

CUT & GLUE SORT

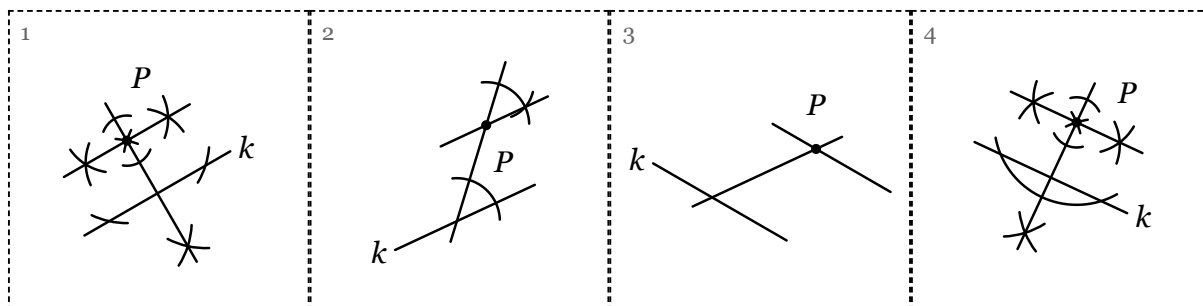


CONSTRUCTING A PARALLEL LINE

Parallel Through a Point: Which Fact Proves It?

A copied angle · two perpendiculars · or nothing, however parallel it looks

FREE



1. **Hand out pages 3 and 4**, one of each per student, with scissors and glue.
2. **Say this once:** *“Every line on these pieces is parallel. That is not the question. The question is how the marks prove it. On some pieces, nothing proves it.”*
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 question on this sheet is which fact proves the lines parallel. State exams ask this question often. Rows 1 and 2 are the two methods of the lesson. Row 1 copies the angle that a slanted line makes with k , up at P , in the same position (the corresponding angle). Row 2 draws a line through P perpendicular to k , and then a second line perpendicular to that one at P . Two lines perpendicular to the same line are parallel. On exams, a common wrong answer gives this second reason for a figure that was built by copying an angle.

The third row is the hard one: the line is parallel, but nothing proves it. Every line on the sheet is drawn exactly parallel, so a student cannot sort by looking. A drawing can show that two lines meet. No drawing can show that they never meet. Row 3 holds unfinished attempts at both methods. In some, a line through P is drawn by eye. In one, the arc at the crossing stops before it reaches k . Guessing does not work: every simple guessing rule, such as counting the arcs, gets at most nine of the twelve pieces 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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Which fact proves it parallel?

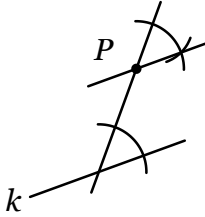
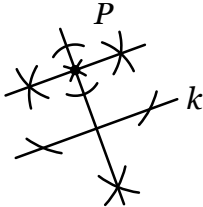
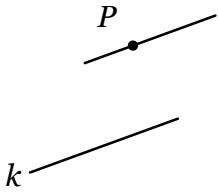
A copied angle, two perpendiculars, or nothing

Name _____

Period _____

Date _____

Cut out the twelve pieces on the next page. Each piece is a finished line through P parallel to k , with every mark left on. The one dot is P . **What proves it parallel?** Row 1: an angle copied up to P the same way round, one opening at both, the gap carried across. Row 2: a line through P proved perpendicular to k , and the new line proved perpendicular to that. Row 3: no mark proves it, however parallel it looks. Glue each piece into its row.

 1 • Correct: a copied angle	 2 • Correct: two perpendiculars	 3 • Wrong: nothing proves it
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1 • Correct: a copied angle — *the angle a slanted line makes with k , copied up to P the same way round*

2 • Correct: two perpendiculars — *a line through P proved perpendicular to k , and the new line proved perpendicular to it*

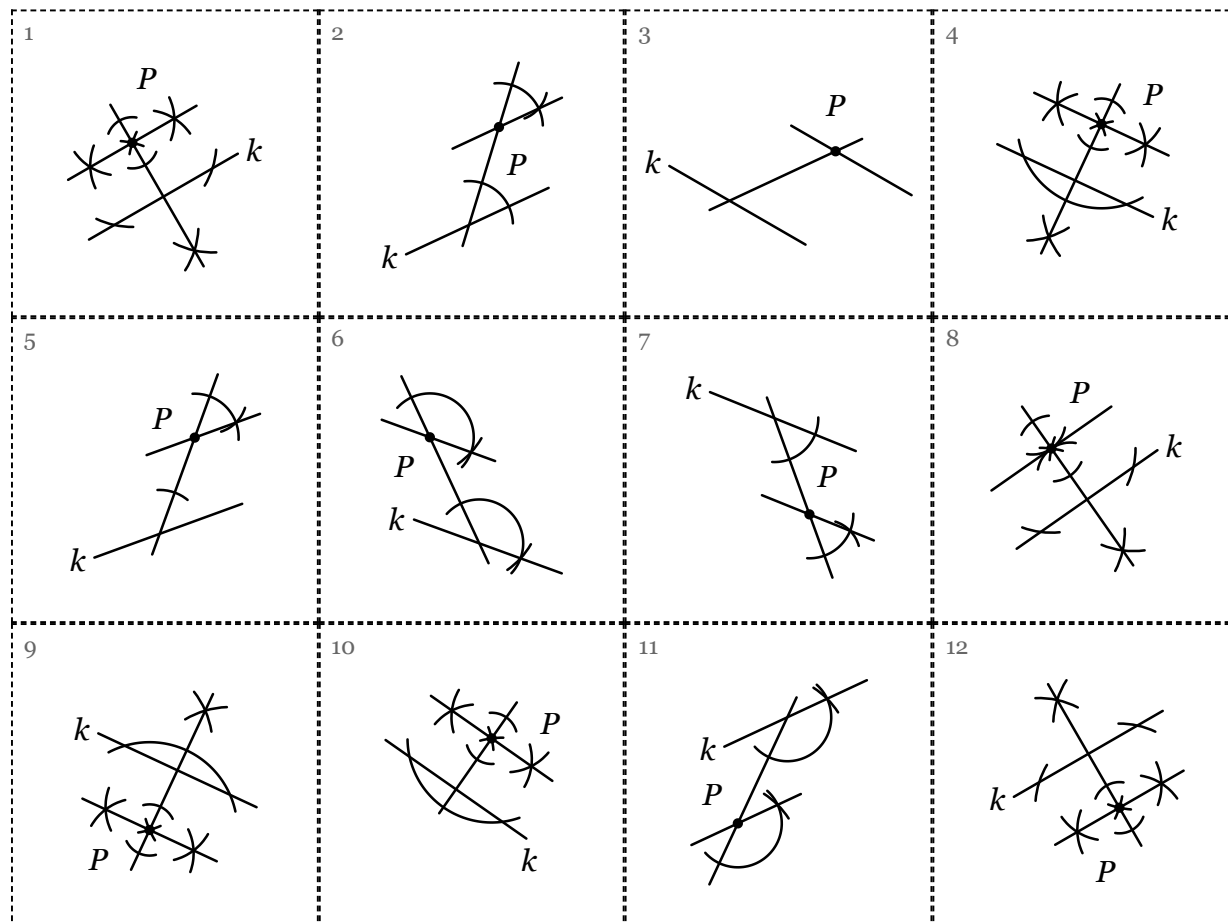
3 • Wrong: nothing proves it — *however parallel it looks*

The twelve pieces

Cut along the dotted lines

This lesson has no new rule. This is the only sheet in the unit with no opening rule of its own. Whichever method you use, follow that method's own rule. If you copy an angle, use one opening at both vertices, then carry the chord. If you use two perpendiculars, follow last lesson's rules.

Last lesson: on the line, the pair must be larger than the first arc. If they are equal, that is the failure. Off the line, the first arc must reach the line twice. The pair can be any size. If it equals the first arc, the construction still works.



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Cut & Glue Sort — answers

For the teacher

Correct: a copied angle	2 — The angle is copied with one compass opening, and the gap between its sides is copied at P.	6 — An obtuse angle is copied. The gap is also marked on the first angle.	7 — The angle is copied. Here the angle opens the other way along k.	11 — An obtuse angle is copied. The piece is turned around on the page.
Correct: two perpendiculars	1 — A line through P is drawn perpendicular to k. Then a second line is drawn perpendicular to it at P.	4 — The same two perpendiculars. The first arc is drawn in one piece.	9 — The same two perpendiculars, with P a little farther from k.	12 — The same two perpendiculars, turned around on the page.
Wrong: nothing proves it	3 — A slanted line is drawn, but the line through P is drawn by eye.	5 — The arc at the crossing stops before it reaches k, so the angle was never copied.	8 — The first line through P is proved perpendicular to k. For the second right angle, the two arcs meet only at P, so the parallel line is drawn by eye.	10 — The first two arcs meet only at P, so the first line through P is drawn by eye. The second right angle is proved.

No piece depends on sharp eyes. Two arcs either have the same compass opening or differ by at least 4 mm. A crossing of two arcs is either on a line or at least 2.5 mm away from it. Every line is drawn exactly parallel to k.