

Worksheet 1

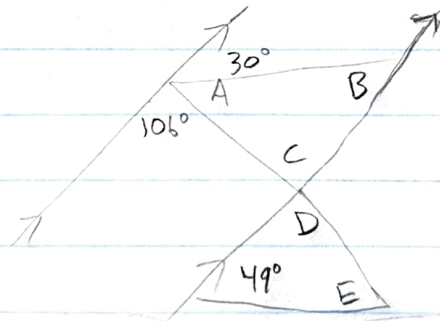
- ① A certain convex polygon has an interior angle sum of 1800° . How many sides does this polygon have?
Show work.

The interior angle sum of a polygon with N sides is $180 \cdot (N-2)^\circ$, so we solve for N :

$$180 \cdot (N-2) = 1800$$

$$\Rightarrow N-2 = 10 \Rightarrow \boxed{N = 12}$$

- ② Find all missing angles indicated by letters in the diagram below. For each letter, show your work and state which theorem(s) you used to determine that angle value.



(Arrows indicate parallel)

A: Note that $\angle A$ + the 106° and 30° angles add to a straight angle, so $A + 106^\circ + 30^\circ = 180^\circ$.
Thus $A = 180^\circ - 136^\circ = 44^\circ$.

B: Note that $\angle B$ and 30° are alternate interior angles, so $\angle B = 30^\circ$ since alternate interior angles are congruent when lines are parallel.

C: Note $\angle A$, $\angle B$ and $\angle C$ form a triangle, so
 $\angle A + \angle B + \angle C = 180^\circ$ while $\angle A = 44^\circ$, $\angle B = 30^\circ$
so $44^\circ + 30^\circ + \angle C = 180^\circ \Rightarrow \angle C = 106^\circ$.

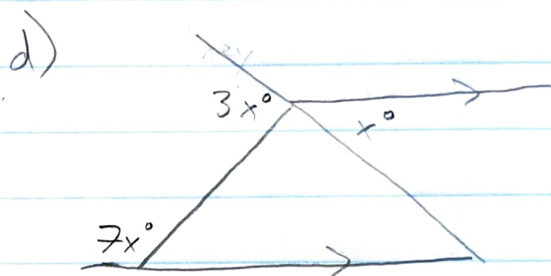
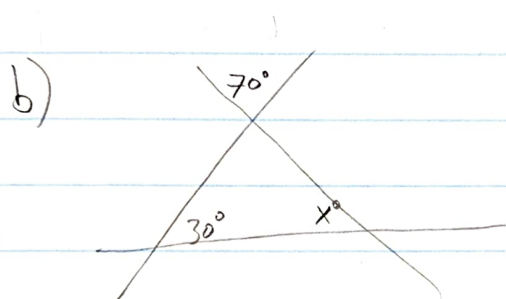
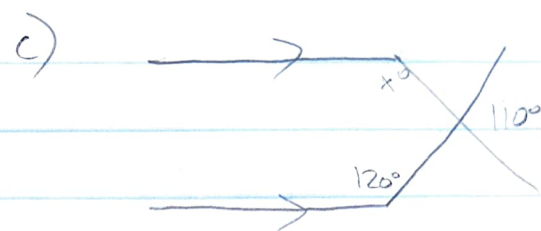
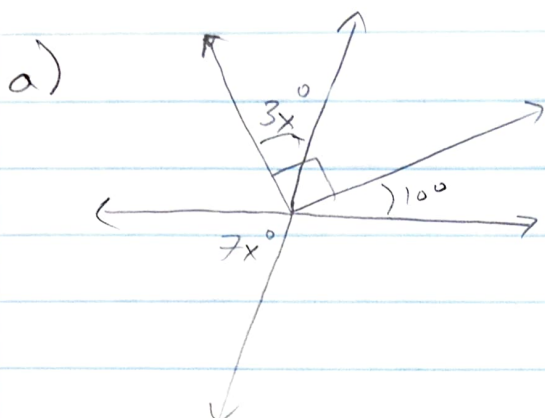
You could also note that the 106° angle and $\angle C$ are alternate interior angles.

D: Since $\angle C$ and $\angle D$ are opposite/vertical angles, they are congruent, so $\angle C = \angle D = 106^\circ$.

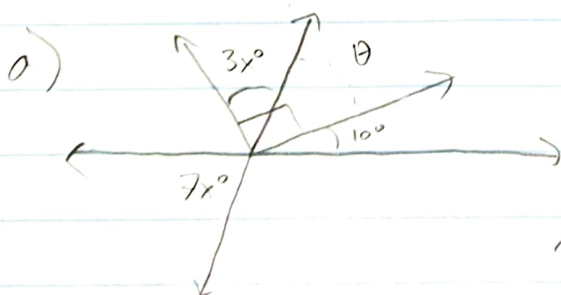
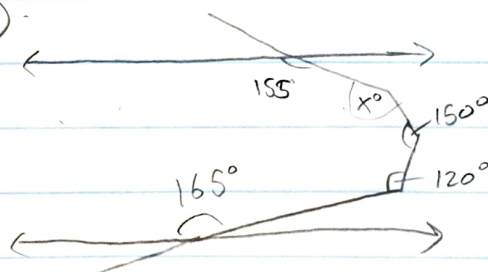
E: Note that $\angle D$, $\angle E$ and the 49° angle form a triangle, so $\angle D + \angle E + 49^\circ = 180^\circ \Rightarrow 106^\circ + \angle E + 49^\circ = 180^\circ$
 $\angle E + 155^\circ = 180^\circ$
 $\Rightarrow \angle E = 25^\circ$.

③ Show all steps. Indicate clearly in your work where you use any of the following:

- Angles surrounding a point sum to 360°
- Vertical angles are congruent
- The angles of a triangle sum to 180°
- Alternate interior angles are congruent when lines are parallel.
- Corresponding angles are congruent when lines are parallel
- Same-side interior angles sum to 180° when lines are parallel.
- The exterior angle of a triangle equals the sum of the two opposite interior angles.
- The sum of interior angles of an n -gon is 180° .



(extra credit) e)



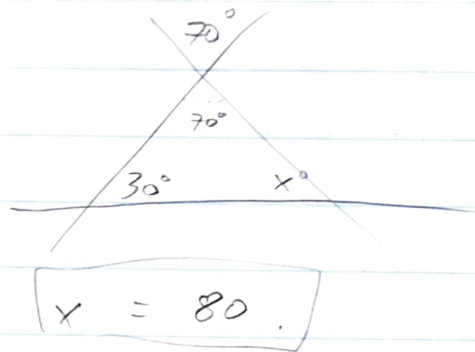
Note that $7x^\circ$ is opposite from $\theta + 10^\circ$, so they are congruent and $7x^\circ = \theta + 10^\circ$.

Thus $\theta = 7x - 10^\circ$.

Note further that $3x + \theta = 90$, so

$$3x + 7x - 10 = 90 \Rightarrow 10x = 100 \Rightarrow \boxed{x = 10^\circ}$$

b)

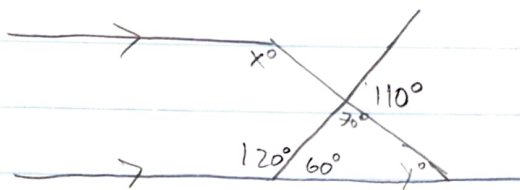


so

$$x = 80$$

Note 70° is opposite from a 70° angle forming a triangle with x° and 30° . Thus $30^\circ + 70^\circ + x^\circ = 180^\circ$,

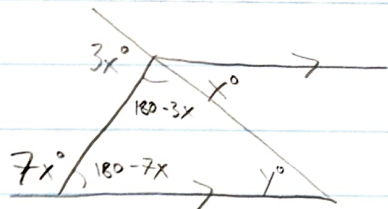
c)



Since the lines touching x° and 120° are parallel, x° corresponds to y° as in the parallel postulate, so $x^\circ = y^\circ$.

Also, 120° and 60° form a straight angle, as do 110° and 70° . Now, $y^\circ = x^\circ$, 60° and 70° form a triangle, so $60^\circ + 70^\circ + x^\circ = 180^\circ \Rightarrow x = 50$

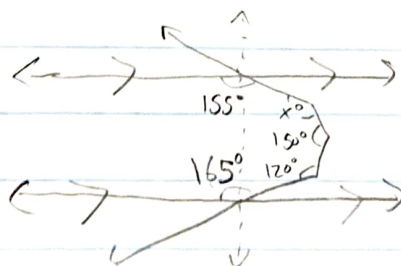
d)



Since the lines touching x° and $7x^\circ$ are parallel, x° and y° are alternate interior angles, so they're congruent.

Further, $7x^\circ$ and $180-7x^\circ$ form a straight angle, as do $3x^\circ$ and $180-3x^\circ$. Last, $180-3x^\circ$, $180-7x^\circ$, and $y^\circ = x^\circ$ form a triangle, so $180-3x + 180-7x + x = 180$, so $360 - 9x = 180 \Rightarrow 180 = 9x \Rightarrow x = 20$

(extra credit) e)



Draw a transversal from 155° to 165° creating same-side interior angles on the left and right which sum to 180° . Now,

$180^\circ + x^\circ + 150^\circ + 120^\circ = 540^\circ$ since the interior angle sum

of a pentagon is $540^\circ = 180(5-2)^\circ$. Then,

$$x^\circ + 450^\circ = 540^\circ \Rightarrow \boxed{x = 90}$$