

ANSWER MAZE



RECTANGLES, RHOMBUSES AND SQUARES

Rectangle Rule or Rhombus Rule?

One page · 10–15 minutes · nothing to prepare

FREE

5

In rhombus ABCD, each side is 13 and diagonal AC is 24. How long is diagonal BD?

10 → **go to 2**

24 → **go to 8**

Draw the four small triangles at M. Which lengths of one of them are known?

2

In rectangle ABCD, the diagonals meet at M, and $\angle MAB = 27^\circ$. Find $\angle AMB$.

90° → **go to 3**

126° → **go to 7**

Look at triangle AMB. Which of its sides are pieces of the diagonals?

1. **Hand out page 3**, one per student. Nothing else is needed.
2. **Say this once:** *“Start at box 5. Use the drawings at the top to see where the letters go. 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. At the top it shows a rectangle and a rhombus side by side, lettered, with what is true of each.
Answers	page 4.

Every wrong answer is the other figure’s fact. On a rectangle box, the wrong answer uses a rhombus fact: diagonals that are perpendicular, a diagonal that cuts the corner in half, or four triangles at the crossing that are all the same. These wrong answers send the student to box 3. On a rhombus box, the wrong answer uses a rectangle fact: diagonals of the same length, or half-diagonals MA and MB of the same length. These 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 last two boxes of the route ask the rules backward: which figure a parallelogram must be when its diagonals are perpendicular, or the same length.

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 six boxes.

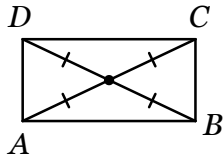


This is the free lesson this activity came from. The worksheet, the full answers and the lesson plan are on it, at three levels of difficulty.
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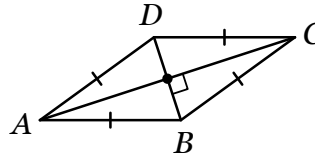
Name _____

Period _____

Date _____



Rectangle: four right angles. Its diagonals are **equal**. They cut each other in half. A parallelogram is a rectangle if it has **one right angle**, if **two angles next to each other** are equal, or if its **diagonals are equal**.



Rhombus: four equal sides. Its diagonals are **perpendicular**. They cut each other in half. Each diagonal cuts the two corners it joins in half. A parallelogram is a rhombus if **two sides next to each other** are equal, if its **diagonals are perpendicular**, or if a diagonal **cuts a corner in half**.

A square is both a rectangle and a rhombus. Everything true of a rectangle and everything true of a rhombus is true of a square. In every box, **M** is the point where the diagonals cross.

Answer the question in the box. Choose an answer, and go to the box it names. The drawings above show where the letters A, B, C and D go. Write each box number in the row at the bottom as you reach it.

1

ABCD is a parallelogram, and its diagonals are perpendicular. What must ABCD be?
a rhombus → **go to 6**
a rectangle → **go to 8**
Look at the mark where the diagonals meet in each drawing of the strip.

2

In rectangle ABCD, the diagonals meet at M, and $\angle MAB = 27^\circ$. Find $\angle AMB$.
 $90^\circ \rightarrow$ **go to 3**
 $126^\circ \rightarrow$ **go to 7**
Look at triangle AMB. Which of its sides are pieces of the diagonals?

3

In rectangle ABCD, the diagonals meet at M, and $\angle AMB = 124^\circ$. Find $\angle BMC$.
 $124^\circ \rightarrow$ **go to 2**
 $56^\circ \rightarrow$ **go to 7**
Look at the two angles at M that sit side by side on line AC. How do they fit together?

4

ABCD is a rectangle 14 cm long and 4 cm wide. Does diagonal AC cut the angle at A into two equal parts?
Yes, each part is 45° . → **go to 3**
No, not equal. → **go to 1**
Picture folding the long thin shape along AC. Does corner B land on corner D?

5

In rhombus ABCD, each side is 13 and diagonal AC is 24. How long is diagonal BD?
 $10 \rightarrow$ **go to 2**
 $24 \rightarrow$ **go to 8**
Draw the four small triangles at M. Which lengths of one of them are known?

6

ABCD is a parallelogram, and its diagonals are the same length. What must ABCD be?
a rhombus → **go to 3**
a rectangle → **you are out**
Look at the ticks on the pieces of the diagonals in each drawing of the strip.

7

In rhombus ABCD, the diagonals meet at M, and $\angle MAB = 37^\circ$. Find $\angle MBA$.
 $53^\circ \rightarrow$ **go to 4**
 $37^\circ \rightarrow$ **go to 8**
Start with the angle at M. What do this shape's diagonals do where they cross?

8

In rhombus ABCD, the diagonals meet at M, and $\angle ABM = 58^\circ$. Find $\angle AMB$.
 $90^\circ \rightarrow$ **go to 2**
 $64^\circ \rightarrow$ **go to 5**
Start with the angle at M. What do this shape's diagonals do where they cross?

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 In rhombus ABCD, each side is 13 and diagonal AC is 24. How long is diagonal BD?	10 The diagonals cut each other in half at M and are perpendicular. So triangle ABM has a right angle at M, $AB = 13$ and $AM = 12$. Then $BM = 5$, and $BD = 10$.	"24" goes to box 8. A rhombus's diagonals are not equal. Equal diagonals belong to a rectangle.
2	Box 2 In rectangle ABCD, the diagonals meet at M, and $\angle MAB = 27^\circ$. Find $\angle AMB$.	126° $MA = MB$, because a rectangle's diagonals are equal and cut each other in half. So $\angle MBA = 27^\circ$ too, and $\angle AMB = 180^\circ - 27^\circ - 27^\circ = 126^\circ$.	" 90° " goes to box 3. A rectangle's diagonals are not perpendicular. That belongs to a rhombus.
3	Box 7 In rhombus ABCD, the diagonals meet at M, and $\angle MAB = 37^\circ$. Find $\angle MBA$.	53° A rhombus's diagonals are perpendicular, so $\angle AMB = 90^\circ$. Then $\angle MBA = 180^\circ - 90^\circ - 37^\circ = 53^\circ$.	" 37° " goes to box 8. This takes $MA = MB$, as in a rectangle. In a rhombus the two half-diagonals are usually different.
4	Box 4 ABCD is a rectangle 14 cm long and 4 cm wide. Does diagonal AC cut the angle at A into two equal parts?	No, not equal. The part next to the long side is about 16° and the other about 74° . Only in a square does the diagonal cut the corner in half.	"Yes, each part is 45° ." goes to box 3. Cutting a corner in half is a rhombus fact. Folding a long rectangle along its diagonal shows it fails.
5	Box 1 ABCD is a parallelogram, and its diagonals are perpendicular. What must ABCD be?	a rhombus A parallelogram with perpendicular diagonals is a rhombus. This is the second half of the rhombus rule, read backward.	"a rectangle" goes to box 8. A rectangle's diagonals are equal, not perpendicular. Each figure's rule is the other one mixed up.
6	Box 6 ABCD is a parallelogram, and its diagonals are the same length. What must ABCD be?	a rectangle A parallelogram whose diagonals are the same length is a rectangle. A rhombus's diagonals are usually different lengths.	"a rhombus" goes to box 3. Many students believe a rhombus has equal diagonals. Only a square, which is also a rectangle, does.
	Box 3 In rectangle ABCD, the diagonals meet at M, and $\angle AMB = 124^\circ$. Find $\angle BMC$.	56° $\angle AMB$ and $\angle BMC$ sit side by side on the straight line AC, so they add to 180° . $\angle BMC = 180^\circ - 124^\circ = 56^\circ$.	" 124° " goes to box 2. A student who still treats the four triangles at M as all the same picks this. In a rectangle they come in two different pairs.
	Box 8 In rhombus ABCD, the diagonals meet at M, and $\angle ABM = 58^\circ$. Find $\angle AMB$.	90° The diagonals of every rhombus are perpendicular, so $\angle AMB = 90^\circ$, whatever the other angles are.	" 64° " goes to box 5. A student who still takes $MA = MB$, as in a rectangle, gets $180^\circ - 58^\circ - 58^\circ$.

How to check any box. Ask: "Is this a rectangle or a rhombus, and which facts belong to it?" A rectangle's diagonals are equal and cut each other in half, so the four triangles at M are isosceles and come in two pairs. A rhombus's diagonals are perpendicular and cut each other in half, and each one cuts the two corners it joins in half.

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.