

CUT & GLUE SORT

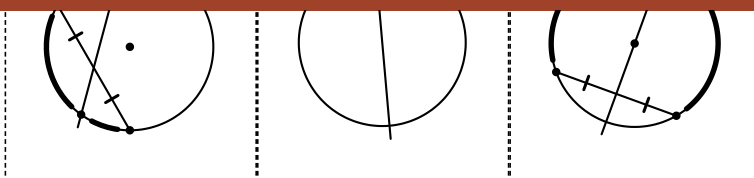


PERPENDICULAR BISECTORS OF CHORDS

Perpendicular Bisectors of Chords: Do the Marks Prove It?

Twelve pieces · congruent arcs, not congruent, or cannot tell · three rows

FREE



Row 1. Yes: the marks prove the two thick arcs are congruent.

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Row 2. No: the marks prove the two thick arcs are not congruent.

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Row 3. Cannot tell: the marks do not decide it.

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Cut & Glue Sort — how to run it

25 minutes, including the cutting

1. **Hand out pages 3 and 4**, one of each per student, with scissors and glue. No calculator is needed.
2. **Say this once:** *“For each piece, decide if the two thick arcs are congruent. Use the marks, not how the drawing looks. A line cuts the arcs in half only if it passes through the center and is perpendicular to the chord.”*
3. **Check a sheet in ten seconds:** every row gets four pieces.

Student sheets pages 3 and 4, one of each per student. Page 3 has the three rows. Page 4 has the pieces and a box with the marks and the three rules.

Answers page 5.

The rules: a line through the center that is perpendicular to a chord cuts the chord and both of its arcs in half. A line through the center that cuts a chord in half is perpendicular to it, if the chord is not a diameter. The perpendicular bisector of a chord passes through the center.

Row 3 holds the pieces where the rules cannot be used. Two diameters always cut each other in half, so tick marks on them say nothing about a right angle. A square alone, with no center shown, does not show that the line cuts the chord in half. Every piece in row 3 looks true. A student who trusts the drawing puts it in row 1. That is the mistake this sort is for.

Row 2 holds the pieces that fool students most. Two diameters marked 88° and 92° look perpendicular, but the arcs they make are not equal. One piece pairs a part of the short arc with a part of the long arc. The marks decide, not the look.

This sheet calls two arcs congruent when they have the same measure in the same circle. Some textbooks use other definitions, so tell the class which ones this sheet uses. Guessing does not work: a simple guessing rule, such as “if it looks true, it is true,” places at most six pieces correctly.



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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Cut & Glue Sort — do the marks prove it?

Perpendicular bisectors of chords

Name _____

Period _____

Date _____

Each piece on the next page has two arcs drawn thick. Decide for each piece: **are the two thick arcs congruent?** Use only the marks and the rules on the next page, not how the drawing looks. Do the marks prove they are congruent, prove they are not, or not decide it? Glue the piece in its row.

Row 1. Yes: the marks prove the two thick arcs are congruent.

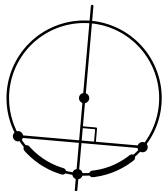
Row 2. No: the marks prove the two thick arcs are not congruent.

Row 3. Cannot tell: the marks do not decide it.

Cut & Glue Sort — the pieces

Cut along the dashed lines

Cut out the twelve pieces. Glue each one in its row on the other sheet. The box below shows what each mark means, and the three rules.



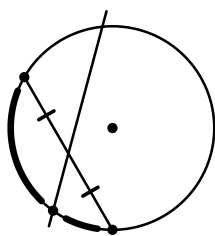
The dot inside the circle is the center. No dot inside means the center is not shown. **A small square** means a right angle. **One tick mark on each part** of the chord means the line cuts the chord in half. **Each thick arc** runs from one dot on the circle to the next. The dot between the two thick arcs is where one ends and the other begins.

Rule 1. A line through the center that is perpendicular to a chord cuts the chord and both of its arcs in half.

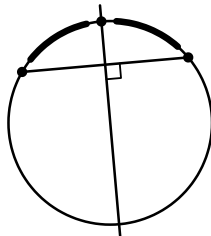
Rule 2. A line through the center that cuts a chord in half is perpendicular to it. This is true only when the chord is not a diameter.

Rule 3. The perpendicular bisector of a chord passes through the center.

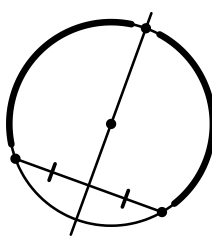
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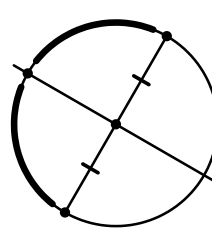
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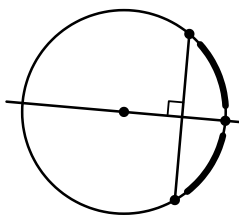
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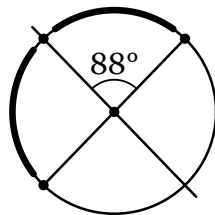
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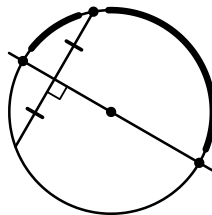
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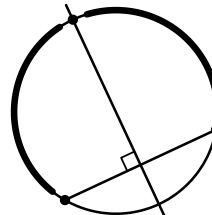
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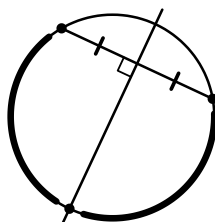
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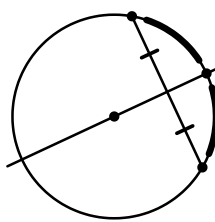
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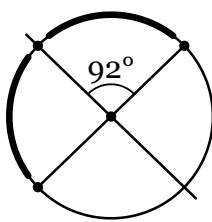
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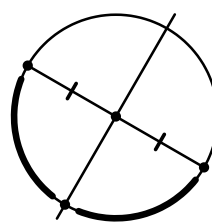
10



11



12



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Each row holds four pieces. Every piece is listed by the number printed on its corner, with the reason.

1 Yes: the marks prove the two thick arcs are congruent.

3. Line through the center. Tick marks. Thick: the two parts of the long arc. *Why:* The line passes through the center and cuts the chord in half, and the chord is not a diameter. So the line is perpendicular to the chord and cuts the long arc in half.

5. Line through the center. Square. Thick: the two parts of the short arc. *Why:* The line passes through the center and is perpendicular to the chord. So it cuts the chord and both of its arcs in half, and the two parts of the short arc are congruent.

9. No center shown. Square and tick marks. Thick: the two parts of the long arc. *Why:* The square and the tick marks make the line the perpendicular bisector of the chord. The perpendicular bisector of a chord passes through the center, so it cuts the long arc in half.

10. Line through the center. Tick marks. Thick: the two parts of the short arc. *Why:* The line passes through the center and cuts the chord in half, and the chord is not a diameter. So the line is perpendicular to the chord and cuts the short arc in half.

2 No: the marks prove the two thick arcs are not congruent.

1. Line misses the center. Tick marks. Thick: the two parts of the short arc. *Why:* The line cuts the chord in half but misses the center. A line through the middle of a chord that misses the center is not perpendicular, so it does not cut the arc in half.

6. Two diameters. Angle 88° . Thick: the two parts of one half circle. *Why:* The angle between the diameters is 88° , not 90° . So the thick arcs are 88° and 92° , and they are not congruent.

7. Line through the center. Square and tick marks. Thick: one part of each arc. *Why:* The line is the perpendicular bisector, so it cuts each arc in half. The chord misses the center, so it is not a diameter and its short arc is smaller than its long arc. Half of one cannot be congruent to half of the other.

11. Two diameters. Angle 92° . Thick: the two parts of one half circle. *Why:* The angle between the diameters is 92° , not 90° . So the thick arcs are 92° and 88° , and they are not congruent.

3 Cannot tell: the marks do not decide it.

2. No center shown. Square. Thick: the two parts of the short arc. *Why:* The line is perpendicular to the chord, but nothing shows it cuts the chord in half or passes through the center. It only looks that way.

4. Two diameters. Tick marks. Thick: the two parts of one half circle. *Why:* The chord is itself a diameter. Two diameters always cut each other in half, so the tick marks say nothing new. Nothing shows a right angle, so the arcs could be unequal.

8. No center shown. Square. Thick: the two parts of the long arc. *Why:* The line is perpendicular to the chord, but nothing shows it cuts the chord in half or passes through the center. It only looks that way.

12. Two diameters. Tick marks. Thick: the two parts of one half circle. *Why:* The chord is itself a diameter. Two diameters always cut each other in half, so the tick marks say nothing new. Nothing shows a right angle, so the arcs could be unequal.

To check a piece with a student, ask: “Does the line pass through the center? What shows that it is perpendicular to the chord? Are both thick arcs parts of the same arc?”