

SCAVENGER HUNT



THE MIDPOINT ON A NUMBER LINE AND IN THE PLANE

Midpoints on a Number Line & in the Plane

Forwards and backwards · a number or a pair · the cards check the
answers

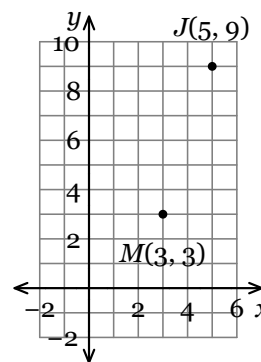
FREE

ANSWER

1

M is the midpoint of JK . **Find K .** The answer is a
pair.

Averaging the two numbers you have gives a point
between them. The answer is past the midpoint. A
midpoint never subtracts.



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K

1. **Tape the 16 cards round 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 D G N B Q L E.**
2. **Say this once:** “Distance subtracts. The midpoint adds, then halves. Going backwards, take the same step again from the midpoint. Eight lines and you are back where you started.”
3. **Find the place. Then find the card with that number or pair at the top.**

16 cards	pages 3–10, one copy. There are two cards to a sheet, so cut the stack once.
Record sheet	page 11, one per student. The midpoint, the plane and going backwards are on it as pictures.
Answers	pages 12–13. These are for you. They do not go in the room.

What the cards ask. Nine cards ask for a midpoint, and seven ask for the other endpoint. The two kinds are mixed around the ring, not grouped. Eight cards are in the plane, and they say that the answer is a pair. Negative coordinates appear from the first card. One of the ring's answers is a half. A half is a right answer, not a sign of a mistake.

Eight of the 16 cards make the ring. The other eight are where a wrong answer goes. They look the same as the ring cards. A group may subtract and halve, which gives half the distance. That is a length, not a place. It may average the endpoint it was given with the midpoint, which lands a quarter of the way along. Or it may average an x with a y . Then its answer is at the top of one of those cards. 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, never forward.

The check is the length of their row. A clean run is **eight lines**. Every wrong answer adds two more. On a ring card, the line at the foot is a general tip. On a card off the ring, it is a tip about the card the group came from. If a group goes round in circles, do not give the answer. Ask: “*Is your answer between the two endpoints? Or, going backwards, is it past the midpoint?*”



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ANSWER

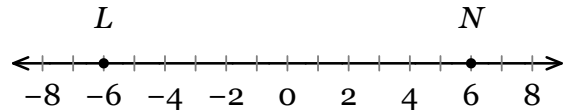
$(-0.5, 4)$

L and N are marked on the number line.

Where is the midpoint of LN ?

Averaging an x with a y lands here.

Average the two x 's, then the two y 's.



A

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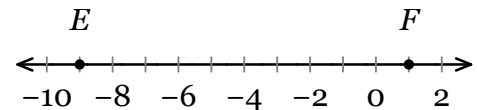
ANSWER

$(-1.5, 5)$

E and F are marked on the number line.

Where is the midpoint of EF ?

Is your answer between the two endpoints? A midpoint always is.



B

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ANSWER

(4, 6)

F is $(-9, 4)$ and G is $(-5, -6)$. **Find the midpoint of FG .** The answer is a pair.

Subtracting says how far apart they are. The midpoint adds the two and halves. Going backwards, the answer is past the midpoint.

C

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ANSWER

-2

A is $(-6, 5)$ and B is $(4, -9)$. **Find the midpoint of AB .** The answer is a pair.

Check: each coordinate of your answer lies between the two endpoints.

D

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ANSWER

(1, -3)

S is the midpoint of *RT*. On a number line *R* is at 3 and *S* is at -1. **Where is *T*?**

The other endpoint is further along than the midpoint, never between.

E

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ANSWER

(2, 5)

M is the midpoint of *DE*. On a number line *D* is at 8 and *M* is at 2. **Where is *E*?**

The endpoint you want is beyond the midpoint. A midpoint is found by adding, never by halving the gap.

F

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ANSWER

$(-1, -2)$

N is the midpoint of PQ . On a number line P is at 8 and N is at 4. **Where is Q ?**

Going backwards, take the same step again from the midpoint.

G

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ANSWER

$(5, 7)$

M is the midpoint of AB . On a number line A is at 10 and M is at 4. **Where is B ?**

Half the steps across and up is how far, not where. Going backwards, take the same step again past the midpoint.

H

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ANSWER

-5

On a number line, A is at -9 and B is at 5 . **Where is the midpoint of AB ?**

Distance subtracts. The midpoint adds.

J

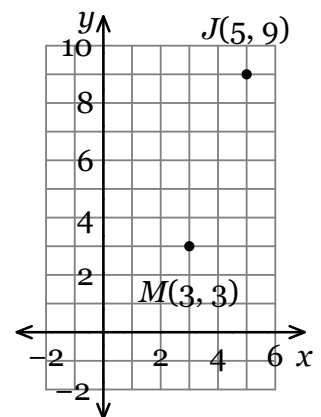
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ANSWER

1

M is the midpoint of JK . **Find K .** The answer is a pair.

Averaging the two numbers you have gives a point between them. The answer is past the midpoint. A midpoint never subtracts.



K

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ANSWER

$(-7, -1)$

U is $(-3, 3)$ and V is $(5, -9)$. **Find the midpoint of UV .** The answer is a pair.

The answer to a plane question is a pair, in brackets.

L

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ANSWER

6

$W(3, 4)$ is the midpoint of XY , and X is $(7, 10)$. **Find Y .** The answer is a pair.

Averaging the endpoint with the midpoint lands between them. Go past the midpoint instead. For a midpoint, add. Never subtract.

M

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ANSWER

0

C is $(-5, 4)$ and D is $(2, 6)$. **Find the midpoint of CD .** The answer is a pair.

Write the average of the x 's on one line and of the y 's on the next.

N

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ANSWER

5

P is $(-7, 6)$ and Q is $(4, 4)$. **Find the midpoint of PQ .** The answer is a pair.

Half the gap between two points is a length, not a point on the line. Does the other endpoint lie past the midpoint?

P

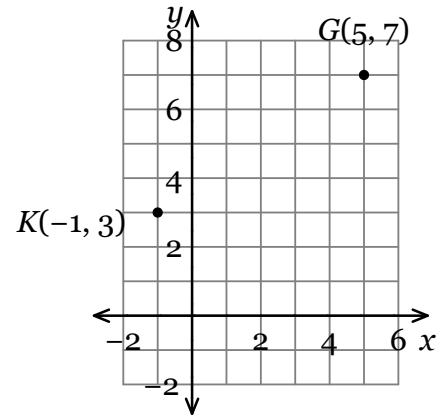
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ANSWER

-4

K is the midpoint of GH . **Find H .** The answer is a pair.

Average your answer with the endpoint you were given: do you get the midpoint back?



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Q

ANSWER

7

On a number line, H is at -6 and J is at -4 . **Where is the midpoint of HJ ?**

A midpoint adds and halves. Half the gap is a length. The other endpoint lies past the midpoint, not between.

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R

Scavenger Hunt — where I went

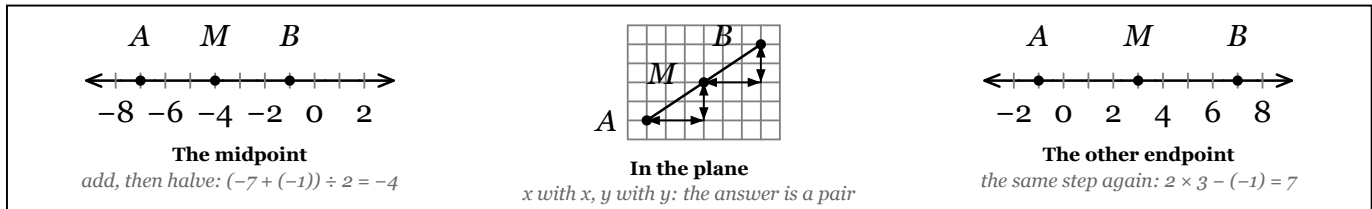
Midpoints on a number line and in the plane

Name _____

Period _____

Date _____

Work out the answer for the card you are at. Fill in one line. Then find the card with your answer at the top. **In the plane, work out x and y on separate lines.** Then write the pair. A clean run is eight lines. **On a card you reached by going wrong, the foot line is about the card you came from.** Otherwise, skip it.



Card letter	Working — x on one line, y on the next	My answer
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

A lives at -8 and B lives at -2. They meet at the midpoint of AB to share a pizza. What do they say?

Write the letter for each answer in the box above it. Leave the other boxes empty. Then read the boxes you filled, top row then bottom. **If they do not spell two words, an answer was wrong.**

-5 = G -4 = O -2 = H 0 = A 1 = H 5 = E 6 = S 7 = V (-7, -1) = L (-1.5, 5) = V (-1, -2) = E (-0.5, 4) = A
(1, -3) = S (2, 5) = O (4, 6) = L (5, 7) = G

-5	-4	-2	0	1	5	6	7
(-7, -1)	(-1.5, 5)	(-1, -2)	(-0.5, 4)	(1, -3)	(2, 5)	(4, 6)	(5, 7)



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Scavenger Hunt — answers

For the teacher

The ring, in order, is below. A group may start at any card on it. Eight right answers bring the group back to that card.

J → D → G → N → B → Q → L → E → J

A lives at -8 and B lives at -2 . They meet at the midpoint of AB to share a pizza. What do they say? GO HALVES. Read the boxes of the record sheet in order: the numbers from smallest to largest, and then the pairs.

The answers on the ring in that order: $-5 = G$; $-4 = O$; $-2 = H$; $0 = A$; $(-7, -1) = L$; $(-1.5, 5) = V$; $(-1, -2) = E$; $(1, -3) = S$. That spells GO HALVES.

	Card	Kind of card	Working	Answer	Wrong answer	Letter for its top answer
1	J	the midpoint on a number line	$(-9 + 5) \div 2$	-2	7. This is half the distance. It is a length, not a place.	G
2	D	the midpoint in the plane	x: $(-6 + 4) \div 2$; y: $(5 + (-9)) \div 2$	(-1, -2)	(5, 7). This is half the steps across and half the steps up. It is a distance, not a place.	H
3	G	the other endpoint on a number line	$2 \times 4 - 8$	0	6. The student averaged the endpoint with the midpoint. That is a quarter of the way along.	E
4	N	the midpoint in the plane	x: $(-5 + 2) \div 2$; y: $(4 + 6) \div 2$	(-1.5, 5)	(-0.5, 4). The student averaged each point's x with its own y.	A
5	B	the midpoint on a number line (with a drawing)	$(-9 + 1) \div 2$	-4	5. This is half the distance. It is a length, not a place.	V
6	Q	the other endpoint in the plane (with a drawing)	x: $2 \times (-1) - 5$; y: $2 \times 3 - 7$	(-7, -1)	(2, 5). The student averaged the endpoint with the midpoint. That is a quarter of the way along.	O
7	L	the midpoint in the plane	x: $(-3 + 5) \div 2$; y: $(3 + (-9)) \div 2$	(1, -3)	(4, 6). This is half the steps across and half the steps up. It is a distance, not a place.	L
8	E	the other endpoint on a number line	$2 \times (-1) - 3$	-5	1. The student averaged the endpoint with the midpoint. That is a quarter of the way along.	S

Each wrong answer is the top of a card on the next page. None of them is an arithmetic slip. Each comes from a common mistake: giving half the distance as the midpoint, averaging the endpoint with the midpoint, or averaging an x with a y.

Scavenger Hunt — the cards off the ring

For the teacher

These eight cards are where a wrong answer goes. The top of each is the place a group gets by making a mistake at one ring card. Its own answer is the top of that ring card. So a group that lands here goes back to the card it got wrong, and its row is two lines longer. **A group cannot reach one of these cards by being right.** A mistake on one of these cards gives the top of the card before it in this list. So going wrong twice sends a group one more card back. It never sends the group forward, and it never gives a place that is on no card.

Card	Kind of card	Working	Answer	Wrong answer	Letter for its top answer
R	the midpoint on a number line	$(-6 + (-4)) \div 2$	-5	1. This is half the distance. It is a length, not a place.	V
H	the other endpoint on a number line	$2 \times 4 - 10$	-2	7. The student averaged the endpoint with the midpoint. That is a quarter of the way along.	G
M	the other endpoint in the plane	x: $2 \times 3 - 7$; y: $2 \times 4 - 10$	(-1, -2)	(5, 7). The student averaged the endpoint with the midpoint. That is a quarter of the way along.	S
A	the midpoint on a number line (with a drawing)	$(-6 + 6) \div 2$	0	6. This is half the distance. It is a length, not a place.	A
P	the midpoint in the plane	x: $(-7 + 4) \div 2$; y: $(6 + 4) \div 2$	(-1.5, 5)	(-0.5, 4). The student averaged each point's x with its own y.	E
F	the other endpoint on a number line	$2 \times 2 - 8$	-4	5. The student averaged the endpoint with the midpoint. That is a quarter of the way along.	O
C	the midpoint in the plane	x: $(-9 + (-5)) \div 2$; y: $(4 + (-6)) \div 2$	(-7, -1)	(2, 5). This is half the steps across and half the steps up. It is a distance, not a place.	L
K	the other endpoint in the plane (with a drawing)	x: $2 \times 3 - 5$; y: $2 \times 3 - 9$	(1, -3)	(4, 6). The student averaged the endpoint with the midpoint. That is a quarter of the way along.	H

The line at the foot of every card is a tip, not an answer. Every card has one in the same place. On a card off the ring, it names the mistake that sent the group there. Cards with a drawing and cards without are on the ring and off it. Every kind of card off the ring is also on the ring.

Other mistakes never lead to a ring card. A group may make a different mistake from the one a card catches. For example, it may halve the gap on a going-backwards card. All twelve of those other mistakes give a place that is on no card, so the group knows at once.

Guessing does not work. No simple rule that uses only the printed numbers, such as always averaging them, gets more than seven of the 16 cards right.