

SCAVENGER HUNT



PROPERTIES OF KITES

Which Pair Matches? Which Half Is Cut?

One kite on every card · angles and diagonals · the cards check the answers

FREE

ANSWER

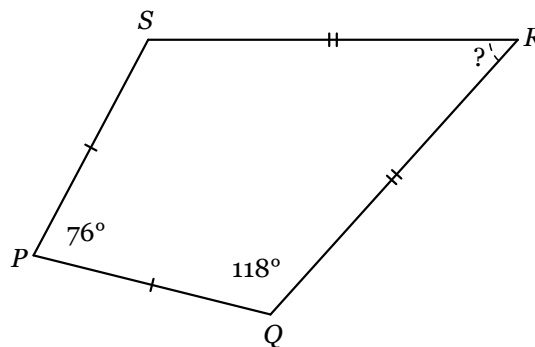
15

PQRS is a kite with $PQ = PS$ and $RQ = RS$.

$\angle P = 76^\circ$ $\angle Q = 118^\circ$

How big is $\angle R$?

The main diagonal joins the two corners where the equal sides meet.



R

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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: *R M J D F Q N H*.
2. **Say this once:** *“In every kite, first find the two corners where the equal sides meet. The diagonal between them is the main diagonal. Before you work anything out, write which rule you use. Eight right answers bring you back to your first card.”*
3. **Each group finds the answer, 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 the three kite rules as small drawings, numbered 1, 2 and 3.
Answers	pages 12–13, for you only. Do not put them up in the room.

Every card shows one kite. The words and the ticks say which sides are equal. The *main diagonal* joins the two corners where the equal sides meet. The two angles it misses are equal. On two ring cards one angle at an end of the main diagonal is given, and the angle at the other end is asked. The common mistake is to copy the given angle, as if the two ends were the equal pair. On two ring cards both end angles are given, and one of the other two angles is asked. The two equal angles share what is left of 360° . The common mistake is to give one angle all of it.

The other four ring cards are about the diagonals. The main diagonal cuts the other diagonal in half, but it is not cut in half itself (unless the kite is a rhombus). This sheet counts a rhombus as a kite. Some textbooks do not, so tell the class which definition this sheet uses. On two cards a piece of the main diagonal is asked: it is the whole main diagonal minus the given piece. On two cards a piece of the other diagonal is asked: it is half of that diagonal. On both kinds the common mistake is to cut the main diagonal in half.

The check is the length of the group's list. A clean run is **eight lines**. On every ring card, the common mistake gives the number at the top of one of the eight other cards. That card's answer sends the group back to the card it got wrong, so each wrong answer adds two lines. Every card has a line in small type under the question. It tells a group that arrived by a wrong answer what to check. If a group keeps coming back to the same cards, do not give the answer. Ask: *“Where do the equal sides meet? Draw the main diagonal between those corners.”*



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

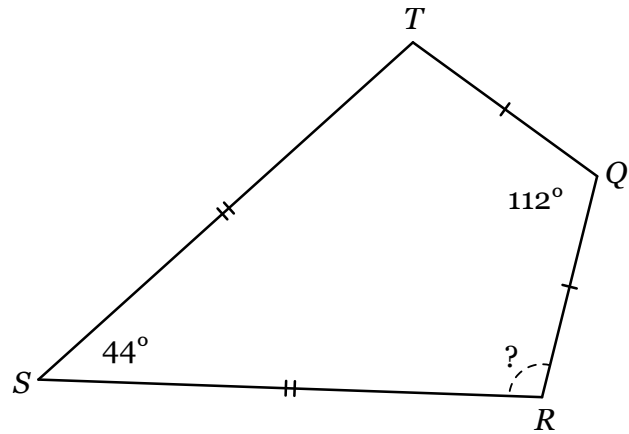
11

QRST is a kite with $QR = QT$ and $SR = ST$.

$$\angle Q = 112^\circ \quad \angle S = 44^\circ$$

How big is $\angle R$?

The two matching angles share the rest of 360° equally.



A

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ANSWER

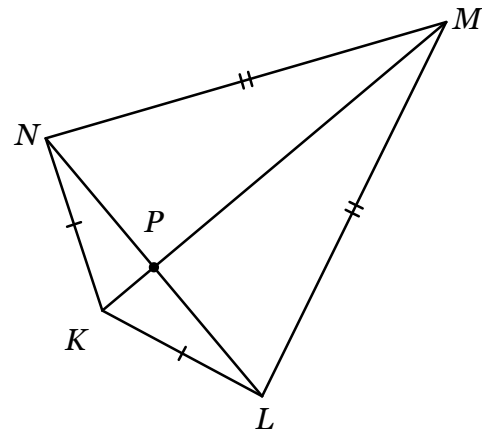
76

KLMN is a kite with $KL = KN$ and $ML = MN$.
Its diagonals cross at P.

$$KM = 40, KP = 6, LN = 30$$

How long is LP?

Only one diagonal is cut in half. Find the main diagonal first.



B

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ANSWER

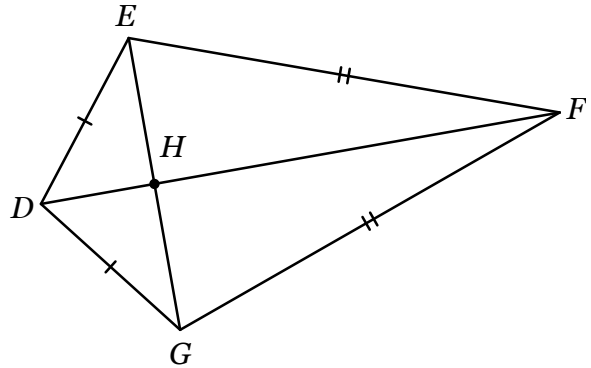
204

DEFG is a kite with $DE = DG$ and $FE = FG$. Its diagonals cross at H.

$DF = 32$, $EG = 18$, $DH = 7$

How long is HF?

The two pieces of the main diagonal add up to the whole diagonal.



C

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ANSWER

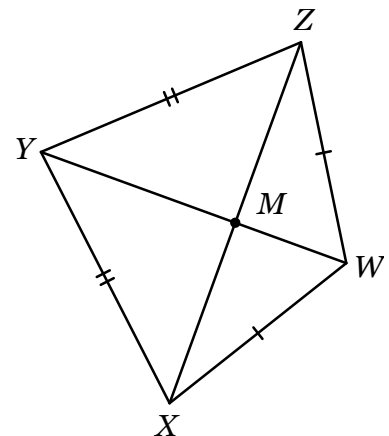
102

WXYZ is a kite with $WX = WZ$ and $YX = YZ$. Its diagonals cross at M.

$WY = 22$, $XZ = 26$, $WM = 8$

How long is XM?

The main diagonal cuts the other diagonal into two equal pieces.



D

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ANSWER

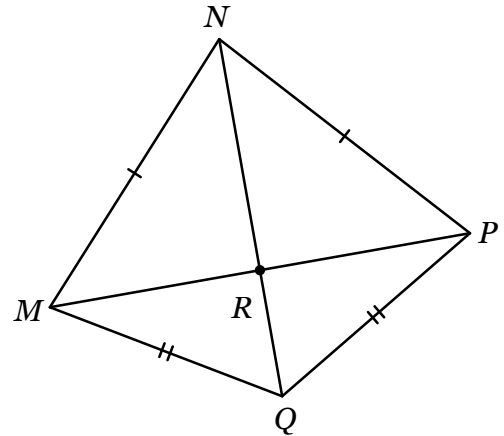
206

MNPQ is a kite with $NP = NM$ and $QP = QM$.
Its diagonals cross at R.

$PM = 40$, $NQ = 34$, $NR = 22$

How long is RQ?

The crossing point is not the middle of the main diagonal.



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E

ANSWER

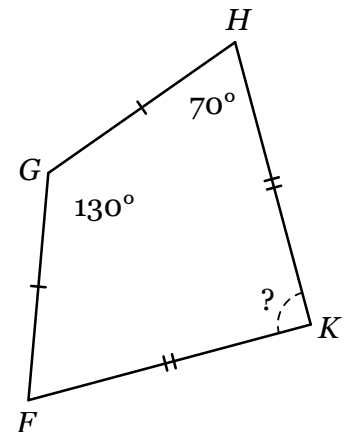
13

FGHK is a kite with $GH = GF$ and $KH = KF$.

$\angle H = 70^\circ$ $\angle G = 130^\circ$

How big is $\angle K$?

Which two angles does the main diagonal miss? Only those two match.



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F

ANSWER

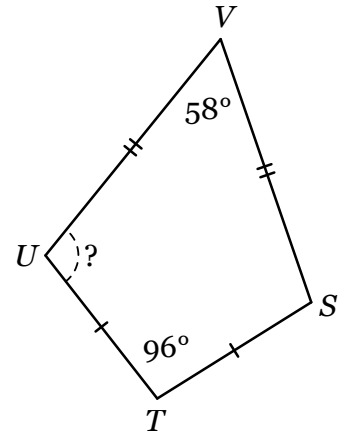
20

STUV is a kite with $TU = TS$ and $VU = VS$.

$$\angle T = 96^\circ \quad \angle V = 58^\circ$$

How big is $\angle U$?

Two matching angles and two other angles make 360° in all.



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G

ANSWER

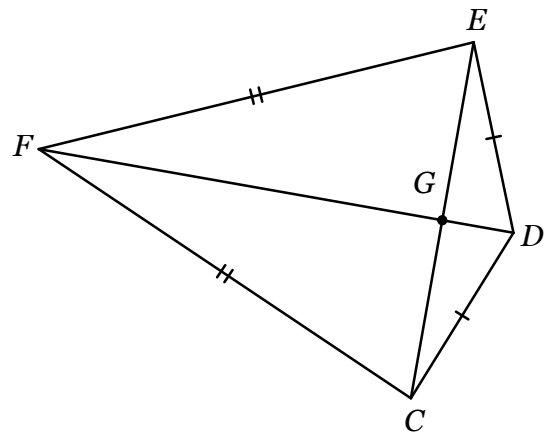
103

CDEF is a kite with $DE = DC$ and $FE = FC$.
Its diagonals cross at G.

$$DF = 40, DG = 6, EC = 30$$

How long is EG?

*Is the piece in the question part of the main diagonal, or
of the other one?*



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H

ANSWER

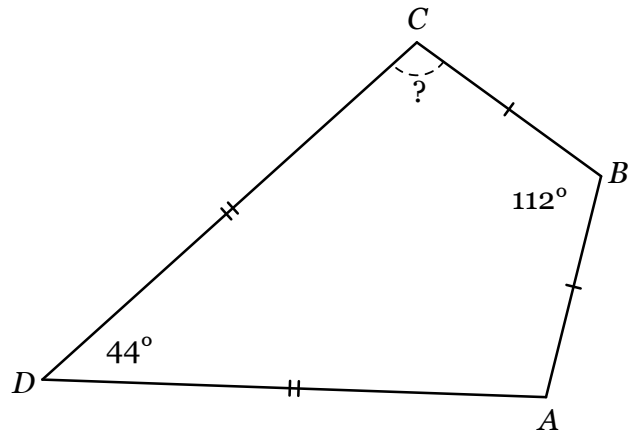
25

ABCD is a kite with $BC = BA$ and $DC = DA$.

$$\angle B = 112^\circ \quad \angle D = 44^\circ$$

How big is $\angle C$?

Two of the four angles match, and all four add to 360° .



J

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ANSWER

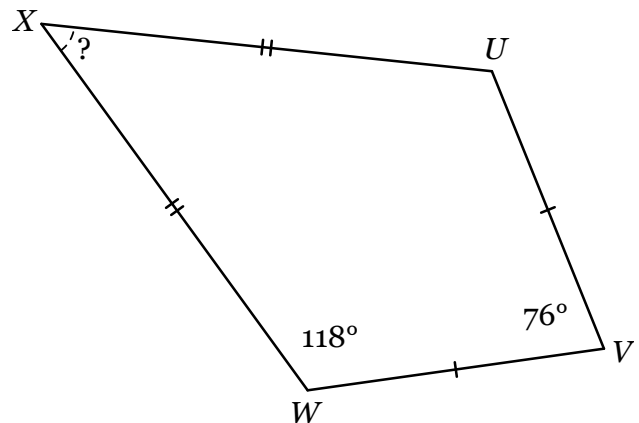
16

UVWX is a kite with $VW = VU$ and $XW = XU$.

$$\angle W = 118^\circ \quad \angle V = 76^\circ$$

How big is $\angle X$?

The angles at the two ends of the main diagonal match only in a rhombus.



K

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ANSWER

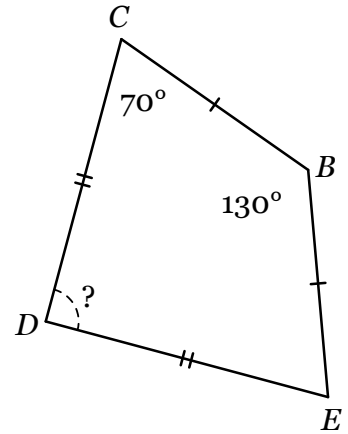
17

BCDE is a kite with $BC = BE$ and $DC = DE$.

$$\angle B = 130^\circ \quad \angle C = 70^\circ$$

How big is $\angle D$?

Put a finger on each corner where equal sides meet. Which two angles are left?



L

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ANSWER

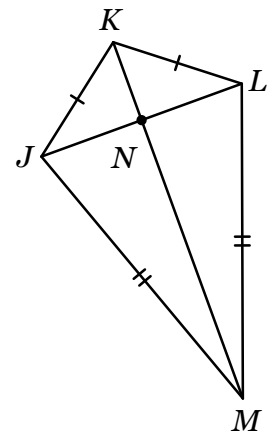
48

JKLM is a kite with $KL = KJ$ and $ML = MJ$. Its diagonals cross at N.

$$KM = 32, LJ = 18, KN = 7$$

How long is NM?

The main diagonal is not cut in half. Its two pieces can differ.



M

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ANSWER

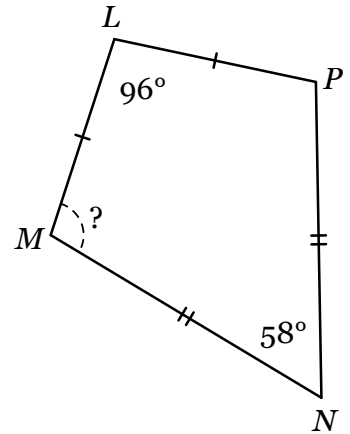
12

LMNP is a kite with $LM = LP$ and $NM = NP$.

$$\angle L = 96^\circ \quad \angle N = 58^\circ$$

How big is $\angle M$?

Share what is left of 360° equally between the two matching angles.



N

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ANSWER

130

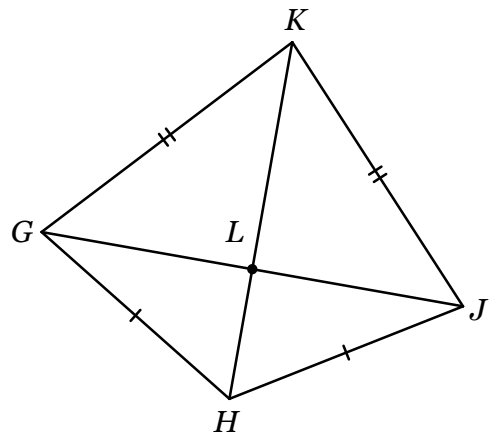
GHJK is a kite with $HJ = HG$ and $KJ = KG$.

Its diagonals cross at L.

$$HK = 22, \quad JG = 26, \quad HL = 8$$

How long is JL?

Half of the cut diagonal runs from a corner to the crossing point.



P

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ANSWER

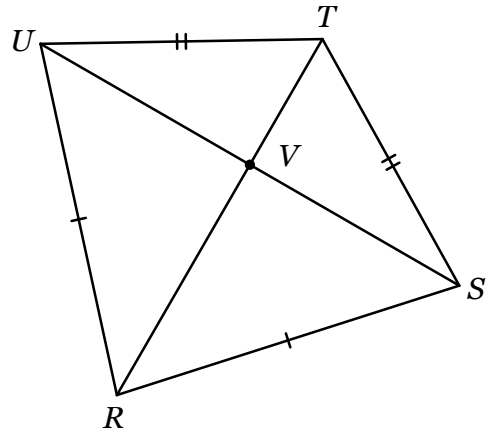
90

RSTU is a kite with $RS = RU$ and $TS = TU$. Its diagonals cross at V.

$SU = 40$, $RT = 34$, $RV = 22$

How long is VT?

Which diagonal holds the piece in the question? Look at that diagonal only.



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Q

ANSWER

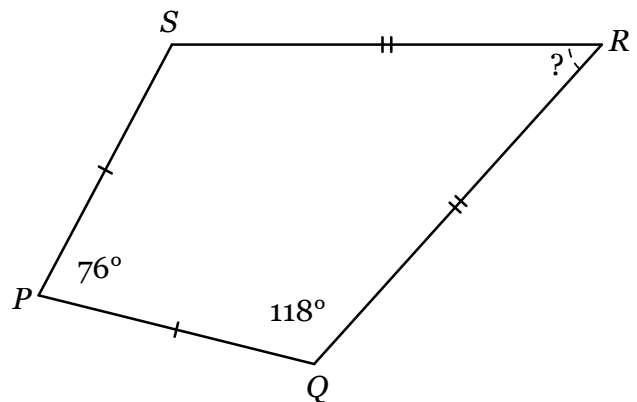
15

PQRS is a kite with $PQ = PS$ and $RQ = RS$.

$\angle P = 76^\circ$ $\angle Q = 118^\circ$

How big is $\angle R$?

The main diagonal joins the two corners where the equal sides meet.



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R

Scavenger Hunt — where I went

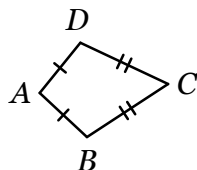
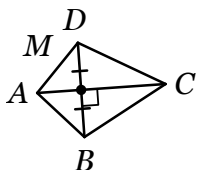
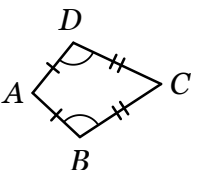
Properties of kites

Name _____

Period _____

Date _____

Do the card you are at. Fill in one line. Then find the card with your answer at the top. **Before you work anything out, write the number of the rule you use (1, 2 or 3).** 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.**

		
1. A kite has two pairs of equal sides. The two sides of each pair meet at a corner.	2. 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.	3. $\angle B = \angle D$: the two angles the main diagonal misses. $\angle A$ and $\angle C$ are equal only in a rhombus.
The four angles of any quadrilateral add to 360°.		

Card letter	Rule I use (1, 2 or 3)	My answer
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

What does every kite have, even one that caves in?

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 the answer to the joke, one answer is wrong.**

11 = S 12 = T 13 = W 15 = O 16 = A 17 = I 20 = R 25 = P 48 = A 76 = P 90 = I 102 = R 103 = S 130 = T
204 = O 206 = W

11	12	13	15	16	17	20	25	48	76	90	102	103	130	204	206



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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.

R → M → J → D → F → Q → N → H → R

What does every kite have, even one that caves in? The answer is *TWO PAIRS*. The ring's answers, in the order of the boxes on the record sheet (smallest number first), with their letters: **12 T • 13 W • 15 O • 25 P • 48 A • 90 I • 102 R • 103 S**.

The rule numbers are the ones on the record sheet: 1 is “a kite has two pairs of equal sides that meet at corners”, 2 is “the main diagonal cuts the other diagonal in half”, and 3 is “the two angles the main diagonal misses are equal”.

Card	Given and asked	Answer, and why	Wrong answer from the common mistake	Joke letter for the number at its top
1 R	$\angle P = 76^\circ$, $\angle Q = 118^\circ$; find $\angle R$	48° (rule 3). The main diagonal PR misses Q and S, so $\angle S = \angle Q = 118^\circ$. Then $\angle R = 360^\circ - 76^\circ - 118^\circ - 118^\circ = 48^\circ$.	76°, from copying $\angle P$, as if the two ends of the main diagonal were the equal pair	O
2 M	KM = 32, LJ = 18, KN = 7; find NM	25 (rule 2). KM is the main diagonal, and it is not cut in half. N is on it, so $NM = 32 - 7 = 25$.	16, from cutting the main diagonal KM in half	A
3 J	$\angle B = 112^\circ$, $\angle D = 44^\circ$; find $\angle C$	102° (rule 3). The main diagonal BD misses C and A, so they are equal. They share $360^\circ - 112^\circ - 44^\circ = 204^\circ$, so $\angle C = 102^\circ$.	204°, from giving $\angle C$ all of what is left of 360° , when two equal angles share it	P
4 D	WY = 22, XZ = 26, WM = 8; find XM	13 (rule 2). The main diagonal WY cuts XZ in half, so XM is half of 26, which is 13.	11, from cutting the main diagonal WY in half instead of the other one	R
5 F	$\angle H = 70^\circ$, $\angle G = 130^\circ$; find $\angle K$	90° (rule 3). The main diagonal GK misses H and F, so $\angle F = \angle H = 70^\circ$. Then $\angle K = 360^\circ - 130^\circ - 70^\circ - 70^\circ = 90^\circ$.	130°, from copying $\angle G$, as if the two ends of the main diagonal were the equal pair	W
6 Q	SU = 40, RT = 34, RV = 22; find VT	12 (rule 2). RT is the main diagonal, and it is not cut in half. V is on it, so $VT = 34 - 22 = 12$.	17, from cutting the main diagonal RT in half	I
7 N	$\angle L = 96^\circ$, $\angle N = 58^\circ$; find $\angle M$	103° (rule 3). The main diagonal LN misses M and P, so they are equal. They share $360^\circ - 96^\circ - 58^\circ = 206^\circ$, so $\angle M = 103^\circ$.	206°, from giving $\angle M$ all of what is left of 360° , when two equal angles share it	T
8 H	DF = 40, DG = 6, EC = 30; find EG	15 (rule 2). The main diagonal DF cuts EC in half, so EG is half of 30, which is 15.	20, from cutting the main diagonal DF in half instead of the other one	S

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 mistake again, it goes to another card off the ring. So a second wrong answer never moves a group forward.

Card	Given and asked	Answer, and why	Wrong answer from the common mistake	Joke letter for the number at its top
B	KM = 40, KP = 6, LN = 30; find LP	15 (rule 2). The main diagonal KM cuts LN in half, so LP is half of 30, which is 15.	20, from cutting the main diagonal KM in half instead of the other one	P
K	$\angle W = 118^\circ$, $\angle V = 76^\circ$; find $\angle X$	48° (rule 3). The main diagonal VX misses W and U, so $\angle U = \angle W = 118^\circ$. Then $\angle X = 360^\circ - 76^\circ - 118^\circ - 118^\circ = 48^\circ$.	76°, from copying $\angle V$, as if the two ends of the main diagonal were the equal pair	A
C	DF = 32, EG = 18, DH = 7; find HF	25 (rule 2). DF is the main diagonal, and it is not cut in half. H is on it, so HF = 32 - 7 = 25.	16, from cutting the main diagonal DF in half	O
A	$\angle Q = 112^\circ$, $\angle S = 44^\circ$; find $\angle R$	102° (rule 3). The main diagonal QS misses R and T, so they are equal. They share $360^\circ - 112^\circ - 44^\circ = 204^\circ$, so $\angle R = 102^\circ$.	204°, from giving $\angle R$ all of what is left of 360° , when two equal angles share it	S
P	HK = 22, JG = 26, HL = 8; find JL	13 (rule 2). The main diagonal HK cuts JG in half, so JL is half of 26, which is 13.	11, from cutting the main diagonal HK in half instead of the other one	T
L	$\angle B = 130^\circ$, $\angle C = 70^\circ$; find $\angle D$	90° (rule 3). The main diagonal BD misses C and E, so $\angle E = \angle C = 70^\circ$. Then $\angle D = 360^\circ - 130^\circ - 70^\circ - 70^\circ = 90^\circ$.	130°, from copying $\angle B$, as if the two ends of the main diagonal were the equal pair	I
E	PM = 40, NQ = 34, NR = 22; find RQ	12 (rule 2). NQ is the main diagonal, and it is not cut in half. R is on it, so RQ = 34 - 22 = 12.	17, from cutting the main diagonal NQ in half	W
G	$\angle T = 96^\circ$, $\angle V = 58^\circ$; find $\angle U$	103° (rule 3). The main diagonal TV misses U and S, so they are equal. They share $360^\circ - 96^\circ - 58^\circ = 206^\circ$, so $\angle U = 103^\circ$.	206°, from giving $\angle U$ all of what is left of 360° , when two equal angles share it	R

Other mistakes lead to no card at all. A group might leave out the fourth angle, take 180° minus an angle as in a parallelogram, or copy a printed piece of a diagonal. Its answer is then not the number at the top of any card, and the group knows to check its work.

Guessing does not work. Every simple rule that uses only the printed numbers, such as always taking 360° minus the two angles and halving it, answers at most six of the sixteen cards correctly.