

Circle Intersection Plans

Use SSS construction logic to locate a triangle's third vertex.

HIGH SCHOOL • MA.912.GR.5

MA.912.GR.5 "Make formal geometric constructions with a variety of tools and methods."

NAME _____

DATE _____

BUILD WITH TWO CIRCLES

To construct a triangle from three side lengths, draw a base with a straightedge, then draw two compass circles from its endpoints using the other side lengths. The circle intersections give the third vertex, so two intersections make two mirror-image choices, one makes one choice, and none means no triangle.

WORKED EXAMPLE

Plan an SSS construction for triangle PQR with $PQ = 7$ cm, $PR = 6$ cm, and $QR = 5$ cm.

1. Draw segment PQ with length 7 cm.
2. Draw a circle centered at P with radius 6 cm.
3. Draw a circle centered at Q with radius 5 cm.
4. Label either circle intersection R, then connect R to P and Q.

Answer: Two mirror-image triangles are possible.

PRACTICE 5 problems

- 1** Can a triangle with side lengths 3 cm, 8 cm, and 10 cm be constructed?

ANSWER _____

- 2** Can a triangle with side lengths 2 cm, 4 cm, and 9 cm be constructed?

ANSWER _____

- 3** Points A and B are 11 cm apart. Point C must be 8 cm from A and 10 cm from B. How many possible locations can C have?

ANSWER _____

- 4** Points A and B are 13 cm apart. Point C must be 3 cm from A and 10 cm from B. How many possible locations can C have?

ANSWER _____

- 5** Points A and B are 15 cm apart. Point C must be 4 cm from A and 9 cm from B. How many possible locations can C have?

ANSWER _____

APPLY IT Show your work

- 1** A robotics team needs a triangular brace with side lengths 9 cm, 12 cm, and 16 cm. Can the team construct the brace? State the circle construction plan.

WORK SPACE

ANSWER _____

- 2** Two concert light poles are 18 m apart. A camera mount must be 11 m from one pole and 13 m from the other. How many possible mount locations are there?

WORK SPACE

ANSWER _____

CHALLENGE One step up

CHALLENGE

Segment AB is 20 cm long. Point C must be 13 cm from B, and AC must be a positive integer less than 12 cm. List every possible length of AC that allows triangle ABC to be constructed.

PART 1 • PRACTICE

#	PROBLEM	ANSWER
1	Can a triangle with side lengths 3 cm, 8 cm, and 10 cm be constructed?	Yes.
2	Can a triangle with side lengths 2 cm, 4 cm, and 9 cm be constructed?	No.
3	Points A and B are 11 cm apart. Point C must be 8 cm from A and 10 cm from B. How many possible locations can C have?	2 locations.
4	Points A and B are 13 cm apart. Point C must be 3 cm from A and 10 cm from B. How many possible locations can C have?	1 location.
5	Points A and B are 15 cm apart. Point C must be 4 cm from A and 9 cm from B. How many possible locations can C have?	0 locations.

PART 2 • APPLY IT

1. **Yes. Draw a 16 cm base, then draw circles with radii 9 cm and 12 cm from the base endpoints.** Because $9 + 12$ is greater than 16, the circles intersect. An intersection is the third vertex of the brace.
2. **2 locations.** Draw circles centered at the poles with radii 11 m and 13 m. The circles intersect twice, once on each side of the segment between the poles.

CHALLENGE

AC can be 8 cm, 9 cm, 10 cm, or 11 cm.

Accept equivalent construction language that names the base segment and the two correct circle radii. For location counts, accept "two," "one," or "none" in place of numerals.