

SCAVENGER HUNT



PROPORTIONAL SEGMENTS AND THE ANGLE BISECTOR THEOREM

Which Pieces Make the Proportion?

Parallel lines and angle bisectors · find x · the cards check the answers

FREE

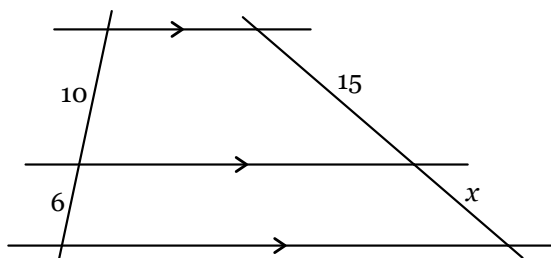
ANSWER

24

The three lines with arrowheads are parallel.

Find x .

*Trace one line from top to bottom.
Its two pieces make one fraction.*



Q

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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: *Q K F B E C A M*.
2. **Say this once:** “Write a proportion before you do any arithmetic. A piece goes with the piece or the side that matches it, not the one across from it. Eight right answers bring you back to your first card.”
3. **Each group finds x , 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. A box on it shows both rules with a drawing.
Answers	pages 12–13, for you only. Do not put them up in the room.

The cards use two facts. Three parallel lines cut any two lines (transversals) into proportional pieces: the top piece over the bottom piece is the same fraction on both transversals. And the angle bisector of a triangle cuts the opposite side into two pieces in the same ratio as the two sides at that corner. Each piece goes with the side that touches it at a corner. On these sheets, an angle bisector of a triangle is the segment from a corner to the opposite side that cuts the angle at that corner into two equal angles. Some textbooks use other definitions, so tell the class which ones this sheet uses.

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. On every ring card, pairing the pieces the wrong way round gives the number at the top of one of the eight other cards. The group does that card, and its right answer sends the group back to the card it got wrong.

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: “Which corner does this piece touch? Which side touches that corner too?” or “Trace one line with your finger. Which two pieces did you touch?”



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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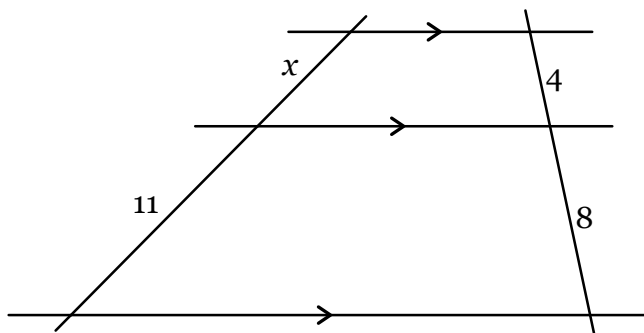
ANSWER

12

The three lines with arrowheads are parallel.

Find x .

A steep line has short pieces. The pieces still keep the same ratio.



A

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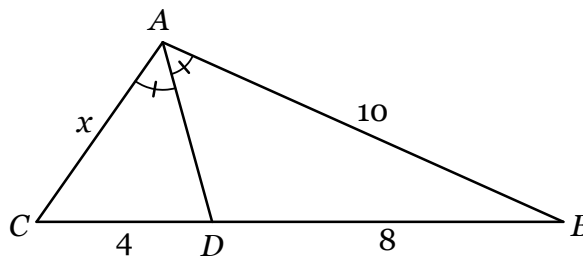
ANSWER

14

AD cuts angle A into two equal angles.

Find x .

Point to a piece. Then point to the side that meets it at a corner.



B

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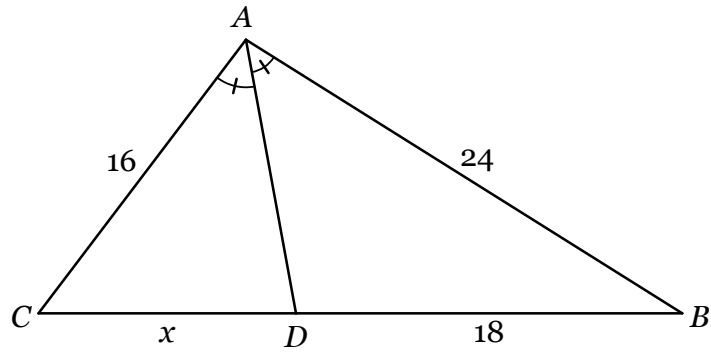
ANSWER

32

AD cuts angle A into two equal angles.

Find x .

Which corner does each piece touch? Use the side at that corner.



C

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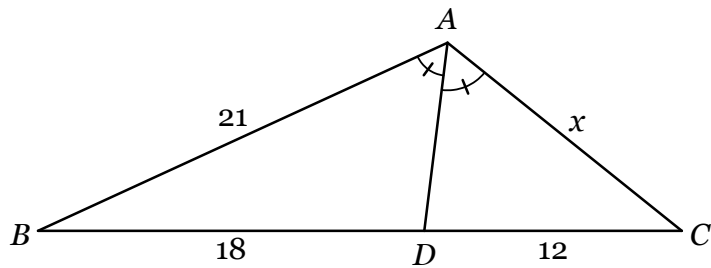
ANSWER

20

AD cuts angle A into two equal angles.

Find x .

*The bisector cuts the angle in half.
It does not cut the bottom side in half.*



D

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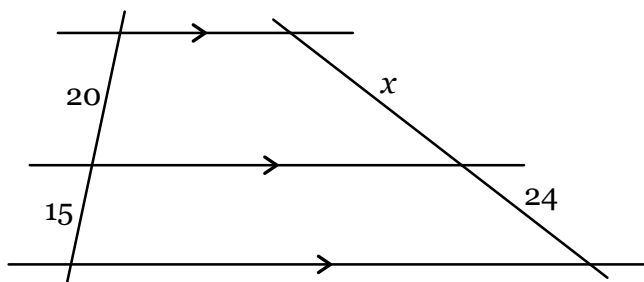
ANSWER

5

The three lines with arrowheads are parallel.

Find x .

Is x on the top piece or the bottom piece? Keep that place in both fractions.



E

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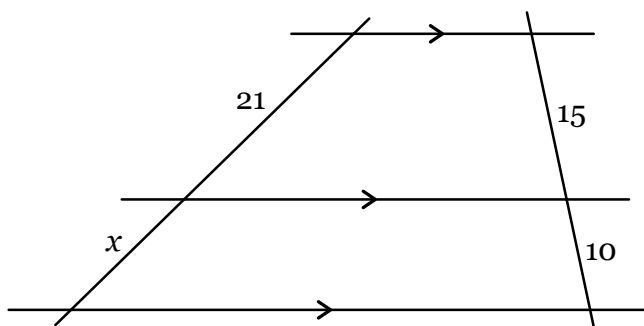
ANSWER

8

The three lines with arrowheads are parallel.

Find x .

Which line holds x ? Write the fraction for that line first.



F

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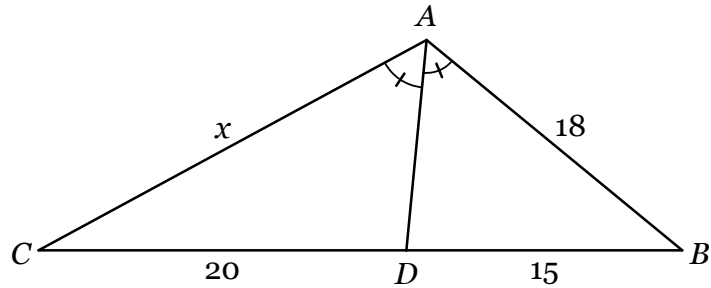
ANSWER

25

AD cuts angle A into two equal angles.

Find x .

The bigger piece is next to the longer side. Check this before you write.



G

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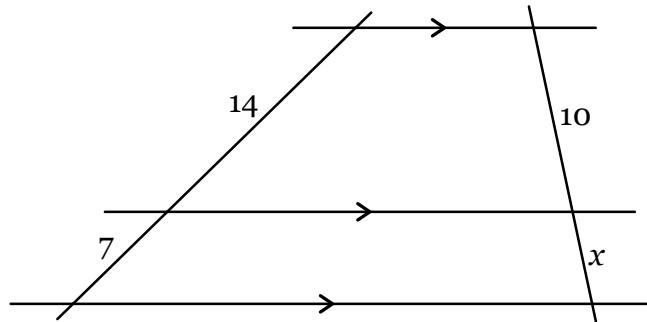
ANSWER

18

The three lines with arrowheads are parallel.

Find x .

Compare the pieces of one line with the pieces of the other line.



H

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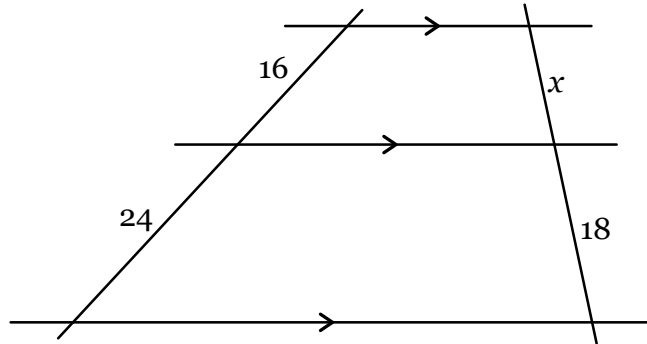
ANSWER

22

The three lines with arrowheads are parallel.

Find x .

The two lines keep the same ratio of top piece to bottom piece.



J

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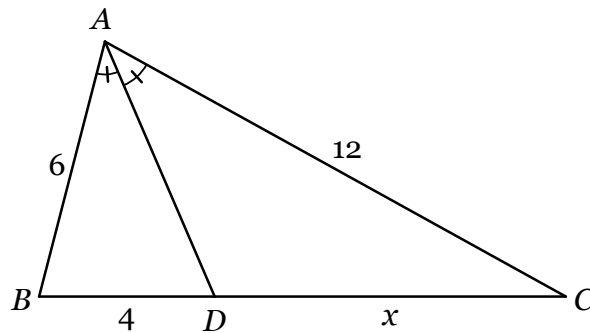
ANSWER

9

AD cuts angle A into two equal angles.

Find x .

Each piece of the bottom side goes with the side that touches it at a corner.



K

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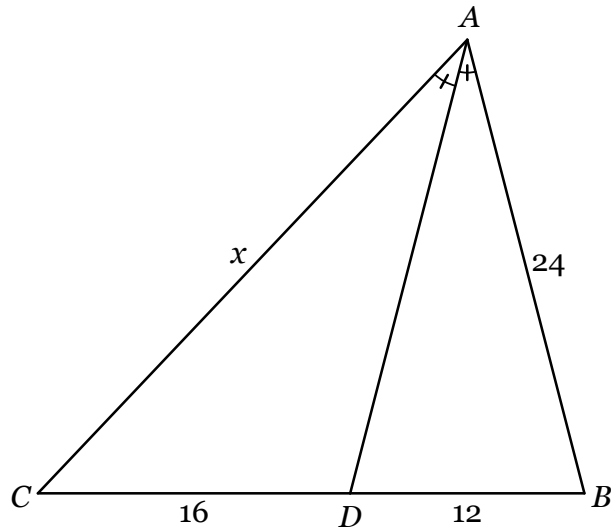
ANSWER

27

AD cuts angle A into two equal angles.

Find x .

Write the pieces in one fraction and the sides in the other, in the same order.



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L

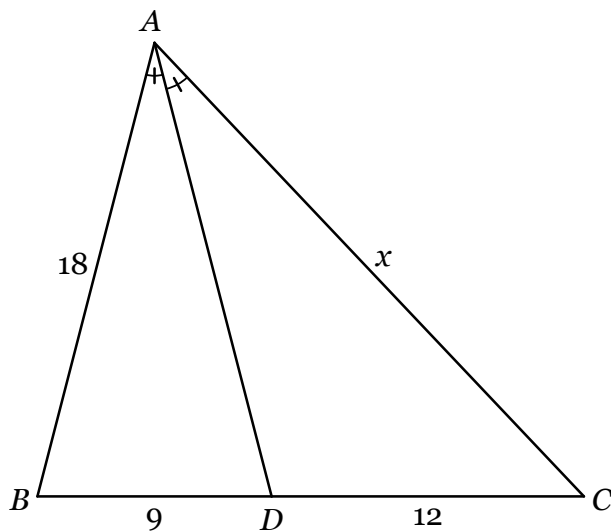
ANSWER

5.5

AD cuts angle A into two equal angles.

Find x .

Is the longer side on the left or the right? The bigger piece is on that side too.



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M

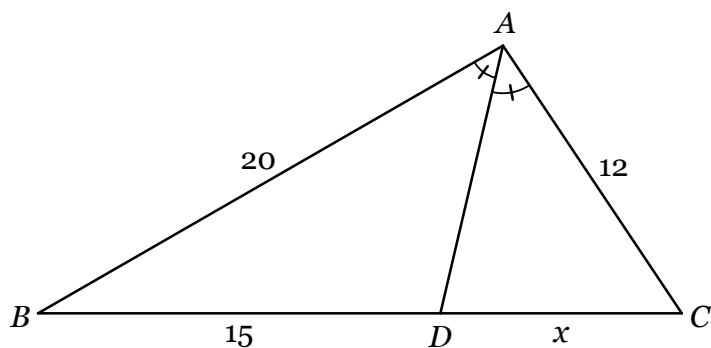
ANSWER

2

AD cuts angle A into two equal angles.

Find x .

BD goes with AB because both touch B. DC goes with AC.



N

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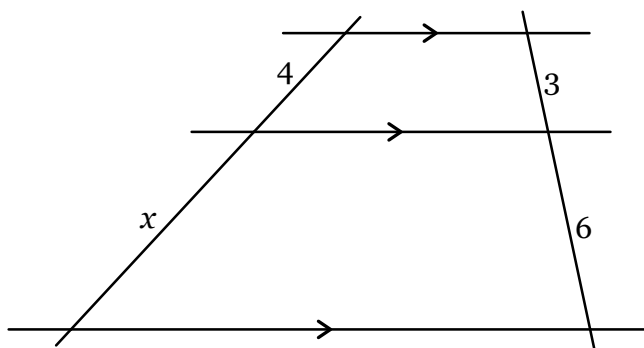
ANSWER

31.5

The three lines with arrowheads are parallel.

Find x .

Does each fraction use two pieces of one line? Check both fractions.



P

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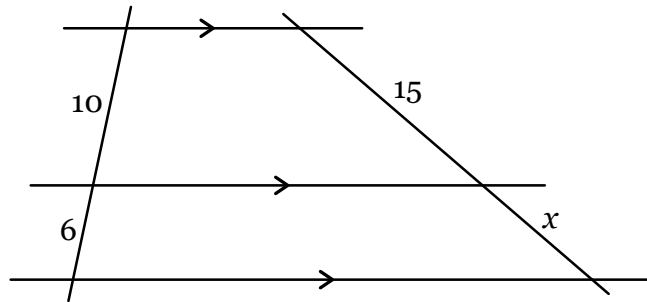
ANSWER

24

The three lines with arrowheads are parallel.

Find x .

*Trace one line from top to bottom.
Its two pieces make one fraction.*



Q

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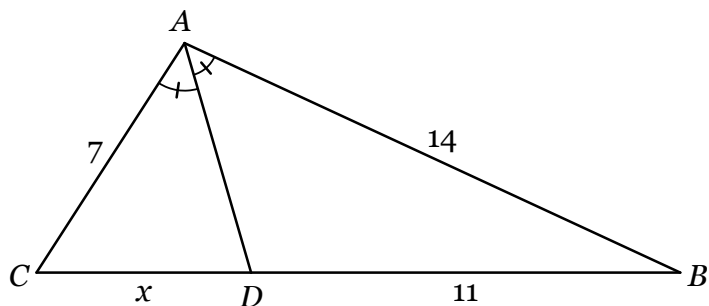
ANSWER

13.5

AD cuts angle A into two equal angles.

Find x .

Does a piece face the side across from it? Pair it with the side at its corner.



R

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Scavenger Hunt — where I went

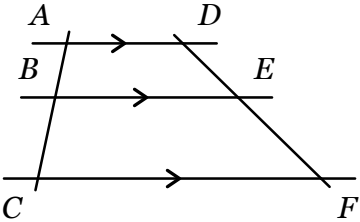
Proportional pieces

Name _____

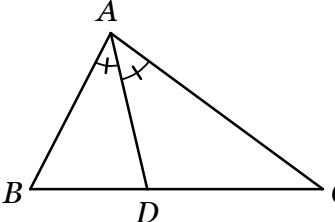
Period _____

Date _____

Do the card you are at. Fill in one line. Then find the card with your answer at the top. **Write the proportion before you do any arithmetic.** 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.**



Parallel lines
 $\frac{AB}{BC} = \frac{DE}{EF}$
 AB and BC are on one line.
 DE and EF are on the other line.



Angle bisector AD
 $\frac{BD}{DC} = \frac{AB}{AC}$
 BD and AB meet at B. DC and AC meet at C.

You may know other facts about angle bisectors. This sheet uses only this one.

Card letter	My proportion	x
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

Two parallel lines go to the same party. How well do they know each other?

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 of your answers is wrong.**

2 = T 5 = N 5.5 = E 8 = V 9 = E 12 = R 13.5 = E 14 = M 18 = M 20 = R 22 = E 24 = E 25 = V 27 = E 31.5 = N
 32 = T

2	5	5.5	8	9	12	13.5	14	18	20	22	24	25	27	31.5	32	



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Scavenger Hunt — answers

For the teacher

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

Q (9) → K (8) → F (14) → B (5) → E (32) → C (12) → A (5.5) → M (24) → Q

Two parallel lines go to the same party. How well do they know each other? The answer is *NEVER MET*. It is read along the boxes of the record sheet, which run from the smallest number to the largest.

	Card	The question on the card	Answer, and why	Wrong answer from pairing the wrong way round	Joke letter for the number at its top
1	Q	The three lines with arrowheads are parallel. Left transversal, top to bottom: 10, 6. Right transversal: 15, x. Find x.	9. Top piece over bottom piece on both transversals: $10/6 = 15/x$. So $x = 6 \times 15 \div 10 = 9$.	25. The fraction for one line is written upside down, so the pieces are compared the wrong way round.	E
2	K	AD cuts angle A into two equal angles. AB = 6, AC = 12, BD = 4. Find x = DC.	8. BD touches B, like AB. DC touches C, like AC. So $4/x = 6/12$, and $x = 4 \times 12 \div 6 = 8$.	2. A piece is paired with the side across from it instead of the side that touches it.	E
3	F	The three lines with arrowheads are parallel. Left transversal, top to bottom: 21, x. Right transversal: 15, 10. Find x.	14. Top piece over bottom piece on both transversals: $21/x = 15/10$. So $x = 10 \times 21 \div 15 = 14$.	31.5. The fraction for one line is written upside down, so the pieces are compared the wrong way round.	V
4	B	AD cuts angle A into two equal angles. BD = 8, DC = 4, AB = 10. Find x = AC.	5. BD touches B, like AB. DC touches C, like AC. So $8/4 = 10/x$, and $x = 10 \times 4 \div 8 = 5$.	20. A piece is paired with the side across from it instead of the side that touches it.	M
5	E	The three lines with arrowheads are parallel. Left transversal, top to bottom: 20, 15. Right transversal: x, 24. Find x.	32. Top piece over bottom piece on both transversals: $20/15 = x/24$. So $x = 20 \times 24 \div 15 = 32$.	18. The fraction for one line is written upside down, so the pieces are compared the wrong way round.	N
6	C	AD cuts angle A into two equal angles. AB = 24, AC = 16, BD = 18. Find x = DC.	12. BD touches B, like AB. DC touches C, like AC. So $18/x = 24/16$, and $x = 18 \times 16 \div 24 = 12$.	27. A piece is paired with the side across from it instead of the side that touches it.	T
7	A	The three lines with arrowheads are parallel. Left transversal, top to bottom: x, 11. Right transversal: 4, 8. Find x.	5.5. Top piece over bottom piece on both transversals: $x/11 = 4/8$. So $x = 4 \times 11 \div 8 = 5.5$.	22. The fraction for one line is written upside down, so the pieces are compared the wrong way round.	R
8	M	AD cuts angle A into two equal angles. BD = 9, DC = 12, AB = 18. Find x = AC.	24. BD touches B, like AB. DC touches C, like AC. So $9/12 = 18/x$, and $x = 18 \times 12 \div 9 = 24$.	13.5. A piece is paired with the side across from it instead of the side that touches it.	E

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

Card	The question on the card	Answer, and why	Wrong answer from pairing the wrong way round	Joke letter for the number at its top
G	AD cuts angle A into two equal angles. $BD = 15$, $DC = 20$, $AB = 18$. Find $x = AC$.	24. BD touches B, like AB. DC touches C, like AC. So $15/20 = 18/x$, and $x = 18 \times 20 \div 15 = 24$.	13.5. A piece is paired with the side across from it instead of the side that touches it.	V
N	AD cuts angle A into two equal angles. $AB = 20$, $AC = 12$, $BD = 15$. Find $x = DC$.	9. BD touches B, like AB. DC touches C, like AC. So $15/x = 20/12$, and $x = 15 \times 12 \div 20 = 9$.	25. A piece is paired with the side across from it instead of the side that touches it.	T
P	The three lines with arrowheads are parallel. Left transversal, top to bottom: 4, x . Right transversal: 3, 6. Find x .	8. Top piece over bottom piece on both transversals: $4/x = 3/6$. So $x = 6 \times 4 \div 3 = 8$.	2. The fraction for one line is written upside down, so the pieces are compared the wrong way round.	N
D	AD cuts angle A into two equal angles. $BD = 18$, $DC = 12$, $AB = 21$. Find $x = AC$.	14. BD touches B, like AB. DC touches C, like AC. So $18/12 = 21/x$, and $x = 21 \times 12 \div 18 = 14$.	31.5. A piece is paired with the side across from it instead of the side that touches it.	R
H	The three lines with arrowheads are parallel. Left transversal, top to bottom: 14, 7. Right transversal: 10, x . Find x .	5. Top piece over bottom piece on both transversals: $14/7 = 10/x$. So $x = 7 \times 10 \div 14 = 5$.	20. The fraction for one line is written upside down, so the pieces are compared the wrong way round.	M
L	AD cuts angle A into two equal angles. $BD = 12$, $DC = 16$, $AB = 24$. Find $x = AC$.	32. BD touches B, like AB. DC touches C, like AC. So $12/16 = 24/x$, and $x = 24 \times 16 \div 12 = 32$.	18. A piece is paired with the side across from it instead of the side that touches it.	E
J	The three lines with arrowheads are parallel. Left transversal, top to bottom: 16, 24. Right transversal: x , 18. Find x .	12. Top piece over bottom piece on both transversals: $16/24 = x/18$. So $x = 16 \times 18 \div 24 = 12$.	27. The fraction for one line is written upside down, so the pieces are compared the wrong way round.	E
R	AD cuts angle A into two equal angles. $AB = 14$, $AC = 7$, $BD = 11$. Find $x = DC$.	5.5. BD touches B, like AB. DC touches C, like AC. So $11/x = 14/7$, and $x = 11 \times 7 \div 14 = 5.5$.	22. A piece is paired with the side across from it instead of the side that touches it.	E

Other mistakes lead to no card on the ring. A group might treat the bisector as if it cut the opposite side in half, or think pieces across from each other on two transversals are equal, or add instead of using a ratio. Its answer is then not the number at the top of a ring card.

Guessing does not work. Every simple guessing rule, such as multiplying the two largest numbers and dividing by the smallest, answers at most six of the sixteen cards correctly.