SECTION 3.2: PROPERTIES OF PARALLEL LINES

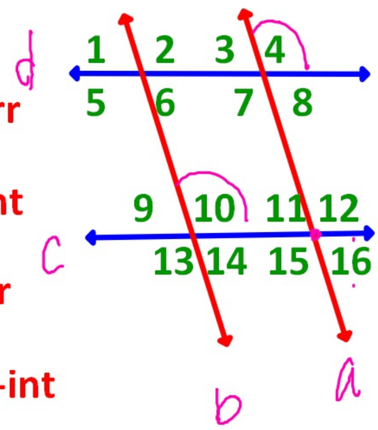
Standards:

2.0 - Students write geometric proofs, including proofs by contradiciton.

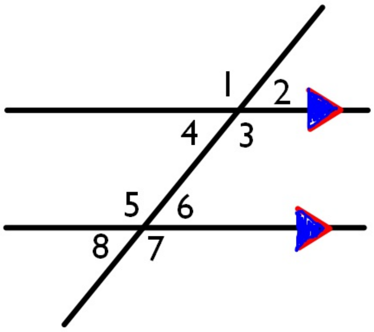
7.0 - Students prove and use theorems involving the properties of parallel lines cut by a transversal, the properties of quadrilaterals, and the properties of circles.

WARMUP

Classify each pair of angles as alt-int, s-s-int, corresponding, or none of these.



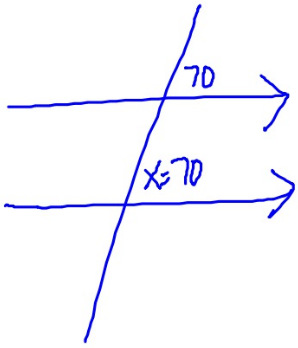
1. $\angle 7 \& \angle 11$ s-s-int
2. $\angle 14 \& \angle 16$ corr
3. $\angle 4 \& \angle 10$ none
4. $\angle 3 \& \angle 6$ alt-int
5. $\angle 6 \& \angle 11$ none
6. $\angle 2 \& \angle 10$ corr
7. $\angle 2 \& \angle 3$ s-s-int
8. $\angle 7 \& \angle 12$ alt-int



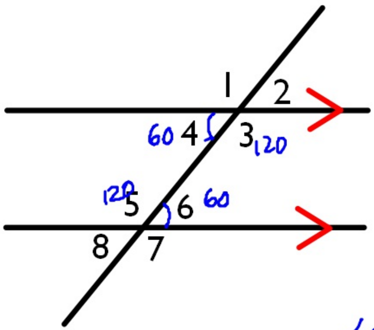
POSTULATE

If 2 // lines are cut by a transversal, then the corresponding angles are ≅

Ex:



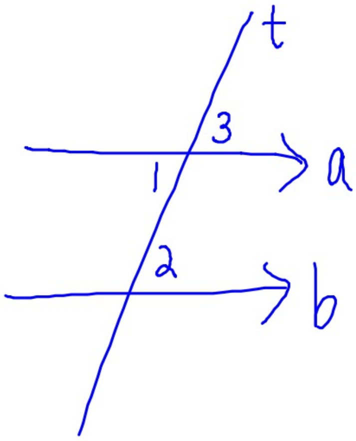
if lines are ||,
then corr. ∠'s are ≅



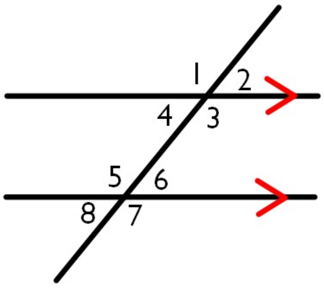
THEOREM

If 2 // lines are cut by a transversal, then alternate interior angles are ≅

Ex:



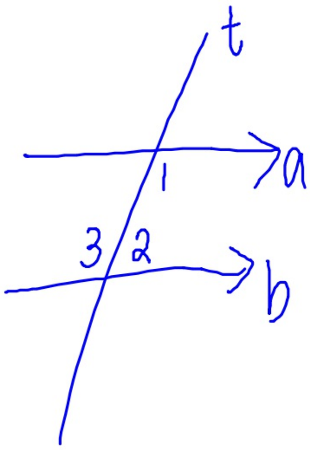
1. a ∥ b	1. GIVEN
2. ∠2 ≅ ∠3	2. if 2 lines are ∥, then corr. ∠'s ≅
3 ∠3 ≅ ∠1	3. vertical ∠'s are ≅
4. ∠1 ≅ ∠2	4. Transitive/SUB



THEOREM

If 2 // lines are cut by a transversal, then same-side interior angles are supplementary.

Ex:



1. a ∥ b	1. GIVEN
2. ∠1 ≅ ∠3	2. if lines are ∥, then alt-int ∠'s ≅
3. m∠2 + m∠3 = 180	3 Angle Add Post.
4. m∠2 + m∠1 = 180	4 SUB
5. ∠1 & ∠2 are supplementary	5. Def. of supp. ∠'s

Summary:

If 2 // lines are cut by a transversal:

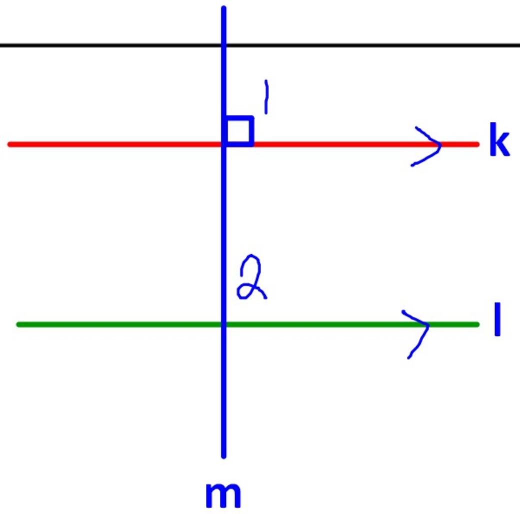
- Corresponding angles are≅
- Alt-int angles are≅
- Same-side int angles are supplementary

THEOREM

If a transversal is perp. to one of the 2// lines then it is perp to the other line also.

GIVEN: $k \parallel l$; $m \perp k$

PROVE: $m \perp l$

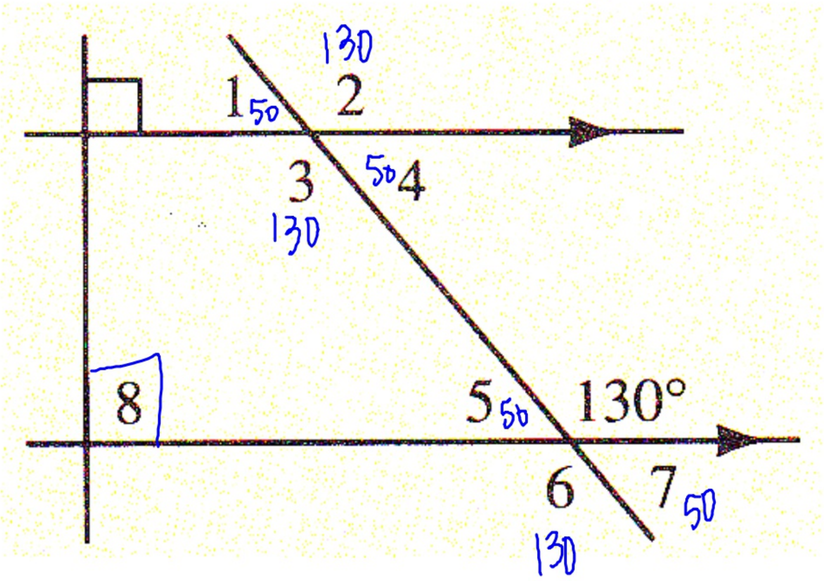


If k // l and m ⊥ k then m ⊥ l

1. $k \parallel l$ $m \perp k$	1. GIVEN
2. $m\angle 1 = 90$	2. Def. of ⊥ lines
3. $\angle 1 \cong \angle 2$	3. if lines ∥ then corr. ∠s are ≅
4. $m\angle 2 = 90$	4. SUB
5. $l \perp m$	5. Def. of ⊥ lines

EXAMPLE 1

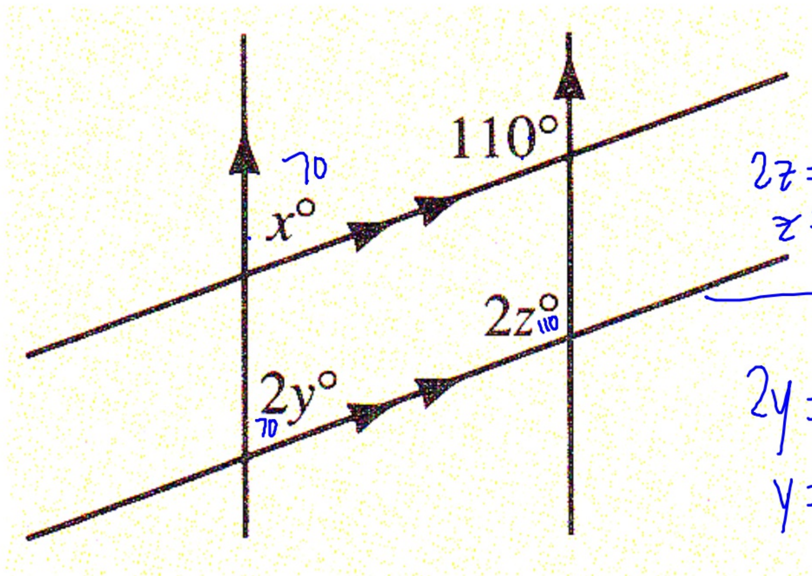
Find the measures of the angles named.



Answer

EXAMPLE 2

Find the measures of the angles named.



$2z = 110$

$z = 55$

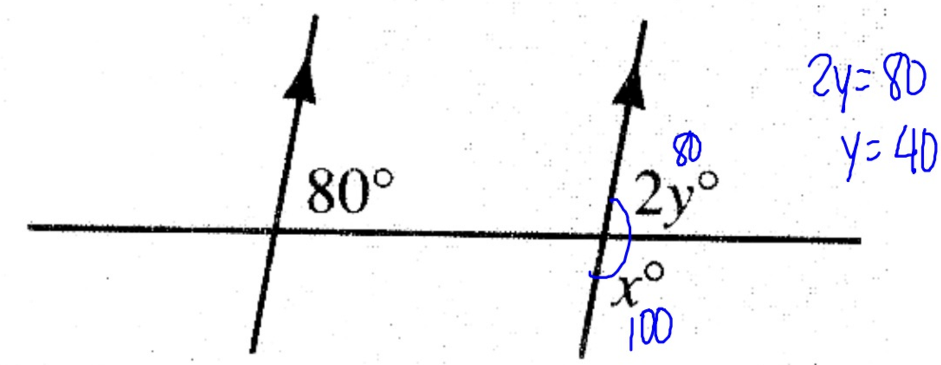
$2y = 70$

$y = 35$

Answer

EXAMPLE 3

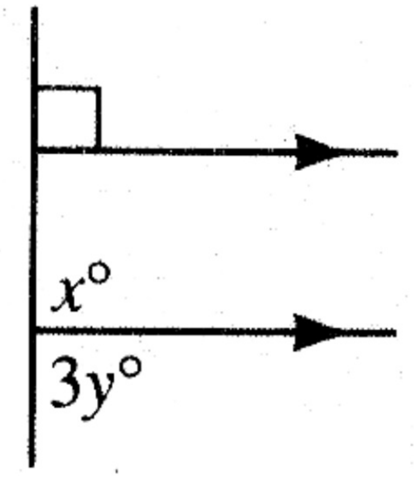
Find the values of *x* and *y*.



Answer

EXAMPLE 4

Find the values of *x* and *y*.



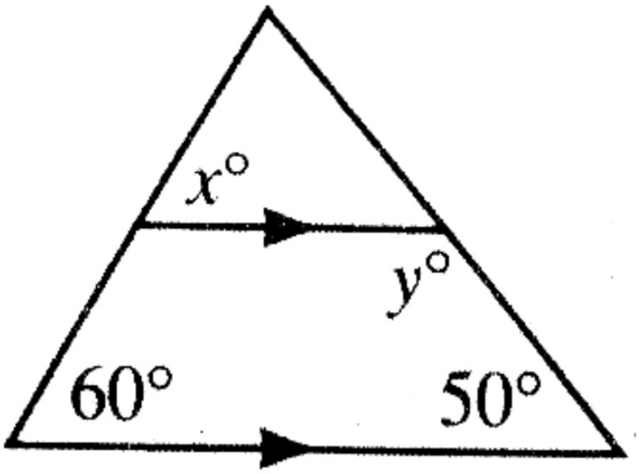
x = 90

y = 30

Answer

EXAMPLE 5

Find the values of *x* and *y*.

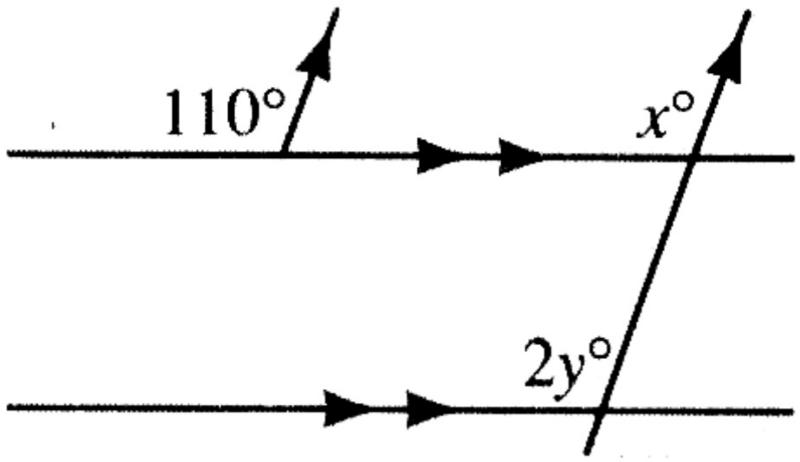


x = 60
y = 130

Answer

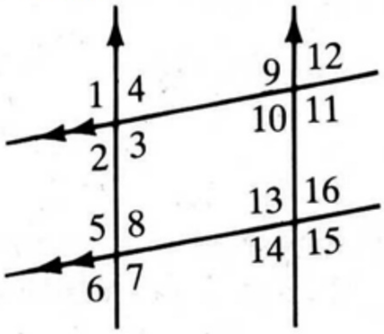
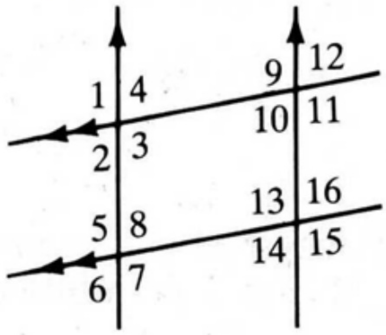
EXAMPLE 6

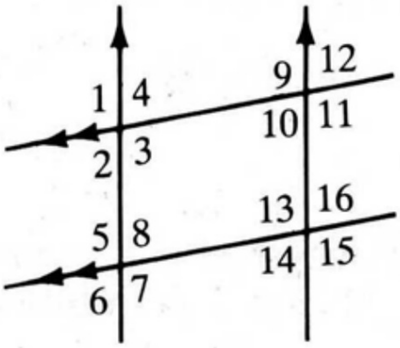
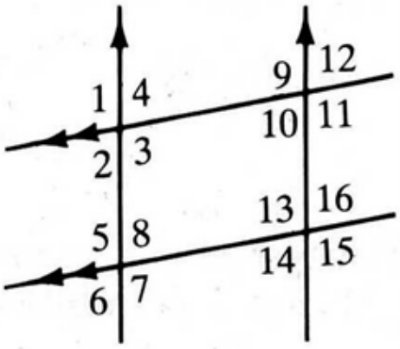
Find the values of *x* and *y*.

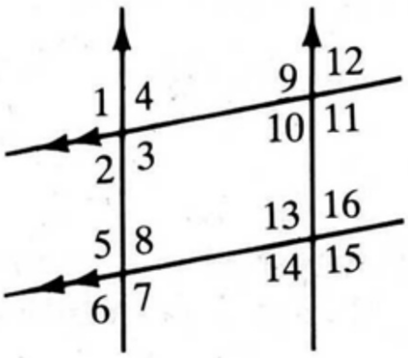
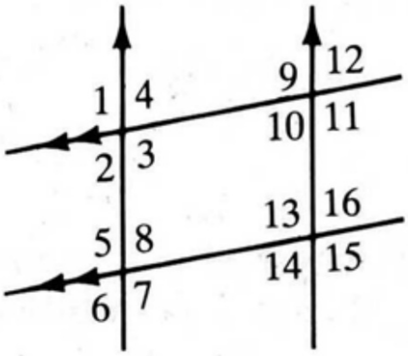


x = 110
y = 55

Answer

1) If $m(\angle 2)=80$, then	2) If $m(\angle 9)=105$, then
$m(\angle 6)=$ 80 and	$m(\angle 10)=$ 75 and
$m(\angle 7)=$ 100	$m(\angle 16)=$ 75
	

3) If $m(\angle 8)=85$**, then** $m(\angle 16)=$ 85 **and** $m(\angle 10)=$ 85 	**4) If** $m(\angle 15)=95$**, then** $m(\angle 8)=$ 85 **and** $m(\angle 1)=$ 95 

5) **If** $m(\angle 3)=m(\angle 4)+30$, **find** $m(\angle 5)$.	6) **If** $m(\angle 16)=m(\angle 13)-20$, **find** $m(\angle 11)$.
	**100** 

$m\angle 3 + m\angle 4 = 180$

$m\angle 4 + 30 + m\angle 4 = 180$

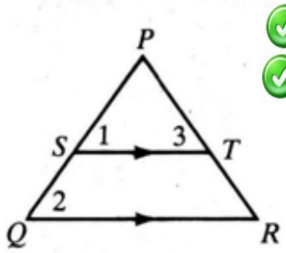
$2\ m\angle 4 = 150$

$m\angle 4 = 75$

$m\angle 3 = 105$

7)

Given: $\overline{ST} \parallel \overline{QR}$;
$\angle 1 \cong \angle 3$
Prove: $\angle 2 \cong \angle 3$

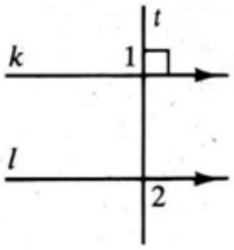


Statements	Reasons
1. $\angle 1 \cong \angle 3$	1. Given
2. $\angle 1 \cong \angle 2$	2. corr $\angle$ $\cong$
3. $\angle 2 \cong \angle 3$	3. Substitution

8)

Given: $k \parallel l$; $k \perp t$

Prove: $\angle 1 \cong \angle 2$



Statements	Reasons
1. $k // l; k \perp t$	1. Given
2. $m\angle 1 = 90$	2. Def of perp lines
3. $l \perp t$	3. Transversal
4. $m\angle 2 = 90$	4. Def of perp lines
5. $m\angle 1 = m\angle 2$, or $\angle 1 \cong \angle 2$	5. Substitution

If a transversal is perp to one of the 2 //lines, then it is perp to the other line