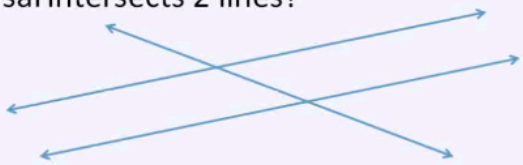
2.2 Properties of Parallel Lines

Name: _____

Transversal

- Any line that intersects two other lines in the same plane.

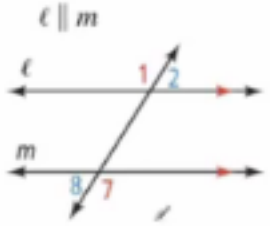
- How many angles are formed when a transversal intersects 2 lines?



Corresponding Angles Postulate: If a transversal intersects two parallel lines, then corresponding angles are congruent.

Alternate Exterior Angles Theorem

If a transversal intersects two parallel lines, then alternate exterior angles are congruent.

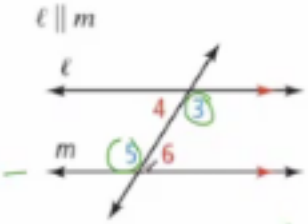


$m\angle 1 = m\angle 7$

$\angle 1 \cong \angle 7$

Alternate Interior Angles Theorem

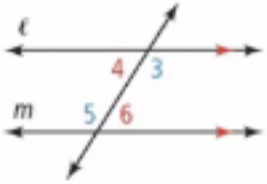
If a transversal intersects two parallel lines, then alternate interior angles are congruent.



$\angle 5 \cong \angle 3$

$\angle 4 \cong \angle 6$

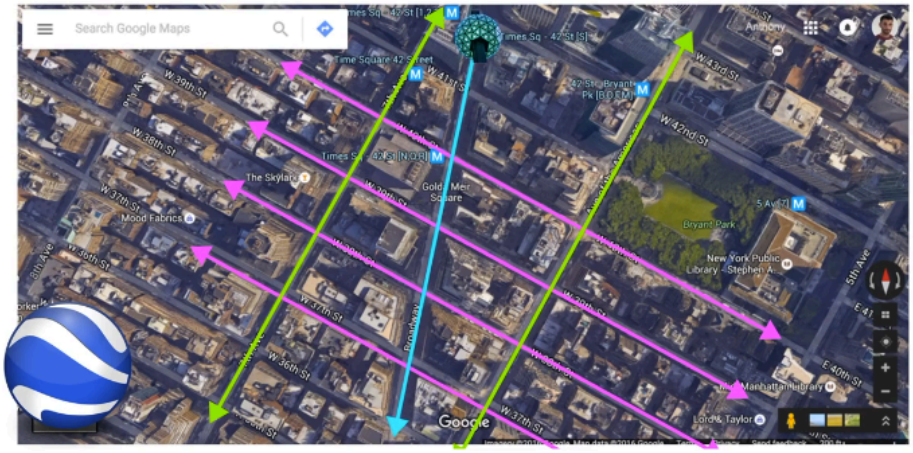
If a transversal intersects two parallel lines, then same-side interior angles are supplementary.



$m\angle 4 + m\angle 5 = 180$

$m\angle 3 + m\angle 6 = 180$

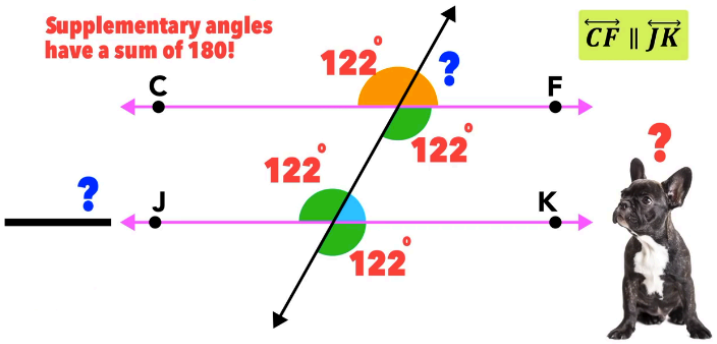
Parallel Lines and Transversals



Parallel Lines and Transversals

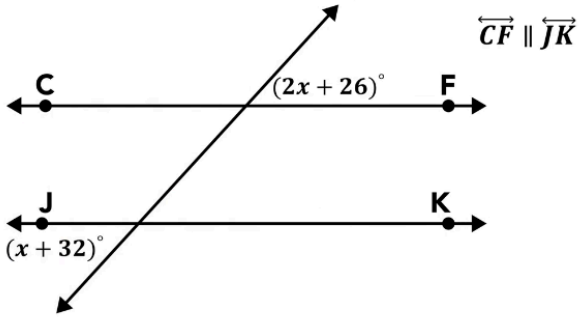
Supplementary angles have a sum of 180!

$\overleftrightarrow{CF} \parallel \overleftrightarrow{JK}$

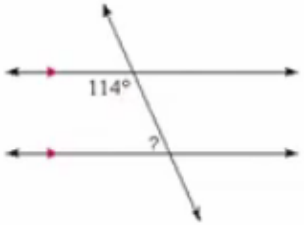


Parallel Lines and Transversals

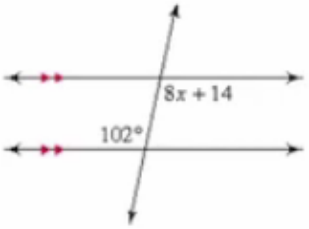
$\overleftrightarrow{CF} \parallel \overleftrightarrow{JK}$



Ex 2: Find the measure of each angle indicated.

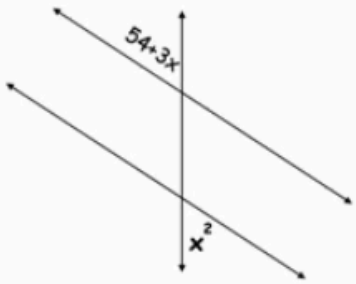


Ex 3: Solve for x.



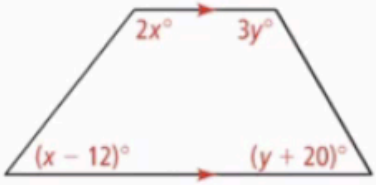
Ex 4:

Find the measure of the angle indicated in bold.



Ex 5:

Find x and y.

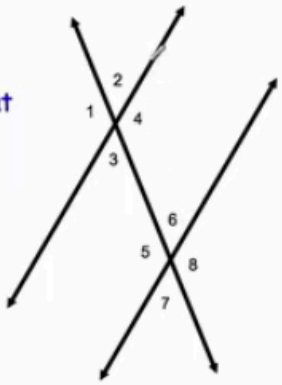


Postulate: Converse of the Corresponding Angles Postulate
If two lines and a transversal form corresponding angles that are congruent, then the lines are parallel.

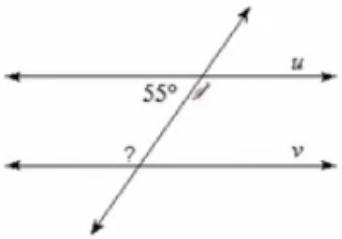
Thm: Converse of the Alternate Interior Angles Theorem
If two lines and a transversal form alternate interior angles that are congruent, then the two lines are parallel.

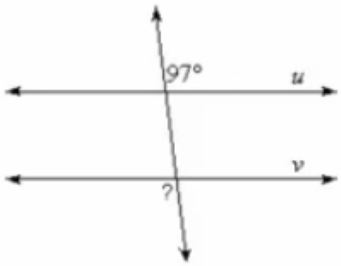
Thm: Converse of the Same-Side Interior Angles Theorem
If two lines and a transversal form same-side interior angles that are supplementary, then the two lines are parallel.

Thm: Converse of the Alternate Exterior Angles Theorem
If two lines and a transversal form alternate exterior angles that are congruent, then the two lines are parallel.



Find the degree of the missing angle that would make lines u and v parallel.





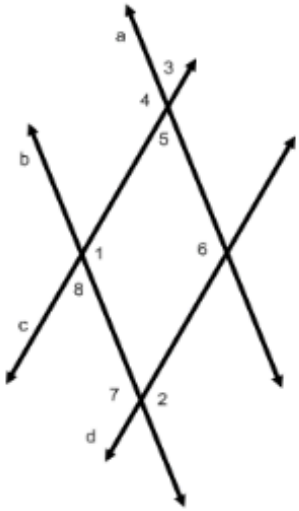
Which lines are parallel if.....Why?

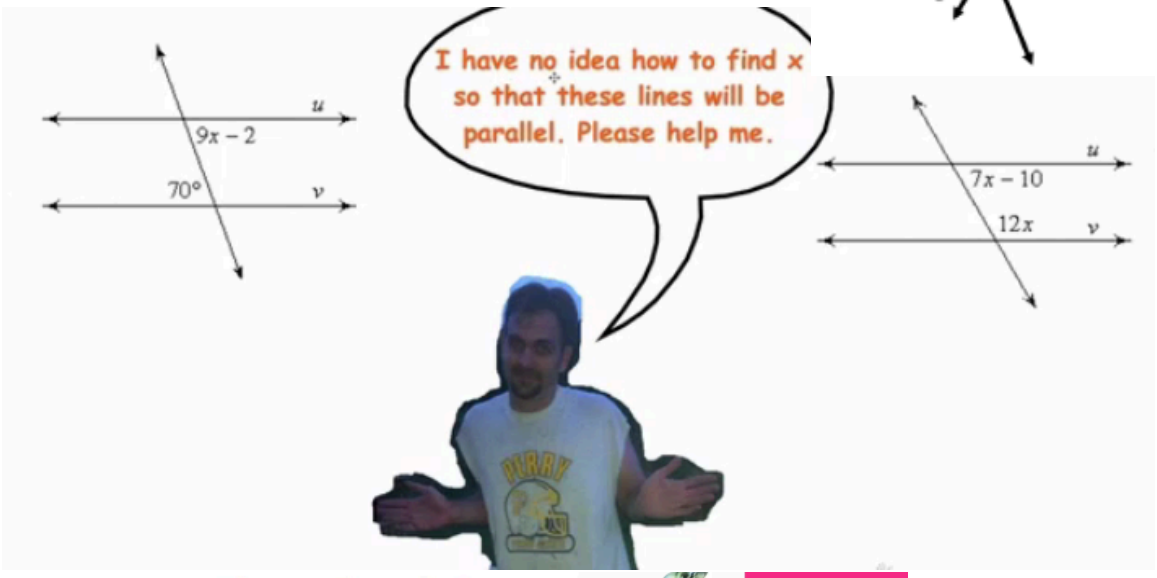
$\angle 1 \cong \angle 2$

$\angle 2 \cong \angle 6$

$\angle 1 + \angle 5 = 180^o$

$\angle 8 \cong \angle 3$

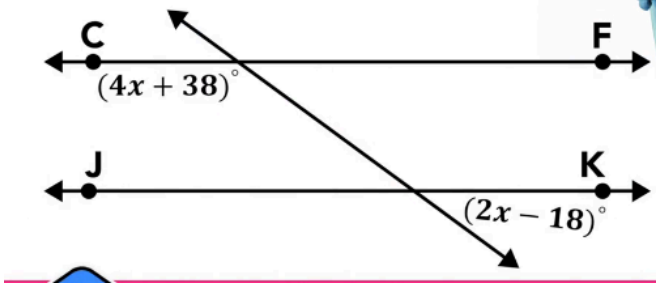




Practice Problem

Solve for x and find the measure of each angle.

$\overleftrightarrow{CF} \parallel \overleftrightarrow{JK}$



Share your answer in the comme

Summary:

2.2 Practice Problems

What is Unusual About The New Surgeon Doll?

Find the answer for any exercise below in the CODE KEY. Notice the letter next to it. Print this letter in the box at the bottom of the page that contains the exercise number. Keep working and you will discover the answer to the title question. (Assume that lines in each figure which do not intersect are parallel.)

CODE KEY

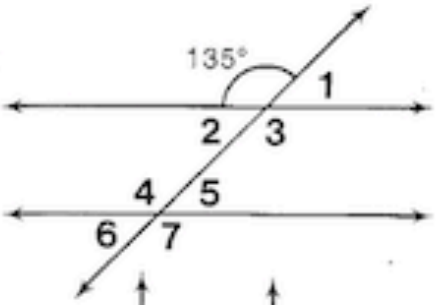
40°	N
45°	E
55°	A
65°	O
70°	S
85°	B
110°	T
115°	R
135°	I
140°	P

In the first figure at the right, find:

① $m\angle 3 =$ ④ $m\angle 5 =$

② $m\angle 4 =$ ⑤ $m\angle 6 =$

③ $m\angle 2 =$ ⑥ $m\angle 1 =$

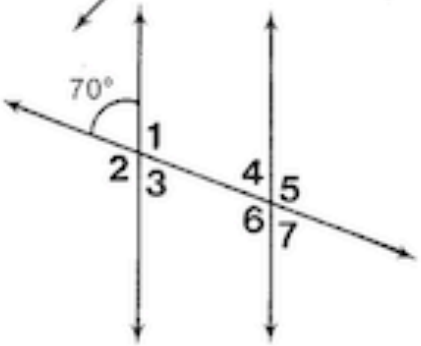


In the second figure, find:

⑦ $m\angle 1 =$ ⑩ $m\angle 7 =$

⑧ $m\angle 6 =$ ⑪ $m\angle 3 =$

⑨ $m\angle 5 =$ ⑫ $m\angle 2 =$

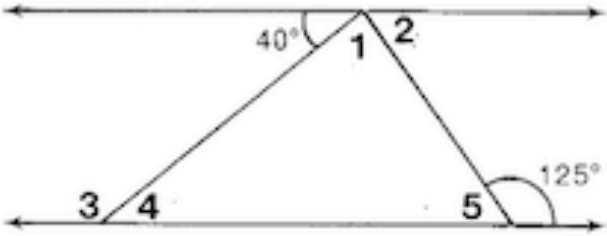


In the third figure, find:

⑬ $m\angle 4 =$ ⑯ $m\angle 2 =$

⑭ $m\angle 3 =$ ⑰ $m\angle 1 =$

⑮ $m\angle 5 =$



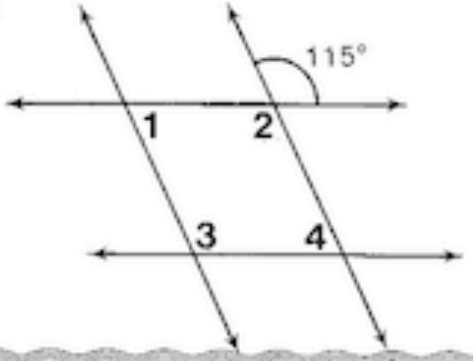
In the fourth figure, find:

⑱ $m\angle 2 =$

⑲ $m\angle 4 =$

⑳ $m\angle 1 =$

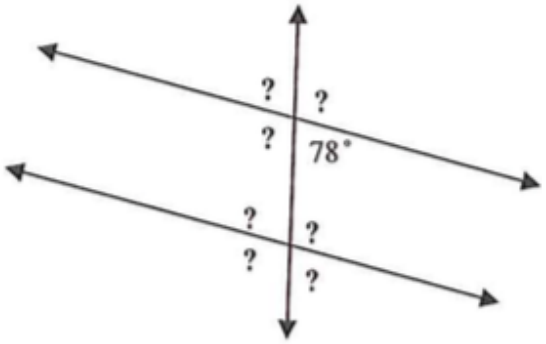
㉑ $m\angle 3 =$



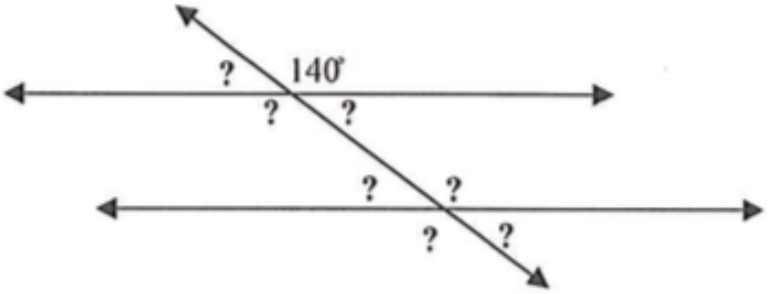
2	9	20	14	4	21	15	8	3	11	19	13	17	16	12	7	5	18	1	6	10

Find all of the missing angles below.

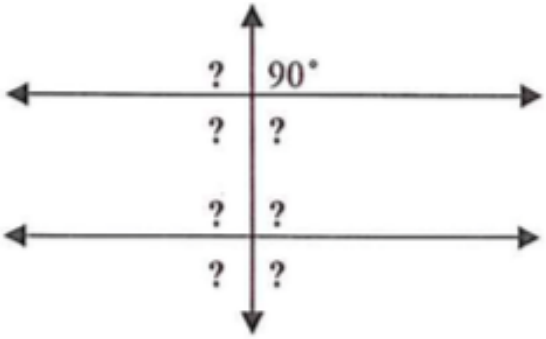
1. a)



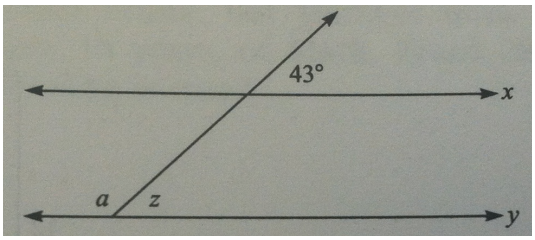
b)



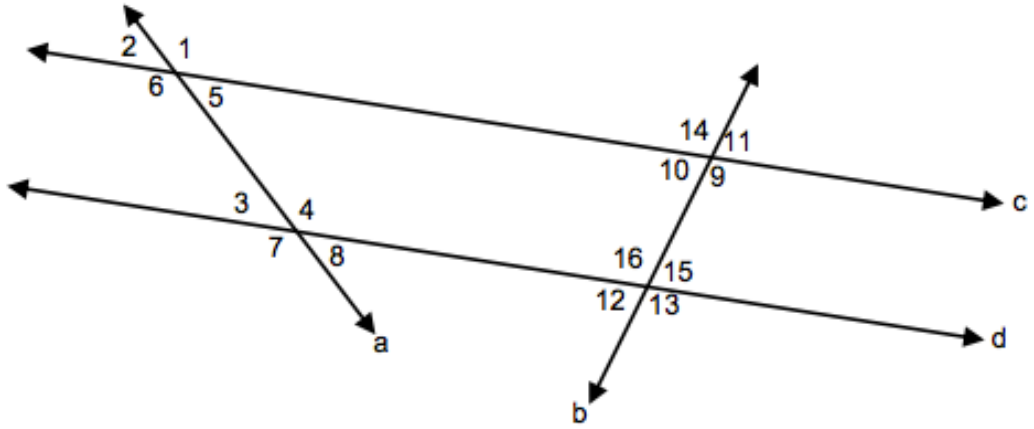
c)



Example 2: In the figure below, line x is parallel to line y. What is the measure of the angle a & angle z?

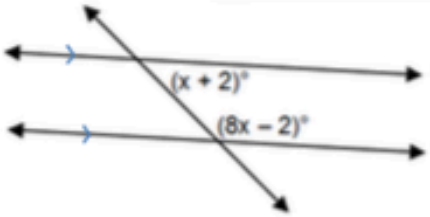


Example 3: In the diagram below, line *a* || line *b* **and** line *c* || line *d*. Also, $m\angle 3 = 65°$ and $m\angle 15 = 85°$
Write in the measures of all missing angles.

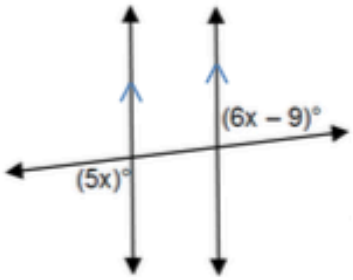


Example 4: Use each diagram below to solve for x. Then write in the measures of all four angles.

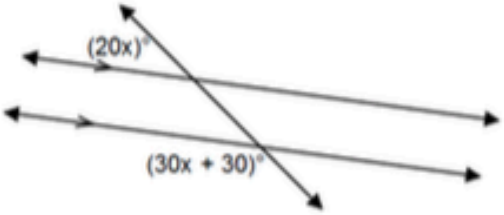
a)



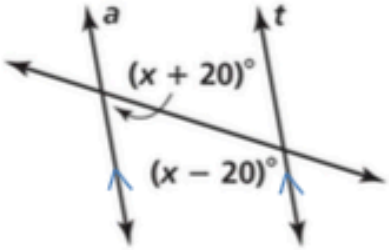
b)



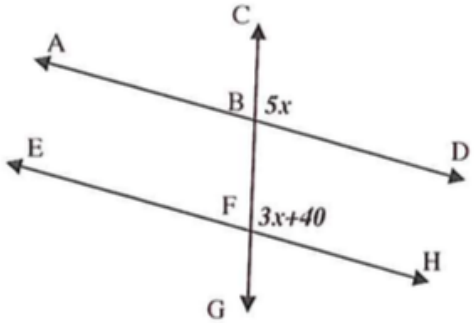
c)



d)



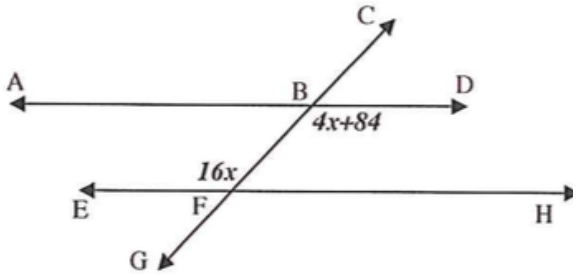
4)



Equation: _____

$x =$ _____ $\angle CBD =$ _____ $\angle HFC =$ _____

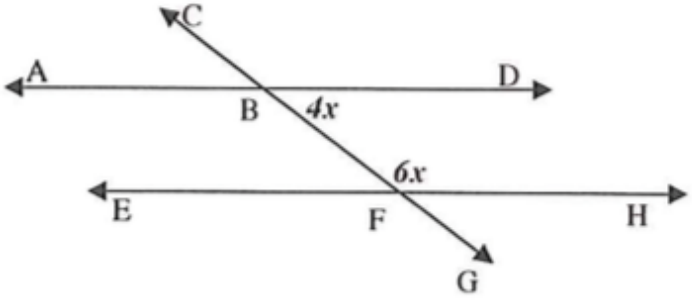
5)



Equation: _____

$x =$ _____ $\angle GBD =$ _____ $\angle EFC =$ _____

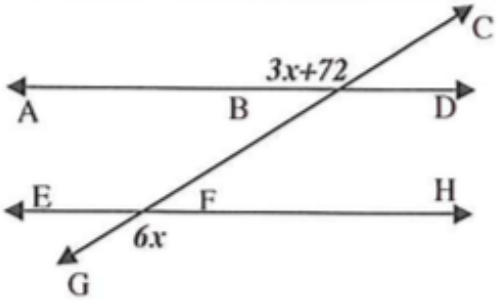
6)



Equation: _____

$x =$ _____ $\angle HFC =$ _____ $\angle DBG =$ _____

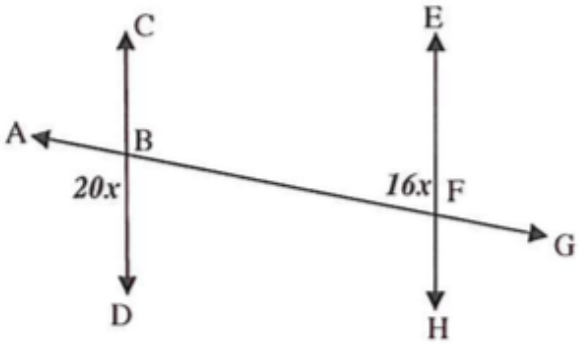
7)



Equation: _____

$x =$ _____ $\angle ABC =$ _____ $\angle GFH =$ _____

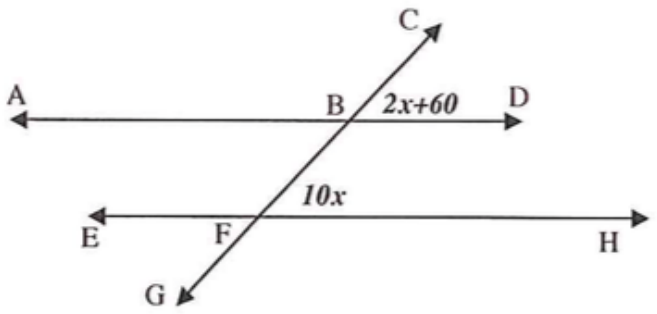
8)



Equation: _____

$x =$ _____ $\angle ABD =$ _____ $\angle AFE =$ _____

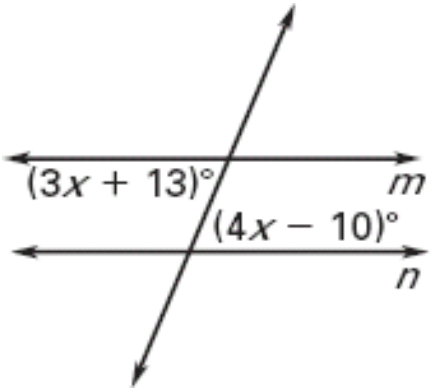
9)



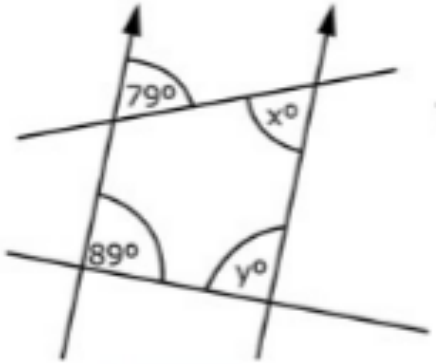
Equation: _____

$x =$ _____ $\angle CFH =$ _____ $\angle CBD =$ _____

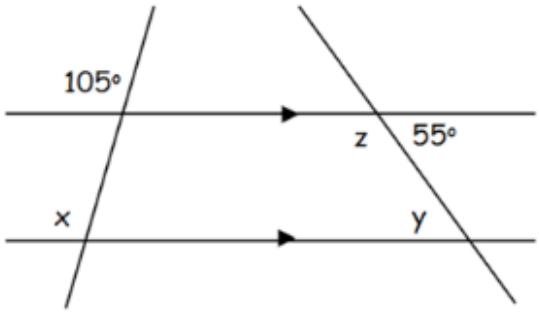
10) Find x.



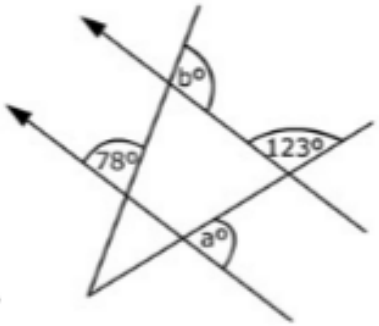
11) Find x and y.



12) Find x, y and z.



13) Find a and b.



14)

3) New York City's streets are laid out in a grid so most of the streets all line up parallel and perpendicular to each other. However, there are a few streets that go diagonally through town. The picture below is a representation of BROADWAY in NYC. It's a transversal to the three parallel streets. Use this information to answer the following questions.

a) If $\angle a = 42°$ and W. 62nd and W. 61st are parallel find the following:

$m\angle b =$ $m\angle c =$ $m\angle d =$ $m\angle e =$

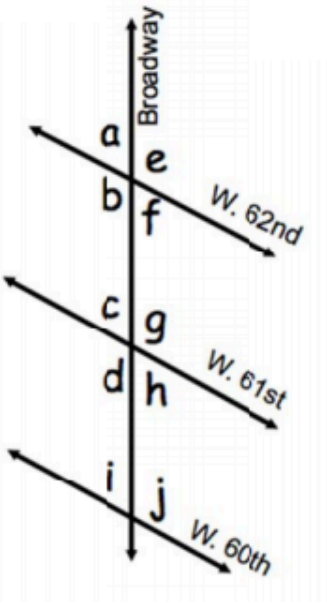
$m\angle f =$ $m\angle g =$ $m\angle h =$

b) If $\angle a = 42°$ and W. 62nd is also parallel to W 60th find the following:

$m\angle i =$ $m\angle j =$

c) What kind of angles are $\angle a, \angle c, and\ \angle i$?

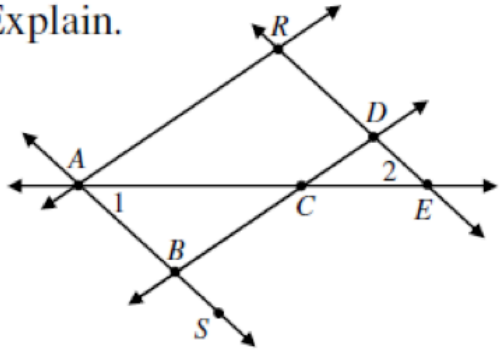
d) If the lines are all parallel then what should be true about all three of the angles? Is it true?



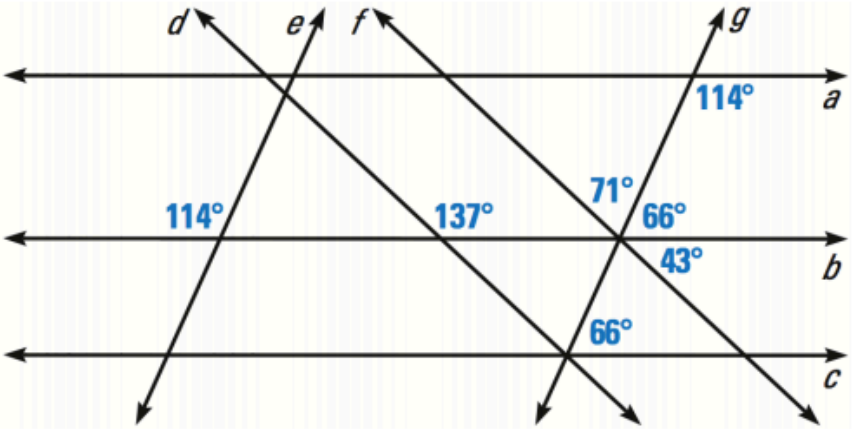
15) If $\angle 1 \cong \angle 2$, which lines must be parallel?

If $\angle RAB \cong \angle CBS$, which lines must be parallel?

Explain.



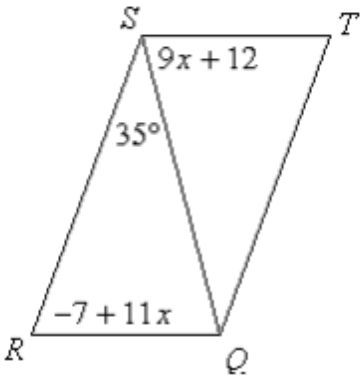
16) Use the diagram below. How would you show that the given lines are parallel?



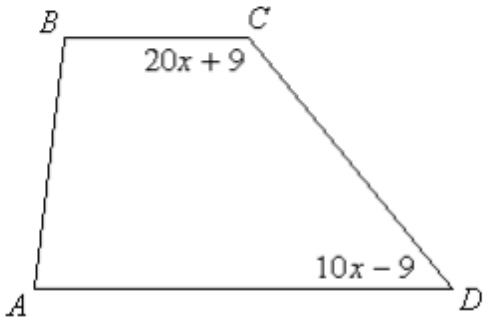
a and b

d and f

17) Solve for x. Opposite sides of the figure are parallel.



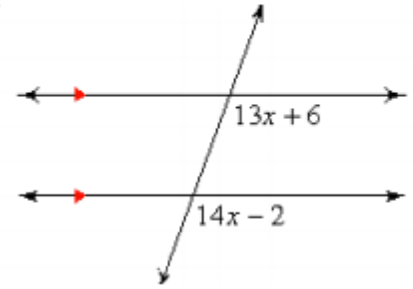
18) Solve for x. The top and bottom sides are parallel.



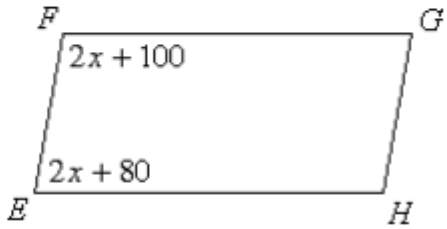
APPLICATIONS

DIRECTIONS: SOLVE FOR X.

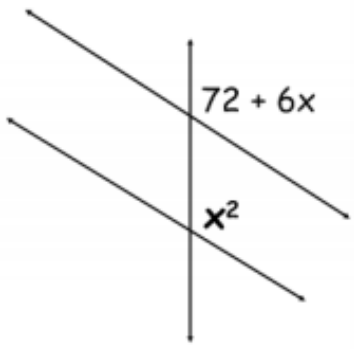
1)



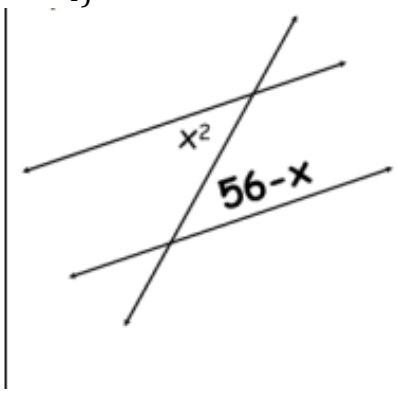
2) Opposite sides are parallel.



3)



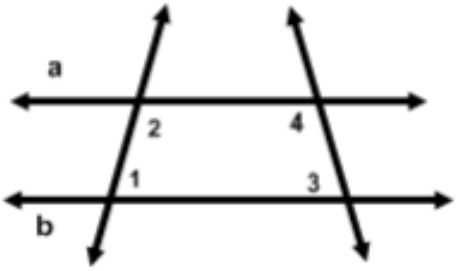
4)



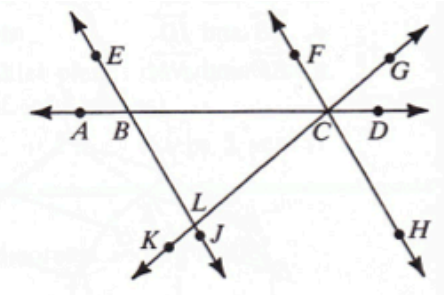
5) Write a two-column proof.

Given: $a \parallel b, \angle 1 \cong \angle 4$

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



6) Given $m\angle ABE = 62^0, m\angle BCL = 58^0$ *and* $m\angle KLJ = 60^0$, find all the missing angles in the diagram below. Assume $\overleftrightarrow{EJ} \parallel \overleftrightarrow{FH}$.

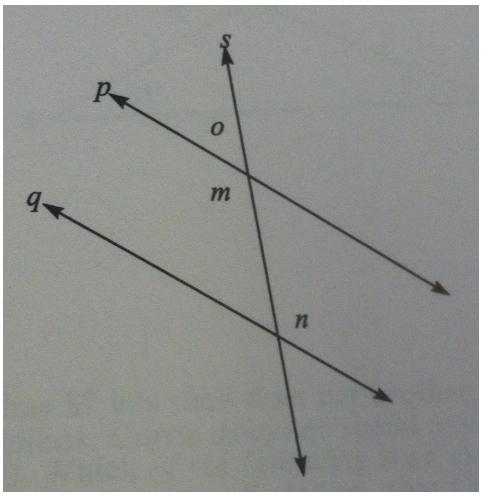


Multiple Choice. Show work to receive credit.

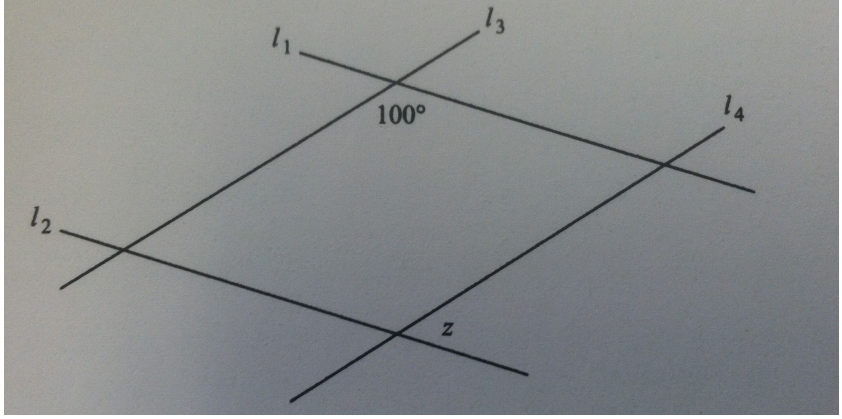
7) Given: p and q are parallel lines
s is a transversal crossing lines p and q.
o, m, and n are angles
m + n = 230^0

What is the measure of angle o?

A. 25°
B. 65°
C. 115°
D. 130°
E. 140°



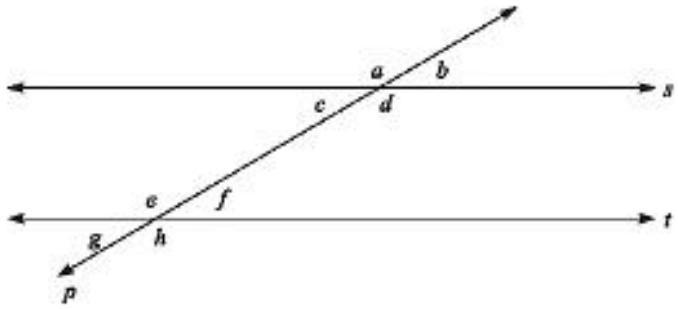
8) In the figure below, l_1 is parallel to l_2, l_3 is parallel to l_4, and the lines intersect as shown. What is the measure of angle z?



A. 40°
B. 50°
C. 60°
D. 70°
E. 80°

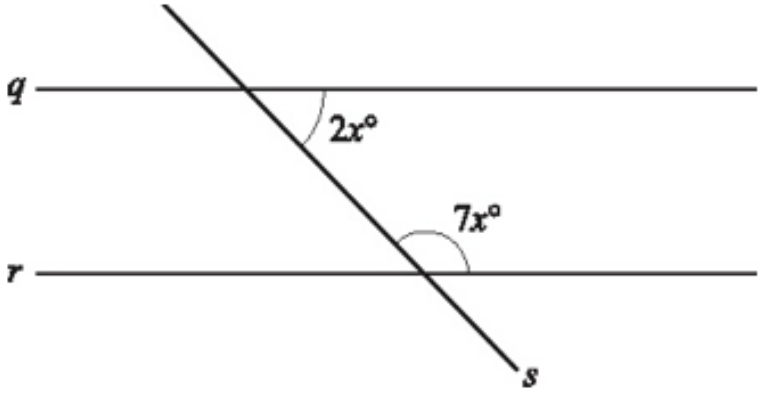
9)

5. In the figure below, line s is parallel to line t, and line p is a transversal crossing both lines s and t. Which of the following lists 3 angles that are equal in measure?



A. angle a, angle b, angle c
B. angle a, angle c, angle d
C. angle a, angle c, angle f
D. angle a, angle d, angle e
E. angle b, angle d, angle e

10) In the figure below, parallel lines q and r are intersected by line s. What is the value of x?



F. 9
H. 20
J. 40
K. 55

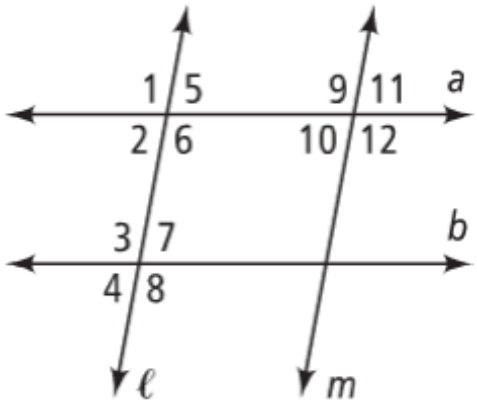
Directions: Use the following diagram to determine which lines (if any are parallel). State the postulate or theorem that justifies your answer.

12) $\angle 2$ *is supplementary to* $\angle 3$

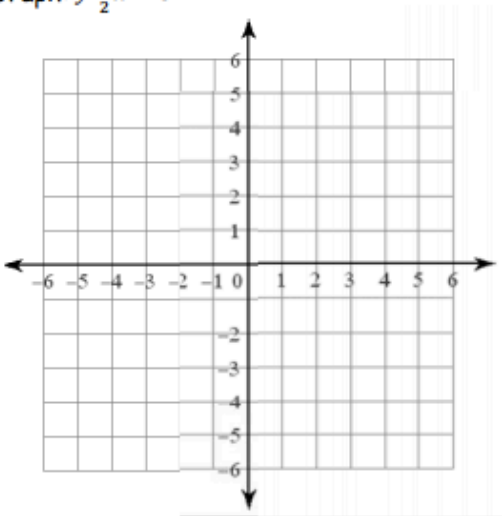
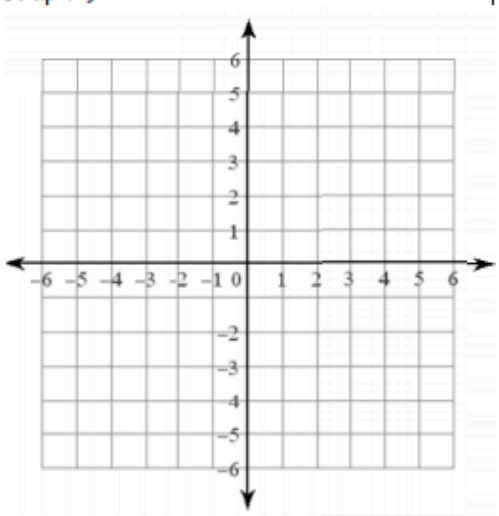
13) $\angle 9 \cong \angle 12$

14) $\angle 5 \cong \angle 10$

15) $\angle 7 \cong \angle 11$



Algebra Review

Solve: $2 = \frac{x}{3} - 4$	Solve: 15 = 2x - 13	Factor: $k^2 + 14k + 45$
Factor: $16x^8 - 56x^5$	Graph: $y\ \frac{1}{2}x - 3$ 	Graph: $y = 4$ 

use the given information to decide if $m \| n$, $p \| q$, or *neither*.

7.

$\angle 2 \cong \angle 11$

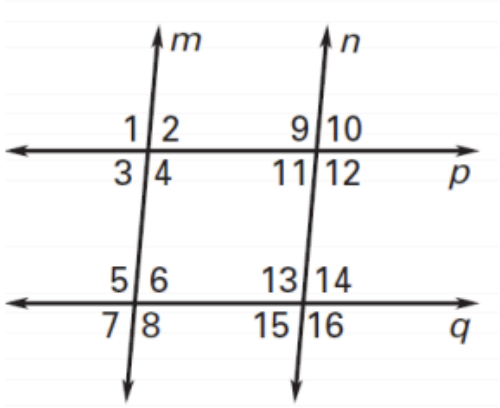
$\angle 3 \cong \angle 6$

$\angle 10 \cong \angle 15$

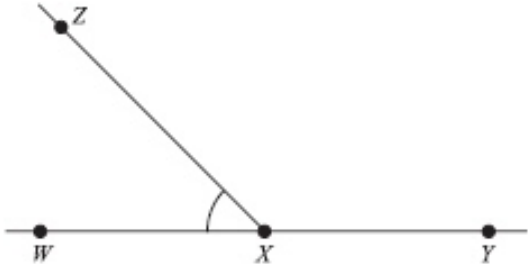
$\angle 14 \cong \angle 15$

$\angle 4 + \angle 11 = 180^\circ$

$\angle 12 + \angle 14 = 180^\circ$

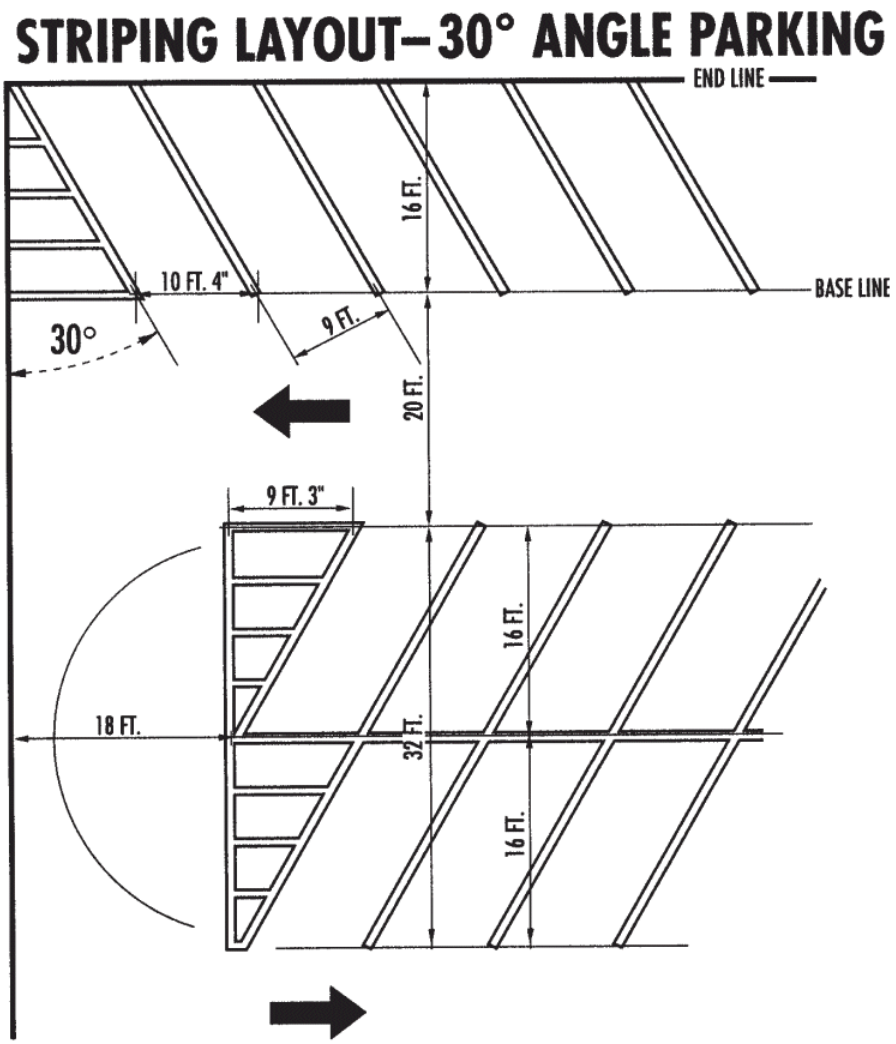


8. In the figure below, W, X, and Y are colinear, the measure of angle WXZ is $4x°$, and the measure of angle YXZ is $8x°$. What is the measure of angle WXZ?



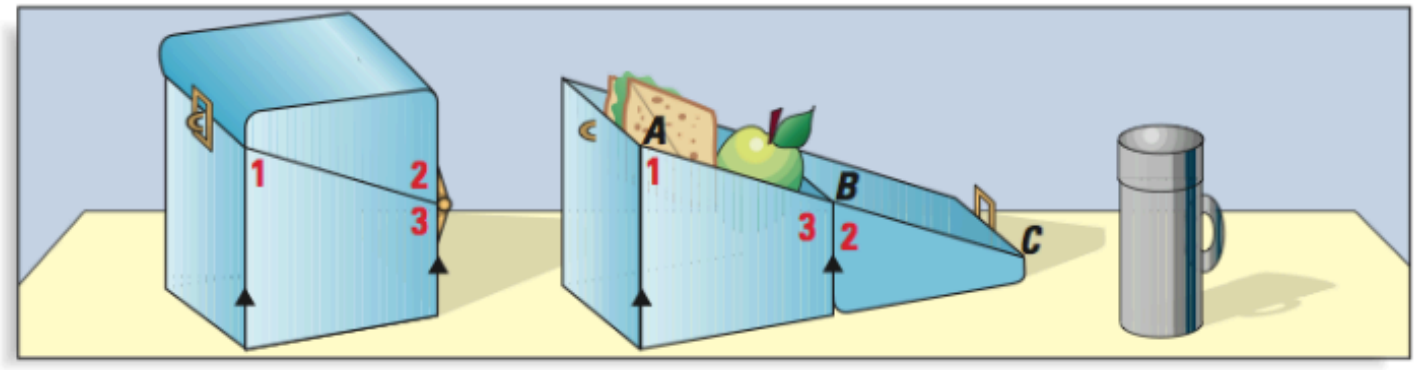
F. 15°
G. 60°
H. 80°
J. 95°
K. 120°

11) Fill in all the angle measure you can below in the diagram below.



12)

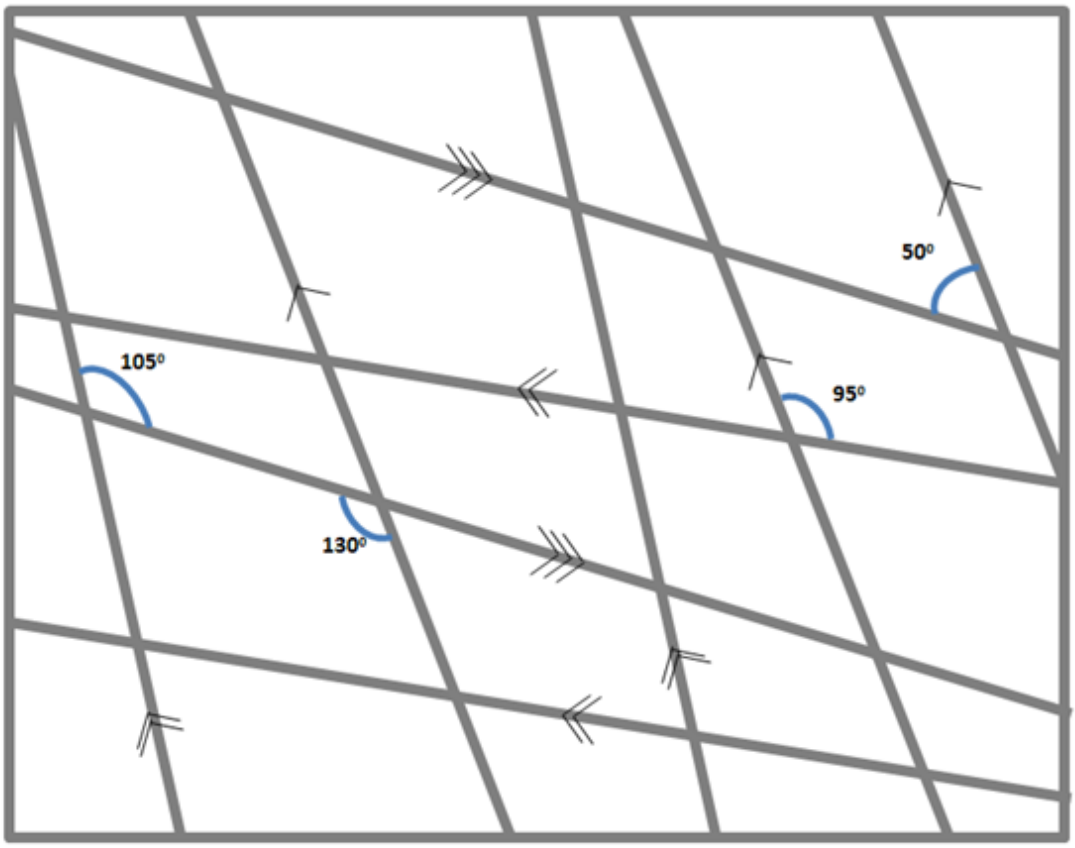
MULTI-STEP PROBLEM You are designing a lunch box like the one below.



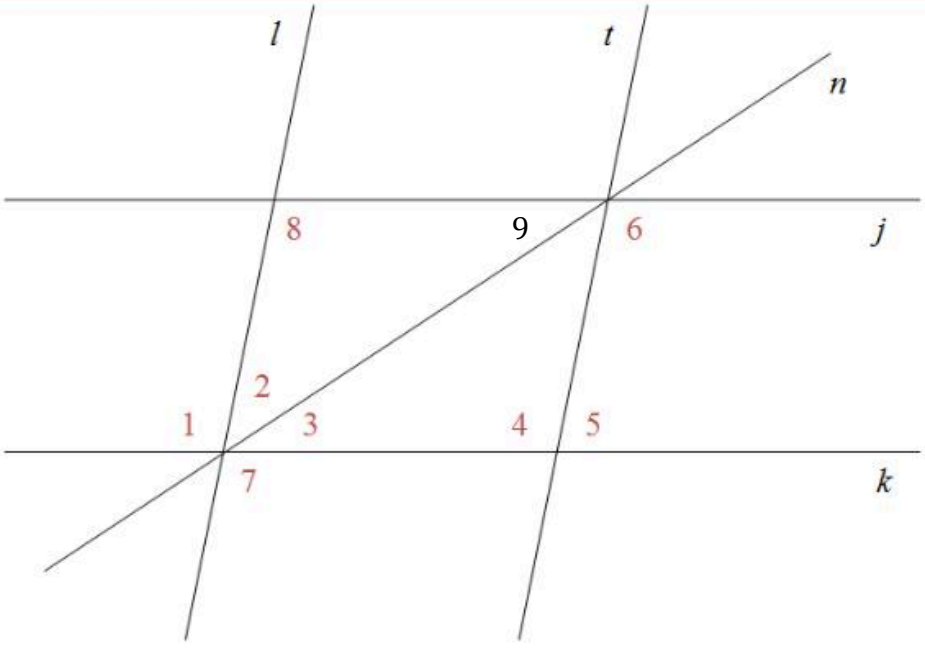
a. The measure of $\angle 1$ is 70°. What is the measure of $\angle 2$? What is the measure of $\angle 3$?

b. *Writing* Explain why $\angle ABC$ is a straight angle.

13) Fill in all the angle measure you can below in the diagram below.



Which lines are parallel? JUSTIFY your answer.



1. $m\angle 1 = m\angle 4$
2. $m\angle 6 = m\angle 4$
3. $m\angle 2 + m\angle 3 = m\angle 5$
4. $m\angle 2 + m\angle 3 + m\angle 8 = 180$
5. $\angle 6 \cong \angle 8$
6. $\angle 7 \cong \angle 1$
7. $m\angle 1 = m\angle 8 = 75$
8. $\angle 5$ and $\angle 6$ are supplementary
9. $\angle 4$ and $\angle 5$ are supplementary
10. $\angle 2$ and $\angle 3$ are complementary and $m\angle 5 = 90$.
11. $\angle 3 \cong \angle 9$