

ANSWER MAZE



PROPERTIES OF KITES

Which Diagonal Gets Cut in Half?

One page · 10–15 minutes · nothing to prepare

FREE

5

Kite ABCD has $BA = BC$ and $DA = DC$.
 $\angle B = 76^\circ$ and $\angle A = 118^\circ$. How big is $\angle D$?

$76^\circ \rightarrow$ **go to 3**

$48^\circ \rightarrow$ **go to 2**

*Find the two corners where the equal sides meet.
Which two angles are away from the line that joins them?*

2

Kite ABCD has $DA = DC$ and $BA = BC$. Its diagonals meet at M. $BD = 30$ and $BM = 7$.
How long is MD?

$23 \rightarrow$ **go to 7**

$15 \rightarrow$ **go to 8**

*Find the two corners where the equal sides meet.
The line that joins them is the main diagonal. Which diagonal is it?*

1. **Hand out page 3**, one per student. Nothing else is needed.
2. **Say this once:** *“Start at box 5. In every kite, first find the two corners where the equal sides meet. Write every box number in the row at the bottom as you go.”*
3. **Check a sheet quickly.** A student with no mistakes writes **5 2 7 4 1 6**: six boxes, then out.

Student sheet	page 3, one per student. It shows the three kite facts as small drawings.
Answers	page 4.

Every wrong answer comes from one of two mistakes. In a kite, the *main diagonal* joins the two corners where the equal sides meet. The first mistake is about angles. The two angles the main diagonal misses are congruent, but many students say “opposite angles are congruent” and use the other pair, the two ends of the main diagonal. These wrong answers send the student to box 3. Those two angles are congruent only when the kite is a rhombus. On this sheet a rhombus counts as a kite. Some textbooks use other definitions, so tell the class which ones this sheet uses.

The second mistake is about the diagonals. The main diagonal cuts the other diagonal in half, but it is not cut in half itself. Students bring “the diagonals bisect each other” from parallelograms, or they think the longer diagonal is the main one. In a wide, flat kite the main diagonal is the shorter one. These wrong answers send the student to box 8. Boxes 3 and 8 ask the same kind of question again, and both of their answers lead back to the route.

The row at the bottom is the check. A clean run is six numbers. Each wrong answer adds at least one more. Guessing does not get a student out: every simple guessing rule, such as always taking the first answer, goes wrong within the first three boxes.

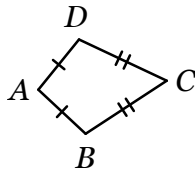


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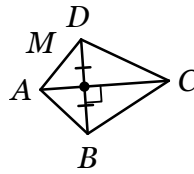
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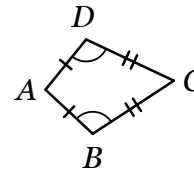
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A **kite** has two pairs of equal sides. The two sides of each pair **meet at a corner**.



The **main diagonal** AC joins the corners where equal sides meet. It cuts BD **in half**, at a right angle. BD does **not** cut AC in half.



$\angle B = \angle D$: the two angles the main diagonal misses. $\angle A$ and $\angle C$ are equal **only in a rhombus**.

Answer the question in the box. Choose an answer, and go to the box it names. Sketch the kite if it helps. Write each box number in the row at the bottom as you reach it.

1

Kite WXYZ has $WX = WZ$ and $YX = YZ$. $\angle X = 98^\circ$ and $\angle Y = 50^\circ$. How big is $\angle W$?

$114^\circ \rightarrow$ **go to 6**

$50^\circ \rightarrow$ **go to 3**

Find the two corners where the equal sides meet. Which two angles are away from the line that joins them?

2

Kite ABCD has $DA = DC$ and $BA = BC$. Its diagonals meet at M. $BD = 30$ and $BM = 7$. How long is MD?

$23 \rightarrow$ **go to 7**

$15 \rightarrow$ **go to 8**

Find the two corners where the equal sides meet. The line that joins them is the main diagonal. Which diagonal is it?

3

Kite EFGH has $FE = FG$ and $HE = HG$. $\angle F = 64^\circ$ and $\angle E = 120^\circ$. How big is $\angle H$?

$64^\circ \rightarrow$ **go to 5**

$56^\circ \rightarrow$ **go to 2**

Find the two corners where the equal sides meet. Which two angles are away from the line that joins them?

4

Kite JKLN has $JK = JN$ and $LK = LN$. Which diagonal is cut in half by the other one?

$KN \rightarrow$ **go to 1**

$JL \rightarrow$ **go to 8**

Find the two corners where the equal sides meet. The line that joins them is the main diagonal. Which diagonal is it?

5

Kite ABCD has $BA = BC$ and $DA = DC$. $\angle B = 76^\circ$ and $\angle A = 118^\circ$. How big is $\angle D$?

$76^\circ \rightarrow$ **go to 3**

$48^\circ \rightarrow$ **go to 2**

Find the two corners where the equal sides meet. Which two angles are away from the line that joins them?

6

Kite ABCD has $BA = BC$ and $DA = DC$. Diagonal AC is longer than diagonal BD. Which one is cut in half?

BD, the shorter one $\rightarrow$ **go to 8**

AC, the longer one $\rightarrow$ **you are out**

Find the two corners where the equal sides meet. The line that joins them is the main diagonal. Which diagonal is it?

7

Kite PQRS has $QP = QR$ and $SP = SR$. $\angle Q = 70^\circ$ and $\angle P = 115^\circ$. How big is $\angle R$?

$105^\circ \rightarrow$ **go to 3**

$115^\circ \rightarrow$ **go to 4**

Find the two corners where the equal sides meet. Which two angles are away from the line that joins them?

8

Kite PQRS has $PQ = PS$ and $RQ = RS$. Its diagonals meet at T. $PR = 20$ and $PT = 6$. How long is TR?

$14 \rightarrow$ **go to 7**

$10 \rightarrow$ **go to 2**

Find the two corners where the equal sides meet. The line that joins them is the main diagonal. Which diagonal is it?

Write each box number as you reach it:

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The route, in order. Boxes 3 and 8 are not on it. A student reaches them only by a wrong answer. They are the last two rows of the table.

5 → 2 → 7 → 4 → 1 → 6 → out

	Box	Right answer, and why	Wrong answer, and why a student picks it
1	Box 5 Kite ABCD has $BA = BC$ and $DA = DC$. $\angle B = 76^\circ$ and $\angle A = 118^\circ$. How big is $\angle D$?	48° The main diagonal BD joins B and D, where the equal sides meet. It misses A and C, so $\angle C = \angle A = 118^\circ$. Then $\angle D = 360^\circ - 76^\circ - 118^\circ - 118^\circ = 48^\circ$.	" 76° " goes to box 3. This takes $\angle D = \angle B$, as if B and D were the equal pair. They are the two ends of the main diagonal.
2	Box 2 Kite ABCD has $DA = DC$ and $BA = BC$. Its diagonals meet at M. $BD = 30$ and $BM = 7$. How long is MD?	23 BD is the main diagonal, and nothing cuts it in half. M is on BD, so $MD = 30 - 7 = 23$.	"15" goes to box 8. This cuts BD in half. In a kite the main diagonal cuts the other one in half, not the other way round.
3	Box 7 Kite PQRS has $QP = QR$ and $SP = SR$. $\angle Q = 70^\circ$ and $\angle P = 115^\circ$. How big is $\angle R$?	115° The equal sides meet at Q and S, so the main diagonal is QS. It misses P and R, so $\angle R = \angle P = 115^\circ$.	" 105° " goes to box 3. This takes Q and S as the equal pair ($\angle S = 70^\circ$), then subtracts. Q and S are the ends of the main diagonal.
4	Box 4 Kite JKLN has $JK = JN$ and $LK = LN$. Which diagonal is cut in half by the other one?	KN The equal sides meet at J and at L, so JL is the main diagonal. It cuts the other diagonal, KN, in half.	"JL" goes to box 8. JL is the main diagonal. It does the cutting. It is not cut in half itself (unless the kite is a rhombus).
5	Box 1 Kite WXYZ has $WX = WZ$ and $YX = YZ$. $\angle X = 98^\circ$ and $\angle Y = 50^\circ$. How big is $\angle W$?	114° The main diagonal WY misses X and Z, so $\angle Z = \angle X = 98^\circ$. Then $\angle W = 360^\circ - 98^\circ - 98^\circ - 50^\circ = 114^\circ$.	" 50° " goes to box 3. This takes $\angle W = \angle Y$, as if W and Y were the equal pair. They are the two ends of the main diagonal.
6	Box 6 Kite ABCD has $BA = BC$ and $DA = DC$. Diagonal AC is longer than diagonal BD. Which one is cut in half?	AC, the longer one BD is the main diagonal, because the equal sides meet at B and D. It cuts AC in half, even when AC is the longer one.	"BD, the shorter one" goes to box 8. Many students think the main diagonal is always the longer one. In a wide, flat kite it is the shorter one.
	Box 3 Kite EFGH has $FE = FG$ and $HE = HG$. $\angle F = 64^\circ$ and $\angle E = 120^\circ$. How big is $\angle H$?	56° The main diagonal FH misses E and G, so $\angle G = \angle E = 120^\circ$. Then $\angle H = 360^\circ - 64^\circ - 120^\circ - 120^\circ = 56^\circ$.	" 64° " goes to box 5. A student who still takes the two ends of the main diagonal as the equal pair picks this.
	Box 8 Kite PQRS has $PQ = PS$ and $RQ = RS$. Its diagonals meet at T. $PR = 20$ and $PT = 6$. How long is TR?	14 PR is the main diagonal, and nothing cuts it in half. T is on PR, so $TR = 20 - 6 = 14$.	"10" goes to box 2. A student who still cuts the main diagonal in half picks this.

How to check any box. Ask the student to sketch the kite and mark the two corners where the equal sides meet. The line between them is the main diagonal. It cuts the other diagonal in half, and the two angles it misses are congruent. The angles at its two ends are congruent only in a rhombus.

A student can find the last four boxes of the route by following the arrows backward from "you are out." So ask a student with a clean row to explain one box.