19) Suppose $J$ is between $H$ and $K$. Use the Segment Addition Postulate to solve for $x$. Then find the length of each segment.

$HJ = 2x + 4$
$JK = 3x + 3$
$KH = 22$

\[
\begin{array}{c}
2x+4 \\
H \\
J \\
K \\
3x+3 \\
22
\end{array}
\]

$HJ + JK = HK$

\[
2x+4 + 3x+3 = 22
\]

\[
5x + 7 = 22
\]

\[
5x = 15
\]

\[
x = 3
\]

$HJ = 10$
$JK = 12$
$HK = 22$

20) Find the coordinate of the midpoint of a segment with the given endpoints $A$ and $B$. $A(-3, 5)$ and $B(5, -1)$.

\[
\text{midpoint: } \left( \frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)
\]

\[
\left( \frac{-3 + 5}{2}, \frac{5 + (-1)}{2} \right)
\]

\[
\left( \frac{2}{2}, \frac{4}{2} \right)
\]

\[
1, 2
\]

\[
(1, 2)
\]
21) Find the coordinates of the other endpoint of the segment with the given endpoint $A$ and midpoint $M$. \( A(-4, 3) \) and $M(-1, -1)$

\[
\begin{align*}
\frac{x_1 + x_2}{2} &= x_m \\
\frac{y_1 + y_2}{2} &= y_m \\
-4 + x &= -1 \\
\frac{3 + y}{2} &= -1 \\
-4 + x &= -2 \\
\frac{3 + y}{2} &= -2 \\
x &= 2 \\
y &= -5
\end{align*}
\]

OR

\[
\begin{align*}
\frac{x_1 + x_2}{2} &= x_m \\
\frac{y_1 + y_2}{2} &= y_m \\
-4 + x &= -1 \\
\frac{3 + y}{2} &= -1 \\
-4 + x &= -2 \\
\frac{3 + y}{2} &= -2 \\
x &= 2 \\
y &= -5
\end{align*}
\]

True or False?

\( \bigcirc \) $\overline{AB} = \overline{BA}$  \( \bigcirc \) $\overline{AB} = \overline{BA}$  \( \times \) $\overline{AB} = \overline{BA}$

\( \times \) $\overline{AB} = \overline{BA}$

\( e) \overline{AB} = \overline{BA} \) **TRUE**

Segments are congruent $\rightarrow \overline{AB} \cong \overline{BA}$

Lengths are equal $\rightarrow \overline{AB} = \overline{BA}$
E is the midpoint of \( \overline{DF} \). So \( DE = EF \)

a) \( DE = 2x - 3, \ EF = 5x - 24 \). Solve for \( x \).
\[
2x - 3 = 5x - 24 \\
21 = 3x \\
\Rightarrow x = 7
\]

b) \( GE = z, \ GH = 4z + 6, \ EH = 30 \). Solve for \( z \).
\[
GE + EH = GH \\
24 = 3z \\
8 = z
\]

c) If \( D(6, 3) \) and \( F(-4, -3) \), find the coordinates of \( E \).
\[
\left( \frac{6 + (-4)}{2}, \frac{3 + (-3)}{2} \right) = \left( \frac{2}{2}, \frac{0}{2} \right) = (1, 0)
\]

d) If \( D(7, 3) \) and \( E(2, 1) \), find the coordinates of \( F \).
\[
F(-3, -1)
\]

\( M \) is between \( O \) and \( P \) with the following measurements:
\[
\begin{align*}
OM &= x + 8 \\
MP &= 2x - 6 \\
OP &= 44
\end{align*}
\]

Is \( M \) the midpoint of \( \overline{OP} \)? Justify your answer with an explanation.

\[
OM + MP = OP \\
x + 8 + 2x - 6 = 44 \\
3x + 2 = 44 \\
3x = 42 \\
\Rightarrow x = 14
\]

since \( x = 14 \), \( OM = 22 \) and \( MP = 22 \)

which means \( \boxed{\text{YES}} \)

\( M \) is the midpoint of \( \overline{OP} \)
since it divides the segment into 2 congruent parts.
Point $T$ is the midpoint of $RS$. $W$ is the midpoint of $RT$, and $Z$ is the midpoint of $WS$. If the length of $TZ$ is $x$, find the lengths of $RW$, $WZ$, and $RS$ terms of $x$.

Let $WT=y$.

Since $RW=WT$, $RW=y$.

We know $WT+TZ=WZ$, and so $y+x=WZ$.

And since $WZ=2x$, we can say $y+x=2x$.

Now, we need an equation we can use to solve for $y$ in terms of $x$.

\[
\begin{align*}
RT &= TS \\
RW + WT &= TZ + ZS \\
y + y &= x + y + x \\
y &= 2x
\end{align*}
\]

So, $y=2x$.

\[
\begin{align*}
RS &= y + y + x + y + x \\
RS &= 8x
\end{align*}
\]

$A$, $B$, and $C$ are three points on a number line.

$AC = BC = 5$. The coordinate of $C$ is 8, and the coordinate of $A$ is greater than the coordinate of $B$. What are the coordinates of $A$ and $B$?

$B$ is at 3

$A$ is at 13
Solve for $x$ and $y$. 

\[
\begin{align*}
A & \quad 4 \quad B \quad y \quad C \quad y \quad D \quad 2x - 3y \quad E \\
\hline
x & \\
30
\end{align*}
\]

\[
\begin{align*}
AB + BC + CD &= AD \\
4 + y + y &= x \\
4 + 2y &= x \\
4 + 2(6) &= x \\
16 &= x
\end{align*}
\]

\[
\begin{align*}
AB + BC + CD + DE &= AE \\
4 + y + y + 2x - 3y &= 30 \\
4 + 2x - y &= 30 \\
2x - y &= 26 \\
2(4+2y) - y &= 26 \\
8 + 4y - y &= 26 \\
8 + 3y &= 26 \\
3y &= 18
\end{align*}
\]

\[
y = 6
\]

---

$G$, $H$, and $K$ are three points on a number line. The coordinates of $G$ and $H$ are 4 and -3 respectively. If $H$ is between $G$ and $K$ and $GK = 13$, what is the coordinate of $K$?

\[
? \quad -3 \quad 4 \\
K \quad H \quad G
\]

\[
13
\]

\[
K \text{'s at } -9
\]
$B$, the midpoint of $AC$, has a coordinate of 5. If the coordinate of $A$ is greater than the coordinate of $C$, and if $BC = 9$, what are the coordinates of $A$ and $C$?

A segment has midpoint $M(3, -5)$ and one endpoint is $A(2, -4)$. What are the coordinates of $B$, the other endpoint?
Solve for $x$.

\[ 3x + 2x + 15 = 9x \]
\[ 5x + 15 = 9x \]
\[ 15 = 4x \]
\[ \frac{15}{4} = x \]
\[ 3\frac{3}{4} = x \]

\[
\text{If } U \text{ is between } T \text{ and } B, \text{ find the value of } x \text{ and the length of } \overline{TU}. 
\]
\[ TU = 1 - x, \ TB = -3x, \ UB = 4x + 17. \]
Find the length of the segment in inches, centimeters, and millimeters.

\[ 2 \frac{5}{16} \text{ in.} \quad 6 \text{ cm} \quad 60 \text{ mm} \]

In the figure, \( \overline{CX} \) bisects \( \overline{AB} \), \( AX = 2x + 11 \), and \( XB = 4x - 5 \). Find the length of \( AB \).

\[
\begin{align*}
AX &= XB \\
2x + 11 &= 4x - 5 \\
-7x &= -2x \\
11 &= 2x - 5 \\
4x &= 16 \\
2x &= 8 \\
x &= 4 \\
AB &= AX + XB \\
&= 2(8) + 11 + 4(8) - 5 \\
&= 16 + 11 + 32 - 5 \\
&= 54
\end{align*}
\]
Use a ruler to find the perimeter of the rectangle in inches.

\[ P = \frac{7}{8} + 2\frac{3}{4} + \frac{7}{8} + 2\frac{6}{8} \]

\[ = 6 + \frac{26}{8} = 6 + 3\frac{2}{8} = 9\frac{1}{4} \text{ in.} \]

---

\[ A(-4.5, 1.5) \]
\[ B(6, 1.5) \]
\[ C(-4.5, 8) \]
\[ D(6, 1.5) \]

Find each length.

\[ AB = 10.5 \]
\[ AC = 6.5 \]
\[ BD = 0 \text{ (same point)} \]
Find $x$ and the perimeter.

$53 + 40 = x + 61$

$x = 32$

BAD QUESTION! TYPO made this an impossible diagram