Geometry 1.3

Find the distance between 2 points *8th standard

Find the midpoint of a segment

coordinates*

pythagorean theorem* $a^2+b^2=c^2$

distance

irrational number $\sqrt{17}$

midpoint equal dist each end

segment bisector crosses @ mp

activity: string

Quiz 1.1-1.2 tomorrow
There will be (at least)
one construction

How far is it from here to Murdo? (odometer)

ending - Start

KeyConcept Distance Formula (on Number Line)

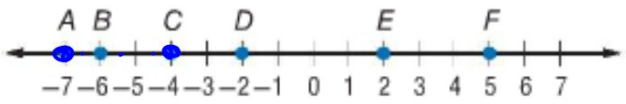
Words The distance between two points is the absolute value of the difference between their coordinates.

Symbols If P has coordinate x_1 and Q has coordinate x_2, $PQ = |x_2 - x_1|$ or $|x_1 - x_2|$.

Would it make sense for a distance to be negative?

Example 1 Find Distance on a Number Line

Use the number line to find *BE*.



BE = 8

2 + 6 =
−4 + +7

Use the number line above to find each measure.

1A. *AC* = 3

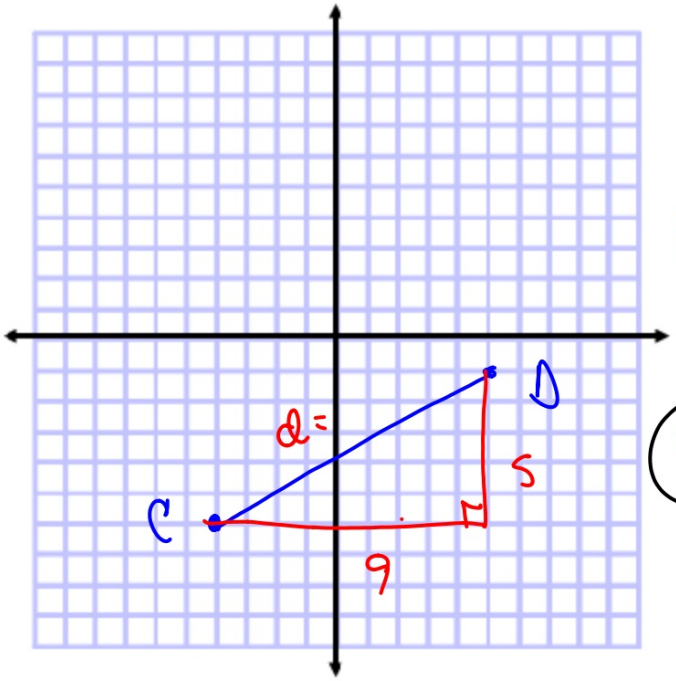
1B. *CF*

1C. *FB*

Pythagorean theorem

Example 2 Find Distance on a Coordinate Plane

Find the distance between $C(-4, -6)$ and $D(5, -1)$.



$5^2 + 9^2 = d^2$

$25 + 81 = d^2$

$106 = d^2$

$\sqrt{106} = d$

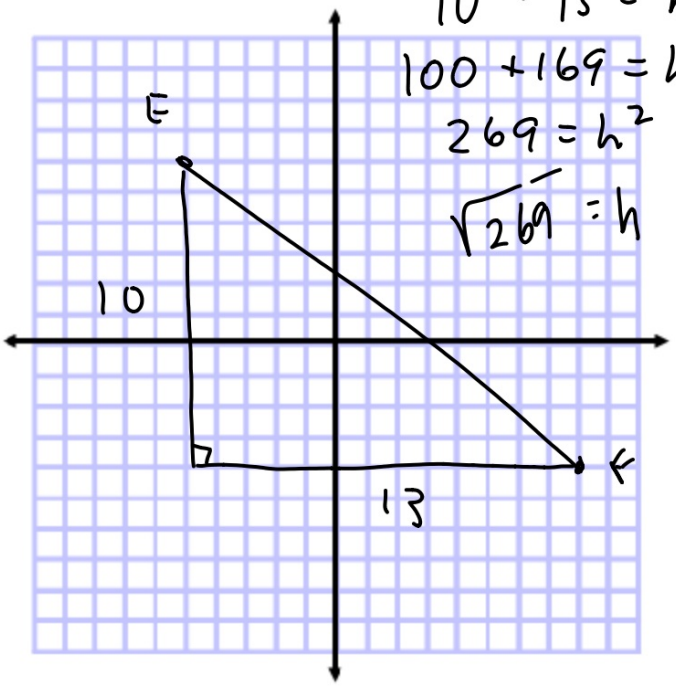
$10.3 \approx d$

GuidedPractice

Find the distance between each pair of points.

2A. $E(-5, 6)$ and $F(8, -4)$

2B. $J(4, 3)$ and $K(-3, -7)$



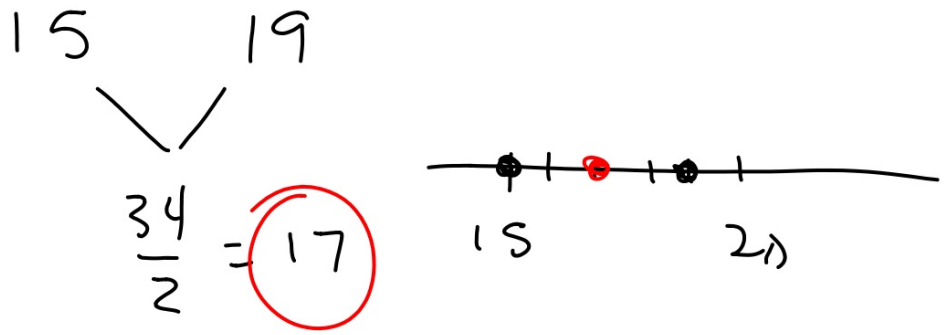
$10^2 + 13^2 = h^2$

$100 + 169 = h^2$

$269 = h^2$

$\sqrt{269} = h$

Marilyn's quiz scores are:



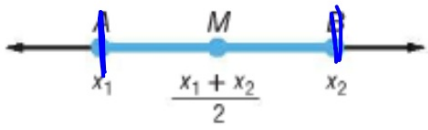
How do you find the average?
(halfway in between...)

2 Midpoint of a Segment The **midpoint** of a segment is the point halfway between the endpoints of the segment. If X is the midpoint of $\overline{AB}$, then $AX = XB$ and $\overline{AX} \cong \overline{XB}$. You can find the midpoint of a segment on a number line by finding the *mean*, or the average, of the coordinates of its endpoints.

KeyConcept Midpoint Formula (on Number Line)

If $\overline{AB}$ has endpoints at x_1 and x_2 on a number line, then the midpoint M of $\overline{AB}$ has coordinate

$$\frac{x_1 + x_2}{2}.$$



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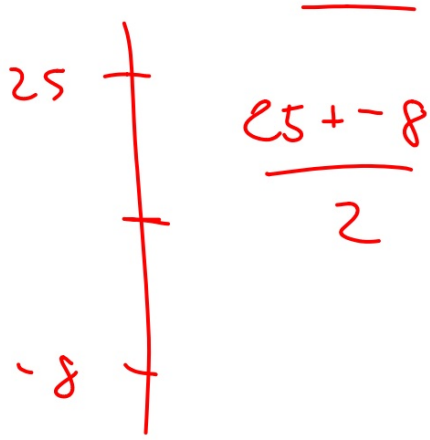
3. **TEMPERATURE** The temperature on a thermometer dropped from a reading of 25° to −8°. Find the midpoint of these temperatures.



$\frac{25 + -8}{2}$

mp = 8.5°

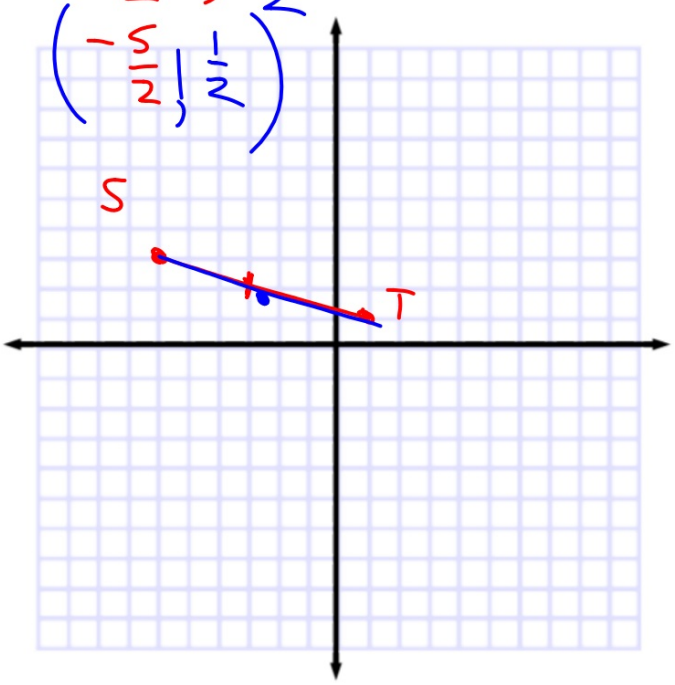
String: halfway for x, halfway for y

Example 4 Find Midpoint in Coordinate Plane

Find the coordinates of M, the midpoint of $\overline{ST}$, for $S(-6, 3)$ and $T(1, 0)$.

$\left(\frac{-6+1}{2}, \frac{3+0}{2}\right)$

$\left(-\frac{5}{2}, \frac{1}{2}\right)$



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Find the coordinates of the midpoint of a segment with the given coordinates.

4A. $A(5, 12), B(-4, 8)$

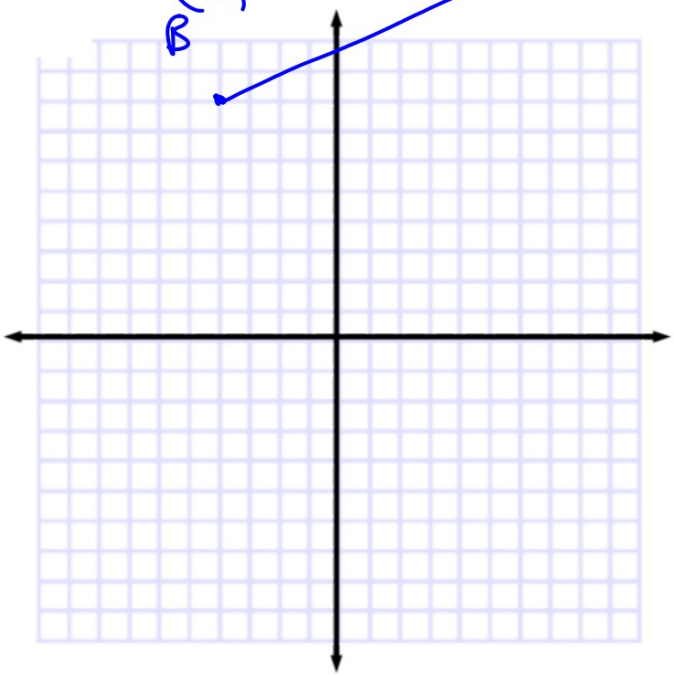
4B. $C(-8, -2), D(5, 1)$

$\left(\frac{5+-4}{2} \quad \frac{12+8}{2}\right)$

$\left(\frac{1}{2}, 10\right)$

B

A

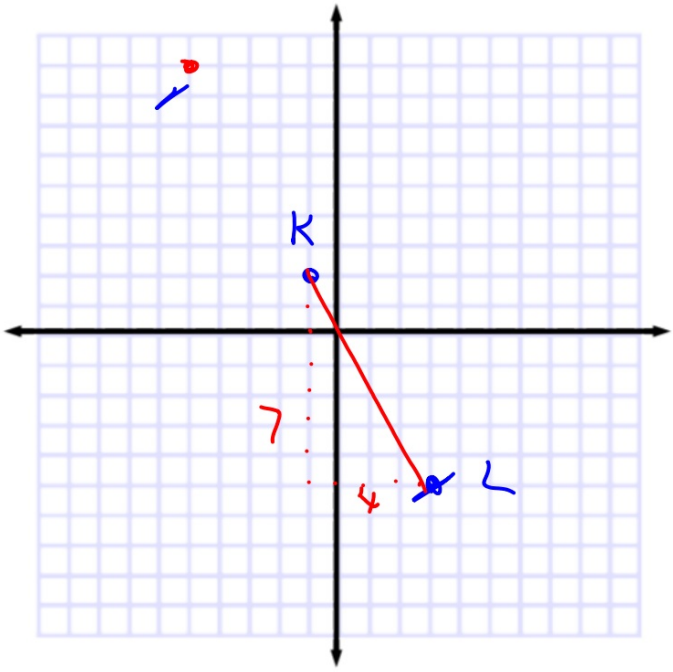


How is this question different?

Example 5 Find the Coordinates of an Endpoint

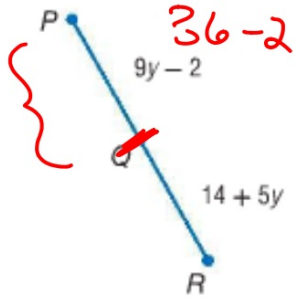
Find the coordinates of J if $K(-1, 2)$ is the midpoint of $\overline{JL}$ and L has coordinates $(3, -5)$.

$(-5, 9)$



Example 6 Use Algebra to Find Measures

ALGEBRA Find the measure of $\overline{PQ}$ if Q is the midpoint of $\overline{PR}$.



$9 \cdot 4 - 2$

$36 - 2$

$y = 4$

$PQ = 34$

$14 + 5y = 9y - 2$

$+2 - 5y \quad -5y \quad +2$

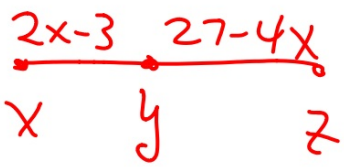
$16 = 4y$

One picture is worth 1000 words...

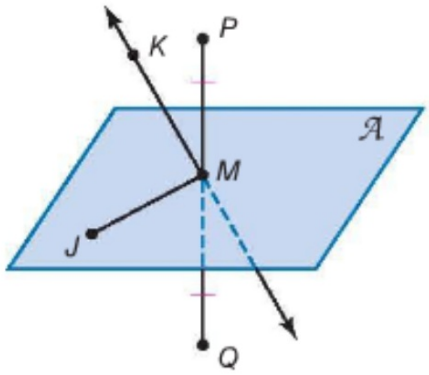
GuidedPractice

6A. Find the measure of $\overline{YZ}$ if Y is the midpoint of $\overline{XZ}$ and $XY = 2x - 3$ and $YZ = 27 - 4x$.

6B. Find the value of x if C is the midpoint of $\overline{AB}$, $AC = 4x + 5$, and $AB = 78$.



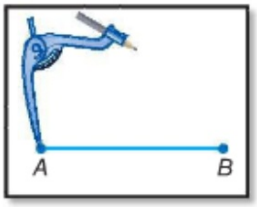
Any segment, line, or plane that intersects a segment at its midpoint is called a **segment bisector**. In the figure at the right, M is the midpoint of $\overline{PQ}$. Plane $\mathcal{A}$, $\overline{MJ}$, $\overleftrightarrow{KM}$, and point M are all bisectors of $\overline{PQ}$. We say that they *bisect* $\overline{PQ}$.



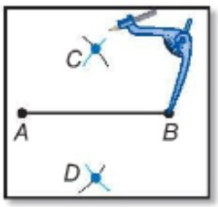
p.30

Construction Bisect a Segment

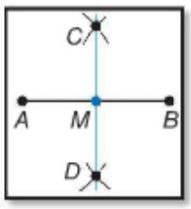
Step 1 Draw a segment and name it $\overline{AB}$. Place the compass at point A. Adjust the compass so that its width is greater than $\frac{1}{2}AB$. Draw arcs above and below $\overline{AB}$.



Step 2 Using the same compass setting, place the compass at point B and draw arcs above and below $\overline{AB}$ so that they intersect the two arcs previously drawn. Label the points of the intersection of the arcs as C and D.



Step 3 Use a straightedge to draw $\overline{CD}$. Label the point where it intersects $\overline{AB}$ as M. Point M is the midpoint of $\overline{AB}$, and $\overline{CD}$ is a bisector of $\overline{AB}$.



1.3 13-57 e00