

SCAVENGER HUNT



ANGLE ADDITION AND ANGLE BISECTORS

Angle Addition & Angle Bisectors

Part, half or whole? · x is not the answer · the cards check the answers

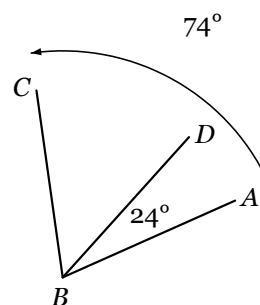
FREE

ANSWER

61°

Find $m\angle DBC$.

Write the equation in angle names first, then put the numbers in.



J

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Scavenger Hunt — how to run it

a full class period

1. **Tape the 16 cards around the room**, in any order. Send each group to a *different* card. Each card has a large letter in its bottom left corner. **Start each group on one of these eight cards: J E C B K P F A.**
2. **Say this once:** *“Write the equation in angle names first, then put the numbers in. Circle what the card asks for. It could be a part, a half, or the whole. It is never x. Eight lines and you are back where you started.”*
3. **Find the angle. Then find the card with that number at the top.**

16 cards	pages 3–10, one copy. There are two cards on each sheet. Cut the stack once, through the middle.
Record sheet	page 11, one per student. It shows a ray inside an angle, a bisected angle and two angles sharing only a vertex as pictures.
Answers	pages 12–13. These are for you. Do not put them up in the room.

There are six kinds of card. Each kind has its own common mistake. The answer pages give the kind of each card. Every card asks for an angle, never for x . Many students find x and stop there. Every figure is drawn to scale, and no ray is horizontal or vertical.

Eight of the 16 cards form a closed loop. The other eight are where a wrong answer goes. They look like every other card. Some mistakes give a number that is at the top of one of these cards. The mistakes are: doubling instead of halving, halving instead of doubling, adding a part to the whole, forgetting to double the half, and stopping at x or at one half. The group does that card, and its answer sends the group back to the card it got wrong. If it goes wrong there too, it goes one more card back, never forward.

The check is the length of their row. A clean run is **eight lines**. Every wrong answer adds two more. On a card of the loop, the line at the bottom of the card is a good habit. On a card off the loop, it is a tip about the card the group came from. If a group keeps going in circles, do not give the answer. Ask: *“What did the question ask for: a part, a half, or the whole?”*



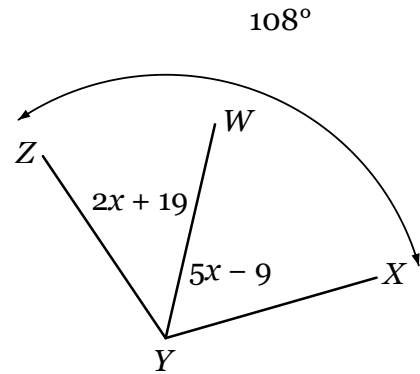
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ANSWER

74°

Find $m\angle XYW$.

The letter x is not the final answer. The question asks for an angle.



A

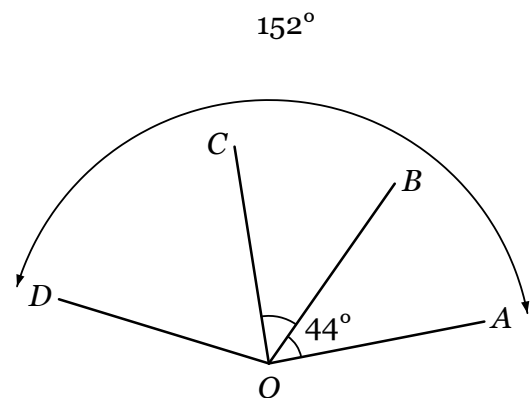
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ANSWER

32°

Ray OB bisects $\angle AOC$. **Find $m\angle COD$.**

Which angle does the bisector cut in half?
Find that one first.



B

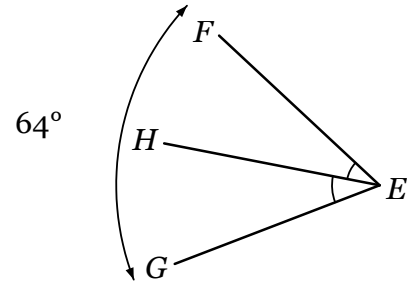
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ANSWER

82°

Ray EH bisects $\angle FEG$. **Find $m\angle FEH$.**

A half of an acute angle is acute.



C

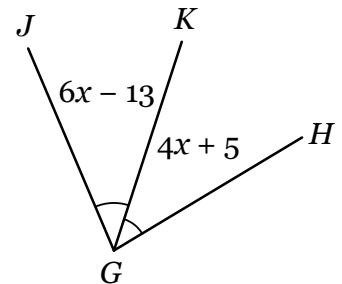
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ANSWER

128°

Ray GK bisects $\angle HGJ$. **Find $m\angle HGJ$.**

If the card gives the whole and asks for a half, halve it.



D

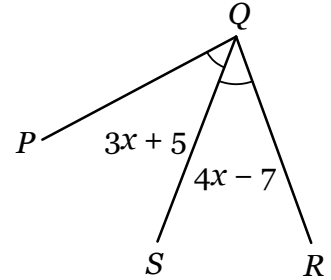
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ANSWER

50°

Ray QS bisects $\angle PQR$. Find $m\angle PQR$.

Circle what the question asks for: x , a half, or the whole.



E

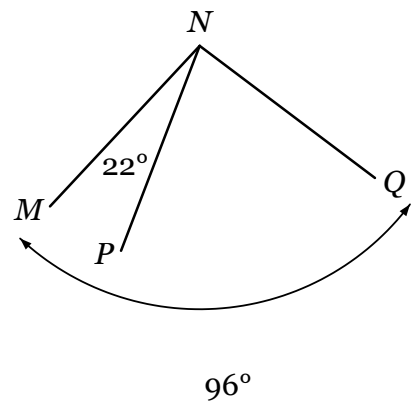
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ANSWER

92°

Find $m\angle PNQ$.

A part is never bigger than the whole it is part of.



F

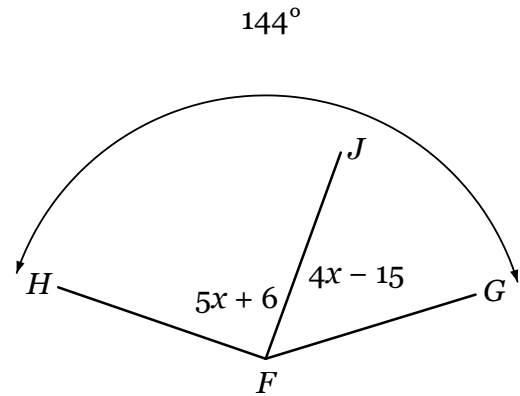
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ANSWER

23°

Find $m\angle GFJ$.

The card gives a half and asks for the whole. Is the whole bigger or smaller than the half?



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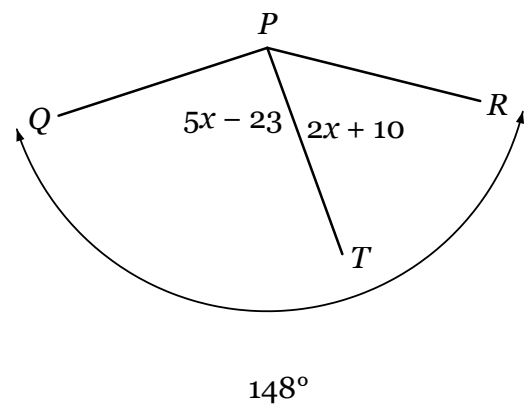
G

ANSWER

118°

Find $m\angle QPT$.

Adding the part to the whole counts that part twice.



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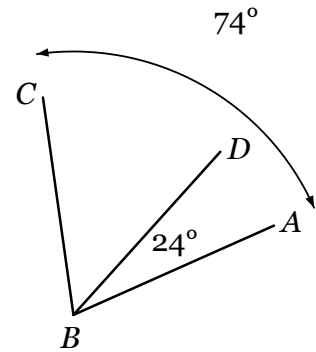
H

ANSWER

61°

Find $m\angle DBC$.

Write the equation in angle names first, then put the numbers in.



J

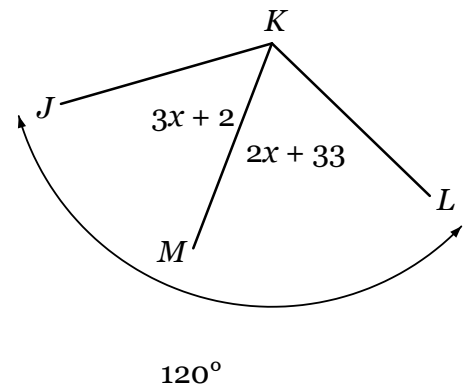
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ANSWER

64°

Find $m\angle JKM$.

Put x back into both parts. Do they add up to the whole?



K

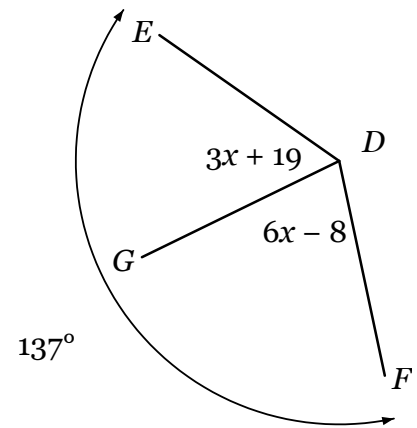
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ANSWER

98°

Find $m\angle EDG$.

If the card gives the whole, take away the other part to find your part.



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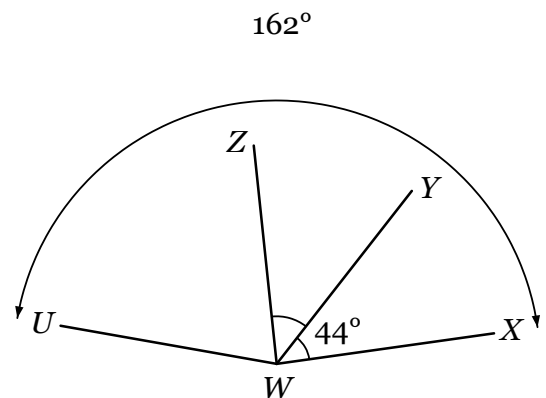
L

ANSWER

14°

Ray WY bisects $\angle XWZ$. **Find $m\angle ZWU$.**

Finding x is not the last step. Put it back into the angle in the question.



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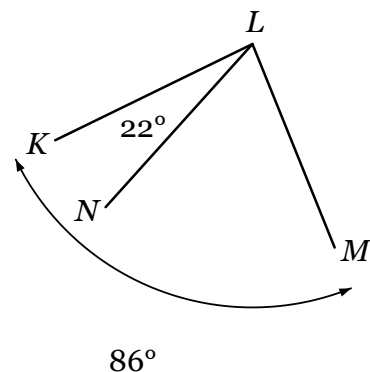
M

ANSWER

17°

Find $m\angle NLM$.

Put x back into the angle the question names.



N

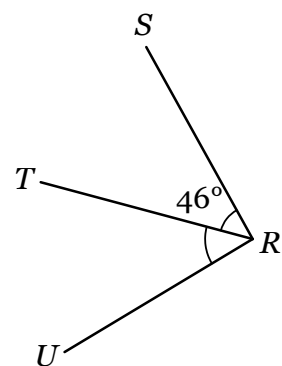
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ANSWER

53°

Ray RT bisects $\angle SRU$. **Find $m\angle SRU$.**

The whole is twice either half.



P

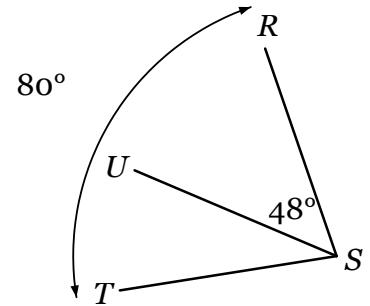
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ANSWER

108°

Find $m\angle UST$.

If the angle on the card is a half, double it before you take it away from the whole.



Q

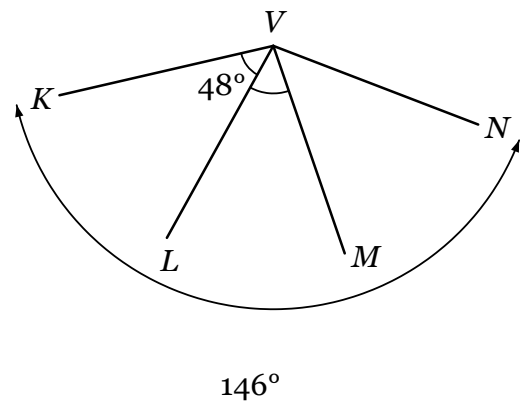
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ANSWER

41°

Ray VL bisects $\angle KVM$. **Find $m\angle MVN$.**

Check what the question asks for: a half, or the whole it comes from.



R

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Scavenger Hunt — where I went

Angle addition & bisectors

Name _____

Period _____

Date _____

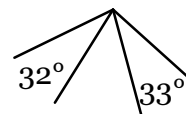
Work out the angle on the card you are at. Fill in one line on this sheet. Then find the card with your answer at the top. **Write the equation in angle names first.** For example: $m\angle ABD + m\angle DBC = m\angle ABC$, or $m\angle ABC = 2 \cdot m\angle ABD$. Then put the numbers in. Circle what the card asks for. If you get every answer right, you write eight lines. A longer row means one answer was wrong. **You may be on this card because you went wrong on another card.** If so, look at the line under the question. It tells you what to check on the card you came from. If you were right, skip that line.



A ray inside the angle
part + part = whole



Matching arcs: the bisector
half = half · whole = 2 × half



Share only the vertex
no equation, a part is missing

Card letter	The equation, in angle names first	My answer
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

Ray BD bisects $\angle ABC$. How much of the angle does each of its two parts get?

Every number stands for a letter. Write the letter for each answer in the box above that number. Leave the other boxes empty. Then read the letters in the boxes from left to right. **If it does not spell two words, one answer was wrong.**

14 = C 17 = H 23 = E 32 = H 41 = A 50 = A 53 = L 61 = F 64 = E 74 = A 82 = C 92 = H 98 = H 108 = F
118 = A 128 = L

14	17	23	32	41	50	53	61	64	74	82	92	98	108	118	128



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Scavenger Hunt — answers

For the teacher

This is the loop, in order. A group may start anywhere on it. Wherever it starts, eight right answers bring it back to that card.

J → E → C → B → K → P → F → A → J

Ray BD bisects $\angle ABC$. How much of the angle does each of its two parts get? HALF EACH.

Students read it in the boxes of the record sheet, from the smallest number to the largest.

The answers on the loop, smallest first: $32^\circ = H$, $50^\circ = A$, $53^\circ = L$, $61^\circ = F$, $64^\circ = E$, $74^\circ = A$, $82^\circ = C$, $92^\circ = H$. That spells HALF EACH.

	Card	Kind of card	How to find it	Answer	Wrong answer, and why	Letter for the joke
1	J	The whole and one part are given. Find the other part.	$74 - 24$	50°	98. The student added the part to the whole.	F
2	E	Each half of a bisected angle has an expression. Find the whole.	$x = 12$, so each half is 41. Double it.	82°	41. The student gave one half, $m\angle PQS$, but the question asks for the whole angle.	A
3	C	An angle is bisected, and the whole is given. Find a half.	$64 \div 2$	32°	128. The student doubled instead of halving.	C
4	B	A bisector inside a bigger angle. Find the angle left over.	$152 - 2 \times 44$	64°	108. The student used the half as if it were all of $\angle AOC$, and did not double it.	H
5	K	Each part has an expression, and the whole is given. Find a part.	$x = 17$. Then find the part.	53°	17. The student stopped at x , but the question asks for an angle.	E
6	P	An angle is bisected, and a half is given. Find the whole.	2×46	92°	23. The student halved instead of doubling.	L
7	F	The whole and one part are given. Find the other part.	$96 - 22$	74°	118. The student added the part to the whole.	H
8	A	Each part has an expression, and the whole is given. Find a part.	$x = 14$. Then find the part.	61°	14. The student stopped at x , but the question asks for an angle.	A

Each wrong answer is the number at the top of a card off the loop. Those cards are on the next page. None of these wrong answers is an arithmetic slip. Each one is a mistake students really make: x , a half of the same figure, or what the figure gives when its marks are read the wrong way.

Scavenger Hunt — the cards off the loop

For the teacher

These eight cards are where a wrong answer goes. The number at the top of each one is the wrong answer to one card of the loop. Its own answer is the number at the top of that loop card. So a group that lands here goes back to the card it got wrong, and its row gets two lines longer. **A group cannot reach one of these cards with a right answer.** The same mistake on one of these cards gives the number at the top of the card just before it in this list. So going wrong twice sends a group one card further back, never forward.

Card	Kind of card	How to find it	Answer	Wrong answer, and why	Letter for the joke
L	Each part has an expression, and the whole is given. Find a part.	$x = 14$. Then find the part.	61°	14. The student stopped at x , but the question asks for an angle.	H
R	A bisector inside a bigger angle. Find the angle left over.	$146 - 2 \times 48$	50°	98. The student used the half as if it were all of $\angle KVM$, and did not double it.	A
D	Each half of a bisected angle has an expression. Find the whole.	$x = 9$, so each half is 41. Double it.	82°	41. The student gave one half, $m\angle HGK$, but the question asks for the whole angle.	L
Q	The whole and one part are given. Find the other part.	$80 - 48$	32°	128. The student added the part to the whole.	F
N	The whole and one part are given. Find the other part.	$86 - 22$	64°	108. The student added the part to the whole.	H
G	Each part has an expression, and the whole is given. Find a part.	$x = 17$. Then find the part.	53°	17. The student stopped at x , but the question asks for an angle.	E
H	Each part has an expression, and the whole is given. Find a part.	$x = 23$. Then find the part.	92°	23. The student stopped at x , but the question asks for an angle.	A
M	A bisector inside a bigger angle. Find the angle left over.	$162 - 2 \times 44$	74°	118. The student used the half as if it were all of $\angle XWZ$, and did not double it.	C

Other mistakes lead to no card. Ten other wrong answers are possible: x on a card that asks for the whole, the other part, and the angle halfway along a chain (A: 47, B: 88, D: 9, E: 12, G: 91, H: 56, K: 67, L: 76, M: 88, R: 96). None of them is at the top of any card. A group with one of these answers finds no card, so it knows to check again.

The line at the bottom of every card is a habit, not an answer. Every card has one, in the same place. On a card off the loop, it says what went wrong on the card the group came from. Bisected figures and expressions appear both on the loop and off it.

Using only the printed numbers does not work. Every simple rule, such as subtracting the smaller printed number from the larger, gets at most four of the 16 cards right.