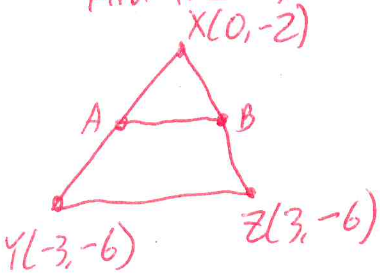
1. A and B are the midpoint of XY and XZ. Find the length of AB.



Step 1: Find A

Step 2: Find B

Step 3: Find AB

Step 2: B is the midpoint of XZ

$X(0,-2)$ $Z(3,-6)$

x_1 y_1 x_2 y_2

$X_m = \frac{x_1+x_2}{2}$ $Y_m = \frac{y_1+y_2}{2}$

$X_m = \frac{0+3}{2}$ $Y_m = \frac{-2+-6}{2}$

$X_m = 3/2$ $Y_m = \frac{-8}{2}$

$Y_m = -4$

$B(\frac{3}{2},-4)$

Step 1: A is the midpoint of XY

$X(0,-2)$ $Y(-3,-6)$

(x_1,y_1) (x_2,y_2)

$X_m = \frac{x_1+x_2}{2}$ $Y_m = \frac{y_1+y_2}{2}$

$X_m = \frac{0+-3}{2}$ $Y_m = \frac{-2+-6}{2}$

$X_m = \frac{-3}{2}$ $Y_m = \frac{-8}{2}$

$A(\frac{-3}{2},-4)$ $Y_m = -4$

Step 3: Find AB

$A(\frac{-3}{2},-4)$ $B(\frac{3}{2},-4)$

x_1 y_1 x_2 y_2

$d=\sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$

$d=\sqrt{(\frac{3}{2}--\frac{3}{2})^2+(-4--4)^2}$

$d=\sqrt{(\frac{6}{2})^2+(0)^2}$

$\frac{3}{2}--\frac{3}{2}$

$\frac{3}{2}+\frac{3}{2}$

$\frac{6}{2}$

$6\times6=36$

$4\times4=4$

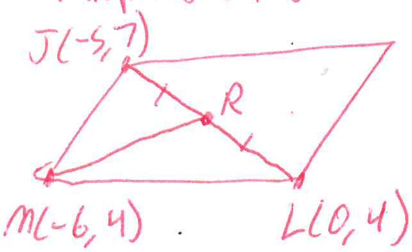
$d=\sqrt{(\frac{36}{4})}$

$d=\sqrt{9}$

$d=3$

$\boxed{AB=3}$

2. Find the length of MR if R is the midpoint of JL.



Step 1: Find R

Step 2: Find JL

Step 1: $J(-5,7)$ $L(0,4)$

$X_m = \frac{x_1+x_2}{2}$ $Y_m = \frac{y_1+y_2}{2}$

$X_m = \frac{-5+0}{2}$ $Y_m = \frac{7+4}{2}$

$Y_m = \frac{11}{2}$

$X_m = \frac{-5}{2}$ $R(\frac{-5}{2},\frac{11}{2})$

Step 2: $R(\frac{-5}{2},\frac{11}{2})$ $M(-6,4)$

$d=\sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$

$d=\sqrt{(\frac{-5}{2}--6)^2+(\frac{11}{2}-4)^2}$

$d=\sqrt{(\frac{-5}{2}+\frac{12}{2})^2+(\frac{11}{2}-\frac{8}{2})^2}$

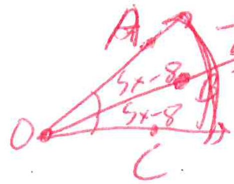
$d=\sqrt{(\frac{7}{2})^2+(\frac{3}{2})^2}$

$d=\sqrt{\frac{49}{4}+\frac{9}{4}}$

$d=\sqrt{\frac{58}{4}} = \boxed{\frac{\sqrt{58}}{2}}$

3. In the given figure, ray $\overrightarrow{OB}$ bisects $\angle AOC$. The measure of $\angle AOC$ is $7x+2$ and $m\angle COB = 5x-8$

what is the measure of $\angle AOB$?



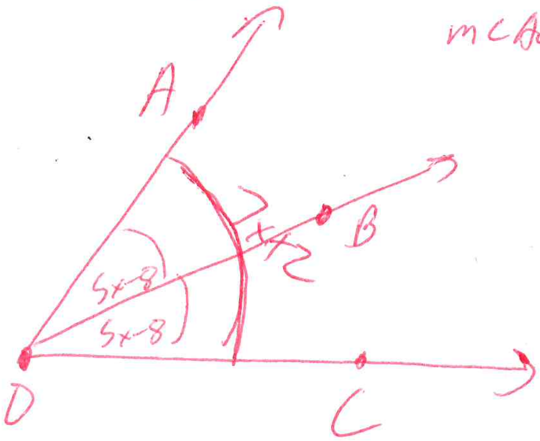
$7x+2$ Since $\overrightarrow{OB}$ bisects angle AOC

$\angle AOB \cong \angle BOC$

so $m\angle AOB = m\angle BOC$

$m\angle AOB = 5x-8$

Option 1



$m\angle AOB + m\angle BOC = m\angle AOC$

$5x-8 + 5x-8 = 7x+2$

$10x - 16 = 7x + 2$

$-7x \qquad -7x$

$3x - 16 = 2$

$+16 \qquad +16$

$\frac{3x}{3} = \frac{18}{3}$

$x = 6$

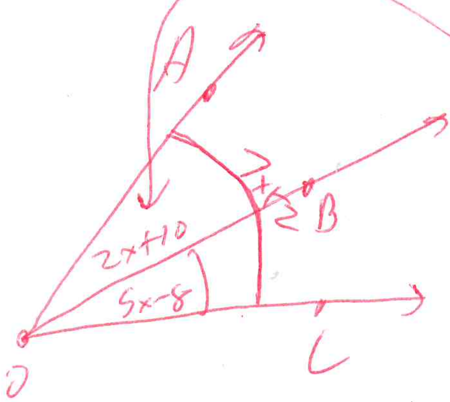
$m\angle AOB = 5x-8$

$= 5(6)-8$

$= 30-8$

$= \boxed{22}$

Option 2



$m\angle AOB + m\angle BOC = m\angle AOC$

$m\angle AOB + 5x-8 = 7x+2$

$-5x+8 \quad -5x+8$

$m\angle AOB = 2x+10$

Since $\overrightarrow{OB}$ bisects $\angle AOC$, ~~$m\angle AOB$~~ $\angle AOB \cong \angle BOC$

So $m\angle AOB = m\angle BOC$

$2x+10 = 5x-8$

$10 = 3x-8$

$18 = 3x$

$6 = x$

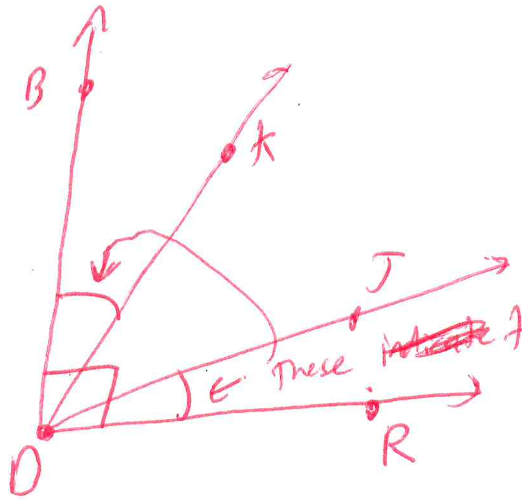
$m\angle AOB = 2x+10$

$= 2(6)+10$

$= 12+10$

$= \boxed{22}$

4.



Find x

$m\angle BDK = 3x+4 \quad m\angle JDR = 5x-10$

~~intersect~~ tell us that $\angle BDK \cong \angle JDR$

so $m\angle BDK = m\angle JDR$

so $3x+4 = 5x-10$

$-3x \qquad -3x$

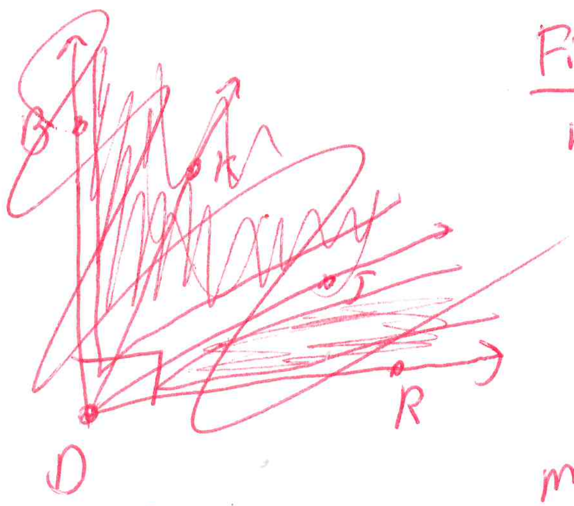
$4 = 2x - 10$

$+10 \qquad +10$

$\frac{14}{2} = \frac{2x}{2}$

$\boxed{7 = x}$

5.

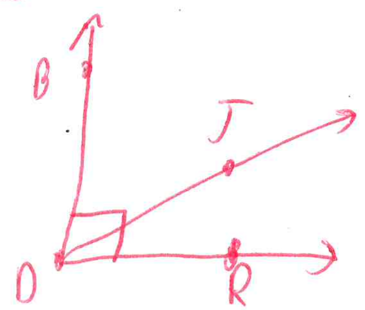


Find y

$m\angle BDJ = 7y+2, \quad m\angle JDR = 2y+7$

we see that $m\angle BDR = 90$ since $\angle BDR$ is a right angle

$m\angle BDJ + m\angle JDR = \cancel{90}\ m\angle BDR$



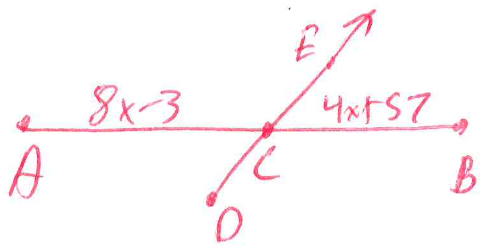
$7y+2+2y+7 = 90$

$9y+9 = 90$

$\frac{9y}{9} = \frac{81}{9}$

$\boxed{y = 9}$

6. $\overrightarrow{DE}$ bisects $\overline{AB}$ at C. If $AC = 8x-3$ and $CB = 4x+57$, find AC.



Since $\overrightarrow{DE}$ bisects at C $\overline{AC} \cong \overline{CB}$

so $AC = CB$

so $8x-3 = 4x+57$

$-4x \quad -4x$

$4x-3 = 57$

$+3 \quad +3$

$\frac{4x}{4} = \frac{60}{4}$

$\boxed{x = 15}$

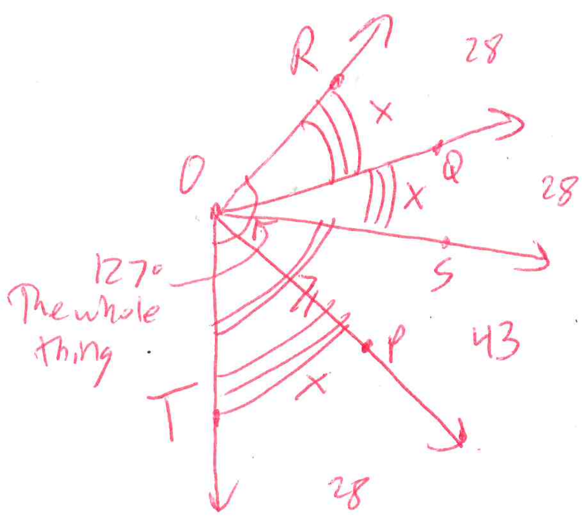
7-9) Q is in the interior of $\angle ROS$, S is in the interior of $\angle QOP$, P is in the interior of $\angle SOT$. $m\angle ROT = 127°$

$m\angle SOT = 71°$

and $m\angle ROQ = m\angle QOS = m\angle POT$

Let x equal all three of these angles

$m\angle ROQ + m\angle QOS + m\angle SOT = m\angle ROT$



$x + x + 71 = 127$

$2x + 71 = 127$

$-71 \quad -71$

$\frac{2x}{2} = \frac{56}{2}$

$x = 28$

$m\angle SOP = 71-28$

$m\angle SOP = 43$

7) Find $m\angle QOP$

$m\angle QOS + m\angle SOP = m\angle QOP$

$28 + 43 = m\angle QOP$

$\boxed{71 = m\angle QOP}$

8) Find $m\angle QOT$

$m\angle QOP + m\angle POT = m\angle QOT$

$71 + 28 = mQOT$

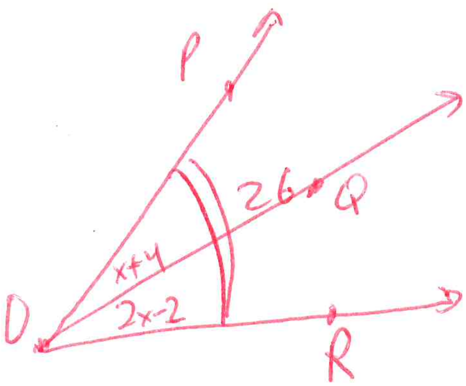
$99 = m\angle QOT$

9) Find $m\angle ROQ$

$x = m\angle ROQ$

$28 = m\angle ROQ$

10. Let Q be in the interior of $\angle POR$. Solve for x. Find measure of each angle.



$m\angle POQ = x+4$

$m\angle QOR = 2x-2$

$m\angle POR = 26$

$m\angle POQ + m\angle QOR = m\angle POR$

$x+4+2x-2=26$

$3x+2=26$

$-2 \quad -2$

$\frac{3x}{3} = \frac{24}{3}$

$\boxed{x=8}$

~~Find measur~~

$m\angle POQ = x+4$

$m\angle POQ = 8+4$

$\boxed{m\angle POQ = 12}$

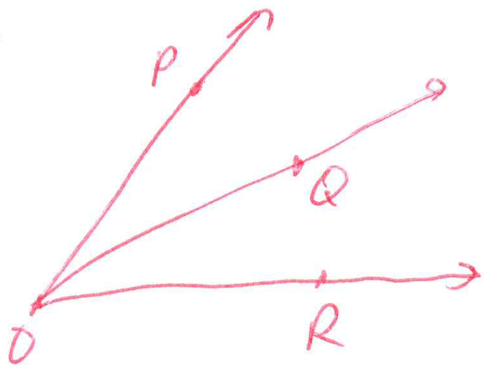
$m\angle QOR = 2x-2$

$m\angle QOR = 2(8)-2$

$m\angle QOR = 16-2$

$\boxed{m\angle QOR = 14}$

11.



$m\angle POQ = 3x+7$

$m\angle QOR = 5x-2$

$m\angle POR = 61$

$m\angle POQ + m\angle QOR = m\angle POR$

$3x+7+5x-2=61$

$8x+5=61$

$8x=56$

$\boxed{x=7}$

$m\angle POQ = 3x+7$

$m\angle POQ = 3(7)+7$

$m\angle POQ = 21+7$

$\boxed{m\angle POQ = 28}$

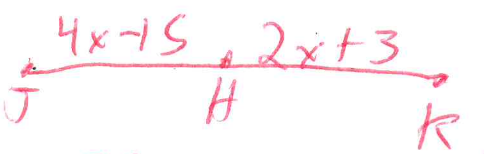
$m\angle QOR = 5x-2$

$m\angle QOR = 5(7)-2$

$m\angle QOR = 35-2$

$\boxed{m\angle QOR = 33}$

12. $JK = 48$ Find the value of x.



25 23

$25+23=48$ ✓

$JH + HK = JK$

$4x-15+2x+3=48$

$6x-12=48$

$\frac{6x}{6} = \frac{60}{6}$

$\boxed{x=10}$

13. M(x,y) is the midpoint of $\overrightarrow{CD}$ with endpoints $C(\overset{x_1}{5},\overset{y_1}{9})$ and $D(\overset{x_2}{17},\overset{y_2}{29})$

a) Find the values of x and y

$X_m = \dfrac{x_1+x_2}{2}$ $\quad Y_m = \dfrac{y_1+y_2}{2}$

$X_m = \dfrac{5+17}{2}$ $\quad Y_m = \dfrac{9+29}{2}$

$X_m = \dfrac{22}{2}$ $\quad Y_m = \dfrac{38}{2}$

$X_m = 11$ $\quad X_m = 19$

$\boxed{(11,19)}$

b. Show MC = MD

Part 1 Find MC

~~M(11,19) C(5,9)~~

M(11,19) C(5,9)

$d=\sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$

$d=\sqrt{(11-5)^2+(19-9)^2}$

$d=\sqrt{(6)^2+(10)^2}$

$d=\sqrt{36+100}$

$d=\sqrt{136}$

Part 2: Find MD

M(11,19) D(17,29)

$d=\sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$

$d=\sqrt{(11-17)^2+(19-29)^2}$

$d=\sqrt{(-6)^2+(-10)^2}$

$d=\sqrt{36+100}$

$d=\sqrt{136}$

MC = MD

$\sqrt{136}=\sqrt{136}$ ✓

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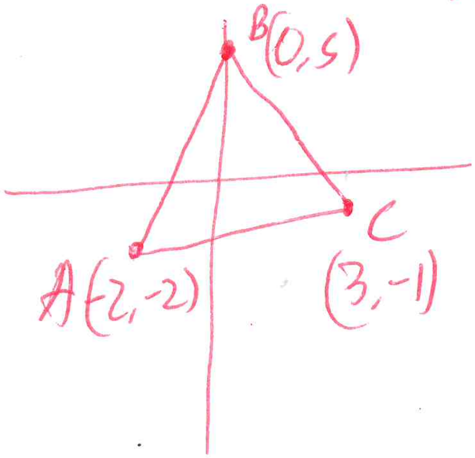
14. To the nearest 10th, find the perimeter of $\triangle ABC$



AB

A(-2,-2) B(0,5)

$d=\sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$

$d=\sqrt{(-2-0)^2+(-2-5)^2}$

$d=\sqrt{(-2)^2+(-7)^2}$

$d=\sqrt{4+49}$

$d=\sqrt{53}\approx 7.3$

Perimeter = AB + BC + AC

BC B(0,5) C(3,-1)

$d=\sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$

$d=\sqrt{(0-3)^2+(5--1)^2}$

$d=\sqrt{(-3)^2+(6)^2}$

$d=\sqrt{9+36}$

$d=\sqrt{45}\approx 6.7$

AC A(-2,-2) C(3,-1)

$d=\sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$

$d=\sqrt{(-2-3)^2+(-2--1)^2}$

$d=\sqrt{(-5)^2+(-1)^2}$

$d=\sqrt{25+1}$

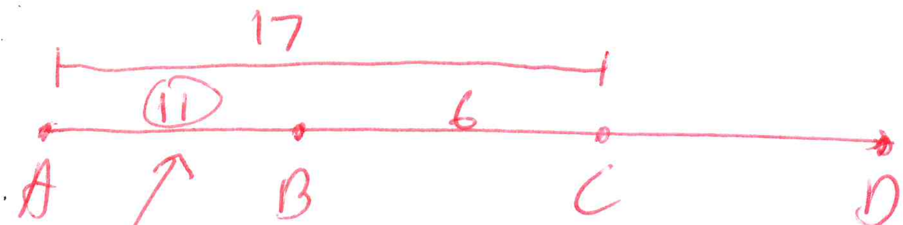
$d=\sqrt{26}\approx 5.1$

Perimeter = 5.1 + 7.3 + 6.7

$\boxed{\text{Perimeter} = 19.1}$

15. Let A, B, C, D be collinear and arranged in that order.

Find X if $AC = 17$ $BD = 2x-6$ $AD = x+16$ $BC = 6$

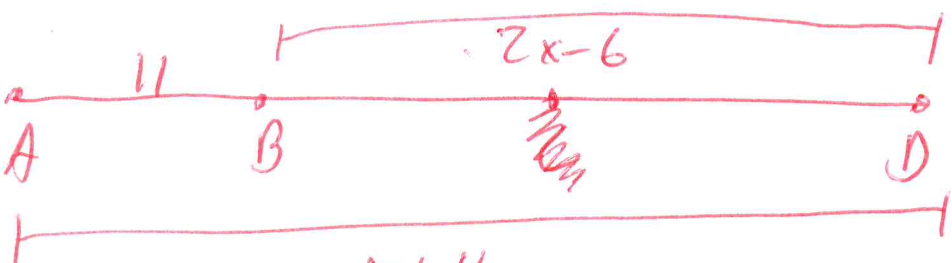


$AB + BC = \cancel{17}\ AC$

$AB + 6 = 17$

$\quad -6 \quad -6$

$AB = 11$



$2x-6 \quad 2(11)-6$

$AB + BD = AD$

$11 + 2x - 6 = x + 16$

$2x + 5 = x + 16$

$-x \qquad -x$

$x + 5 = 16$

$-5 \quad -5$

$\boxed{x = 11}$

$11 + 16 = 27$ ✓

$11 + 16 = 27$