

SCAVENGER HUNT



RECTANGLES, RHOMBUSES AND SQUARES

Which Rule Belongs to Which Shape?

Angles and diagonals in rectangles and rhombuses · the cards check the answers

FREE

ANSWER

14

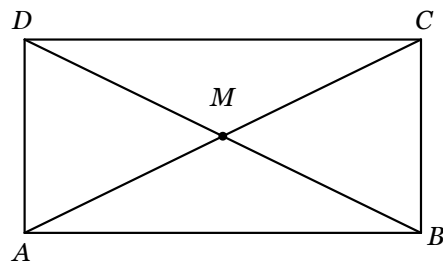
ABCD is a rectangle.

Its diagonals meet at M.

$\angle AMB = 128^\circ$

Find $\angle BMC$.

*Two angles side by side on a straight line add to 180° .
Which two sit at the crossing?*



G

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1. **Tape the 16 cards around the room**, in any order. Each card has a large letter in its bottom left corner. Start each group at a *different* one of these eight cards: *G N H Q A E K R*.
2. **Say this once:** “A rectangle’s diagonals are equal. A rhombus’s diagonals are perpendicular. Both cut each other in half. Eight right answers bring you back to your first card.”
3. **Each group finds the number, then walks to the card with that number at the top.** Nothing else is needed.

16 cards	pages 3–10, one copy. There are two cards on each sheet. Cut the whole stack once.
Record sheet	page 11, one per student. It shows a lettered rectangle and rhombus side by side, with what is true of each.
Answers	pages 12–13, for you only. Do not put them up in the room.

Every card asks for an angle or a length inside a rectangle or a rhombus. Three ring cards are rectangles and five are rhombuses. Each is drawn to scale with both diagonals. In a rectangle, the diagonals are equal and cut each other in half, so the four triangles at the crossing are isosceles and come in two pairs. In a rhombus, the diagonals are perpendicular and cut each other in half, and each diagonal cuts the two corners it joins in half.

Eight of the sixteen cards make the ring. A group reaches the other eight only by a wrong answer, but all the cards look the same. Each ring card has one common mistake, and most of them use one shape’s fact on the other shape: equal diagonals in a rhombus, or four equal angles at the crossing of a rectangle. That mistake gives the number at the top of a card off the ring. The group does that card, and its answer sends the group back to the card it got wrong. If the group goes wrong there too, it goes one more card back and still does not reach the ring.

The check is the length of the group’s list. A clean run is **eight lines**. Each wrong answer adds two. Every card has a line in small type under the question. It tells a group that arrived by a wrong answer what to check. A group that arrived by a right answer skips it. If a group keeps coming back to the same cards, do not give the answer. Ask: “*Is this a rectangle or a rhombus? What do its diagonals do?*”



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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ANSWER

16

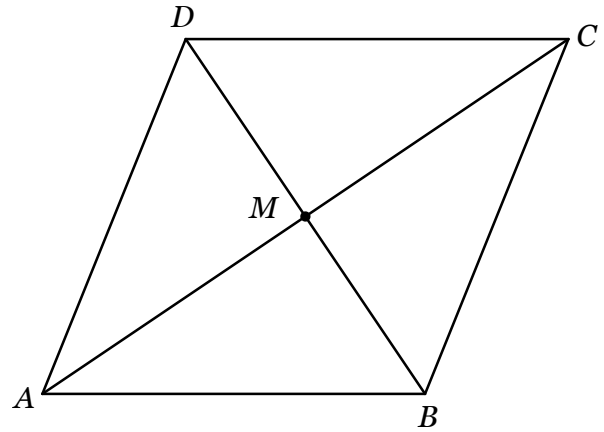
ABCD is a rhombus.

Its diagonals meet at M.

$$\angle MAB = 34^\circ$$

Find $\angle MBA$.

Find the angle at the crossing first. What do the diagonals of a rhombus do?



A

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ANSWER

128

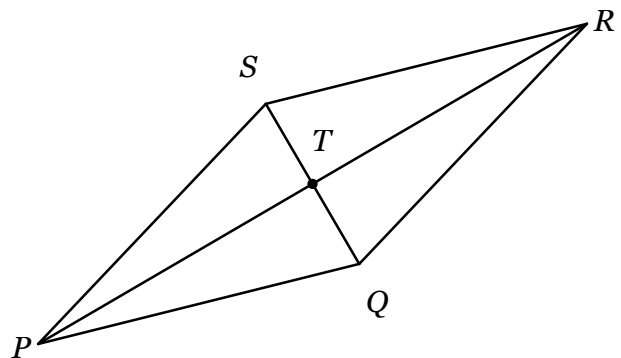
PQRS is a rhombus.

Its diagonals meet at T.

$$PQ = 25 \text{ and } PR = 48$$

Find QS.

In a rectangle, the four angles at the crossing come in two sizes.



B

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ANSWER

22

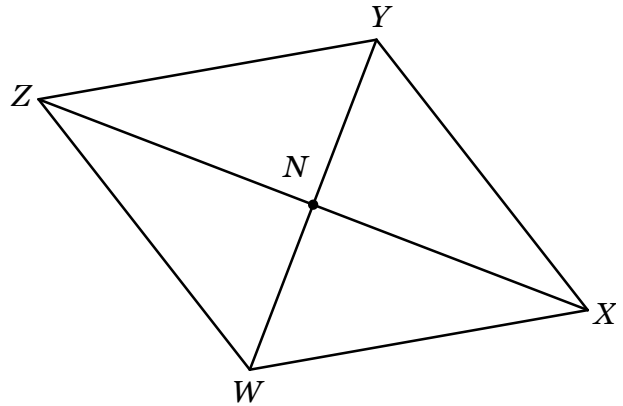
WXYZ is a rhombus.

Its diagonals meet at N.

$$\angle ZWX = 118^\circ$$

Find $\angle WXN$.

The next triangle at the crossing of a rectangle is not a copy.



C

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ANSWER

48

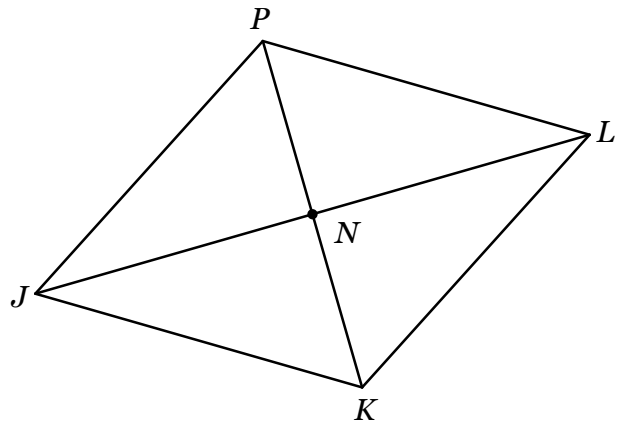
JKLP is a rhombus.

Its diagonals meet at N.

$$\angle PJK = 64^\circ$$

Find $\angle JKN$.

Equal diagonals make a rectangle. In a rhombus, use the right angle at the crossing.



D

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ANSWER

56

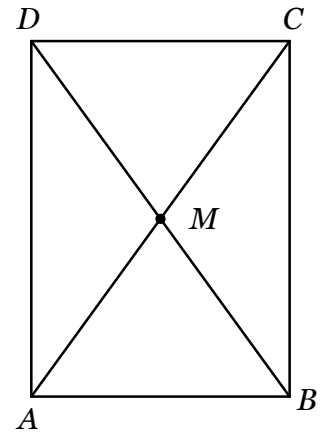
ABCD is a rectangle.

Its diagonals meet at M.

$$\angle AMB = 72^\circ$$

Find $\angle BMC$.

Look along the diagonal AC. How do the two angles at M on it fit together?



E

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ANSWER

34

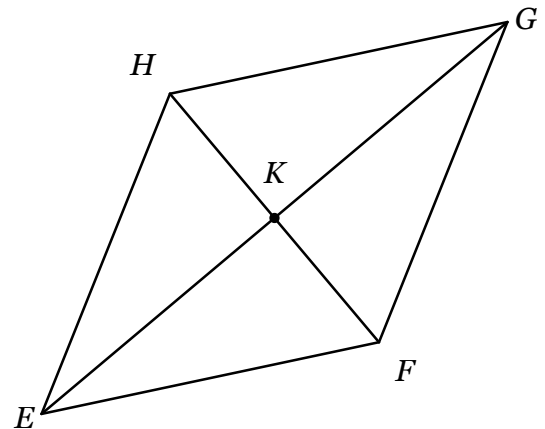
EFGH is a rhombus.

Its diagonals meet at K.

$$EF = 17 \text{ and } EG = 30$$

Find FH.

Half-diagonals of a rhombus are usually different. What is the angle at the crossing?



F

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ANSWER

14

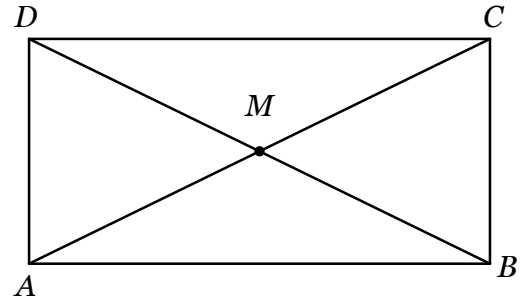
ABCD is a rectangle.

Its diagonals meet at M.

$$\angle AMB = 128^\circ$$

Find $\angle BMC$.

*Two angles side by side on a straight line add to 180° .
Which two sit at the crossing?*



G

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ANSWER

31

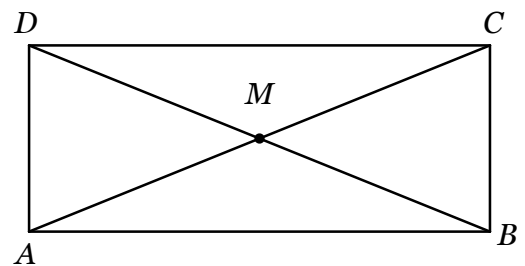
ABCD is a rectangle.

Its diagonals meet at M.

$$\angle MAB = 22^\circ$$

Find $\angle MDA$.

*Each small triangle in a rectangle has two equal sides.
Which two angles match?*



H

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ANSWER

72

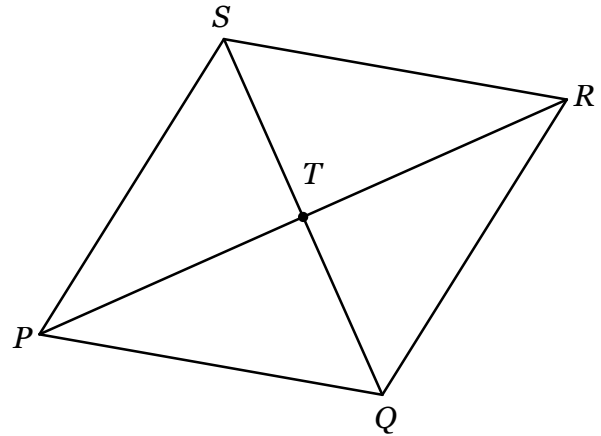
PQRS is a rhombus.

Its diagonals meet at T.

$$\angle TPQ = 34^\circ$$

Find $\angle TQP$.

Four equal angles at the crossing belong to a rhombus. What does a rectangle have?



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J

ANSWER

108

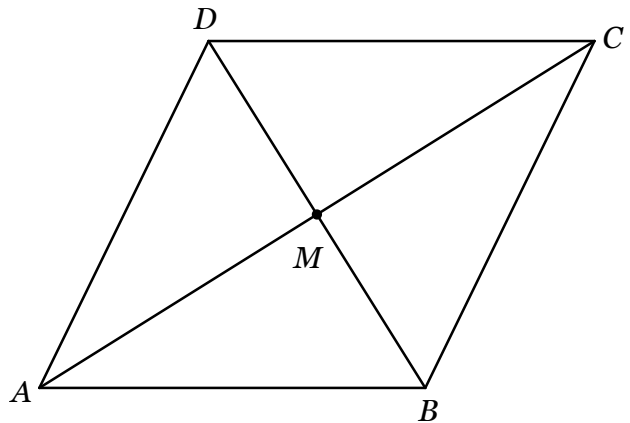
ABCD is a rhombus.

Its diagonals meet at M.

$$\angle DAB = 64^\circ$$

Find $\angle ABM$.

Find the whole angle at B first. Then cut it in half.



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K

ANSWER

30

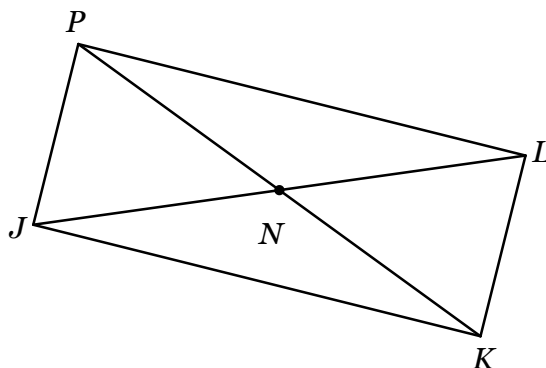
JKLP is a rectangle.

Its diagonals meet at N.

$$\angle NJK = 22^\circ$$

Find $\angle NPJ$.

A rhombus has two diagonals of different lengths. Only a square has equal ones.



L

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ANSWER

59

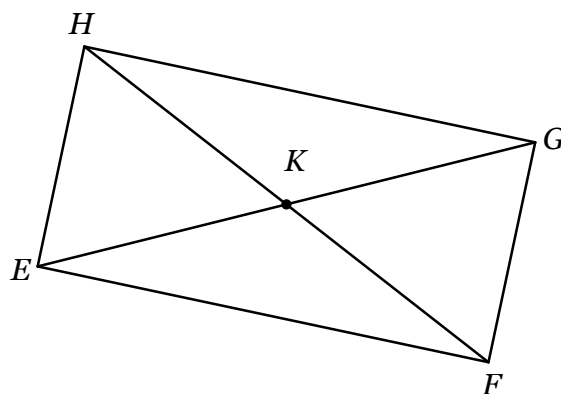
EFGH is a rectangle.

Its diagonals meet at K.

$$\angle EKF = 128^\circ$$

Find $\angle FKG$.

In a rhombus, the corners at the two ends of a side are different. Check the corner.



M

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ANSWER

52

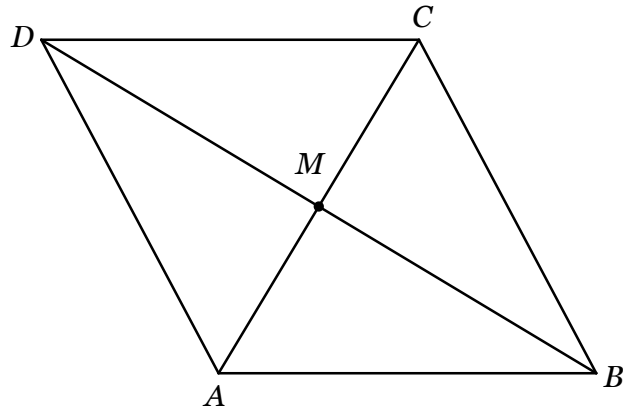
ABCD is a rhombus.

Its diagonals meet at M.

$$\angle DAB = 118^\circ$$

Find $\angle ABM$.

Two corners at the ends of one side are different sizes. Which corner is this angle in?



N

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ANSWER

32

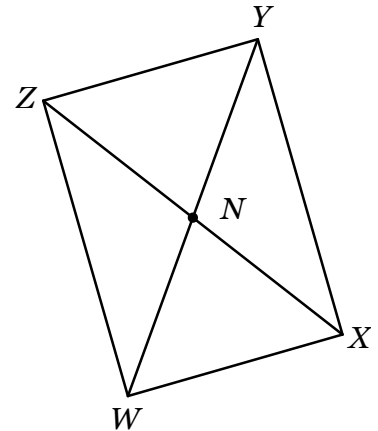
WXYZ is a rectangle.

Its diagonals meet at N.

$$\angle WNX = 72^\circ$$

Find $\angle XNY$.

A diagonal of a rhombus halves only its own two corners. Which corner is this?



P

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ANSWER

68

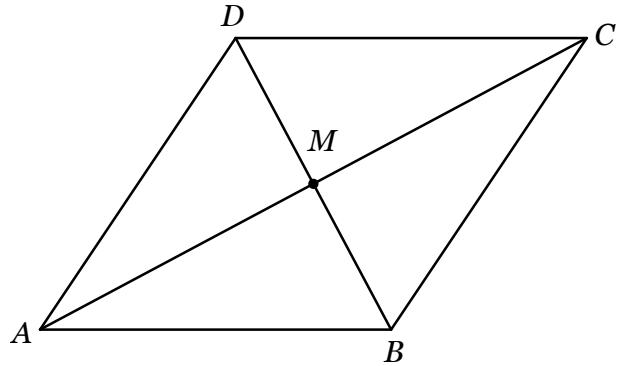
ABCD is a rhombus.

Its diagonals meet at M.

$AB = 17$ and $AC = 30$

Find BD.

Half of each diagonal and one side make a right triangle.



Q

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ANSWER

58

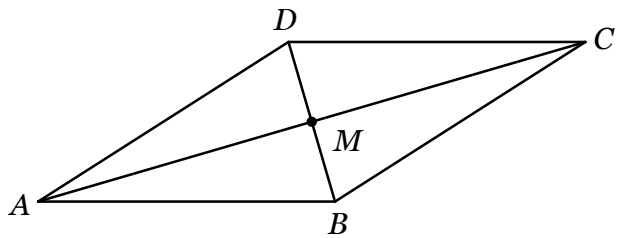
ABCD is a rhombus.

Its diagonals meet at M.

$AB = 25$ and $AC = 48$

Find BD.

Draw triangle ABM. Which two of its sides are known?



R

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Scavenger Hunt — where I went

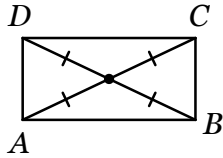
Rectangles and rhombuses

Name _____

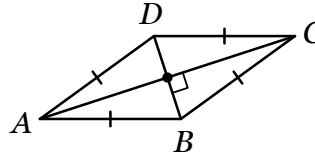
Period _____

Date _____

Do the card you are at. Fill in one line. Then find the card with your answer at the top. A clean run is eight lines. Each card has a line in small type under the question. **If you are on a card because you went wrong, its line says what to check. If you were right, skip it.**



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.

Card letter	My work	My answer
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

Is a square in the rectangle family or in the rhombus family? It belongs ...

Every number stands for a letter. Write the letter for each of your answers in the box above that number. Leave the other boxes empty. Then read the boxes you filled, left to right. **If they do not spell a word, one answer is wrong.**

14 = B 16 = O 22 = S 30 = Y 31 = T 32 = A 34 = W 48 = H 52 = H 56 = W 58 = A 59 = T 68 = Y 72 = O
108 = S 128 = B

14	16	22	30	31	32	34	48	52	56	58	59	68	72	108	128



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Scavenger Hunt — answers

For the teacher

The ring in order. A group may begin anywhere on it. Wherever it begins, eight right answers bring it back to that card.

G → N → H → Q → A → E → K → R → G

Is a square in the rectangle family or in the rhombus family? It belongs ... The answer is **BOTH WAYS**. The ring's answers, in the order of the boxes on the record sheet (smallest number first), with their letters: **14 B • 16 O • 31 T • 52 H • 56 W • 58 A • 68 Y • 108 S**.

	Card	The card	Answer, and why	The common wrong answer	Joke letter for the number at its top
1	G	ABCD is a rectangle. Its diagonals meet at M. $\angle AMB = 128^\circ$ Find $\angle BMC$.	52. $\angle AMB$ and $\angle BMC$ sit side by side on the straight line AC, so they add to 180° . $\angle BMC = 180^\circ - 128^\circ = 52^\circ$.	128, from taking the four angles at the crossing as all equal, as in a rhombus	B
2	N	ABCD is a rhombus. Its diagonals meet at M. $\angle DAB = 118^\circ$ Find $\angle ABM$.	31. The angles at A and B are next to each other, so $\angle ABC = 180^\circ - 118^\circ = 62^\circ$. The diagonal BD cuts the angle at B in half: 31° .	59, from halving the angle at the wrong corner	H
3	H	ABCD is a rectangle. Its diagonals meet at M. $\angle MAB = 22^\circ$ Find $\angle MDA$.	68. $\angle MAD = 90^\circ - 22^\circ = 68^\circ$. MA = MD, because the diagonals of a rectangle are equal and cut each other in half. So $\angle MDA = \angle MAD = 68^\circ$.	22, from copying the angle from the triangle next to it, as if all four triangles were alike	T
4	Q	ABCD is a rhombus. Its diagonals meet at M. AB = 17 and AC = 30 Find BD.	16. The diagonals cut each other in half at right angles, so AM = 15 and triangle ABM has a right angle at M. $BM \times BM = 17 \times 17 - 15 \times 15 = 64$, so BM = 8 and BD = 16.	30, from taking the diagonals as equal, as in a rectangle	Y
5	A	ABCD is a rhombus. Its diagonals meet at M. $\angle MAB = 34^\circ$ Find $\angle MBA$.	56. The diagonals of a rhombus are perpendicular, so $\angle AMB = 90^\circ$. $\angle MBA = 180^\circ - 90^\circ - 34^\circ = 56^\circ$.	34, from taking the two half-diagonals at a side as equal, as in a rectangle	O
6	E	ABCD is a rectangle. Its diagonals meet at M. $\angle AMB = 72^\circ$ Find $\angle BMC$.	108. $\angle AMB$ and $\angle BMC$ sit side by side on the straight line AC, so they add to 180° . $\angle BMC = 180^\circ - 72^\circ = 108^\circ$.	72, from taking the four angles at the crossing as all equal, as in a rhombus	W
7	K	ABCD is a rhombus. Its diagonals meet at M. $\angle DAB = 64^\circ$ Find $\angle ABM$.	58. The angles at A and B are next to each other, so $\angle ABC = 180^\circ - 64^\circ = 116^\circ$. The diagonal BD cuts the angle at B in half: 58° .	32, from halving the angle at the wrong corner	S
8	R	ABCD is a rhombus. Its diagonals meet at M. AB = 25 and AC = 48 Find BD.	14. The diagonals cut each other in half at right angles, so AM = 24 and triangle ABM has a right angle at M. $BM \times BM = 25 \times 25 - 24 \times 24 = 49$, so BM = 7 and BD = 14.	48, from taking the diagonals as equal, as in a rectangle	A

Each wrong answer in the table is the number at the top of a card off the ring. Those cards are on the next page.

Scavenger Hunt — the cards off the ring

For the teacher

A group reaches these eight cards only by a wrong answer. The number at the top of each one is the wrong answer from one ring card. Its right answer is the number at the top of that ring card, so the group goes back to the card it got wrong. If the group makes the same kind of mistake there, it goes to another card off the ring. So a second wrong answer never moves a group forward.

Card	The card	Answer, and why	The common wrong answer	Joke letter for the number at its top
B	PQRS is a rhombus. Its diagonals meet at T. $PQ = 25$ and $PR = 48$ Find QS.	14. The diagonals cut each other in half at right angles, so $PT = 24$ and triangle PQT has a right angle at T. $QT \times QT = 25 \times 25 - 24 \times 24 = 49$, so $QT = 7$ and $QS = 14$.	48, from taking the diagonals as equal, as in a rectangle	B
M	EFGH is a rectangle. Its diagonals meet at K. $\angle EKF = 128^\circ$ Find $\angle FKG$.	52. $\angle EKF$ and $\angle FKG$ sit side by side on the straight line EG, so they add to 180° . $\angle FKG = 180^\circ - 128^\circ = 52^\circ$.	128, from taking the four angles at the crossing as all equal, as in a rhombus	T
C	WXYZ is a rhombus. Its diagonals meet at N. $\angle ZWX = 118^\circ$ Find $\angle WNX$.	31. The angles at W and X are next to each other, so $\angle WXY = 180^\circ - 118^\circ = 62^\circ$. The diagonal XZ cuts the angle at X in half: 31° .	59, from halving the angle at the wrong corner	S
L	JKLP is a rectangle. Its diagonals meet at N. $\angle NJK = 22^\circ$ Find $\angle NPJ$.	68. $\angle NJP = 90^\circ - 22^\circ = 68^\circ$. $NJ = NP$, because the diagonals of a rectangle are equal and cut each other in half. So $\angle NPJ = \angle NJP = 68^\circ$.	22, from copying the angle from the triangle next to it, as if all four triangles were alike	Y
F	EFGH is a rhombus. Its diagonals meet at K. $EF = 17$ and $EG = 30$ Find FH.	16. The diagonals cut each other in half at right angles, so $EK = 15$ and triangle EFK has a right angle at K. $FK \times FK = 17 \times 17 - 15 \times 15 = 64$, so $FK = 8$ and $FH = 16$.	30, from taking the diagonals as equal, as in a rectangle	W
J	PQRS is a rhombus. Its diagonals meet at T. $\angle TPQ = 34^\circ$ Find $\angle TQP$.	56. The diagonals of a rhombus are perpendicular, so $\angle PTQ = 90^\circ$. $\angle TQP = 180^\circ - 90^\circ - 34^\circ = 56^\circ$.	34, from taking the two half-diagonals at a side as equal, as in a rectangle	O
P	WXYZ is a rectangle. Its diagonals meet at N. $\angle WNX = 72^\circ$ Find $\angle XNY$.	108. $\angle WNX$ and $\angle XNY$ sit side by side on the straight line WY, so they add to 180° . $\angle XNY = 180^\circ - 72^\circ = 108^\circ$.	72, from taking the four angles at the crossing as all equal, as in a rhombus	A
D	JKLP is a rhombus. Its diagonals meet at N. $\angle PJK = 64^\circ$ Find $\angle JKN$.	58. The angles at J and K are next to each other, so $\angle JKL = 180^\circ - 64^\circ = 116^\circ$. The diagonal KP cuts the angle at K in half: 58° .	32, from halving the angle at the wrong corner	H

Other mistakes lead to no ring card. For example, a group might forget to halve an angle, stop at half of a diagonal, or find the angle at the crossing instead of the one asked. Its answer is then not the number at the top of any ring card.

Guessing does not work. Every simple rule that uses only the printed numbers, such as taking 180 minus the number, answers at most four of the sixteen cards correctly.