Look for linear pairs and angles of a triangle!

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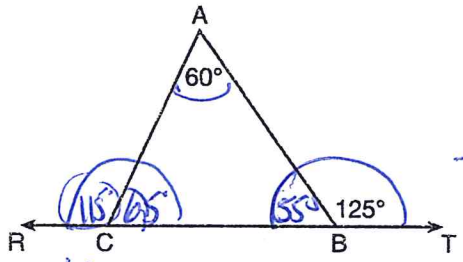
Geometry

Complex Triangle Problems

1. In the diagram below, $\overleftrightarrow{RCBT}$ and $\triangle ABC$ are shown with $m\angle A = 60$ and $m\angle ABT = 125$.

What is $m\angle ACR$?
1) 125
2) 115
3) 65
4) 55

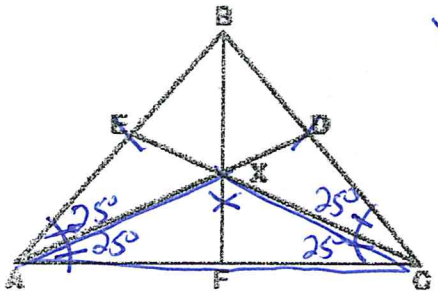
$55+60+x=180$
$115+x=180$
$-115 \quad -115$
$x=65$



$180-125=55$

$180-65=115$

2. In the diagram below of isosceles triangle ABC, $\overline{AB} \cong \overline{CB}$ and angle bisectors $\overline{AD}$, $\overline{BF}$, and $\overline{CE}$ are drawn and intersect at X.
If $m\angle BAC = 50°$, find $m\angle AXC$.



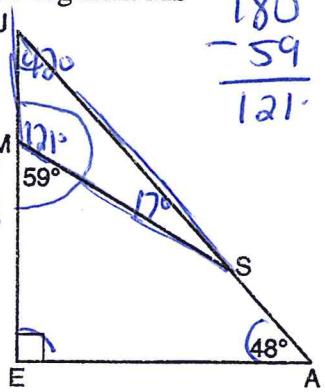
$x+25+25=180$
$x+50=180$
$-50 \quad -50$
$x=130°$

3. In the diagram of $\triangle JEA$ below, $m\angle JEA = 90$ and $m\angle EAJ = 48$. Line segment MS connects points M and S on the triangle, such that $m\angle EMS = 59$.

What is $m\angle JSM$?
1) 163
2) 121
3) 42
4) 17

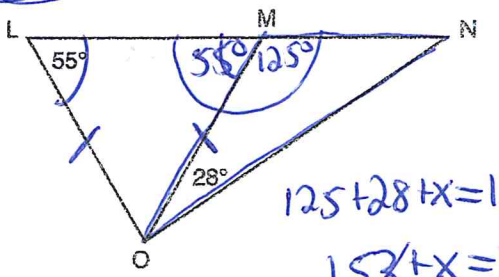
$90+48+x=180$
$138+x=180$
$-138 \quad -138$
$x=42$

$121+42+x=180$
$163+x=180$
$-163 \quad -163$
$x=17$



$180-59=121$

4. In the diagram below, $\triangle LMO$ is isosceles with $LO = MO$.



If $m\angle L = 55$ and $m\angle NOM = 28$, what is $m\angle N$?

1) 27
2) 28
3) 42
4) 70

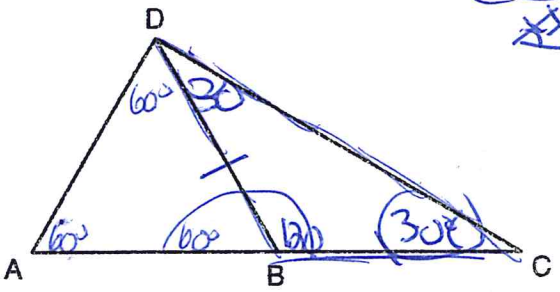
$125 + 28 + x = 180$

$153 + x = 180$

$-153 \quad -153$

$x = 27$

5. In the diagram below of $\triangle ACD$, B is a point on $\overline{AC}$ such that $\triangle ADB$ is an equilateral triangle, and $\triangle DBC$ is an isosceles triangle with $\overline{DB} \cong \overline{BC}$. Find $m\angle C$.



$120 + x + x = 180$

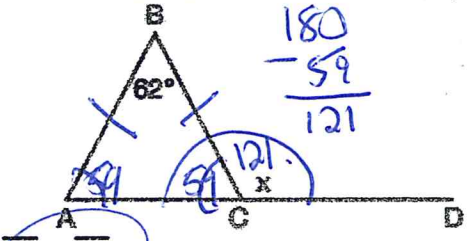
$2x + 120 = 180$

$-120 \quad -120$

$\frac{2x}{2} = \frac{60}{2}$

$x = 30°$

6. Given $\triangle ABC$ with $m\angle B = 62°$ and side $\overline{AC}$ extended to D, as shown below.



Which value of x makes $\overline{AB} \cong \overline{CB}$?

1) 59°
2) 62°
3) 118°
4) 121°

$x + x + 62 = 180$

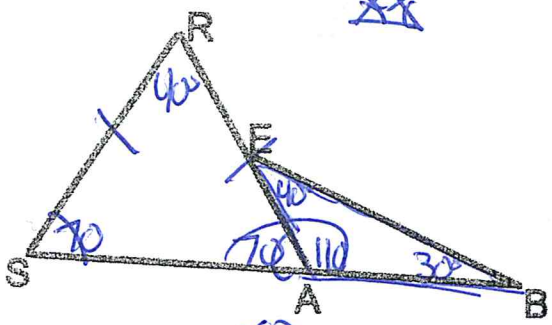
$2x + 62 = 180$

$-62 \quad -62$

$\frac{2x}{2} = \frac{118}{2}$

$x = 59$

7. In the diagram below, $\overline{SR} \cong \overline{RA}$, $m\angle SRA = 40$, and $m\angle ABE = 30$. Find $m\angle BEA$.

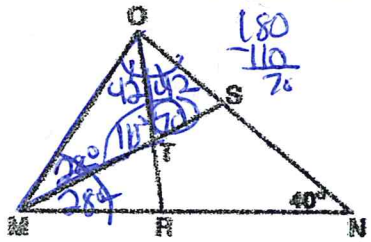


$x+x+40=180$
$2x+40=180$
$-40 \quad -40$
$\frac{2x}{2}=\frac{140}{2}$
$x=70°$

$110+30+x=180$
$140+x=180$
$-140 \quad -140$
$x=40°$

$180-70=110$

8. In the diagram below of triangle MNO, $\angle M$ and $\angle O$ are bisected by $\overline{MS}$ and $\overline{OR}$, respectively. Segments MS and OR intersect at T, and $m\angle N = 40°$.



$42+28+x=180$
$70+x=180$
$-70 \quad -70$
$x=110$

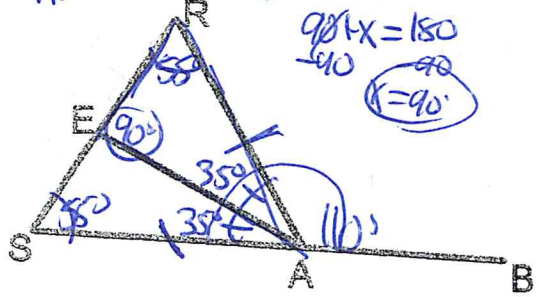
$180-110=70$

$56+40+x=180$
$96+x=180$
$-96 \quad -96$
$x=84$
$\frac{1}{2}(84)=42$

If $m\angle TMR = 28°$, the measure of angle OTS is

1) 40°
2) 50°
3) 60°
4) ~~70°~~

9. In the diagram below, $\overline{EA}$ bisects $\angle SAR$, $\overline{RA} \cong \overline{AS}$ and $m\angle SRA = 55$. Find and $m\angle RAB$ and $m\angle REA$.

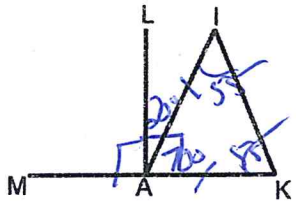


$110°$ $90°$
$55+35+x=180$
$90+x=180$
$-90 \quad -90$
$x=90°$

$180-70=110°$

$55+55+x=180$
$110+x=180$
$-110 \quad -110$
$x=70°$
$\frac{1}{2}(70)=35°$

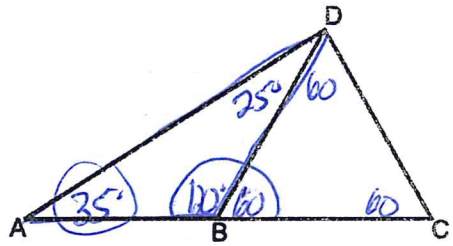
10. In the diagram below, $m\angle MAL = 90$, $m\angle IAL = 20$, and $\overline{IA} \cong \overline{AK}$. Find $m\angle I$.



Complementary
$20 + x = 90$
$-20 \quad -20$
$x = 70$

$x + x + 70 = 180$
$2x + 70 = 180$
$-70 \quad -70$
$2x = 110$
$\frac{2x}{2} = \frac{110}{2}$
$x = 55$

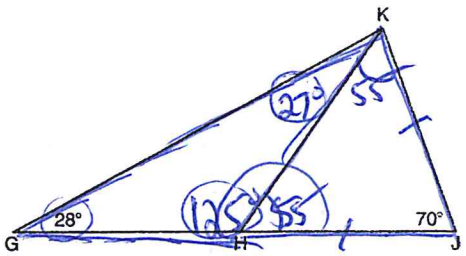
11. In the diagram below, ΔDBC is an equilateral triangle and $m\angle ADB = 25$. Find $m\angle DAB$



$120 + 25 + x = 180$
$145 + x = 180$
$-145 \quad -145$
$x = 35$

$180 - 60 = 120$

12. In the diagram below of ΔGJK, H is a point on $\overline{GJ}$, $\overline{HJ} \cong \overline{JK}$, $m\angle G = 28$, and $m\angle GJK = 70$. Determine whether ΔGHK is an isosceles triangle and justify your answer.



$180 - 55 = 125$

$x + x + 70 = 180$
$2x + 70 = 180$
$-70 \quad -70$
$\frac{2x}{2} = \frac{110}{2}$
$x = 55$

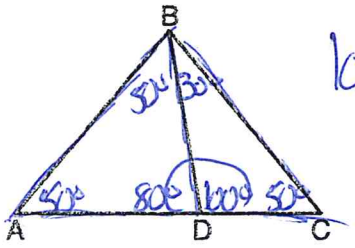
$125 + 28 + x = 180$
$153 + x = 180$
$-153 \quad -153$
$x = 27$

No, it is scalene because all of the angles are different.

13. In the diagram below, $m\angle BDC = 100°$, $m\angle A = 50°$, and $m\angle DBC = 30°$.

Which statement is true?

1) $\triangle ABD$ is obtuse. No, 50, 50, 80
2) $\triangle ABC$ is isosceles. Yes, 50, 50, 80
3) $m\angle ABD = 80°$ No, 50
4) $\triangle ABD$ is scalene. No, 50, 50, 80



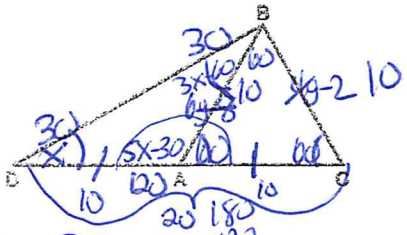
$100+30+X=180$
$130+X=180$
$-130 \quad -130$
$X=50$

$180-100=80$

$50+80+X=180$
$130+X=180$
$-130 \quad -130$
$X=50$

14. In the diagram of $\triangle BCD$ shown below, $\overline{BA}$ is drawn from vertex B to point A on $\overline{DC}$, such that $\overline{BC} \cong \overline{BA}$.

In $\triangle DAB$, $m\angle D = x$, $m\angle DAB = 5x - 30$, and $m\angle DBA = 3x - 60$. In $\triangle ABC$, $AB = 6y - 8$ and $BC = 4y - 2$. [Only algebraic solutions can receive full credit.] Find $m\angle D$. Find $m\angle BAC$. Find the length of $\overline{BC}$. Find the length of $\overline{DC}$.



$X=30$

$3x-60=3(30)-60=30$

$5x-30=5(30)-30=120$

$X+3x-60+5x-30=180$

$9x-90=180$
$+90 \quad +90$
$\frac{9x}{9}=\frac{270}{9}$
$x=30°$

$6y-8=4y-2$
$-4y \quad -4y$
$2y-8=-2$
$+8 \quad +8$
$\frac{2y}{2}=\frac{6}{2}$
$y=3$

$6(3)-8 \quad 4(3)-2$
$10 \quad 10$