Lesson 3 - 2

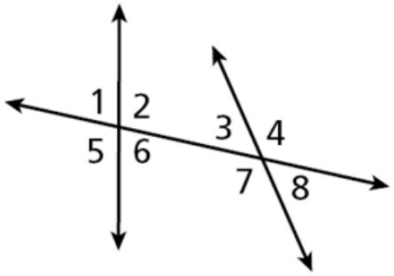
Angles Formed by Parallel Lines and Transversals

Going Deeper

Essential question: *How can you prove and use theorems about angles formed by transversals that intersect parallel lines?*

Warm Up

Identify each angle pair.



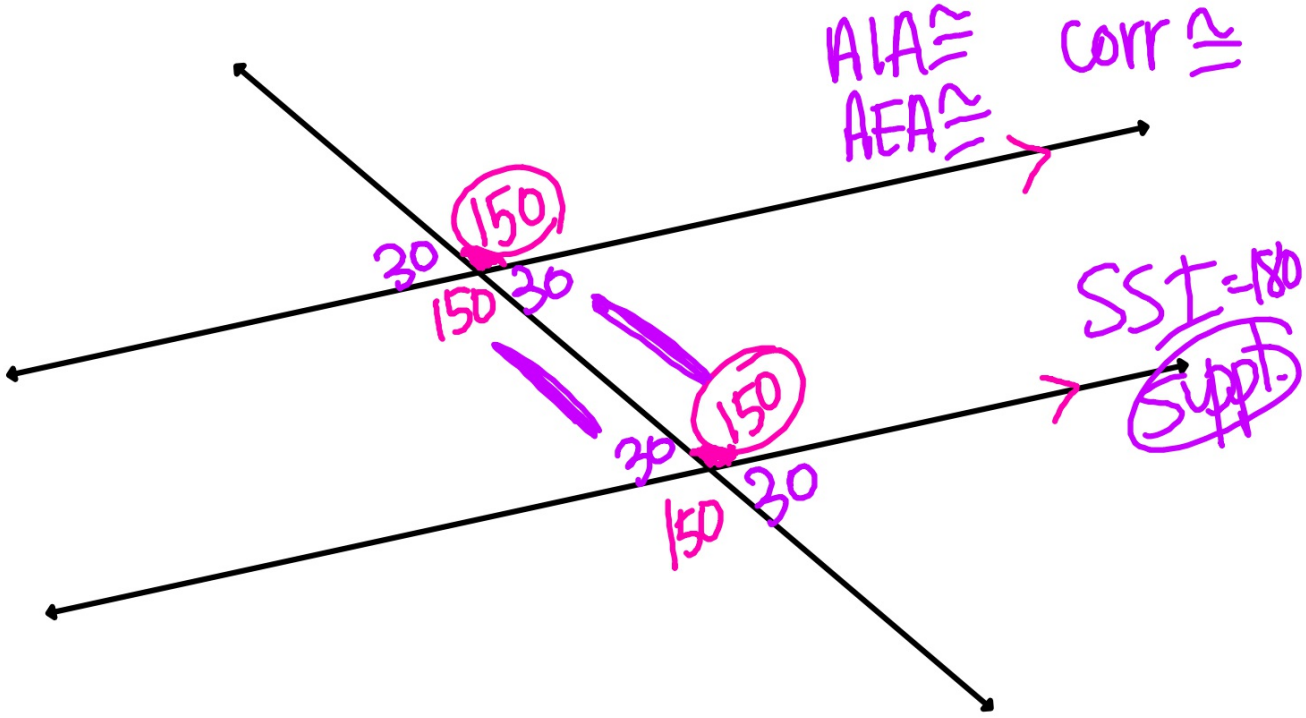
1. ∠1 and ∠3 corr. ∠s

2. ∠3 and ∠6 alt. int. ∠s

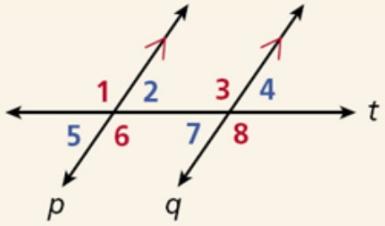
3. ∠4 and ∠5 alt. ext. ∠s

4. ∠6 and ∠7 same-side int ∠s

What happens if parallel lines are cut by a transversal?



Postulate 3-2-1 Corresponding Angles Postulate

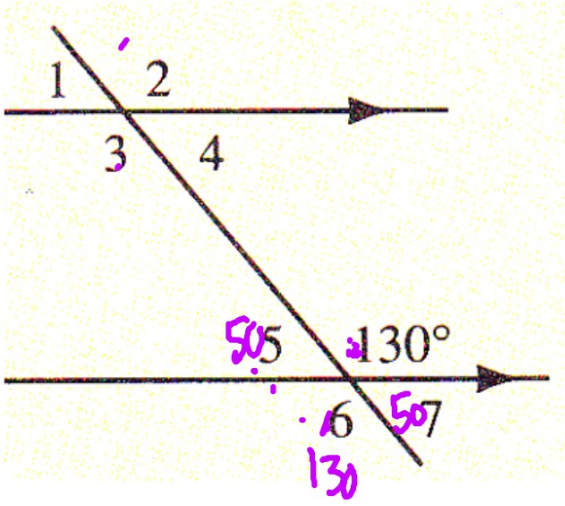
THEOREM	HYPOTHESIS	CONCLUSION
If two parallel lines are cut by a transversal, then the pairs of corresponding angles are congruent.		$\angle 1 \cong \angle 3$ $\angle 2 \cong \angle 4$ $\angle 5 \cong \angle 7$ $\angle 6 \cong \angle 8$

What other angles are also 130 degrees?

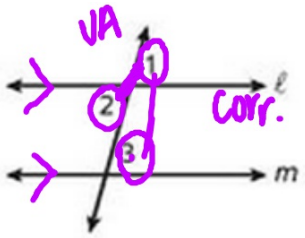
6, 3, 2

How can we find the measure of the other angles?

SUBTr. from 180

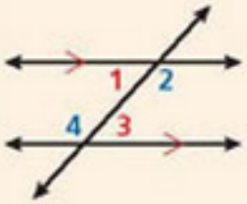
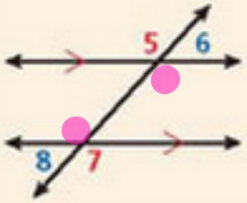
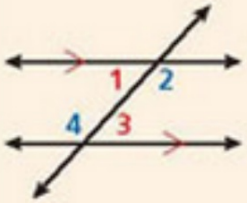


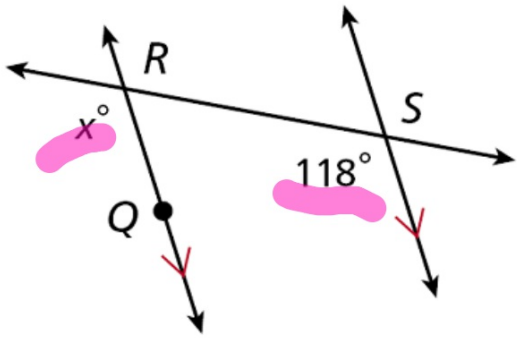
Given: $\ell \parallel m$
Prove: $\angle 2 \cong \angle 3$

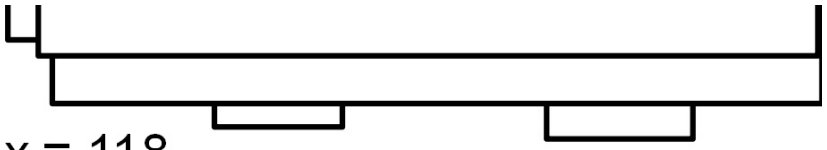


Statements	Reasons
1. $\ell \parallel m$	1. Given
2. $\angle 1 \cong \angle 3$	2. Corresponding Angle Post.
3. $\angle 1 \cong \angle 2$	3. Vertical Angles $\cong$
4. $\angle 2 \cong \angle 3$	4. Substitution

Theorems — Parallel Lines and Angle Pairs

THEOREM	HYPOTHESIS	CONCLUSION
3-2-2 Alternate Interior Angles Theorem If two parallel lines are cut by a transversal, then the pairs of alternate interior angles are congruent.		$\angle 1 \cong \angle 3$ $\angle 2 \cong \angle 4$
3-2-3 Alternate Exterior Angles Theorem If two parallel lines are cut by a transversal, then the two pairs of alternate exterior angles are congruent.		$\angle 5 \cong \angle 7$ $\angle 6 \cong \angle 8$
3-2-4 Same-Side Interior Angles Theorem If two parallel lines are cut by a transversal, then the two pairs of same-side interior angles are supplementary.		$m\angle 1 + m\angle 4 = 180°$ $m\angle 2 + m\angle 3 = 180°$





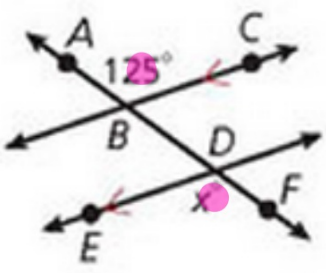
x = 118

Corresponding angles
are congruent

$13x + 23x = 180$

x = 5

Same side interior angles
are supplementary



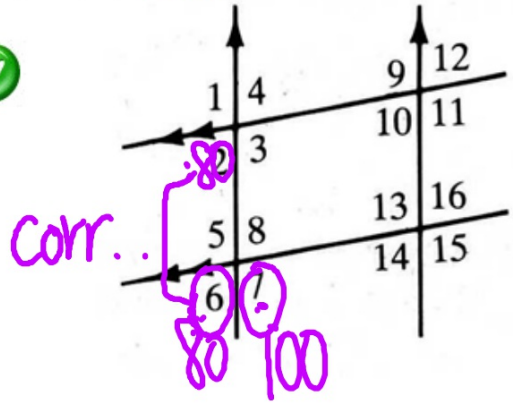
x = 125

Alternate exterior angles
are congruent

1) If $m(\angle 2)=80$, then

$m(\angle 6)=$ **80** and

$m(\angle 7)=$ **100**

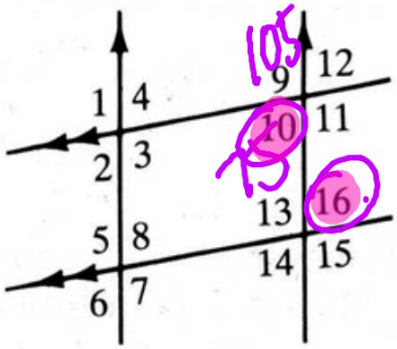


2) If $m(\angle 9)=105$, then

$m(\angle 10)=$ **75** and

$m(\angle 16)=$ **75**

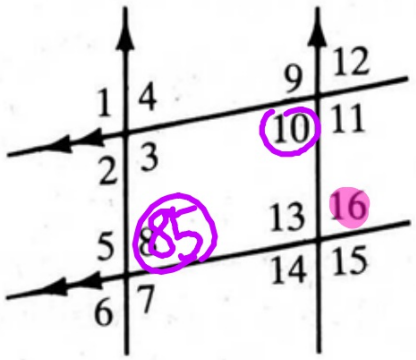
180
-105



3) If $m(\angle 8)=85$, then

$m(\angle 16)=$ **85** and

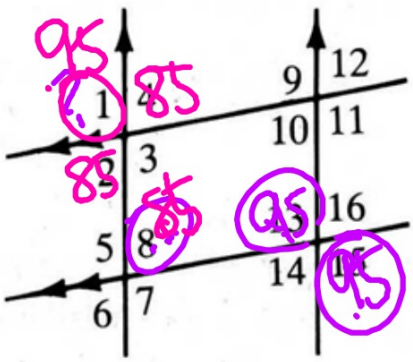
$m(\angle 10)=$ **85**



4) If $m(\angle 15)=95$, then

$m(\angle 8)=$ _____ and

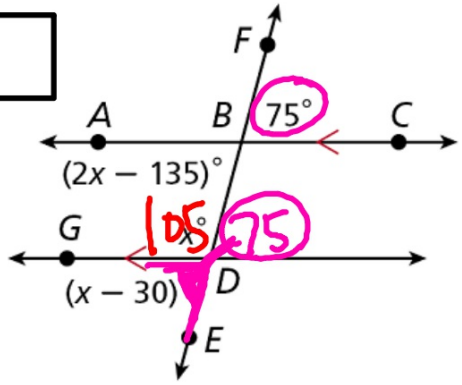
$m(\angle 1)=$ _____



180
−95

Example 2: Finding Angle Measures

Find each angl



A. m∠*EDG*

m∠*EDG* = 75° *Alt. Ext. ∠s Thm.*

B. m∠BDG

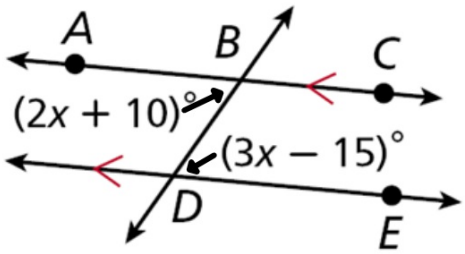
x − 30° = 75° *Alt. Ext. ∠s Thm.*

x = 105 *Add 30 to both sides.*

m∠*BDG* = 105°

Check It Out! Example 2

Find m∠ABD.



$2x + 10° = 3x - 15°$ *Alt. Int. ∠s Thm.*

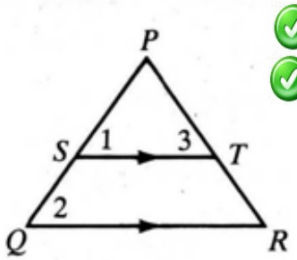
$x = 25$ *Subtract 2x and add 15 to both sides.*

$m\angle ABD = 2(25) + 10 = 60°$ *Substitute 25 for x.*

7)

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

Prove: $\angle 2 \cong \angle 3$

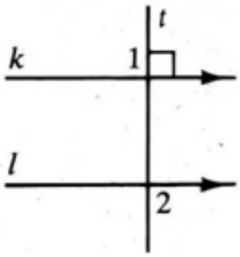


Statements	Reasons
1. $\angle 1 \cong \angle 3$	1. Given
2. $\angle 1 \cong \angle 2$	2. corr $\angle \cong$
3. $\angle 2 \cong \angle 3$	3. Substitution

8)

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

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



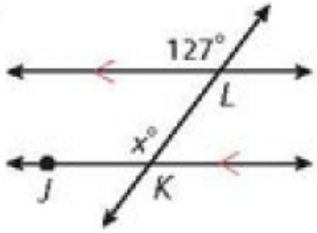
Statements	Reasons
1. $k \parallel l; k \perp t$	1. Given
2. $m\angle 1 = 90$	2. Def of perp lines
3. $l \perp t$	3. Transversal
4. $m\angle 2 = 90$	4. Def of perp lines
5. $m\angle 1 = m\angle 2$, or $\angle 1 \cong \angle 2$	5. Substitution

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

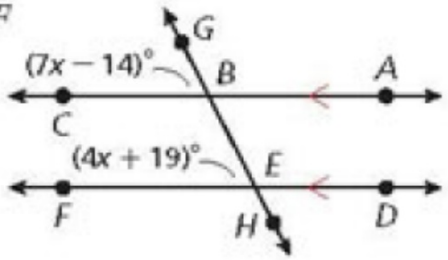
Assignment #3.2a: Pages 158-160 #1-4, 6-11, 13-19, 25, 31 (#13-19: no justfication needed, just find angle measures)

Find each angle measure.

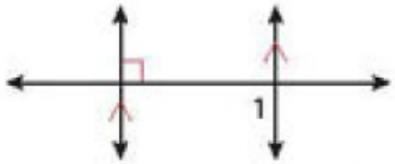
1. m∠*JKL*



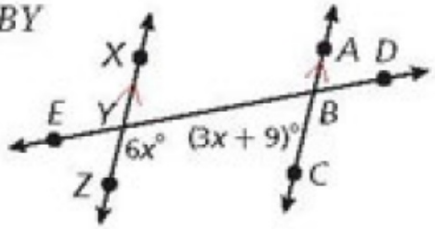
2. m∠*BEF*



3. m∠1

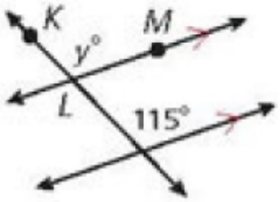


4. m∠*CBY*

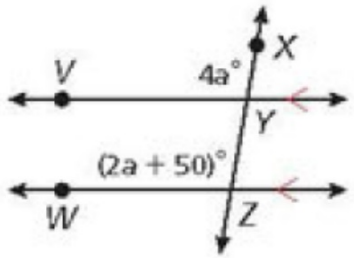


Find each angle measure.

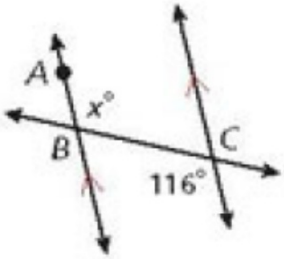
6. m∠*KLM*



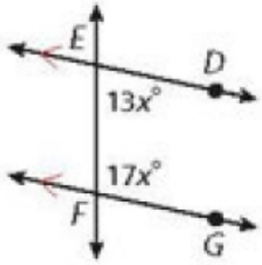
7. m∠*VYX*



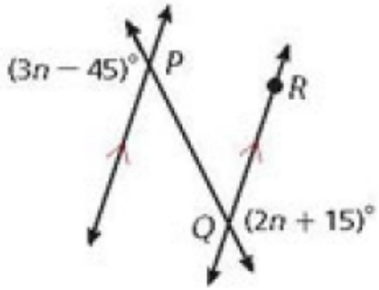
8. m∠*ABC*



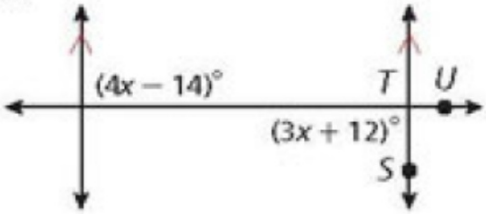
9. m∠*EFG*



10. m∠*PQR*



11. m∠*STU*

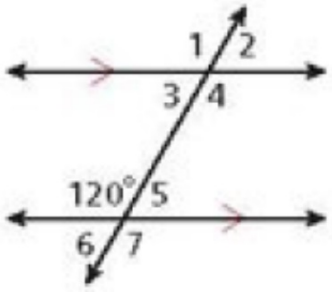


Find each angle measure. ~~Justify each answer with a postulate or theorem.~~

13. m∠1 **14.** m∠2 **15.** m∠3

16. m∠4 **17.** m∠5 **18.** m∠6

19. m∠7

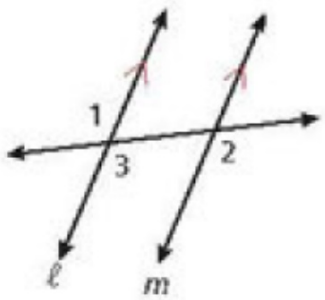


25. Complete the two-column proof of the Alternate Exterior Angles Theorem.

Given: $\ell \parallel m$

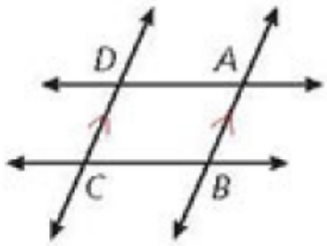
Prove: $\angle 1 \cong \angle 2$

Proof:



Statements	Reasons
1. $\ell \parallel m$	1. Given
2. a. ?	2. Vert. ∡ Thm.
3. $\angle 3 \cong \angle 2$	3. b. ?
4. c. ?	4. d. ?

31. **ERROR ANALYSIS** In the figure, $m\angle ABC = (15x + 5)^\circ$, and $m\angle BCD = (10x + 25)^\circ$. Which value of $m\angle BCD$ is incorrect? Explain.



A

$$15x + 5 = 10x + 25$$
$$-10x \qquad -10x$$
$$5x + 5 = 25$$
$$-5 \qquad -5$$
$$5x = 20$$
$$x = 4$$

$m\angle BCD = 10(4) + 25 = 65^\circ$

B

$$(15x + 5) + (10x + 25) = 180$$
$$25x + 30 = 180$$
$$-30 \qquad -30$$
$$25x = 150$$
$$x = 6$$

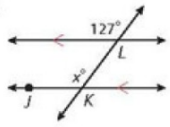
$m\angle BCD = 10(6) + 25 = 85^\circ$

Assignment #3.2a: Pages 158-160 #1-4, 6-11, 13-19, 25, 31

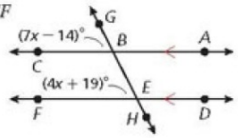
(#13-19: no justfication needed, just find angle measures)

Find each angle measure.

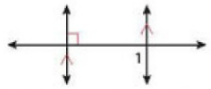
1. m∠*JKL*



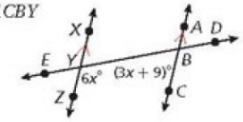
2. m∠*BEF*



3. m∠1

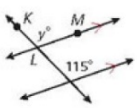


4. m∠*CBY*

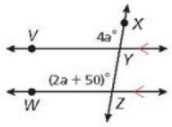


Find each angle measure.

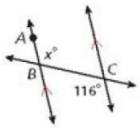
6. m∠*KLM*



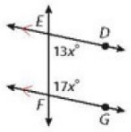
7. m∠*VYX*



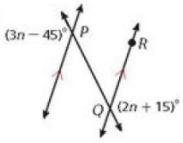
8. m∠*ABC*



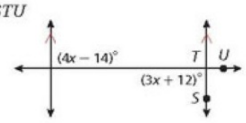
9. m∠*EFG*



10. m∠*PQR*



11. m∠*STU*

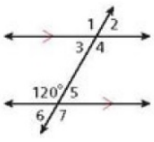


Find each angle measure. Justify each answer with a postulate or theorem.

13. m∠1 **14.** m∠2 **15.** m∠3

16. m∠4 **17.** m∠5 **18.** m∠6

19. m∠7

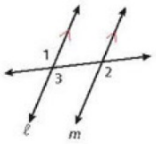


25. **Complete the two-column proof of the Alternate Exterior Angles Theorem.**

Given: $\ell \parallel m$

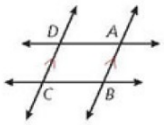
Prove: $\angle 1 \cong \angle 2$

Proof:



Statements	Reasons
1. $\ell \parallel m$	1. Given
2. a. ___?	2. Vert. ∡ Thm.
3. $\angle 3 \cong \angle 2$	3. b. ___?
4. c. ___?	4. d. ___?

31. ///ERROR ANALYSIS/// In the figure, $m\angle ABC = (15x + 5)°$, and $m\angle BCD = (10x + 25)°$. Which value of $m\angle BCD$ is incorrect? Explain.



A

$15x + 5 = 10x + 25$

$-10x \quad -10x$

$5x + 5 = 25$

$-5 \quad -5$

$5x = 20$

$x = 4$

$m\angle BCD = 10(4) + 25 = 65°$

B

$(15x + 5) + (10x + 25) = 180$

$25x + 30 = 180$

$-30 \quad -30$

$25x = 150$

$x = 6$

$m\angle BCD = 10(6) + 25 = 85°$