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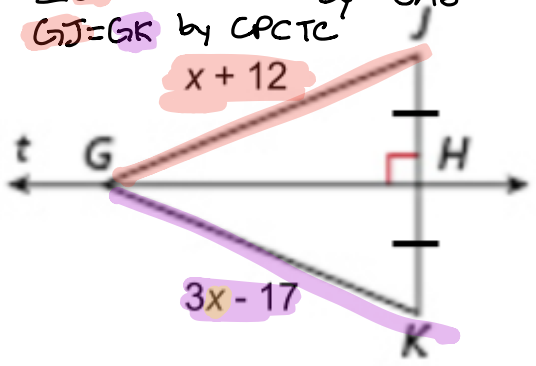
Word Bank			
SSS	ASA	HL	Perpendicular Bisector Theorem
SAS	AAS	CPCTC	Converse of Perpendicular Bisector Theorem
Angle Bisector Theorem	Converse of Angle Bisector Theorem		

1. Find *KG* in the figure below. Tell what theorem/postulate that you used.

line t is a perpendicular bisector by perpendicular bisector theorem

OR $\triangle GJH \cong \triangle GKH$ by SAS
$GJ = GK$ by CPCTC



$GJ = GK$
$x + 12 = 3x - 17$
$-x \quad -x$
$12 = 2x - 17$
$+17 \quad +17$
$\frac{29}{2} = \frac{2x}{2}$
$14.5 = x$

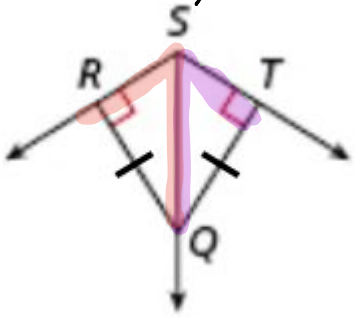
$KG = 3x - 17$
$= 3 \cdot 14.5 - 17$
$= 43.5 - 17$
$KG = 26.5$

Check
$GJ = x + 12$
$= 14.5 + 12$
$GJ = 26.5$ ✓

2. In the figure below, $m\angle QSR = (9a + 48)°$ and $m\angle QST = (6a + 50)°$. Find $m\angle QST$. Tell what theorem/postulate you used.

R and T are equidistant from $\overrightarrow{SQ}$
by converse of angle bisector theorem,

OR $\triangle QRS \cong \triangle QTS$ by HL
$m\angle QSR = m\angle QST$ by CPCTC



$\angle QSR \cong \angle QST$
$m\angle QSR = m\angle QST$
$9a + 48 = 6a + 50$
$-6a \quad -6a$
$3a + 48 = 50$
$-48 \quad -48$
$\frac{3a}{3} = \frac{2}{3}$
$a = \frac{2}{3}$

$m\angle QST = (6a + 50)°$
$= 6 \cdot \frac{2}{3} + 50$
$= \frac{2}{1}\cancel{6} \cdot \frac{2}{\cancel{3}_1} + 50$
$= 4 + 50$
$m\angle QST = 54°$

Check
$m\angle QSR = (9a + 48)°$
$= (9 \cdot \frac{2}{3} + 48)°$
$= (\frac{3}{1}\cancel{9} \cdot \frac{2}{\cancel{3}_1} + 48)°$
$= (6 + 48)° = 54°$ ✓

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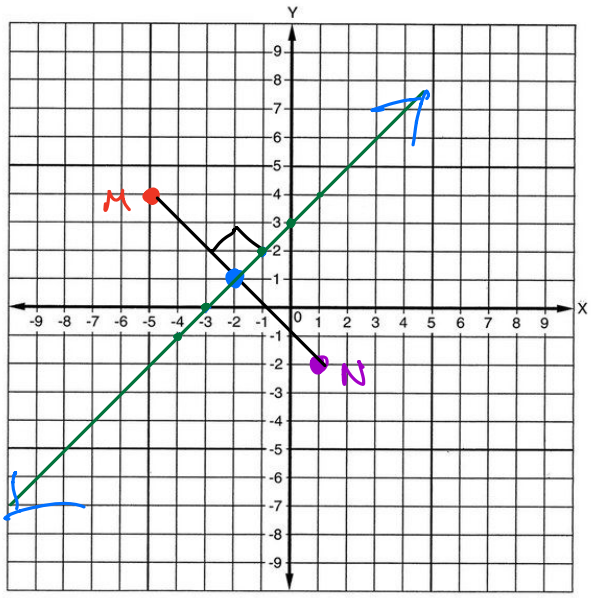
For questions 3-5, write the equation for the perpendicular bisector of each segment.

3. $M(-5, 4)$ and $N(1, -2)$ (x_1, y_1 and x_2, y_2)

Step 1: Find the midpoint

$$M(x, y) = \left(\frac{x_2 + x_1}{2}, \frac{y_2 + y_1}{2}\right)$$
$$= \left(\frac{1 + (-5)}{2}, \frac{-2 + 4}{2}\right)$$
$$= \left(\frac{-4}{2}, \frac{2}{2}\right)$$
$$= (-2, 1)$$



Step 2: Find slope

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$
$$= \frac{-2 - 4}{1 - (-5)}$$
$$= \frac{-6}{6}$$
$$= -1$$

perpendicular: flip & change sign $= 1$

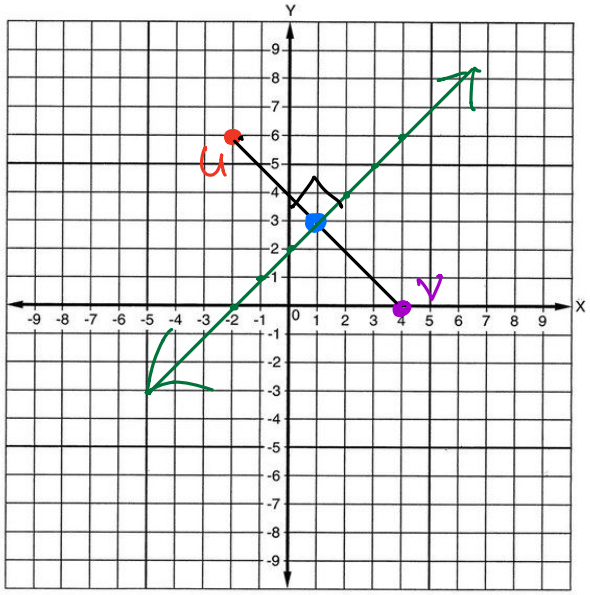
Step 3: Write equation

$$y - y_M = m(x - x_M)$$
$$y - 1 = 1(x - (-2))$$
$$y - 1 = 1(x + 2)$$

4. $U(-2, 6)$ and $V(4, 0)$

Step 1: Find midpoint

$$M(x, y) = \left(\frac{x_2 + x_1}{2}, \frac{y_2 + y_1}{2}\right)$$
$$= \left(\frac{4 + (-2)}{2}, \frac{0 + 6}{2}\right)$$
$$= \left(\frac{2}{2}, \frac{6}{2}\right)$$
$$= (1, 3)$$



Step 2: Find slope

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$
$$= \frac{0 - 6}{4 - (-2)}$$
$$= \frac{-6}{6}$$
$$= -1$$

perpendicular slope.

flip and change sign

$m = 1$

Step 3: Write the equation

$$y - y_M = m(x - x_M)$$
$$y - 3 = 1(x - 1)$$

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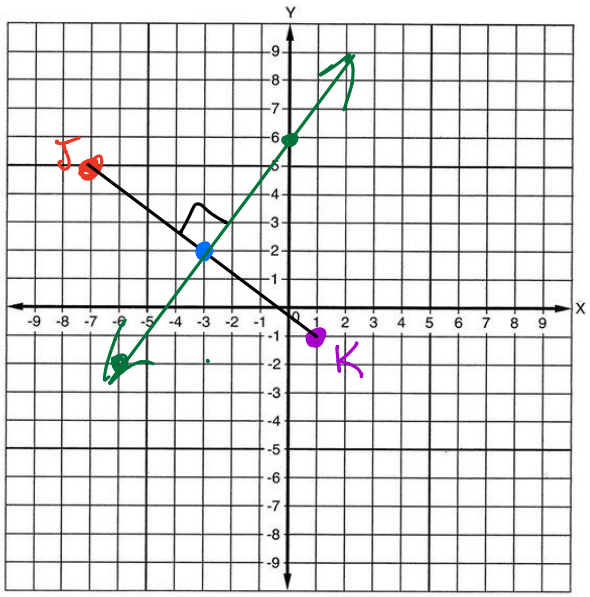
5. $J(-7, 5)$ and $K(1, -1)$



Step 1: Find midpoint

$M(x, y) = \left(\frac{x_2 + x_1}{2}, \frac{y_2 + y_1}{2}\right)$

$= \left(\frac{1 + (-7)}{2}, \frac{-1 + 5}{2}\right)$

$= \left(\frac{-6}{2}, \frac{4}{2}\right)$

$= (-3, 2)$

Step 2: Find Slope

$m = \frac{y_2 - y_1}{x_2 - x_1}$

$= \frac{-1 - 5}{1 - (-7)}$

$= \frac{-6}{8}$

$= -\frac{3}{4}$

perpendicular slope. flip & change sign $= \frac{4}{3}$

Step 3: Write equation

$y - y_M = m(x - x_M)$

$y - 2 = \frac{4}{3}(x - (-3))$

$y - 2 = \frac{4}{3}(x + 3)$

For questions 6-8, two side lengths of a triangle are given. Find the possible lengths for the third side.

$a - b <$ third side $< a + b$ where $a > b$

6. 4 yd, 19 yd

$19 - 4 <$ third side $< 19 + 4$

$15 \text{ yd} <$ third side $< 23 \text{ yd}$

7. 3.07 m, 1.89 m

$3.07 - 1.89 <$ third side $< 3.07 + 1.89$

$1.18 \text{ m} <$ third side $< 4.96 \text{ m}$

8. 9.2 cm, 3.8 cm

$9.2 - 3.8 <$ third side $< 9.2 + 3.8$

$5.4 \text{ cm} <$ third side $< 13 \text{ cm}$

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9. List the sides of the triangle below in order from shortest to longest.

three angles in a triangle always add up to 180°

$m\angle D + m\angle E + m\angle F = 180$

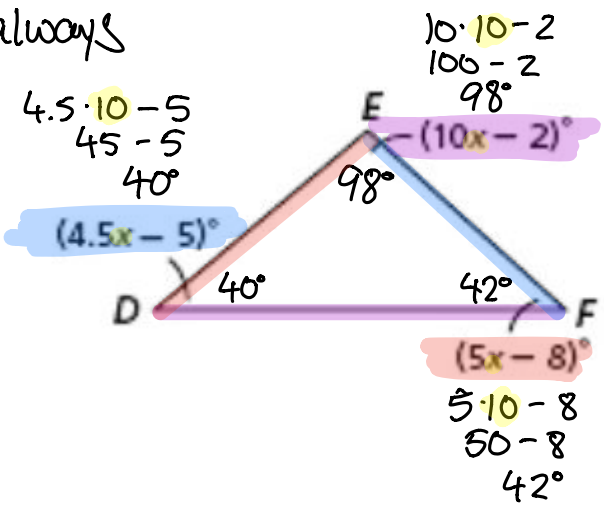
$4.5x-5 + 10x-2 + 5x-8 = 180$

$19.5x - 15 = 180$

$+15 \quad +15$

$\frac{19.5x}{19.5} = \frac{195}{19.5}$

$x = 10$



$4.5 \cdot 10 - 5$
$45 - 5$
40

$10 \cdot 10 - 2$
$100 - 2$
98

$5 \cdot 10 - 8$
$50 - 8$
42

Check $98+40+42 = 180$?
$180 = 180$ ✓

angles from smallest to largest
$\angle D, \angle F, \angle E$

side opposite each angle
$\overline{FE}, \overline{ED}, \overline{DF}$

10. Three sides of a triangle are $n + 1$, $n + 2$, and $n + 3$. Find the range of possible values for n.

the sum of two sides of a triangle always greater than the third side

$n+1 + n+2 > n+3$

$2n+3 > n+3$

$-n \quad -n$

$n+3 > 3$

$-3 \quad -3$

$n > 0$

the difference of two sides is always less than the third side.

$n+3-(n+2) < n+1$

$n+3-n-2 < n+1$

$1 < n+1$

$-1 \quad -1$

$0 < n$

$n > 0$