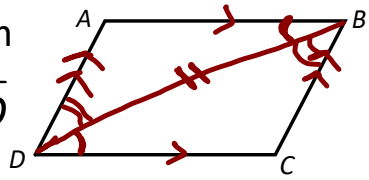
A parallelogram is a quadrilateral in which both pairs of opposite sides are parallel

Given: *ABCD* is a parallelogram

Prove: $\overline{AB} \cong \overline{DC}$ and $\overline{BC} \cong \overline{AD}$

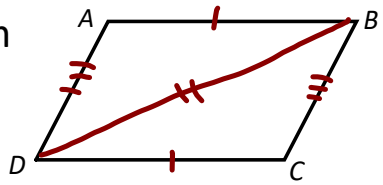


Statements	Reasons
1. ABCD is a //-ogram	1. Given
2. $\overline{AB} // \overline{DC}$ and $\overline{AD} // \overline{BC}$	2. Def. of //-ogram
3. Draw $\overline{BD}$	3. Any 2 pts form a line.
4. $\overline{BD} \cong \overline{BD}$	4. Reflexive Prop $\cong$
5. $\angle BDC \cong \angle ABD$, $\angle ADB \cong \angle CBD$	5. Alt. int. $\angle$'s theo.
6. $\triangle ABD \cong \triangle DCB$	6. ASA
7. $\overline{AB} \cong \overline{DC}$, $\overline{AD} \cong \overline{BC}$	7. CPCTC

$\therefore$ In any //-ogram, the opposite sides are $\cong$.

Given: *ABCD* is a parallelogram

Prove: $\angle A \cong \angle C$

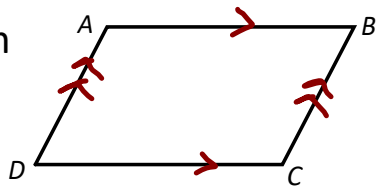


Statements	Reasons
1. ABCD is a //-ogram	1. Given
2. Draw $\overline{BD}$	2. Any 2 pts form a line.
3. $\overline{BD} \cong \overline{BD}$	3. Reflexive prop. $\cong$
4. $\overline{AD} \cong \overline{BC}$, $\overline{AB} \cong \overline{CD}$	4. In a //-ogram, opp. sides are $\cong$.
5. $\triangle ABD \cong \triangle CDB$	5. SSS
6. $\angle A \cong \angle C$	6. CPCTC

$\therefore$ In any //-ogram, the opp. angles are $\cong$.

Given: *ABCD* is a parallelogram

Prove: $\angle A$ is supp to $\angle D$ and
$\angle A$ is supp to $\angle B$

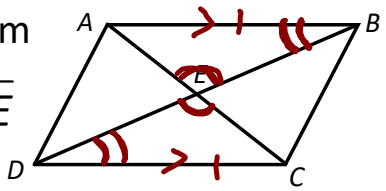


Statements	Reasons
1. ABCD is a //-ogram	1. Given
2. $\overline{AB} \parallel \overline{CD}$ and $\overline{AD} \parallel \overline{BC}$	2. Def. of //-ogram
3. $\angle A$ is supp to $\angle D$ $\angle A$ is supp to $\angle B$	3. Consecutive Int. $\angle$'s theo.

$\therefore$ In any //-ogram, the consecutive $\angle$'s are supp.

Given: *ABCD* is a parallelogram

Prove: $\overline{AE} \cong \overline{CE}$ and $\overline{DE} \cong \overline{BE}$

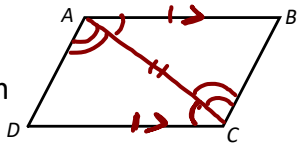


Statements	Reasons
1. ABCD is a //-ogram	1. Given
2. $\angle AEB \cong \angle CED$	2. Vert. ∠'s theo.
3. $\overline{AB} \cong \overline{CD}$	3. In a //-ogram, opp sides are ≅.
4. $\overline{AB} \parallel \overline{CD}$	4. Def. of //-ogram.
5. $\angle ABD \cong \angle BDC$	5. Alt. int. ∠'s theo.
6. $\triangle AEB \cong \triangle CED$	6. AAS
7. $\overline{AE} \cong \overline{CE}$, $\overline{EB} \cong \overline{ED}$	7. CPCTC

∴ In any //-ogram, the diagonals bisect each other.

Given: $\overline{AB} \cong \overline{DC}$ and $\overline{AB} \parallel \overline{DC}$

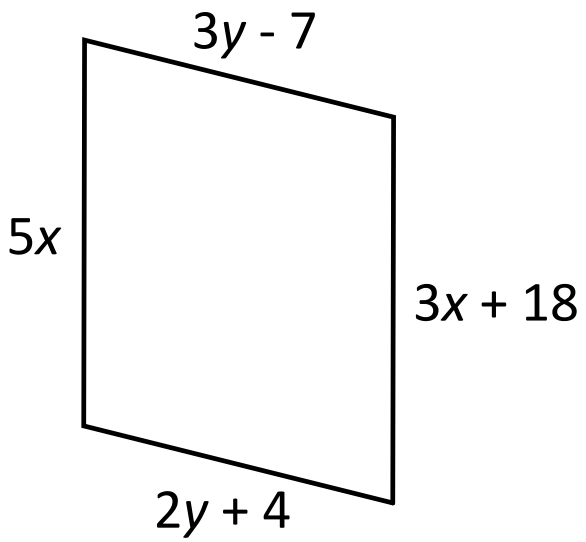
Prove: *ABCD* is a parallelogram



Statements	Reasons
1. $\overline{AB} \cong \overline{DC}$ and $\overline{AB} \parallel \overline{DC}$	1. Given
2. Draw $\overline{AC}$	2. Any 2 pts form a line.
3. $\angle BAC \cong \angle ACD$	3. Alt. int. ∠'s theo.
4. $\overline{AC} \cong \overline{AC}$	4. Reflexive Prop. of ≅.
5. $\triangle ABC \cong \triangle CDA$	5. SAS
6. $\angle CAD \cong \angle ACB$	6. CPCTC
7. $\overline{AD} \parallel \overline{BC}$	7. Alt. int. ∠'s theo Converse
8. ABCD is a //-ogram	8. Def. of //-ogram.

∴ In any quad, if a pair of opp. sides are BOTH // and ≅, then the quad is a //-ogram.

Given the parallelogram, find x and y



$3x + 18 = 5x$

$18 = 2x$

$\boxed{x = 9}$

$3y - 7 = 2y + 4$

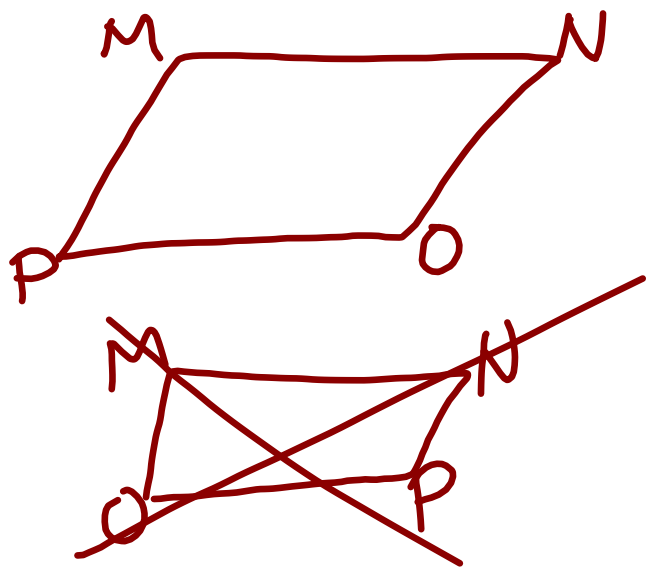
$\boxed{y = 11}$

Given: $MNOP$ is a parallelogram

$m\angle M = 9x + 37$

$m\angle P = 3x + 23$

Find x

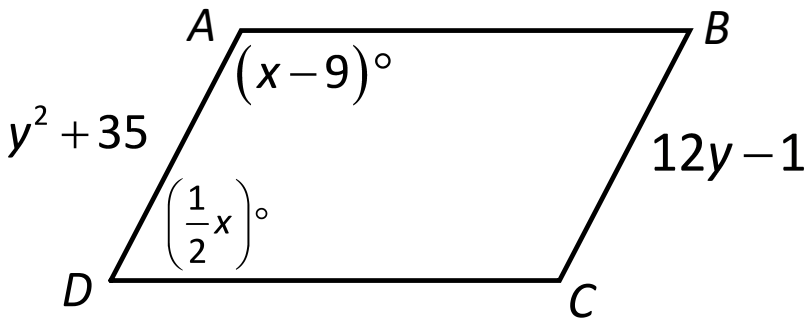


$9x + 37 + 3x + 23 = 180$

$12x + 60 = 180$

$12x = 120$

$\boxed{x = 10}$



$m\angle A = 117^\circ$

$m\angle D = 63^\circ$

$BC = 71$

$x - 9 + \frac{1}{2}x = 180$

$\frac{2}{3}\cdot\frac{3}{2}x = 189\cdot\frac{2}{3}$

$x = 126^\circ$

$y^2 + 35 = 12y - 1$

$y^2 - 12y + 36 = 0$

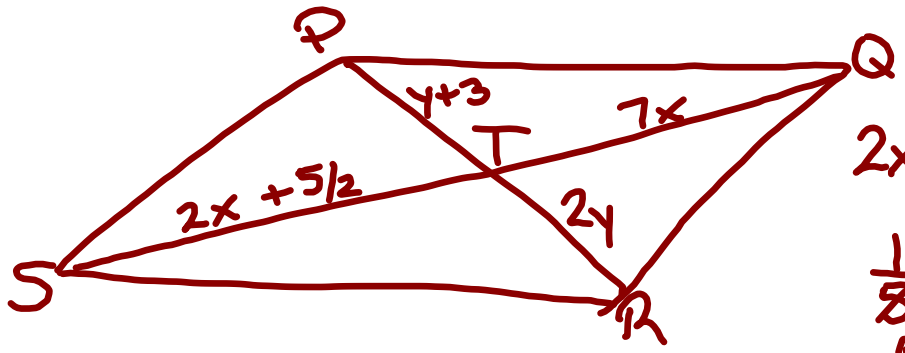
$(y-6)^2 = 0$

$y = 6$

The diagonals of ▱ $PQRS$ intersect at point T.

Given: $QT = 7x,\ TS = 2x + \frac{5}{2},\ RT = 2y,\ TP = y + 3$

~~Find the perimeter of $\triangle PTS$~~



$2x + \frac{5}{2} = 7x$

$\frac{1}{\cancel{5}}\cdot\frac{\cancel{5}}{2} = \frac{5x}{5}$

$\boxed{\frac{1}{2} = x}$

$y + 3 = 2y$

$\boxed{y = 3}$