

MYSTERY PICTURE



ARCS AND CHORDS

Congruent Chords, Congruent Arcs

25 circles · do the marks prove it? · no calculator · a picture appears

FREE

1 The two thick arcs are congruent.	2 The two chords are congruent.	3 The two chords are congruent.	4 The two thick arcs are congruent.	5 The two thick arcs are congruent.
6 The two thick arcs are congruent.	7 The two thick arcs are congruent.	8 The two chords are congruent.	9 The two thick arcs are congruent.	10 The two chords are congruent.
11 The two chords are congruent.	12 The two thick arcs are congruent.	13 The two thick arcs are congruent.	14 The two thick arcs are congruent.	15 The two thick arcs are congruent.
16 The two thick arcs are congruent.	17 The two thick arcs are congruent.	18 The two chords are congruent.	19 The two thick arcs are congruent.	20 The two thick arcs are congruent.
21 The two chords are congruent.	22 The two thick arcs are congruent.	23 The two thick arcs are congruent.	24 The two chords are congruent.	25 The two thick arcs are congruent.

Mystery Picture — how to run it

25–35 minutes

1. **Give each student page 3** and a pencil. No calculator is needed.
2. **Say this once:** *“Use the marks, not how the drawing looks. If the marks prove the sentence under the drawing, fill the square with slanted lines. If they do not prove it, leave it white.”*
3. **Let them work.** The picture shows when they are right. Nothing else is needed.

Student sheet	page 3, one per student. A box at the bottom shows what each mark means.
Answers	pages 4–5, for you.

The rule: in the same circle, or in two circles with the same radius, congruent chords, congruent arcs and congruent central angles go together. Any one of them gives the other two, when both arcs are short arcs (or both are long arcs). Fourteen squares are filled.

The white squares are of two kinds. In five of them the marks prove the sentence false: two circles with one center (square 9), a short arc paired with a long one (squares 7 and 20), chords 5 and 6 in one circle (square 17), or congruent chords in circles of radius 3 and 4 (square 23). In the other six the marks prove nothing: two circles with no radius given, or two chords with nothing marked. These look true on purpose. A student must not trust the look of a drawing.

This sheet calls two arcs congruent when they have the same measure and lie in the same circle or in circles with the same radius. Some textbooks use other definitions, so tell the class which ones this sheet uses.

If part of a student’s picture looks wrong, the mistake is in that square. Ask: *“Is it one circle? If there are two, does anything say they have the same radius?”* Guessing does not work. Every simple guessing rule, such as filling every square whose drawing looks true, gets at least six squares wrong.



This is the free lesson this activity came from. The worksheet, the full answers and the lesson plan are on it, at three levels of difficulty.

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Mystery Picture — do the marks prove it?

Arcs and chords

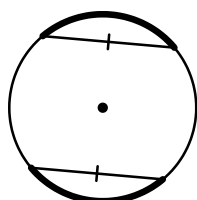
Name _____

Period _____

Date _____

Each square has a drawing and a sentence. Use only the marks, not how the drawing looks. **If the marks prove the sentence, fill the square with slanted lines. If they do not prove it, leave it white.** Leave it white also when you cannot tell. A picture appears. If part of it is missing, check that square again.

1 The two thick arcs are congruent.	2 The two chords are congruent.	3 The two chords are congruent.	4 The two thick arcs are congruent.	5 The two thick arcs are congruent.
6 radius 4 radius 4 The two thick arcs are congruent.	7 radius 4 radius 4 The two thick arcs are congruent.	8 The two chords are congruent.	9 The two thick arcs are congruent.	10 radius 4 radius 4 The two chords are congruent.
11 The two chords are congruent.	12 The two thick arcs are congruent.	13 The two thick arcs are congruent.	14 The two thick arcs are congruent.	15 The two thick arcs are congruent.
16 radius 5 radius 5 The two thick arcs are congruent.	17 The two thick arcs are congruent.	18 125° 125° The two chords are congruent.	19 The two thick arcs are congruent.	20 radius 3 radius 3 The two thick arcs are congruent.
21 The two chords are congruent.	22 The two thick arcs are congruent.	23 radius 3 radius 4 The two thick arcs are congruent.	24 radius 3 radius 3 The two chords are congruent.	25 The two thick arcs are congruent.



radius 5

Tick marks mean the two chords are congruent. **Matching marks** on two angles mean the angles are congruent. **“radius 5”** under a circle gives its radius. **Thick arcs** are the arcs the sentence is about.

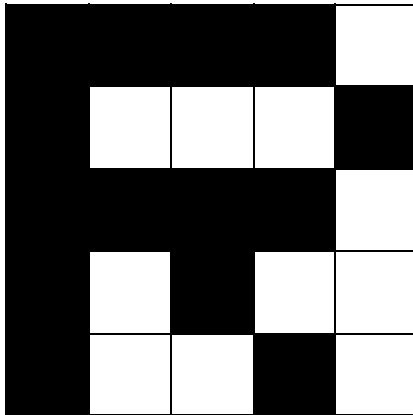
In the same circle, or in two circles with the same radius: congruent chords, congruent arcs and congruent central angles go together. Any one of them gives the other two. Two arcs are congruent only if they have the same measure **and** their circles have the same radius.



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Mystery Picture — answers

For the teacher



The finished picture is **the letter R**. Fourteen squares are filled.

To check a square, ask two things. Is it one circle, or two circles with the same radius given? And do the marks make the chords, the arcs or the central angles congruent? The table gives the reason for every square. It goes on over the page.

	The square	Answer	Why
1	One circle. Tick marks on the chords. "The two thick arcs are congruent."	fill	In one circle, chords, arcs and central angles go together. Here the tick marks make the chords congruent. Both thick arcs are short arcs, so they are congruent too.
2	One circle. Matching marks on the central angles. "The two chords are congruent."	fill	In one circle, chords, arcs and central angles go together. Here the matching marks make the central angles congruent, so the chords are congruent too.
3	One circle. Arcs 110° and 110° . "The two chords are congruent."	fill	In one circle, chords, arcs and central angles go together. Here both arcs are 110° , so the chords are congruent too.
4	One circle. Chords 7 and 7. "The two thick arcs are congruent."	fill	In one circle, chords, arcs and central angles go together. Here both chords are 7. Both thick arcs are short arcs, so they are congruent too.
5	Two circles, no radius given. Tick marks on the chords. "The two thick arcs are congruent."	white	Here the tick marks make the chords congruent, but nothing says the two circles have the same radius. They only look the same size, so the arcs could be different.
6	Two circles, radius 4 and radius 4. Tick marks on the chords. "The two thick arcs are congruent."	fill	Both circles have radius 4, so chords, arcs and central angles go together. Here the tick marks make the chords congruent. Both thick arcs are short arcs, so they are congruent too.
7	Two circles, radius 4 and radius 4. Tick marks on the chords. Thick: the short arc in one circle, the long arc in the other. "The two thick arcs are congruent."	white	Both circles have radius 4 and the tick marks make the chords congruent, so their short arcs are congruent. But one thick arc is a short arc and the other is a long arc, more than half its circle, so the thick arcs are not congruent.
8	Two circles, no radius given. Matching marks on the central angles. "The two chords are congruent."	white	Here the matching marks make the central angles congruent, but nothing says the two circles have the same radius. They only look the same size, so the chords could be different.
9	Two circles with one center, cut by the same two radii. "The two thick arcs are congruent."	white	The same two radii cut both arcs, so the arcs have the same measure. But one circle is inside the other, so the radii are different and the arcs are not congruent.
10	Two circles, radius 4 and radius 4. Matching marks on the central angles. "The two chords are congruent."	fill	Both circles have radius 4, so chords, arcs and central angles go together. Here the matching marks make the central angles congruent, so the chords are congruent too.
11	One circle. Tick marks on the arcs. "The two chords are congruent."	fill	In one circle, chords, arcs and central angles go together. Here the tick marks make the arcs congruent, so the chords are congruent too.
12	One circle. Tick marks on the chords. "The two thick arcs are congruent."	fill	In one circle, chords, arcs and central angles go together. Here the tick marks make the chords congruent. Both thick arcs are short arcs, so they are congruent too.

Mystery Picture — answers, squares 13 to 25

For the teacher

	The square	Answer	Why
13	One circle. Matching marks on the central angles. "The two thick arcs are congruent."	fill	In one circle, chords, arcs and central angles go together. Here the matching marks make the central angles congruent. Both thick arcs are short arcs, so they are congruent too.
14	One circle. Chords 8 and 8. "The two thick arcs are congruent."	fill	In one circle, chords, arcs and central angles go together. Here both chords are 8. Both thick arcs are short arcs, so they are congruent too.
15	One circle. Nothing marked on the chords. "The two thick arcs are congruent."	white	Nothing is marked on the chords. They only look the same length, and a drawing is not a measurement.
16	Two circles, radius 5 and radius 5. Tick marks on the chords. "The two thick arcs are congruent."	fill	Both circles have radius 5, so chords, arcs and central angles go together. Here the tick marks make the chords congruent. Both thick arcs are short arcs, so they are congruent too.
17	One circle. Chords 5 and 6. "The two thick arcs are congruent."	white	In one circle, chords, arcs and central angles go together. Here the chords are 5 and 6, so the arcs are not congruent.
18	One circle. Arcs 125° and 125° . "The two chords are congruent."	fill	In one circle, chords, arcs and central angles go together. Here both arcs are 125° , so the chords are congruent too.
19	Two circles, no radius given. Tick marks on the chords. "The two thick arcs are congruent."	white	Here the tick marks make the chords congruent, but nothing says the two circles have the same radius. They only look the same size, so the arcs could be different.
20	Two circles, radius 3 and radius 3. Tick marks on the chords. Thick: the short arc in one circle, the long arc in the other. "The two thick arcs are congruent."	white	Both circles have radius 3 and the tick marks make the chords congruent, so their short arcs are congruent. But one thick arc is a short arc and the other is a long arc, more than half its circle, so the thick arcs are not congruent.
21	One circle. Tick marks on the arcs. "The two chords are congruent."	fill	In one circle, chords, arcs and central angles go together. Here the tick marks make the arcs congruent, so the chords are congruent too.
22	Two circles, no radius given. Matching marks on the central angles. "The two thick arcs are congruent."	white	Here the matching marks make the central angles congruent, but nothing says the two circles have the same radius. They only look the same size, so the arcs could be different.
23	Two circles, radius 3 and radius 4. Tick marks on the chords. "The two thick arcs are congruent."	white	The circles have radius 3 and radius 4. Congruent chords in circles of different sizes cut arcs of different measures, so the arcs are not congruent.
24	Two circles, radius 3 and radius 3. Matching marks on the central angles. "The two chords are congruent."	fill	Both circles have radius 3, so chords, arcs and central angles go together. Here the matching marks make the central angles congruent, so the chords are congruent too.
25	Two circles, no radius given. Tick marks on the chords. "The two thick arcs are congruent."	white	Here the tick marks make the chords congruent, but nothing says the two circles have the same radius. They only look the same size, so the arcs could be different.