

CUT & GLUE SORT



DISTANCE FROM A POINT TO A LINE

Which Segment Is the Distance?

12 pieces · 3 bins · 25 minutes · no numbers anywhere

FREE

Is that segment the distance?

From the point, to the line

Name _____

Period _____

Date _____

Every piece shows a point P , a line k , and one segment drawn from P . Cut the twelve pieces off the next page. Glue each one into the row it belongs in. **Do not measure anything. There is nothing to measure. A right-angle mark is the only thing that says a segment is perpendicular to a line. Every row gets four.**



It is the distance

It stops on the line. The mark shows a right angle there.



It is not the distance

It does not stop on the line. It goes past the line, stops short of it, or never ends.



There is no way to tell

It does stop on the line, but nothing on it shows a right angle.

Cut & Glue Sort — how to run it

25 minutes, and the first 8 are cutting

1. **Hand out pages 3 and 4**, one of each per student, and scissors and glue. That is the whole preparation.
2. **Say this once:** *“A right-angle mark is the only thing that can tell you a segment is perpendicular. If there is no mark, there is no answer. That case has its own row.”*
3. **Cut out the twelve pieces.** Glue each one into its row. **Every row gets four.** You can check that from across the room.

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

Answers page 5 — which piece goes where, and why.

Every row gets four, and that is the only marking you do. A row with five in it is wrong and the student can see that before you reach the desk. Nothing on the sheet is a number, so no one can measure their way through it.

The third row is the lesson, and it is the one they will fight you on. A segment that runs from the point to the line and carries no right-angle mark *might* be the distance and *might not* — the mark is the only evidence there is. One of those four pieces even carries a right-angle mark: it is square to the *other* line in the figure, and says nothing about the one the question asks about. Without this row the sheet is finished by elimination, and a class learns that every marked drawing has an answer.

The middle row is settled, and it is not the third row. A segment that goes past the line, or stops short of it, or is drawn as a ray with an arrowhead, *cannot* be the distance. The distance is a segment from the point *to the line*. All four pieces in this row are square to the line but the wrong length: the student has the right direction and the wrong ends. Ordinary marking often misses this mistake, because it looks at the direction and not at the ends.

Five of the pieces carry a second line, and they are spread across all three rows on purpose. A student who sorts by “the ones with two lines” gets them scattered through every row and finds out at once.

If you are short of time, cut the pieces yourself before the lesson — but the cutting is doing something. It puts every piece in a student's hand, one at a time, which is eight minutes of looking at twelve figures.



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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Is that segment the distance?

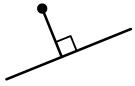
From the point, to the line

Name _____

Period _____

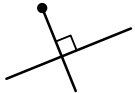
Date _____

Every piece shows a point P , a line k , and one segment drawn from P . Cut the twelve pieces off the next page. Glue each one into the row it belongs in. **Do not measure anything. There is nothing to measure. A right-angle mark is the only thing that says a segment is perpendicular to a line. Every row gets four.**



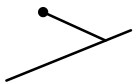
It is the distance

It stops on the line. The mark shows a right angle there.



It is not the distance

It does not stop on the line. It goes past the line, stops short of it, or never ends.



There is no way to tell

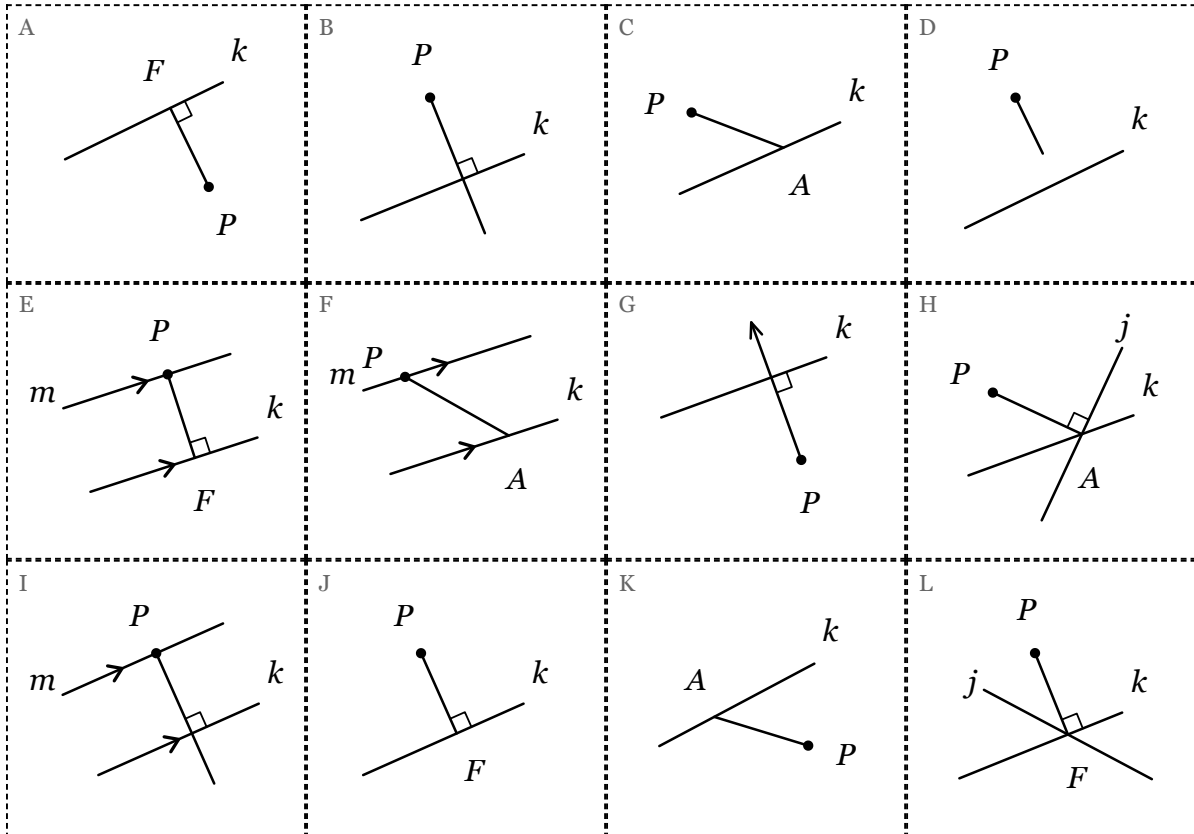
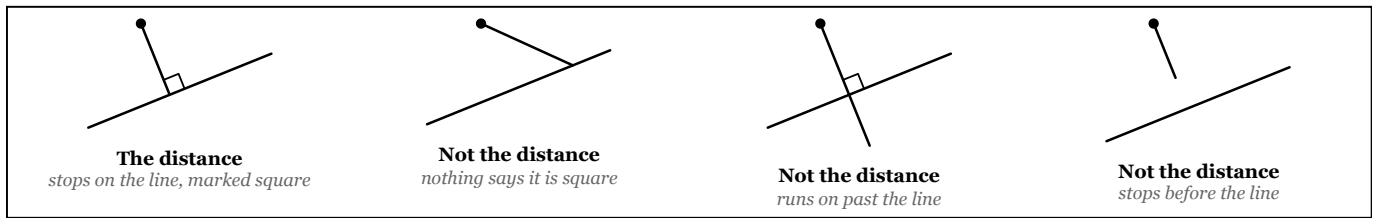
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The twelve pieces

Cut along the dotted lines



Four pieces to a row, always. The letters are printed on the pieces and are in no order that helps — no three letters of one bin run in a step, no two pieces of one bin are printed next to each other, and a bin is never all the odd letters or all the even ones.

A E J L It is the distance

A — the stroke stops on k and the square is marked there, with the point below the line

E — P is on m , and the stroke is square to k at its foot — so it is the distance from m to k as well

J — the stroke stops on k and the square is marked there

L — a second line runs through the foot and changes nothing: the square is marked against k

B D G I It is not the distance

B — square to k and carries on past it, so it is not a segment from P to k

D — it points straight at k and stops before it gets there

G — an arrowhead: it is a ray and it never stops, so it has no length at all

I — square to k and past it: between two parallels the same rule holds, and the ends still decide

C F H K There is no way to tell

C — it stops on k and nothing marks it square, so it may be the distance and may not

F — the two lines are parallel and the stroke crosses from one to the other, and nothing says it is square to either

H — there is a right-angle mark — and it is square to j , not to k , so it says nothing about k

K — it stops on k and nothing marks it square, and the point is below the line

Why the third row is not the second. “No way to tell” and “it is not” are two different answers and a class will run them together. The middle row is *settled*: a segment that does not stop on the line is not a segment from the point to the line, and no further evidence could make it one. The bottom row is *open*: the segment does start at the point and does stop on the line, and the one thing that would settle it — a right-angle mark — is not there. Drawing the mark in would move any of those pieces up into the first row, and that is worth saying aloud: the bottom row is the row that is waiting for one more piece of information.

The check a student can run with nobody around. The distance is the *shortest* segment from the point to the line. If a shorter one can be drawn than the one they called the distance, theirs is wrong. It refutes a wrong answer without a key, which is the strongest thing this lesson owns — and it is why the sheet can be marked by counting to four.