LESSON MAKER PRO

Vector Difference Detectives

Subtract vectors by reversing, then adding.

HIGH SCHOOL · HSN-VM.B.4c

CCSS.Math.Content.HSN-VM.B.4c "Understand vector subtraction v - w as v + (-w), where -w is the additive inverse of w, with the same magnitude as w and pointing in the opposite direction..."

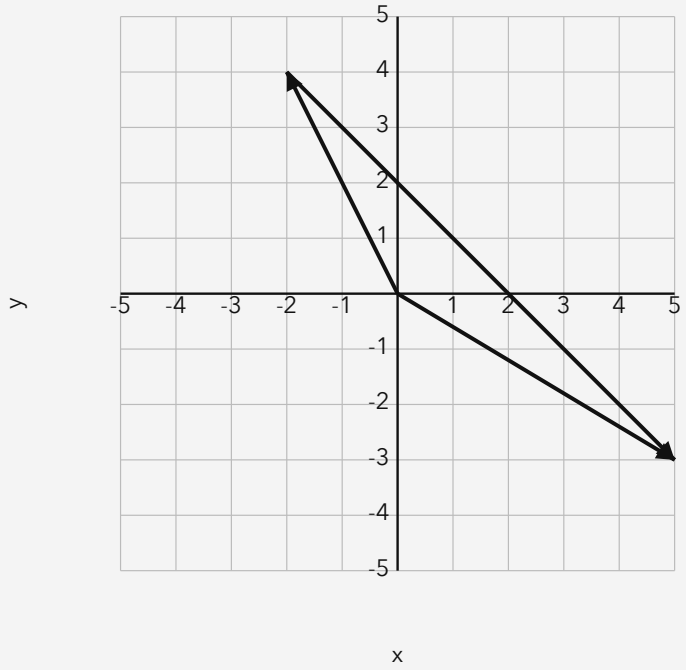
NAME _____ DATE _____

SUBTRACT BY ADDING THE OPPOSITE

To subtract w from v, add the opposite of w: v - w = v + (-w). The vector -w has the same length as w but points in the opposite direction. If v and w start at the same point on a graph, v - w is the arrow from the tip of w to the tip of v.

WORKED EXAMPLE

Find v - w if v = <5, -3> and w = <-2, 4>.



1. v - w = <5, -3> - <-2, 4>
2. Subtract matching components: <5 - (-2), -3 - 4>
3. Simplify: <7, -7>
4. The arrow from the tip of w to the tip of v has displacement <7,−7>; reversing it would represent w−v.

Answer: <7, -7>

PRACTICE 6 problems

1 Compute <1, -7> - <-6, 8>.

ANSWER _____

2 Compute <-9, 6> - <7, -1>.

ANSWER _____

3 Compute <0, 11> - <-8, -9>.

ANSWER _____

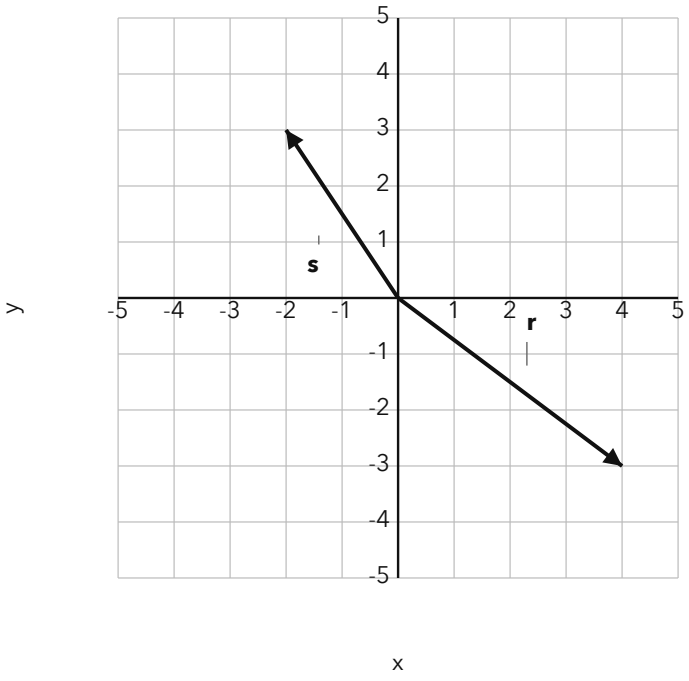
4 Compute <12, -10> - <-11, 13>.

ANSWER _____

5 Let p = <14, 0> and q = <-13, 9>. Find q - p.

ANSWER _____

6 The common-tail vectors r=<4,−3> and s=<−2,3> are shown. Draw and label the arrow for r−s from the correct tip to the other tip. Find its components. Then draw −s from the origin and explain r−s=r+(−s).



ANSWER _____

_____

APPLY IT Show your work

1 In a game design project, an avatar's position vector from the spawn point is <19, -8>. A target's position vector from the same spawn point is <-7, 16>. What displacement vector points from the target to the avatar?

2 At a school film festival, an equipment cart is located at <-18, 22> relative to the entrance. The editing station is located at <17, -11> relative to the entrance. What displacement vector points from the cart to the editing station?

CHALLENGE One step up

Let a = <31, -18> and b = <-12, 17>. A student says that a - b = <19, -1>. Is the student correct? Explain the error and give the correct result.

ANSWER KEY

Vector Difference Detectives

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PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Compute <1, -7> - <-6, 8>.	**<7, -15>**
2	Compute <-9, 6> - <7, -1>.	**<-16, 7>**
3	Compute <0, 11> - <-8, -9>.	**<8, 20>**
4	Compute <12, -10> - <-11, 13>.	**<23, -23>**
5	Let p = <14, 0> and q = <-13, 9>. Find q - p.	**<-27, 9>**
6	The common-tail vectors r=<4,−3> and s=<−2,3> are shown. Draw and label the arrow for r−s from the correct tip to the other tip. Find its components. Then draw −s from the origin and explain r−s=r+(−s).	**Arrow from (−2,3) to (4,−3); r−s=<6,−6>. −s=<2,−3> has the same magnitude as s and opposite direction; r+(−s)=<6,−6>.**

PART 2 · APPLY IT

1. **<26, -24>** Subtract the target's vector from the avatar's vector. Compute <19 - (-7), -8 - 16>.
2. **<35, -33>** Subtract the cart's position vector from the editing station's position vector. Compute <17 - (-18), -11 - 22>.

CHALLENGE

No. <19, -1> is a + b, so the student added b instead of adding its opposite. a - b = <31 - (-12), -18 - 17> = <43, -35>.

Accept component vectors written with angle brackets, parentheses, or as vertical columns if the component order and signs are correct. For graphical subtraction, accept r - s identified as the arrow from the tip of s to the tip of r. Require arrowheads in the correct direction. The difference vector may be translated but must preserve displacement; an undirected connecting segment is insufficient.