

CUT & GLUE SORT

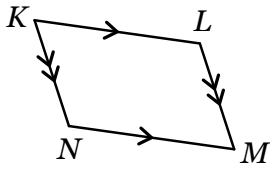
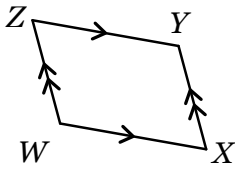
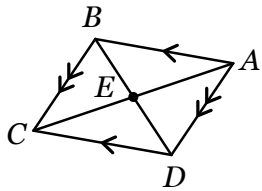
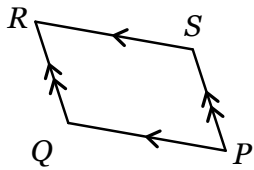


PROPERTIES OF PARALLELOGRAMS

Same Number, 180° Minus, or Can You Not Tell?

Decide before any arithmetic

FREE

 1. $\angle K = 64^\circ$. $\angle M = ?$	 2. $\angle W = 115^\circ$. $\angle X = ?$	 3. $AE = 7$. $BE = ?$
 4. $\angle R = 62^\circ$. $\angle S = ?$		

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. Nothing else is needed.
2. **Say this once:** *“Do not work out any numbers. For each piece, decide: is the question mark the same number, 180 minus the number, or can you not tell?”*
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 shows the four properties of a parallelogram, and the equal angles of a Z, as five small drawings.
Answers	page 5.

The sheet practices one decision: what does a parallelogram say about two of its parts?

Sides across from each other are equal. Angles across from each other are equal. Two angles next to each other add to 180° . The diagonals cut each other in half, so the two pieces of one diagonal are equal. A diagonal also makes a Z with two parallel sides, and the two angles of the Z are equal. Where the diagonals cross, two angles side by side add to 180° , because they make a straight line.

The most common mistake is to mix up “across” and “next to”. Students say that angles across from each other add to 180° , or that angles next to each other are equal. Rows one and two catch this in both directions.

The last row is the most important. It holds pairs the four properties say nothing about: a piece of one diagonal and a piece of the other diagonal, two sides next to each other, the two parts of a corner cut by a diagonal, and two angles at the ends of a diagonal but on the same side of it. Each pair is equal in some parallelograms (a rectangle or a rhombus) but not in all. A student who never uses the last row can place at most eight pieces correctly. For each piece, ask that student: “Is there a rule that links these two parts?” If there is none, the piece goes in the last row. Guessing rules place 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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Same, 180° minus, or cannot tell?

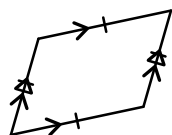
Properties of parallelograms

Name _____

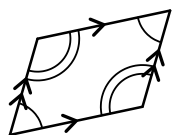
Period _____

Date _____

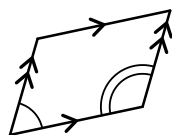
Cut out the twelve pieces on the next page. Each piece shows a parallelogram, a part with its number, and a part with a ?. **Do not work out the ?.** Decide what the parallelogram says about it. Glue the piece in that row.



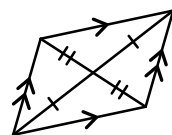
Sides across from each other are equal.



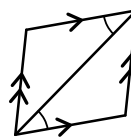
Angles across from each other are equal.



Two angles **next to each other** add to 180° .



The diagonals **cut each other** in half.



A diagonal and two parallel sides make a **Z**. Its two angles are equal.

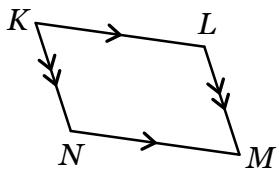
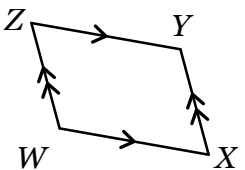
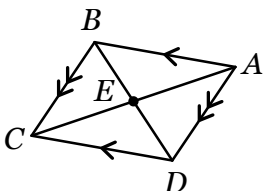
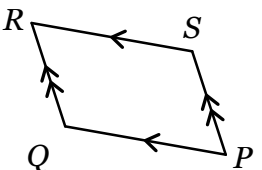
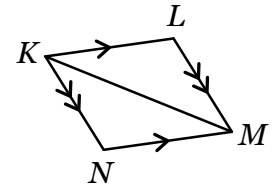
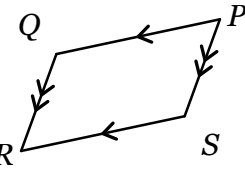
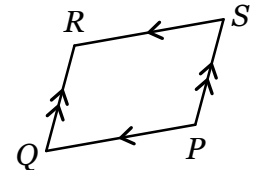
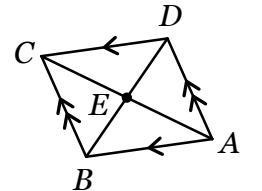
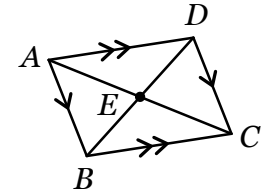
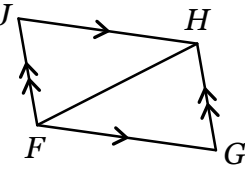
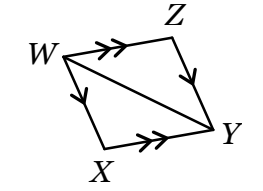
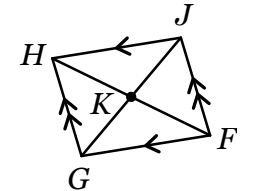
The same number. The ? must be equal to the number.

180° minus the number. The ? and the number must add to 180° .

Cannot tell. Nothing in a parallelogram gives the ?.

The twelve pieces

Cut along the dotted lines

 1. $\angle K = 64^\circ$. $\angle M = ?$	 2. $\angle W = 115^\circ$. $\angle X = ?$	 3. $AE = 7$. $BE = ?$	 4. $\angle R = 62^\circ$. $\angle S = ?$
 5. $\angle LKM = 30^\circ$. $\angle MKN = ?$	 6. $PQ = 9$. $SR = ?$	 7. $PQ = 9$. $QR = ?$	 8. $AE = 7$. $EC = ?$
 9. $\angle AEB = 70^\circ$. $\angle BEC = ?$	 10. $\angle GFH = 35^\circ$. $\angle JHF = ?$	 11. $\angle XWY = 40^\circ$. $\angle XYW = ?$	 12. $\angle FKG = 104^\circ$. $\angle GKH = ?$



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Cut & Glue Sort — answers

For the teacher

The same number	1 ($\angle K = 64^\circ$, $\angle M = ?$) $\angle K$ and $\angle M$ are across from each other, so they are equal.	6 ($PQ = 9$, $SR = ?$) PQ and SR are sides across from each other, so they are equal.	8 ($AE = 7$, $EC = ?$) AE and EC are the two pieces of diagonal AC . The diagonals cut each other in half.	10 ($\angle GFH = 35^\circ$, $\angle JHF = ?$) The diagonal FH crosses the parallel sides FG and JH . $\angle GFH$ and $\angle JHF$ are the two angles of the Z .
180° minus the number	2 ($\angle W = 115^\circ$, $\angle X = ?$) $\angle W$ and $\angle X$ are at the two ends of side WX , so they add to 180° .	4 ($\angle R = 62^\circ$, $\angle S = ?$) $\angle R$ and $\angle S$ are at the two ends of side RS , so they add to 180° .	9 ($\angle AEB = 70^\circ$, $\angle BEC = ?$) $\angle AEB$ and $\angle BEC$ are side by side on the straight line AC , so they add to 180° .	12 ($\angle FKG = 104^\circ$, $\angle GKH = ?$) $\angle FKG$ and $\angle GKH$ are side by side on the straight line FH , so they add to 180° .
Cannot tell	3 ($AE = 7$, $BE = ?$) AE is a piece of AC and BE is a piece of BD . Nothing says the two diagonals are equal.	5 ($\angle LKM = 30^\circ$, $\angle MKN = ?$) The diagonal KM cuts $\angle K$ into two parts. It cuts a corner in half only in a rhombus.	7 ($PQ = 9$, $QR = ?$) PQ and QR are sides next to each other. They are equal only in a rhombus.	11 ($\angle XWY = 40^\circ$, $\angle XYW = ?$) $\angle XWY$ and $\angle XYW$ are at the two ends of diagonal WY , but on the same side of it. That is not a Z , so nothing makes them equal.

Every row holds four pieces. A piece goes in the first row when a property makes the two parts equal. It goes in the second row when the two angles share a side of the parallelogram, or sit side by side on one diagonal, so they add to 180° . It goes in the last row when no property connects the two parts.

To check a piece with a student, ask: “Are the two parts across from each other, next to each other, or on different diagonals?”