EDUCATION
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Geometry

Triangles on the coordinate plane

How do you draw a triangle on the coordinate plane and tell what kind it is? If two points have the same y the side is horizontal, if they have the same x it is vertical: the length is the difference of the coordinates, and horizontal + vertical makes a right angle.

In this video we see the method with an animation and solve 3 exercises step by step.

The method

$$\text{same } y: \ \text{length} = x_2 - x_1$$

$$\text{same } x: \ \text{length} = y_2 - y_1$$

$$\text{horizontal} \perp \text{vertical} \Rightarrow 90^\circ$$

Worked examples

Exercise 1

Plot the points R(1, 3), T(12, 3) and S(12, 9). What kind of triangle is RTS, by sides and by angles?

Data: $R(1,\ 3)\ \cdot\ T(12,\ 3)\ \cdot\ S(12,\ 9)$

1. **R and T have the same y: RT is horizontal**

$$RT = 12 - 1 = 11 \text{ cm}$$

Result: $RT = 11 \text{ cm}$

2. **T and S have the same x: TS is vertical**

$$TS = 9 - 3 = 6 \text{ cm}$$

Result: $TS = 6$ cm

3. **Horizontal + vertical: right angle at T**

$$\hat{T} = 90^\circ \Rightarrow \text{right}$$

$$RS > RT > TS \Rightarrow \text{scalene}$$

💡 RS is the oblique side, the longest: the three sides are different

Result: right scalene

✓ Check

$$RS \approx 12.5 \text{ cm} > 11 > 6 \checkmark$$

Exercise 2

Plot the points G(1, 2), E(11, 2) and P(1, 7). Measure the oblique side with a ruler and find the perimeter of the triangle.

Data: $G(1,\ 2)\ \cdot\ E(11,\ 2)\ \cdot\ P(1,\ 7)$

1. **G and E have the same y: GE is horizontal**

$$GE = 11 - 1 = 10 \text{ cm}$$

Result: $GE = 10$ cm

2. **G and P have the same x: GP is vertical**

$$GP = 7 - 2 = 5 \text{ cm}$$

Result: $GP = 5$ cm

3. **EP is oblique: we measure it with a ruler**

$$EP \approx 11.2 \text{ cm}$$

> 💡 Put the ruler from E to P: about 11.2 cm

Result: $EP \approx 11.2 \text{ cm}$

4. **Perimeter = sum of the three sides**

$$p \approx 10 + 5 + 11.2 = 26.2 \text{ cm}$$

Result: $p \approx 26.2 \text{ cm}$

✓ Check

$$\hat{G} = 90^\circ \Rightarrow \text{right}$$

$$10 \neq 5 \neq 11.2 \Rightarrow \text{scalene} \checkmark$$

Exercise 3

Draw the triangle with vertices A(3, 2), B(10, 2) and C(5, 7). What kind of triangle is it, by sides and by angles?

Data: $A(3,\ 2)\ \cdot\ B(10,\ 2)\ \cdot\ C(5,\ 7)$

1. **A and B have the same y: AB is horizontal**

$$AB = 10 - 3 = 7 \text{ cm}$$

Result: $AB = 7 \text{ cm}$

2. **AC and BC are oblique: ruler**

$$AC \approx 5.4 \text{ cm}$$

$$BC \approx 7.1 \text{ cm}$$

Result: $AC \approx 5.4 \text{ cm} \quad BC \approx 7.1 \text{ cm}$

3. **No vertical side: no right angle. Protractor!**

$$\hat{A} \approx 68^\circ \quad \hat{B} = 45^\circ \quad \hat{C} \approx 67^\circ$$

$$\text{acute scalene}$$

💡 BC runs diagonally across the squares (5 left, 5 up): exactly 45°

Result: acute scalene

✓ **Check**

$$68^\circ + 45^\circ + 67^\circ = 180^\circ \checkmark$$

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