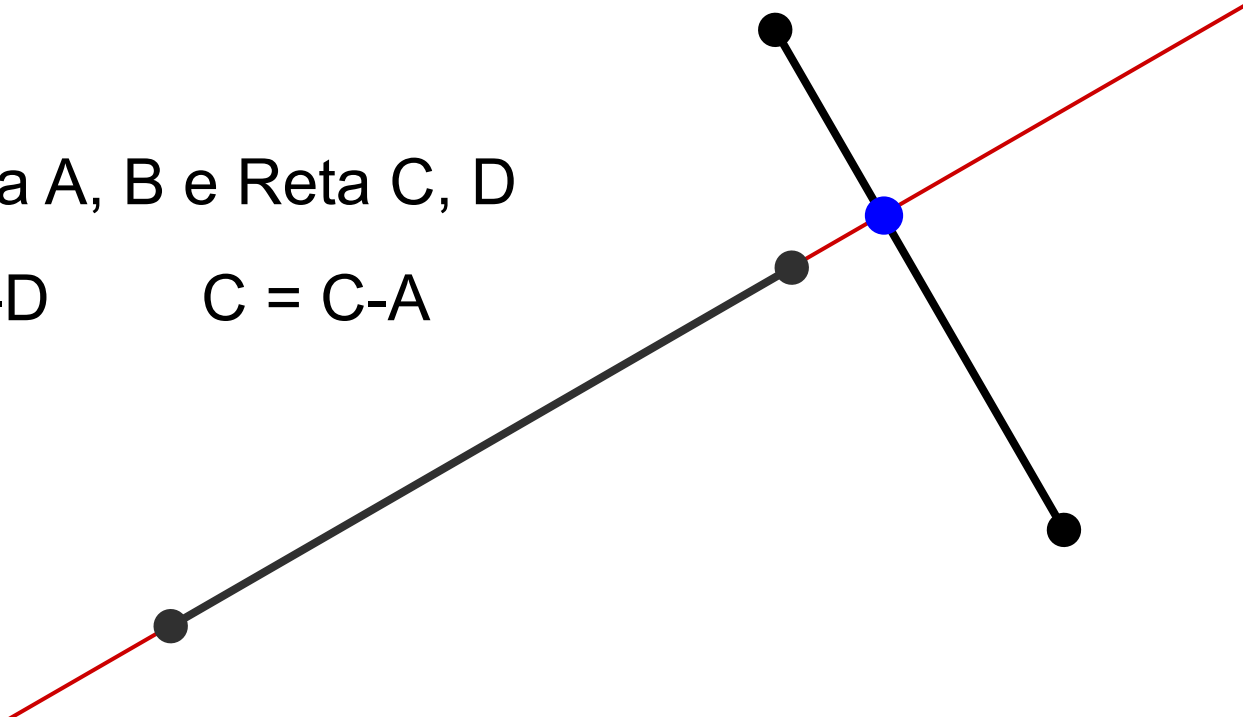
Reta

- Cruzamento Reta A, B e Reta C, D

B = B-A D = C-D C = C-A

A + B*(C^D)/(B^D)

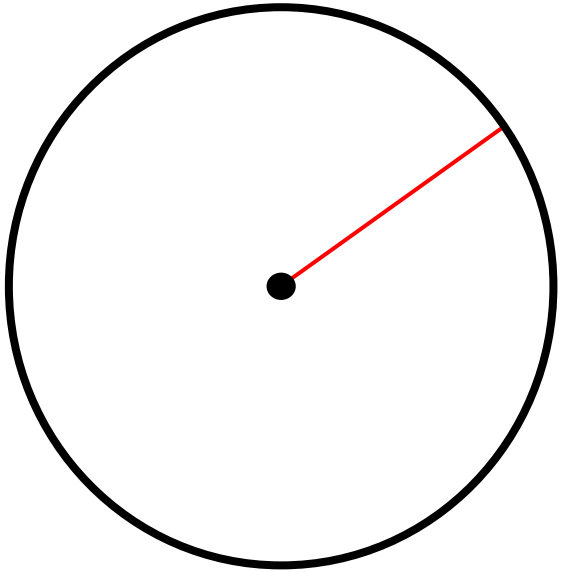


GEOMETRIA

MaratonaCIn

Círculo

- Centro
  - P
- Raio
  - R



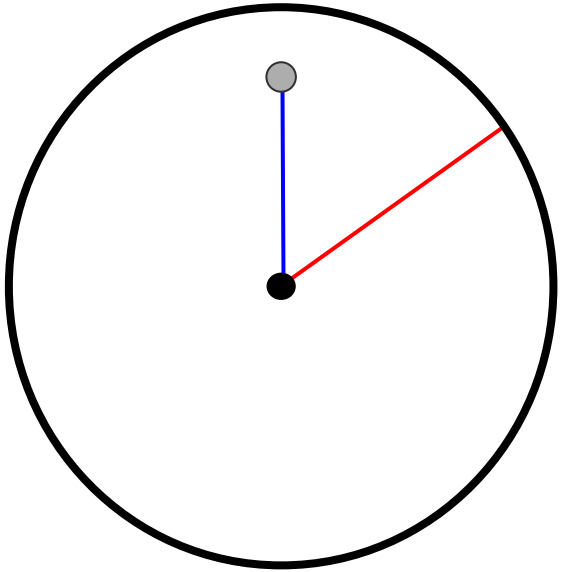
GEOMETRIA

MaratonaCIn

Círculo

- Ponto Q dentro do círculo C ?

  D < R



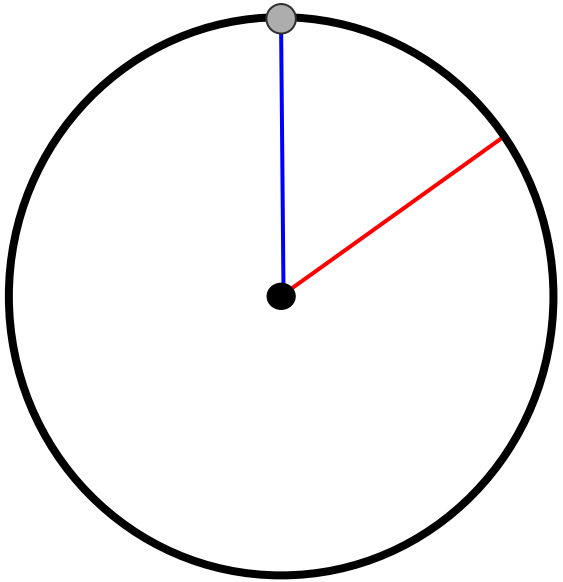
GEOMETRIA

MaratonaCIn

Círculo

- Ponto Q dentro do círculo C ?

  D = R



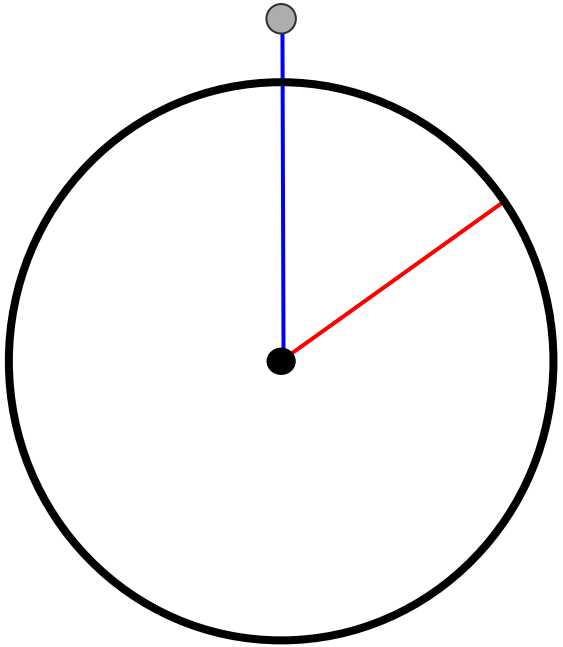
GEOMETRIA

MaratonaCIn

Círculo

- Ponto Q dentro do círculo C ?

  D > R

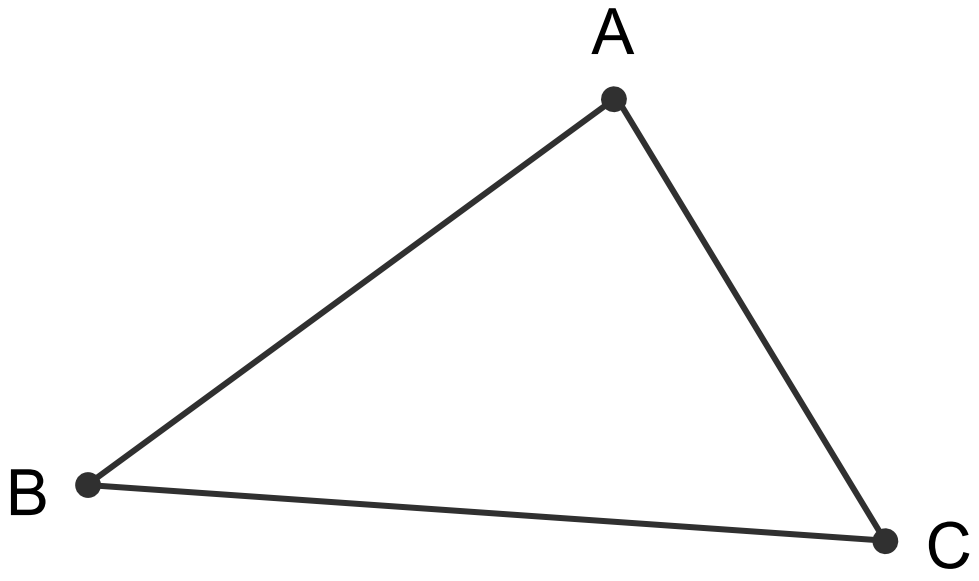


GEOMETRIA

MaratonaCIn

Triângulo

- 3 pontos
  - A
  - B
  - C



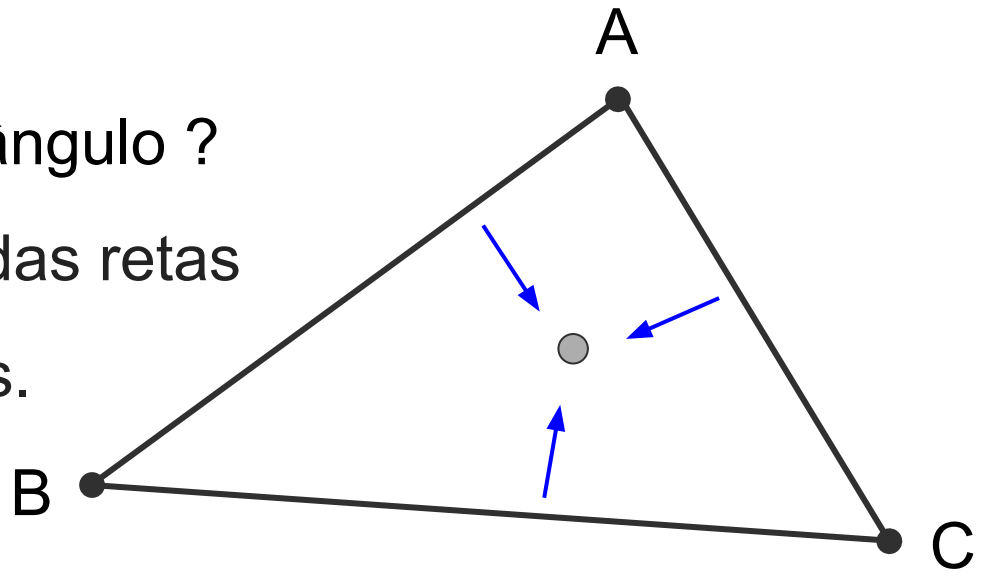
GEOMETRIA

MaratonaCIn

Triângulo

- Ponto dentro do triângulo ?

À direita ou esquerda das retas que compõem os lados.

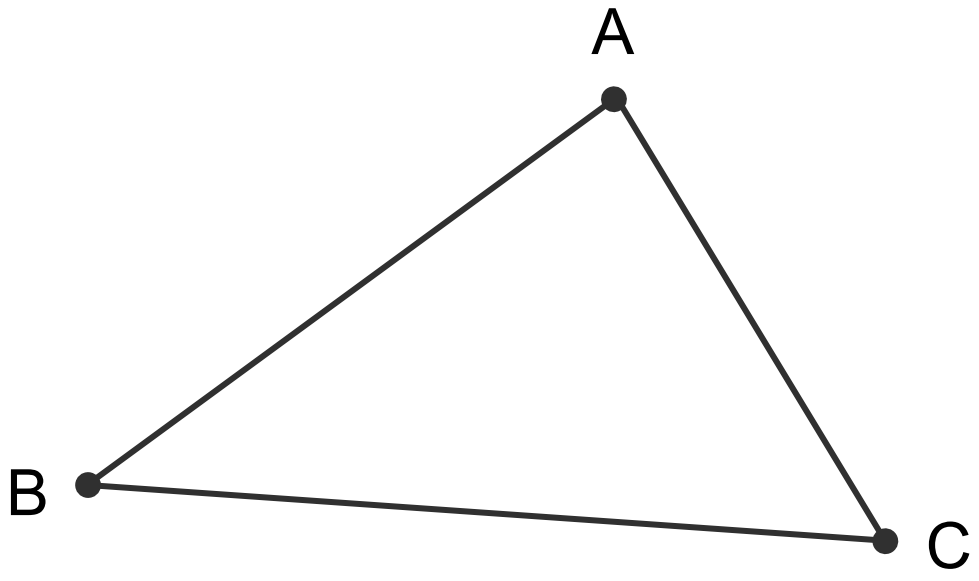


GEOMETRIA

MaratonaCIn

Triângulo

- Área
  - |(B-A)^(C-A)| /2

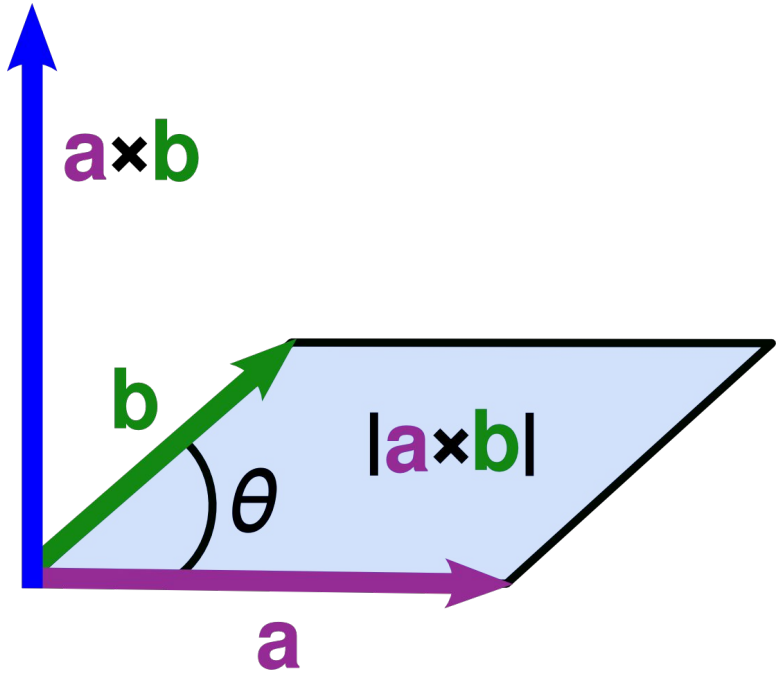


GEOMETRIA

MaratonaCIn

Triângulo

- Área
  - |(B-A)^(C-A)| /2

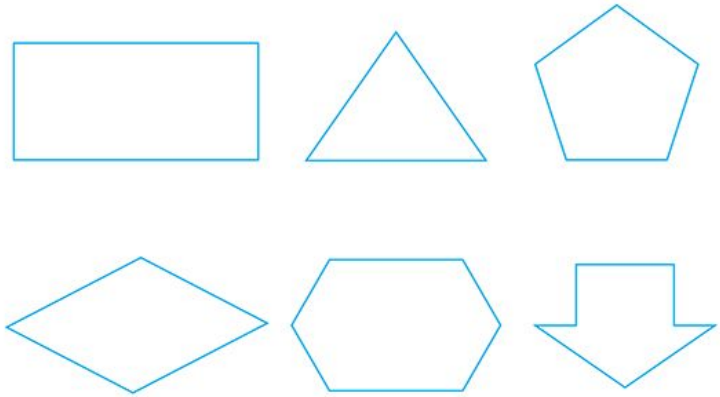


GEOMETRIA

MaratonaCIn

Polígonos

- Pontos que formam o polígono
  - Vetor de pontos P

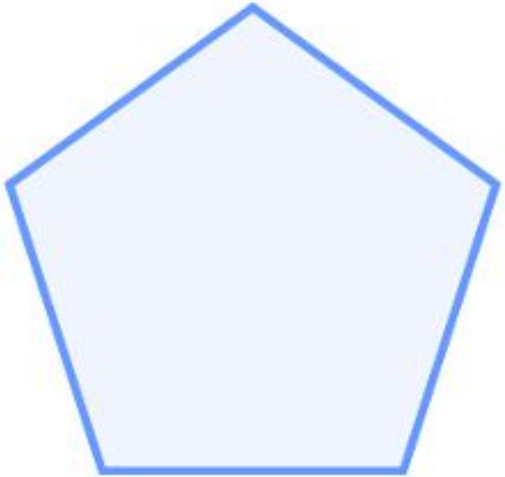


GEOMETRIA

MaratonaCIn

Polígonos

- Convexos x Côncavos

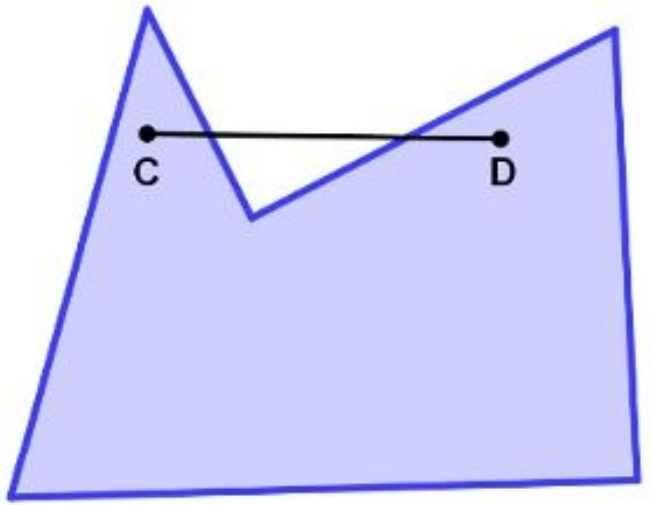


GEOMETRIA

MaratonaCIn

Polígonos

- Convexos x Côncavos

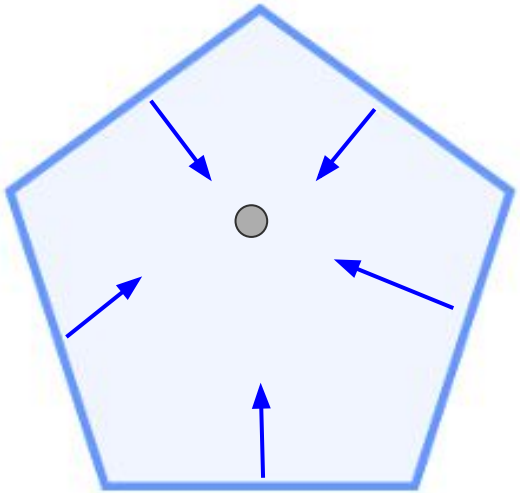


GEOMETRIA

MaratonaCIn

Polígonos

- Ponto dentro do polígono convexo ?
  - Mesma estratégia do triângulo



GEOMETRIA

MaratonaCIn

Polígonos

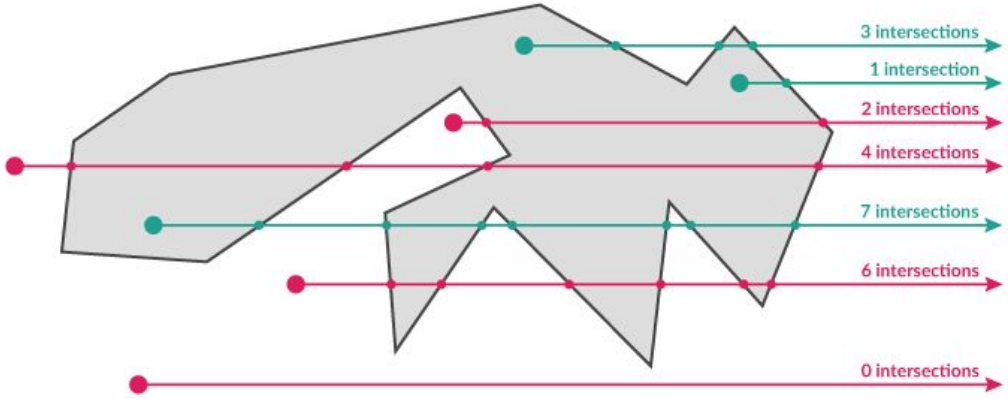
- Ponto dentro do polígono convexo ?

GEOMETRIA

MaratonaCIn

Polígonos

- Ponto dentro do polígono ?

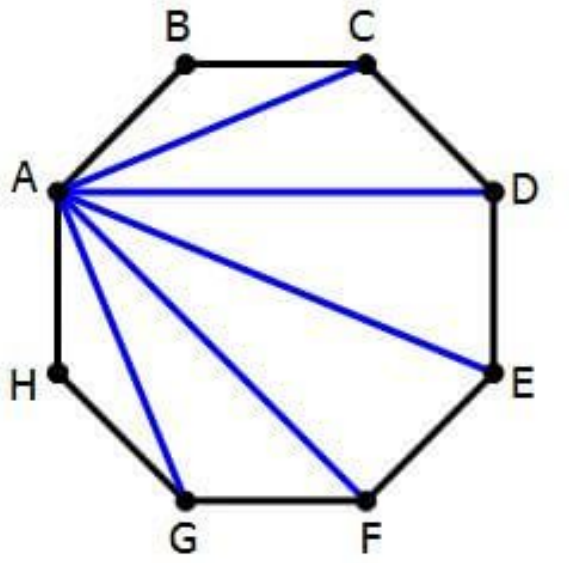


GEOMETRIA

MaratonaCIn

Polígonos

- Área do polígono

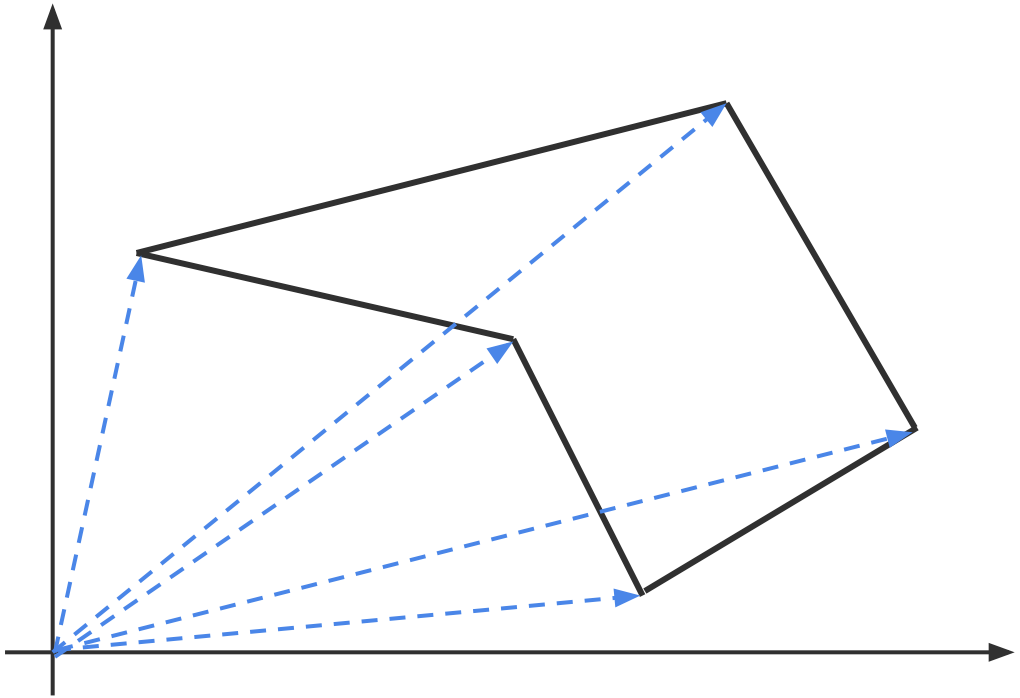


GEOMETRIA

MaratonaCIn

Polígonos

- Área do polígono

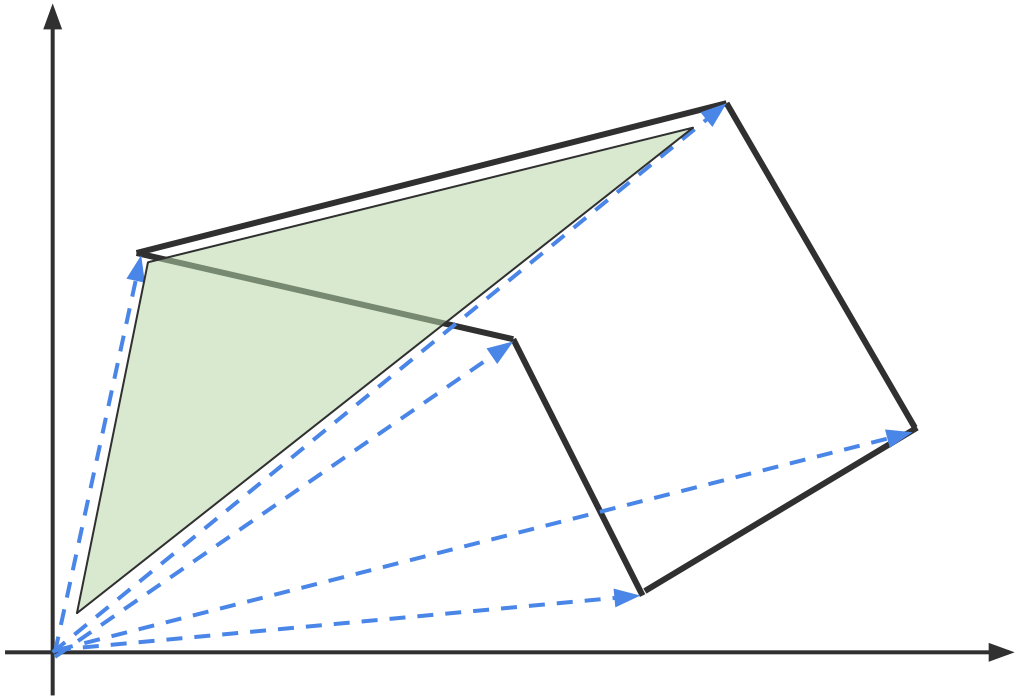


GEOMETRIA

MaratonaCIn

Polígonos

- Área do polígono

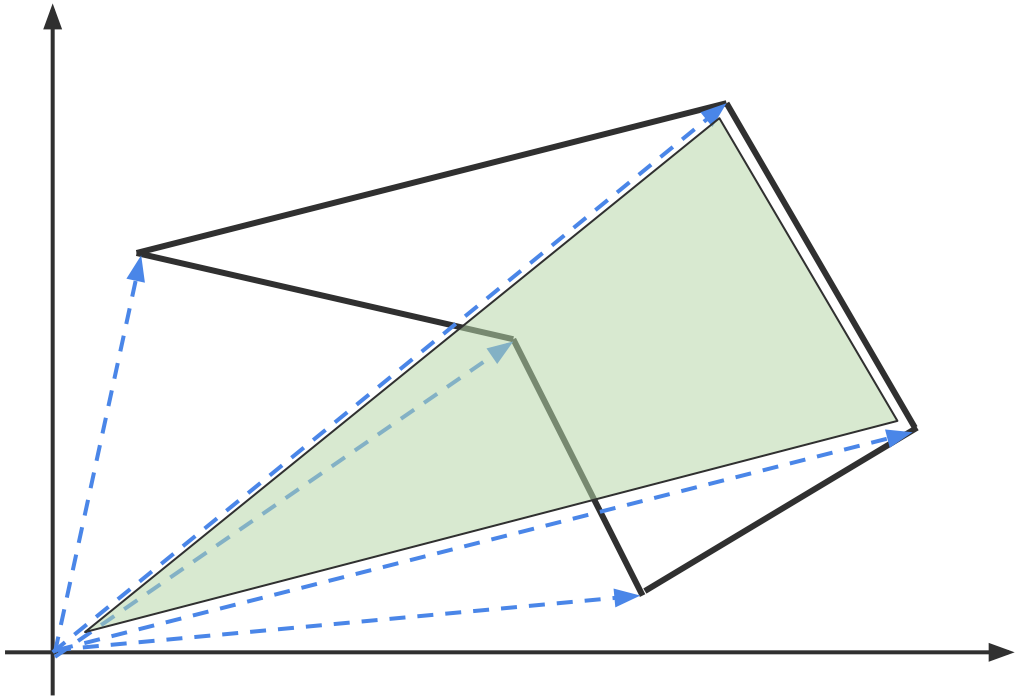


GEOMETRIA

MaratonaCIn

Polígonos

- Área do polígono

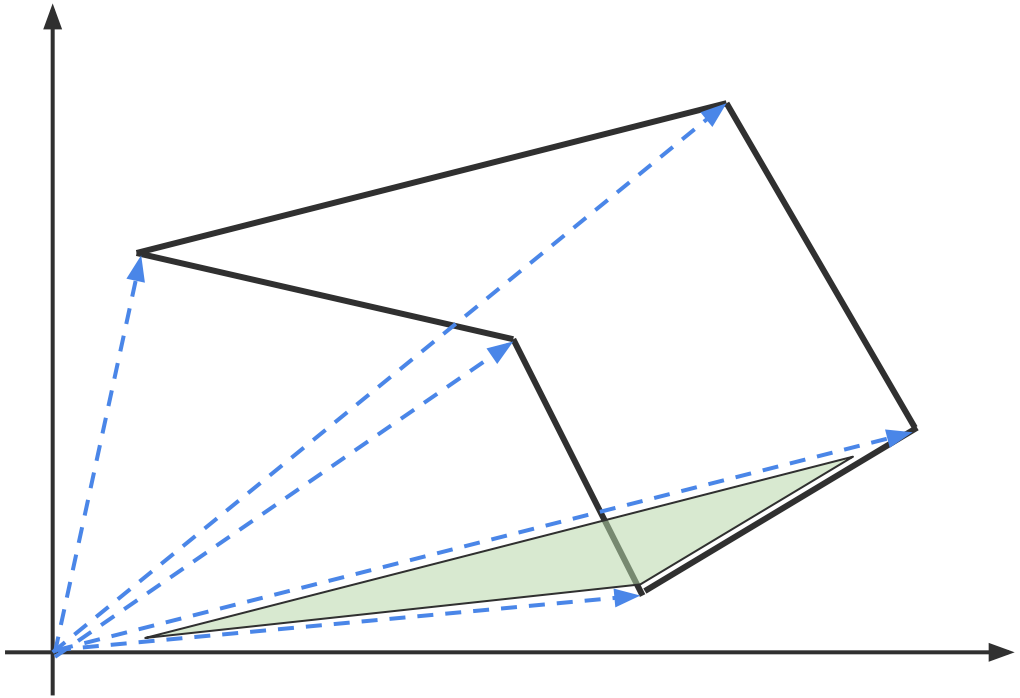


GEOMETRIA

MaratonaCIn

Polígonos

- Área do polígono

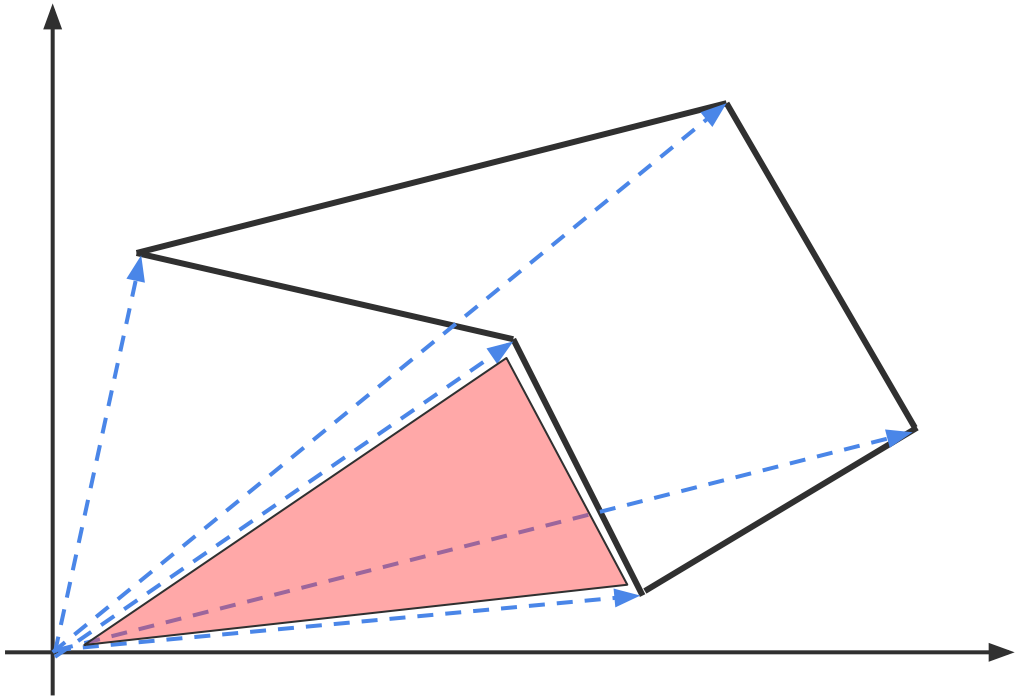


GEOMETRIA

MaratonaCIn

Polígonos

- Área do polígono



GEOMETRIA

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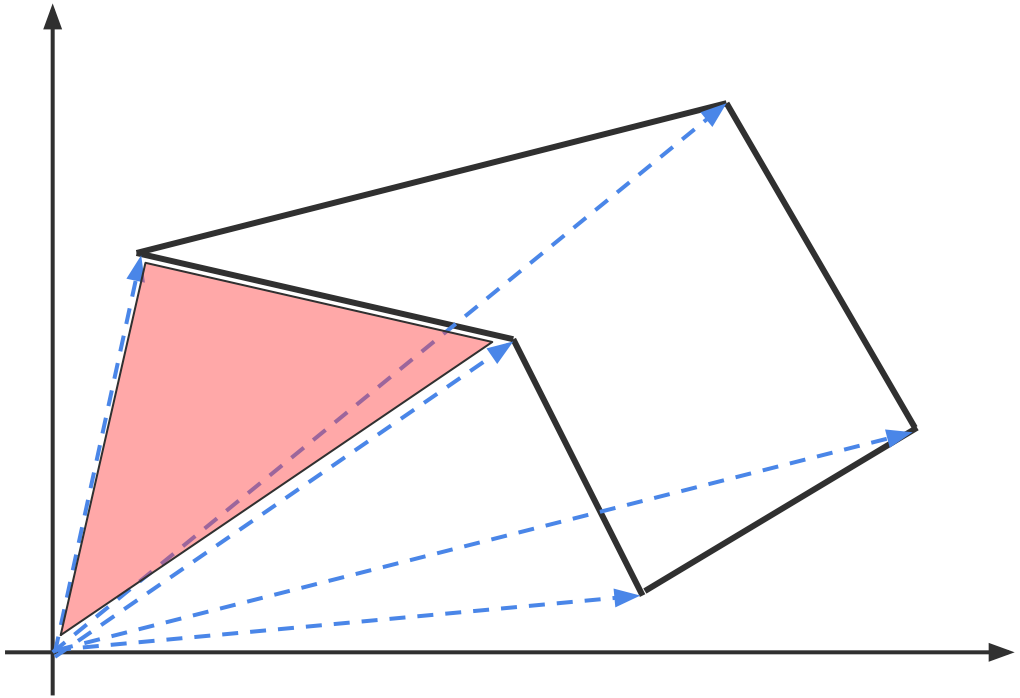
Polígonos

- Área do polígono

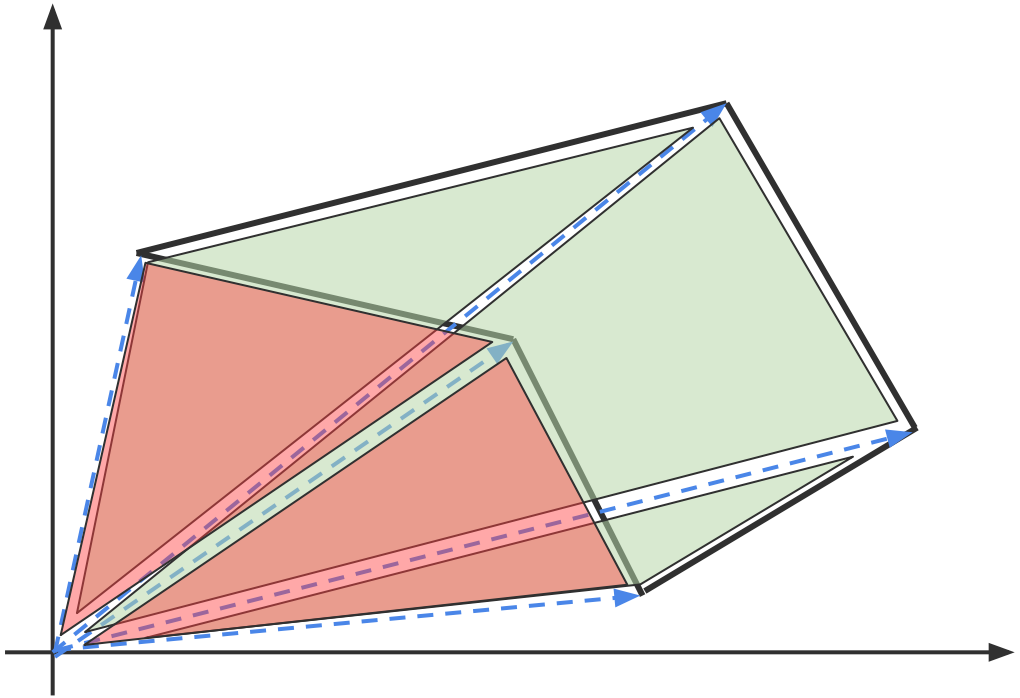


GEOMETRIA

MaratonaCIn

Polígonos

- Área do polígono



GEOMETRIA

Considerações finais

- Erros de precisão
  - Sempre que possível, use int ou long long
  - Caso precise usar double, adicione um l nas funções

Ex: senl(x), cosl(x), atan2l(y,x)


"That's all Folks!"