

CUT & GLUE SORT

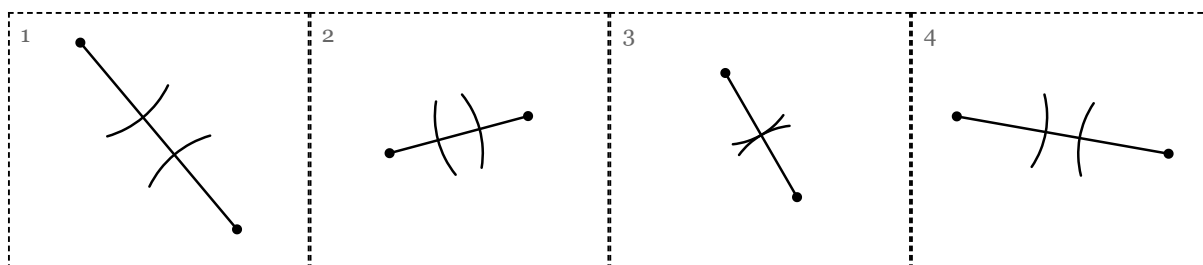


CONSTRUCTING A PERPENDICULAR BISECTOR

The Perpendicular Bisector: Cross, Touch or Never Meet?

One opening from each end · three outcomes · check it with the compass

FREE



1. **Hand out pages 3 and 4**, one of each per student, with scissors, glue and a compass.
2. **Say this once:** *“Decide first. Then draw both arcs longer with your compass and check. Watch for the ones that only touch. One point is not enough for a line.”*
3. **Every row gets 4.** A row with more or fewer has a piece in the wrong place. (This is on your page only, not the student's.)

Student sheets pages 3 and 4, one of each per student.

Answers page 5.

The student predicts first, then checks with the compass. Every piece is a segment with one arc from each end, both at the same opening. The arcs are stopped short. Each arc cuts the segment at a distance from its end equal to the opening. So the two cuts show the answer without a ruler. If the cuts have passed each other, the opening is more than half the segment, and the arcs will cross twice. If there is a gap between the cuts, the opening is less than half, and the arcs never meet. If both cuts are at one point, the opening is exactly half, and the arcs touch once, at the middle.

The third row is the hard one. At exactly half, the arcs touch once, at the midpoint, and stop. One point is not enough to draw a line. The construction has found the middle, but it cannot draw the perpendicular bisector yet. Many students get stuck here and think they made a mistake. It is not a mistake. It is a fact about the construction. A student who only asks “do they cross or not?” puts the four touching pieces in the wrong row and gets eight of the twelve right.

No length is printed anywhere. The segments and openings have different sizes, so rules like “long segments never meet” or “big arcs cross” do not work. A student who only checks whether the arcs already touch on the page gets only eight of the twelve right.



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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Cross, touch or never meet?

One opening, three outcomes

Name _____

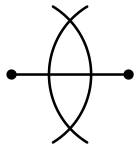
Period _____

Date _____

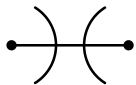
Cut out the twelve pieces on the next page. On each piece, somebody drew one short arc from each end of a segment. **They used the same compass width at both ends**, then stopped. **If both arcs were carried on, would they cross twice, touch once, or never meet?** Look at where each arc cuts the segment. Glue each piece into its row. **Check before you glue.** Put the compass point on one end. Open it to that end's arc. Carry both arcs on, above and below.

This lesson has one rule in two parts. First, the opening from each end must be the *same*. This is what puts the line through the middle. If you get it wrong, the line is still perpendicular, so nothing looks wrong. Second, each opening must be *more than half* the segment. This is what makes the arcs cross. If you get it wrong, you can see it at once.

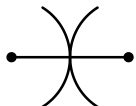
Last lesson: you copied a segment with one setting, never reopened. You copied an angle with two settings.



CROSS TWICE — *two points, so rule the line through them*



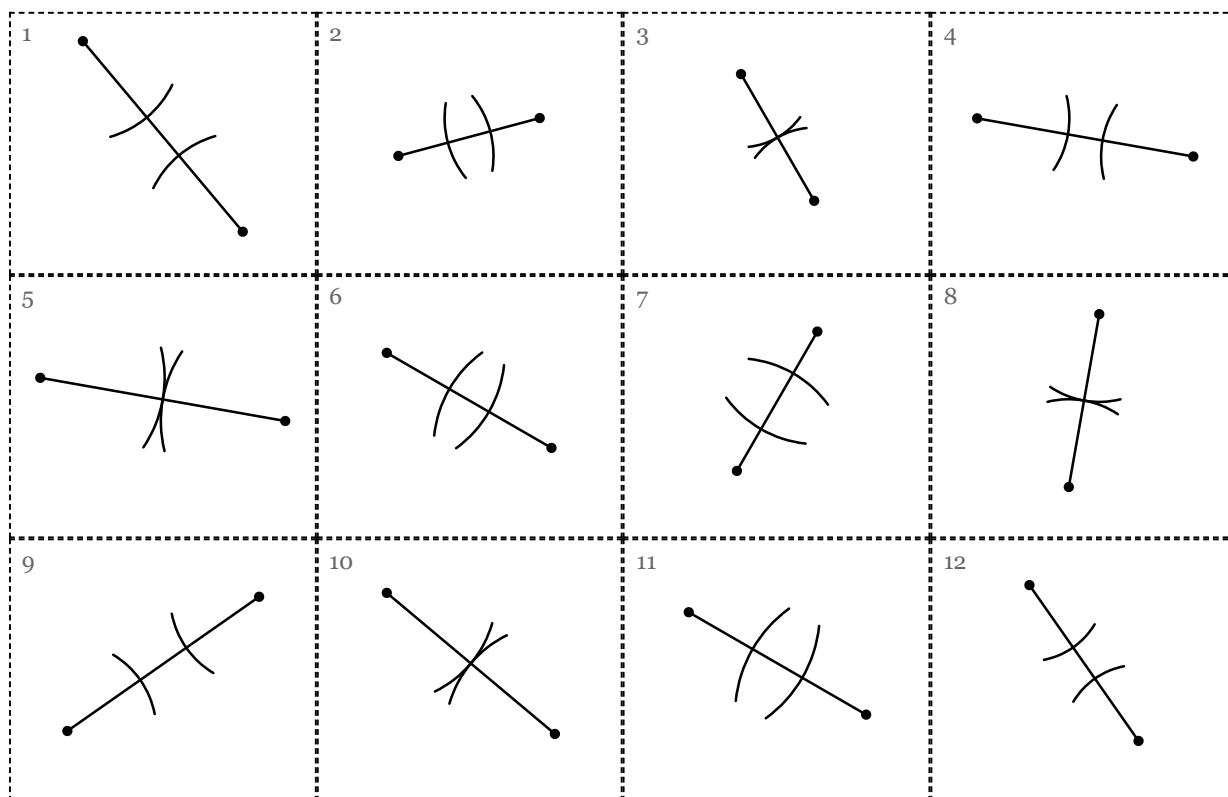
NEVER MEET — *no point to join, because the arcs are too small to reach each other*



TOUCH ONCE — *one point, in the middle, and one point is not enough for a line*

The twelve pieces

Cut along the dotted lines



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Cut & Glue Sort — answers

For the teacher

CROSS TWICE	2 — The arcs cut the segment past each other. The opening is more than half.	6 — The arcs cut the segment past each other. The opening is more than half.	7 — The arcs cut the segment past each other. The opening is more than half.	11 — The arcs cut the segment past each other. The opening is more than half.
NEVER MEET	1 — There is a gap between the two cuts. The opening is less than half.	4 — There is a gap between the two cuts. The opening is less than half.	9 — There is a gap between the two cuts. The opening is less than half.	12 — There is a gap between the two cuts. The opening is less than half.
TOUCH ONCE	3 — Both arcs cut the segment at one point. The opening is exactly half.	5 — Both arcs cut the segment at one point. The opening is exactly half.	8 — Both arcs cut the segment at one point. The opening is exactly half.	10 — Both arcs cut the segment at one point. The opening is exactly half.

On every piece, both arcs have the same opening. No piece needs sharp eyes. The two cuts on the segment are either at one point or at least 2.5 mm apart.