3.1/3.2a Parallel Lines and Transversals Name _____
Geometry Period_____

Relationship between Lines and Planes

When two lines lie in the same plane but don't intersect, they are called _____ lines.

Draw:

When lines never intersect and are also not parallel, they are called _____ lines.

Draw:

Planes that don't intersect are called _____.

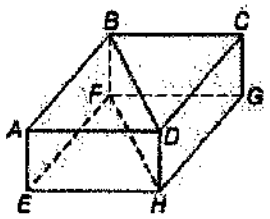
Draw:

1) Refer to the figures at the right to identify each of the following.

   a) All planes parallel to plane ABD

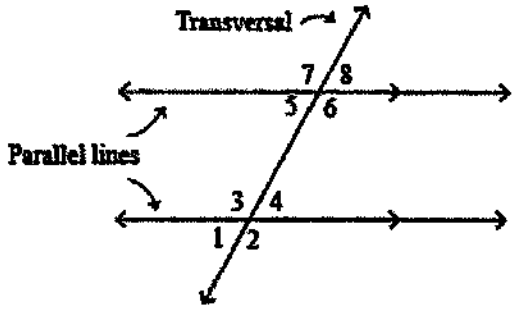
   b) All segments parallel to $\overline{CG}$.

   c) All segments skew to $\overline{EH}$



Angle Relationships

A line that _____ two or more other lines at different points in a plane is called a _____. When this occurs, special angle relationships are formed.



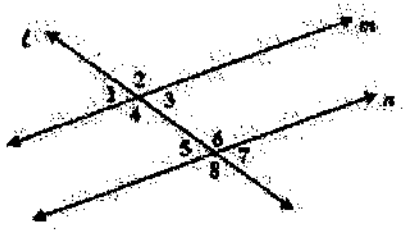
Alternate Interior:

Alternate Exterior

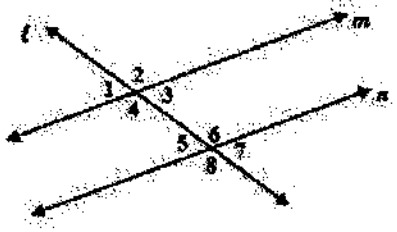
Same Side (consecutive) Interior

Corresponding

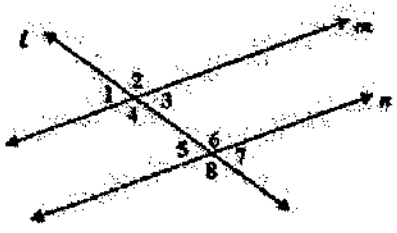
Color one pair of Alternate Interior Angles



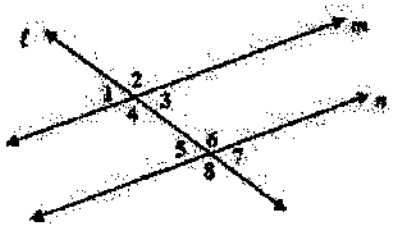
Color one pair of Alternate Exterior Angles



Color one pair of Same Side Interior Angles



Color one pair of Corresponding Angles

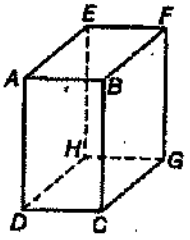


NAME _____ DATE _____ PERIOD _____

Skills Practice

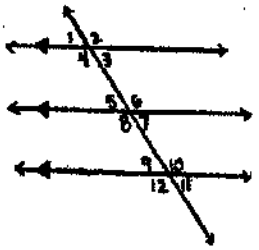
Parallel Lines and Transversals

For Exercises 1–4, refer to the figure at the right to identify each of the following.



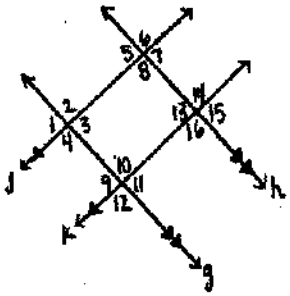
1. all planes that are parallel to plane *DEH*
2. all segments that are parallel to $\overline{AB}$
3. all segments that intersect $\overline{GH}$
4. all segments that are skew to $\overline{CD}$

Classify the relationship between each pair of angles as *alternate interior*, *alternate exterior*, *corresponding*, or *consecutive interior* angles.



5. ∠4 and ∠5
6. ∠5 and ∠11
7. ∠4 and ∠6
8. ∠7 and ∠9
9. ∠2 and ∠8
10. ∠3 and ∠6
11. ∠1 and ∠9
12. ∠3 and ∠9
13. ∠6 and ∠12
14. ∠7 and ∠11

Identify the transversal connecting each pair of angles. Then classify the relationship between each pair of angles.



15. ∠4 and ∠10
16. ∠2 and ∠12
17. ∠7 and ∠3
18. ∠13 and ∠10
19. ∠8 and ∠14
20. ∠6 and ∠14

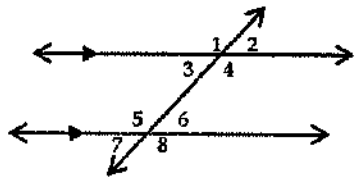
3

3.2 Angles and Parallel Lines

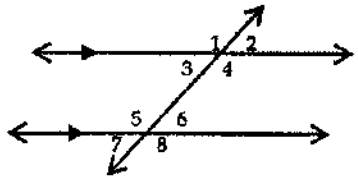
Name _____

Geometry

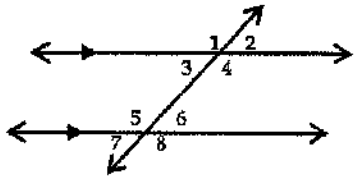
Corresponding Angles
If two parallel lines are cut by a transversal, then each pair of corresponding angles is _____.



Alternate Interior Angles
If two parallel lines are cut by a transversal, then each pair of alternate interior angles is _____.

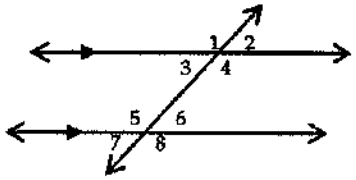


Consecutive Interior Angles
If two parallel lines are cut by a transversal, then each pair of consecutive interior angles is _____.

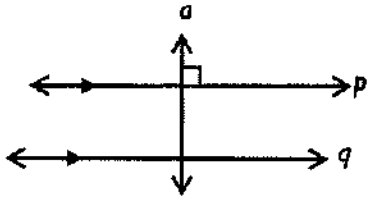


Alternate Exterior Angles

If two parallel lines are cut by a transversal, then each pair of alternate exterior angles is _____.

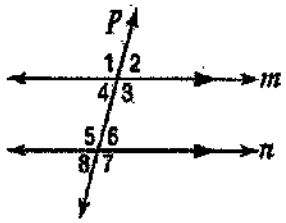


Perpendicular Transversal
In a plane, if a line is perpendicular to one of two parallel lines, then it is _____to the other.

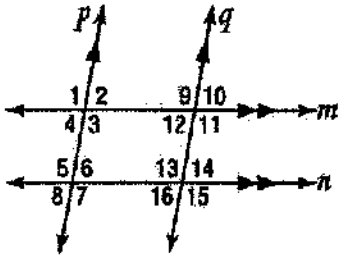


Example 1. In the figure, m<2=64. Find the measure of each angle and state the relationship between angles.

$m\angle 1 =$	$\angle 1$ and $\angle 2$
$m\angle 3 =$	$\angle 3$ and $\angle 2$
$m\angle 4 =$	$\angle 4$ and $\angle 2$
$m\angle 5 =$	$\angle 5$ and $\angle 3$
$m\angle 6 =$	$\angle 6$ and $\angle 2$
$m\angle 7 =$	$\angle 7$ and $\angle 3$
$m\angle 8 =$	$\angle 8$ and $\angle 6$



Example 2. In the figure, m<15=131. Find the measure of each angle.

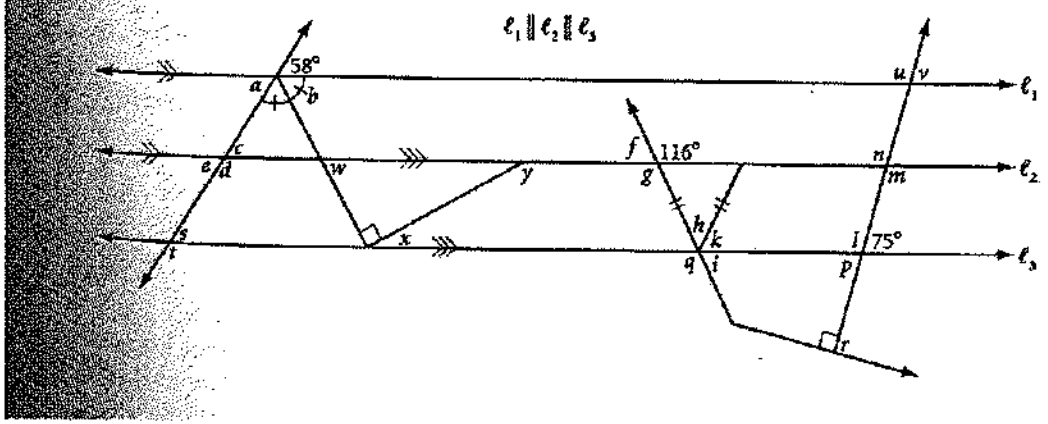


a. m<13= b. m<16= c. m<7=

d. m<6= e. m<3= f. m<4=

g. m<12= h. m<10= i. m<11=

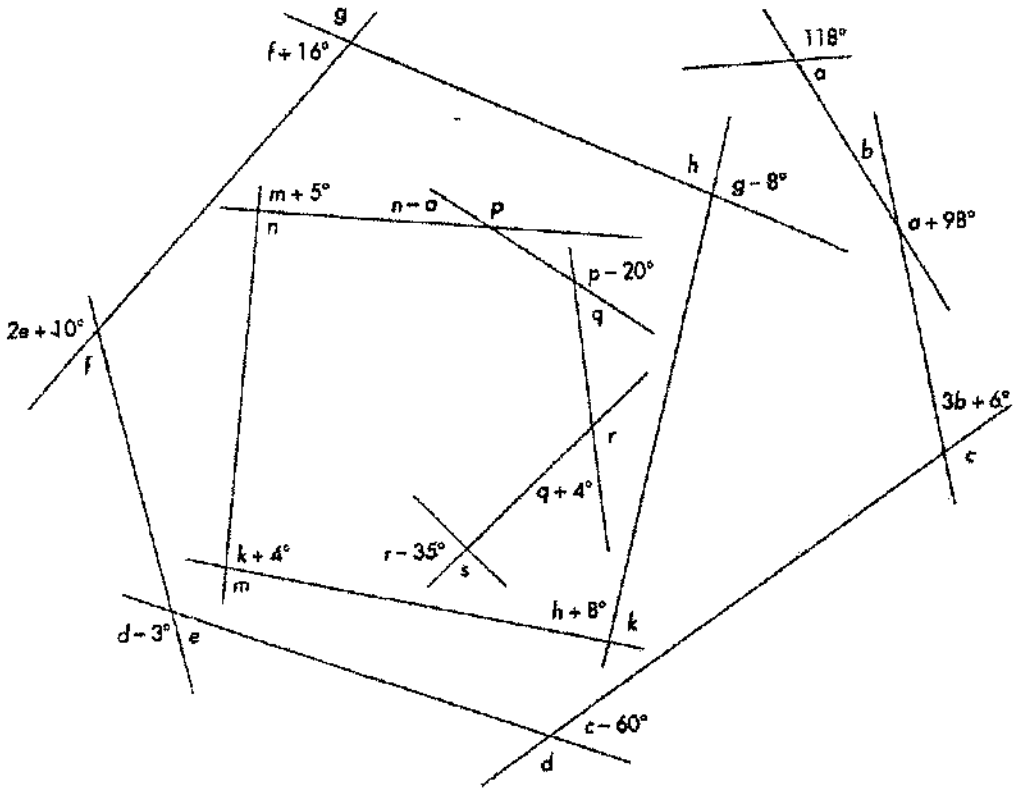
57. Find the measure of each lettered angle in the diagram below.



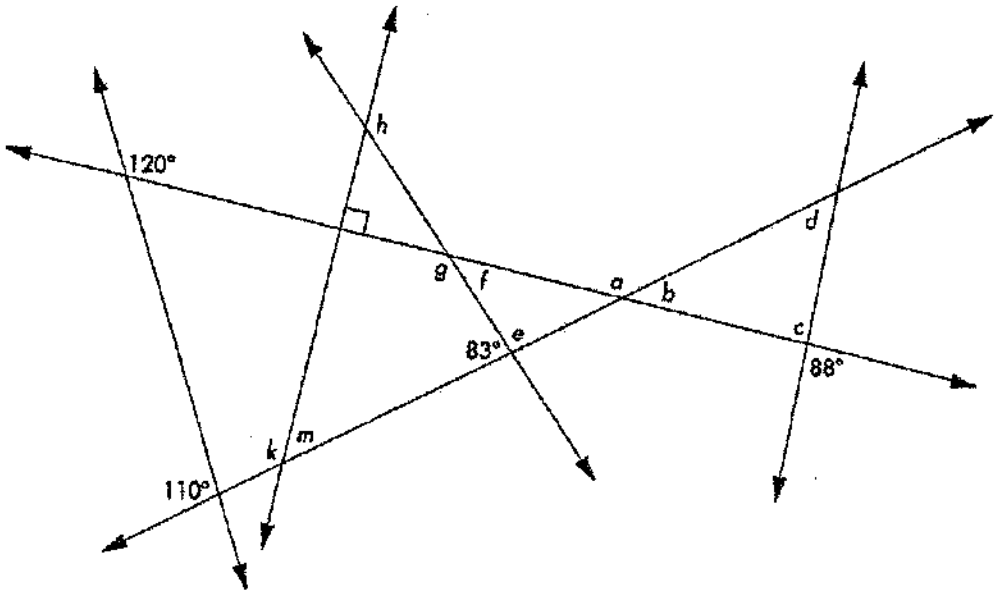
The GREAT Angle Chase .....

Find the measure of each lettered angle.

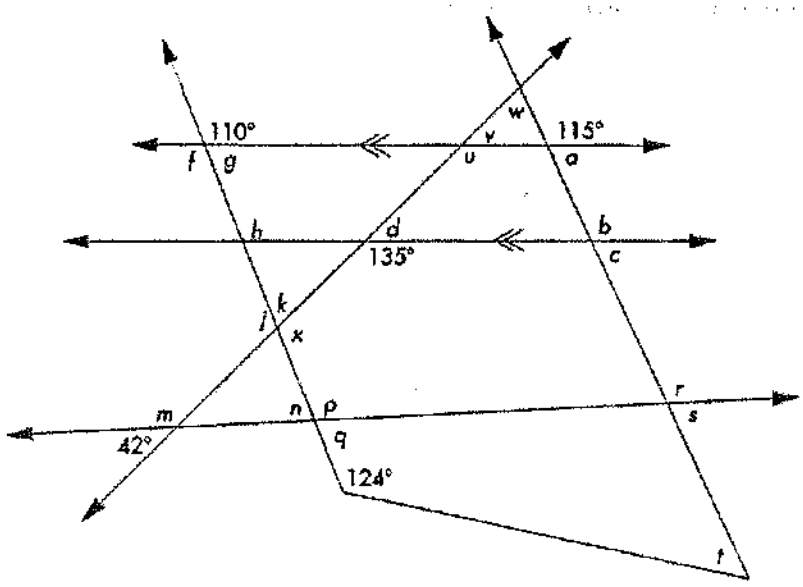
w/ Linear Pairs

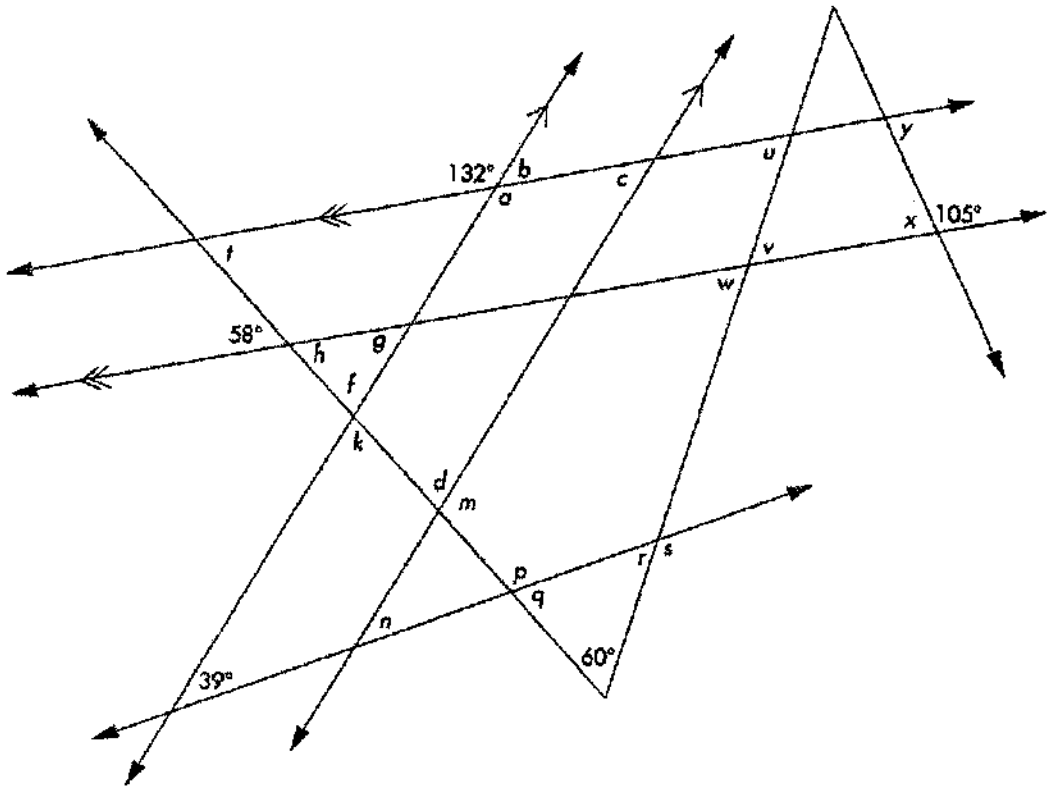


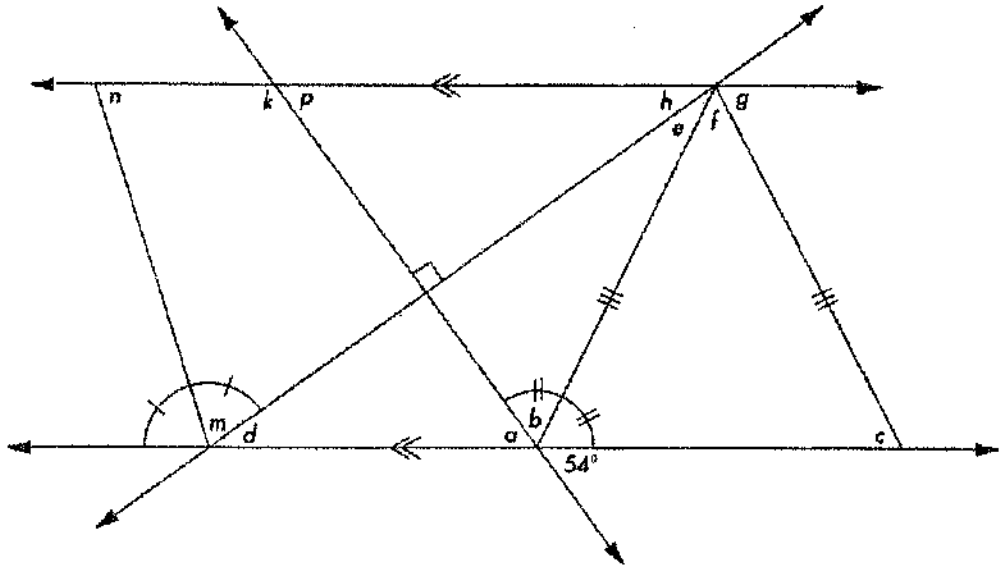
w/ Triangles

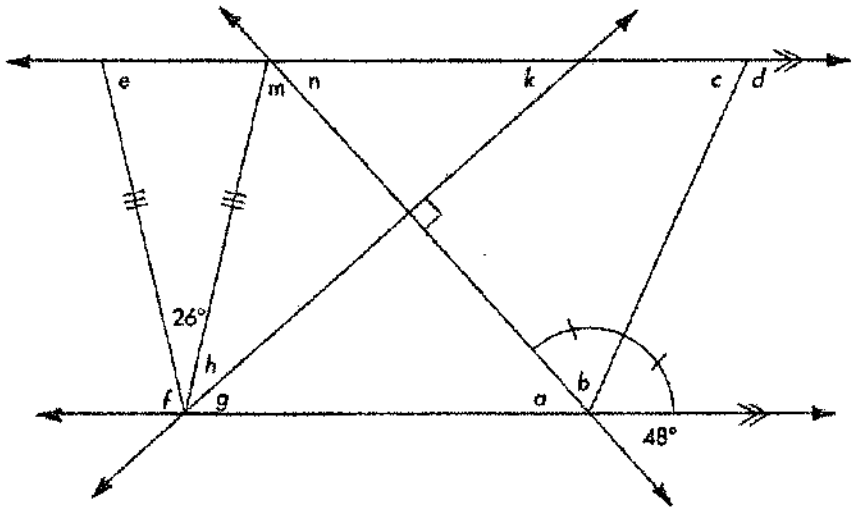


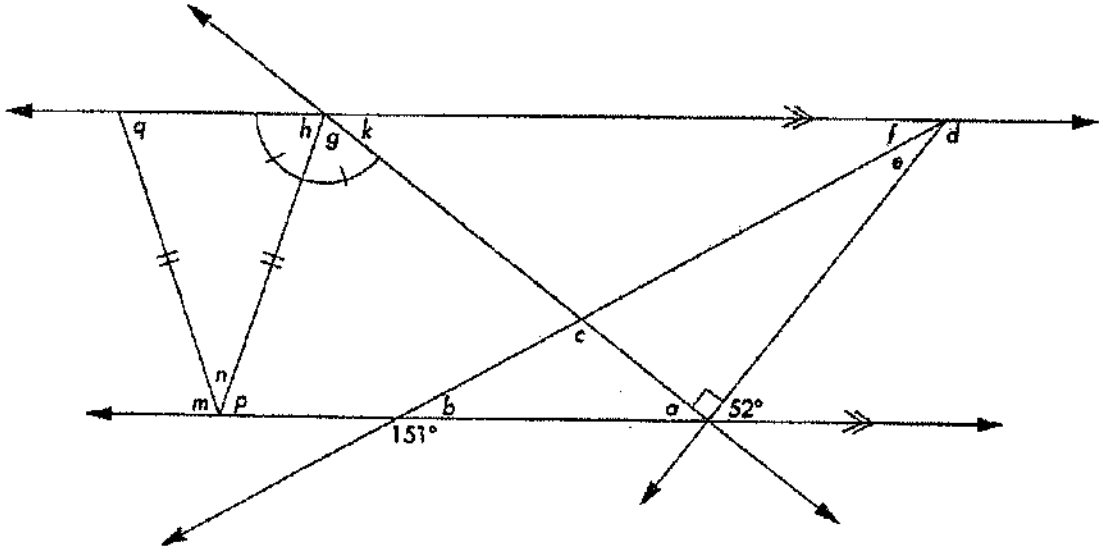
w/Parallel Lines

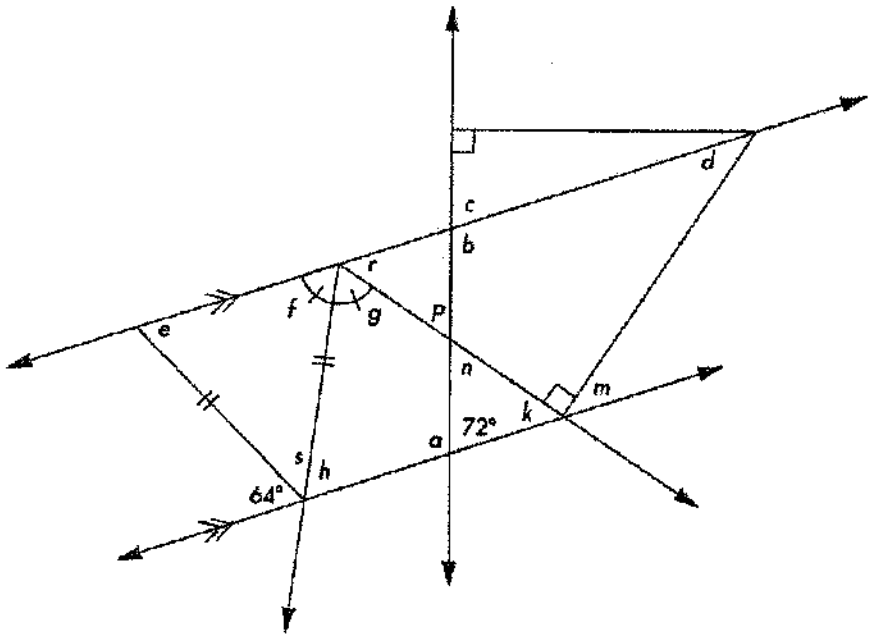


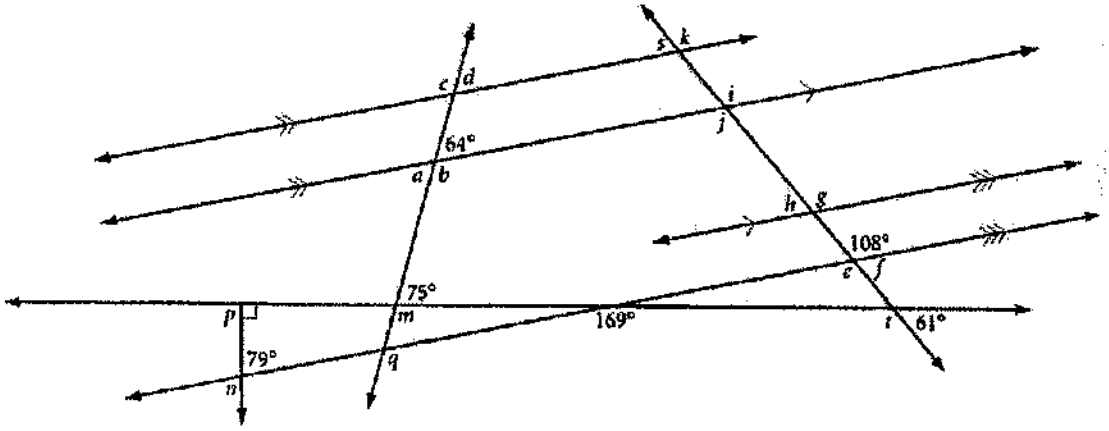

132°
b
a
c
u
y
x
105°
v
w
f
58°
h
g
f
k
d
m
p
r
s
q
n
60°
39°


n
k
p
h
g
e
f
m
d
b
a
c
54°


e
m
n
k
c
d
26°
h
f
g
a
b
48°

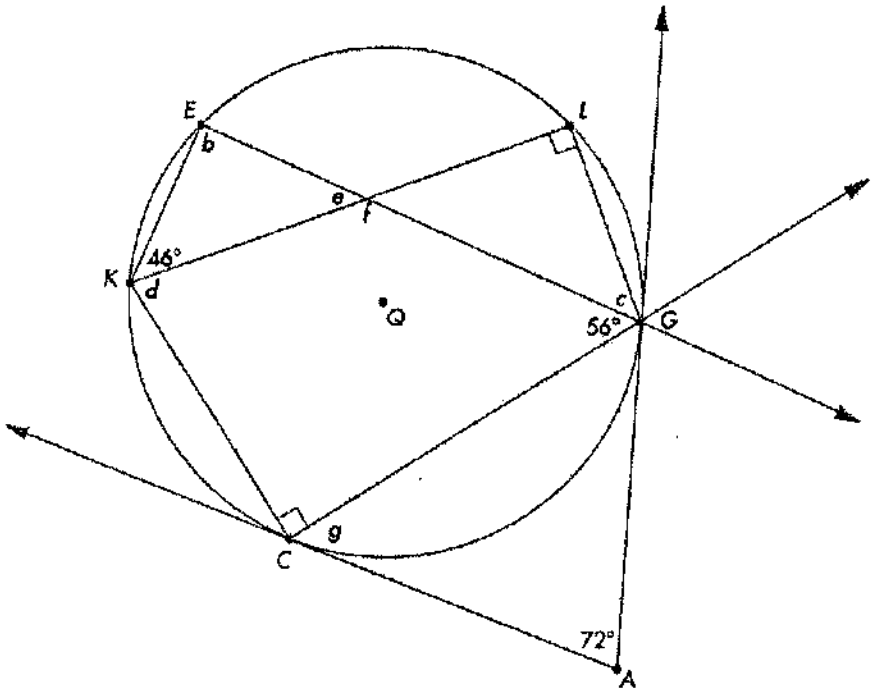

q
h
g
k
f
d
e
c
n
m
p
b
a
52°
151°


d
c
b
r
f
g
P
e
n
m
k
72°
a
s
h
64°

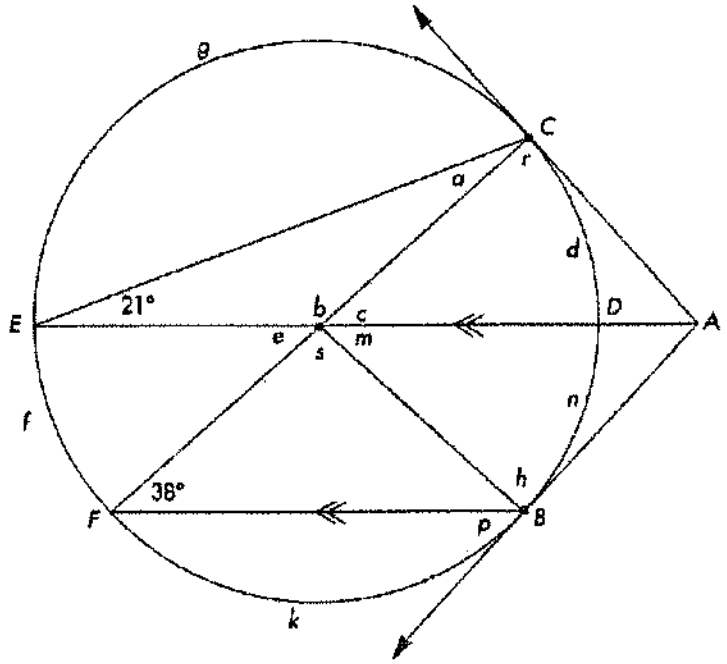

s
k
c
d
i
j
64°
a
b
h
g
108°
e
75°
p
m
169°
t
61°
79°
q
n

w/ Circles

.. $\overleftrightarrow{AG}$ and $\overleftrightarrow{AC}$ are tangents.



$\overrightarrow{AC}$ and $\overrightarrow{AB}$ are tangents. $\overline{DE}$ and $\overline{CF}$ are diameters.

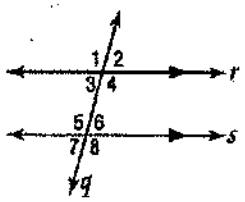


NAME _____ DATE _____ PERIOD _____

3-2 Skills Practice

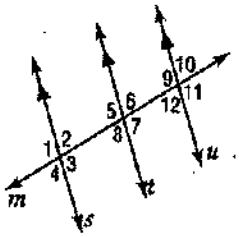
Angles and Parallel Lines

In the figure, $m\angle 2 = 70$. Find the measure of each angle.



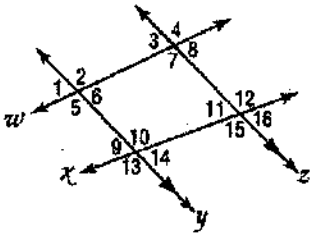
1. $\angle 3$
2. $\angle 5$
3. $\angle 8$
4. $\angle 1$
5. $\angle 4$
6. $\angle 6$

In the figure, $m\angle 7 = 100$. Find the measure of each angle.



7. $\angle 9$
8. $\angle 6$
9. $\angle 8$
10. $\angle 2$
11. $\angle 5$
12. $\angle 11$

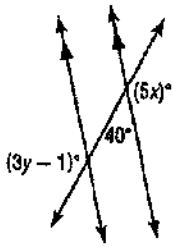
In the figure, $m\angle 3 = 75$ and $m\angle 10 = 105$. Find the measure of each angle.



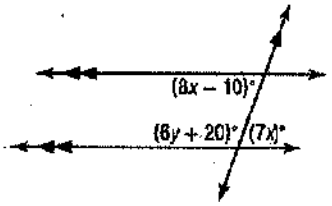
13. $\angle 2$
14. $\angle 5$
15. $\angle 7$
16. $\angle 15$
17. $\angle 14$
18. $\angle 9$

Find the value of the variable(s) in each figure. Explain your reasoning.

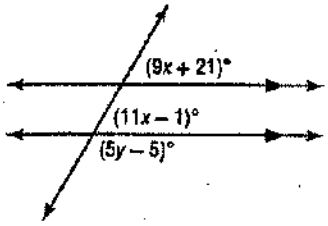
19.



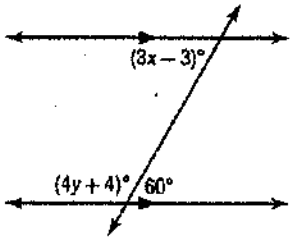
20.

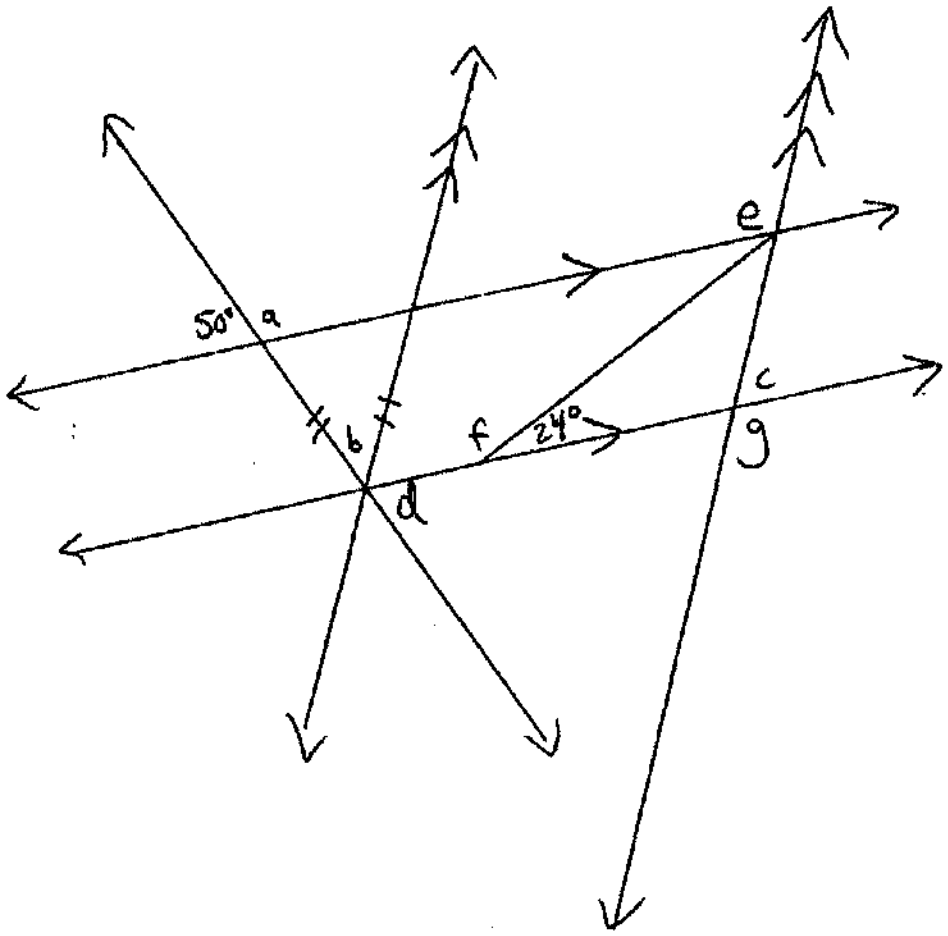


21.



22.




e
50°
a
b
f
24°
c
g
d

3-3 Slopes of Lines Name _____
Geometry Period_____

Skills Warm-up: Evaluate the following expressions.

1) $\frac{-1-4}{4-(-3)}$

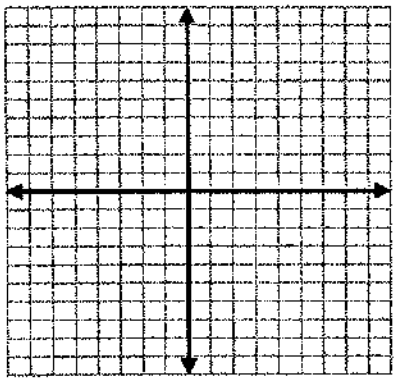
2) $\frac{0-(-2)}{-1-(-2)}$

Finding the slopes of lines

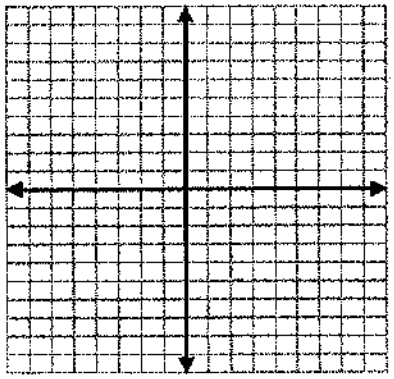
The slope of a line is the ratio of the _____ change (the rise) to the _____ change (the run). The slope of the line is represented by the letter _____. _____points are needed to determine the slope of a line.

3) Find the slope of each line

a.



b. Line 2: through (-2, 6) and (4, -8)

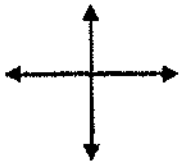


For two points, (x_1, y_1) and (x_2, y_2).

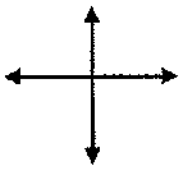
$$m = \frac{rise}{run} =$$

Classification of Lines by slope

- A line with a positive slope _____ from left to right. (m > 0)
- A line with a negative slope _____ from left to right. (m < 0)



Positive slope



Negative slope

4) Find the slope of each line. Without graphing tell whether the line through the given points rises or falls.

a. (-2, 3), (1, 5)

b. (3, 2), (-1, -4)

c. (6, -3), (2, -4)

d. (12, 5), (-4, -3)

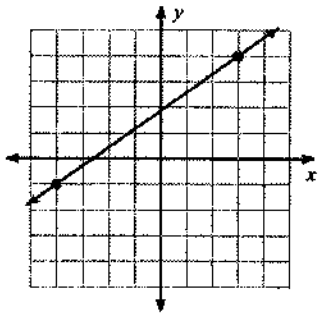
Geometry Name_____

3.3a Slopes of Lines

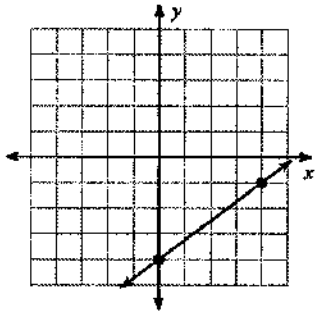
Period____

Find the slope of each line.

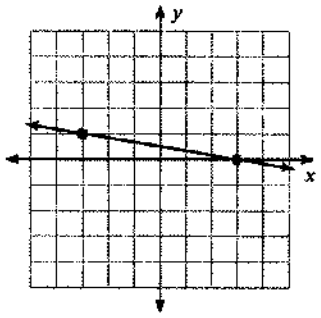
1)



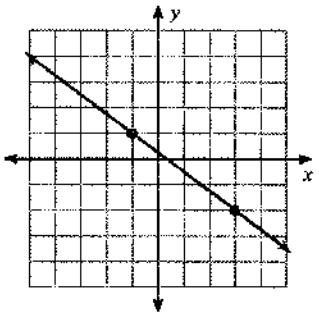
2)



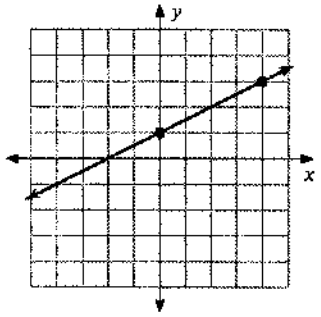
3)



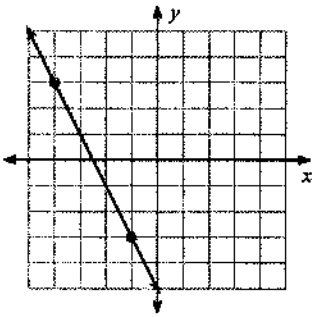
4)



5)



6)



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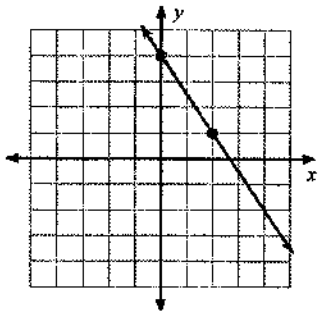
7)



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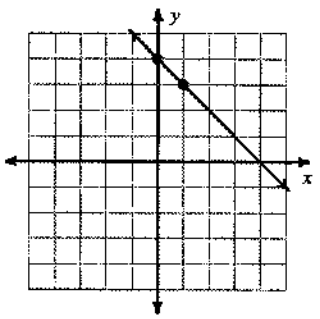

Find the slope of the line through each pair of points. Then tell whether the slope rises or falls.

9) $(0, 7), (11, -7)$

10) $(-19, 2), (11, 16)$

11) $(12, -20), (-2, -17)$

12) $(12, -3), (7, 20)$

13) $(-1, 7), (-15, -1)$

14) $(6, 14), (8, -7)$

15) $(-16, 7), (-10, -15)$

16) $(6, 17), (-11, -11)$

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Slopes of Parallel and Perpendicular lines

PARALLEL LINES:
The lines are parallel **if and only if they have the _____ slope.**

Ex: State the slope of line 2 if the lines 1 and 2 are parallel: $m_1 = \frac{2}{3}$; $m_2 =$ _____

PERPENDICULAR LINES:
The lines are perpendicular **if and only if their slopes are _____ _____ of each other.**

Ex: State the slope of line 2 if lines 1 and 2 are perpendicular: $m_1 = 4$; $m_2 =$ _____

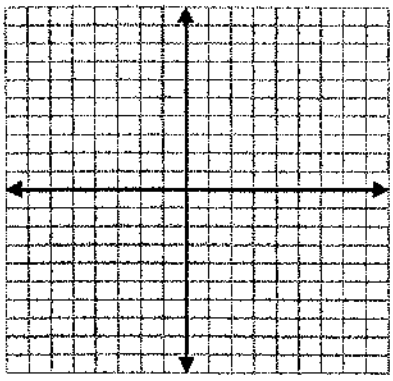
5) Find the slope of line 2:

a) parallel to $m_1 = 2$
$m_2 =$ _____

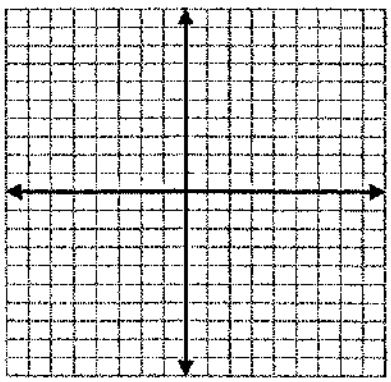
b) perpendicular to $m_1 = \frac{4}{5}$
$m_2 =$ _____

c) perpendicular to $m_1 = 1$
$m_2 =$ _____

6) Graph the line that contains Q(5, 1) and is parallel to $\overleftrightarrow{MN}$ with M(-2, 4) and N(2, 1).



7) Find the value of y that satisfies the given conditions and graph the line. The line containing (-4, 9) and (4, 3) is parallel to the line containing (-8, 1) and (4, y)



5) Without graphing, tell whether the lines are parallel, perpendicular, or neither.

a) Line 1: through (1, -2) and (3, -2)
Line 2: through (-5, 4) and (0, 4)

The lines are: _____

b) Line 1: through (-3, 3) and (3, -1)
Line 2: through (-2, -3) and (2, 3)

The lines are: _____

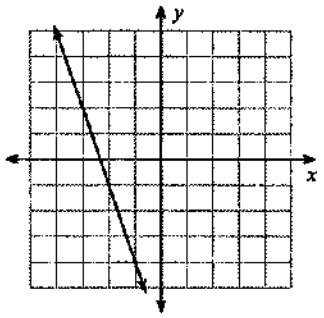
Geometry 3.3b) Name_____ ID: 1

Parallel/Perp. Homework

Date_____ Period____

Find the slope of each line. Graph a parallel and a perpendicular line to the given line on the same coordinate plane.

1)



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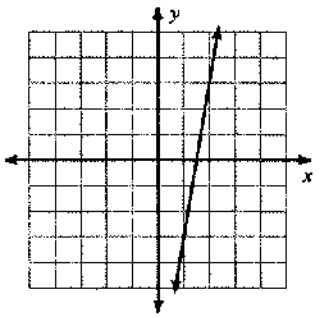

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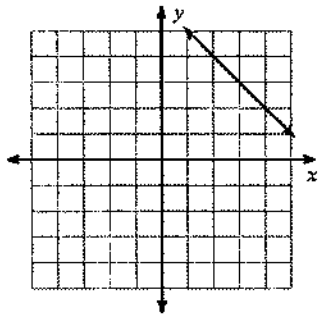

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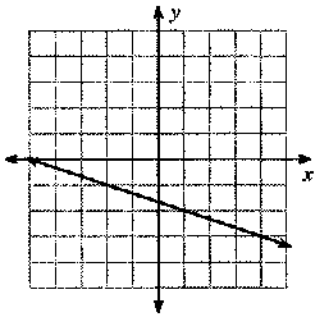

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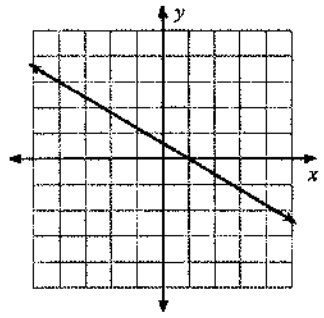

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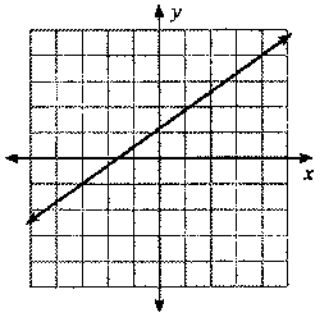

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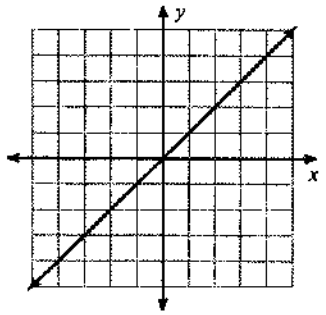


Find the slope of the line through each pair of points, then find the slope of a line parallel to the given line and the slope of a line perpendicular to the given line.

8) $(12, 9), (11, -9)$

9) $(-7, 11), (-14, -19)$

10) $(-2, -2), (-7, -13)$

11) $(2, 15), (20, 15)$

12) $(17, 17), (13, -16)$

13) $(-20, 14), (-17, -7)$

14) $(9, -3), (12, -20)$

Properties of Arithmetic

For any numbers a, b, and c:

Commutative property of addition

$a + b = b + a$

Commutative property of multiplication

$ab = ba$

Associative property of addition

$(a + b) + c = a + (b + c)$

Associative property of multiplication

$(ab)c = a(bc)$

Distributive property

$a(b + c) = ab + ac$

Properties of Equality

For any numbers a, b, c, and d:

Reflexive property

$a = a$ (Any number is equal to itself.)

Transitive property

If $a = b$ and $b = c$, then $a = c$. (This property often takes the form of the **substitution property**, which says that if $b = c$, you can substitute c for b.)

Symmetric property

If $a = b$, then $b = a$.

Addition property

If $a = b$, then $a + c = b + c$.
(Also, if $a = b$ and $c = d$, then $a + c = b + d$.)

Subtraction property

If $a = b$, then $a - c = b - c$.
(Also, if $a = b$ and $c = d$, then $a - c = b - d$.)

Multiplication property

If $a = b$, then $ac = bc$.
(Also, if $a = b$ and $c = d$, then $ac = bd$.)

Division property

If $a = b$, then $\frac{a}{c} = \frac{b}{c}$ provided $c \neq 0$.
(Also, if $a = b$ and $c = d$, then $\frac{a}{c} = \frac{b}{d}$ provided that $c \neq 0$ and $d \neq 0$.)

Square root property

If $a^2 = b$, then $a = \pm\sqrt{b}$.

Zero product property

If $ab = 0$, then $a = 0$ or $b = 0$ or both a and $b = 0$.

POSTULATES of geometry (see p 696)

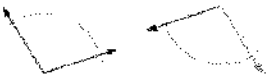
Postulates of Geometry

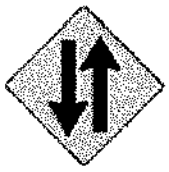
Line Postulate You can construct exactly one line through any two points. In other words, two points determine a line.

Line Intersection Postulate The intersection of two distinct lines is exactly one point.

Segment Duplication Postulate You can construct a segment congruent to another segment.

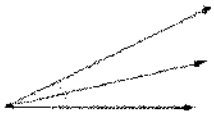
Angle Duplication Postulate You can construct an angle congruent to another angle.





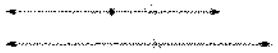
Midpoint Postulate You can construct exactly one midpoint on any line segment.

Angle Bisector Postulate You can construct exactly one angle bisector in any angle.

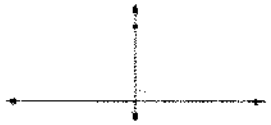


There are certain rules that everyone needs to agree on so we can argue safely. What are the "fixed rules" of geometry?

Parallel Postulate Through a point not on a given line, you can construct exactly one line parallel to the given line.



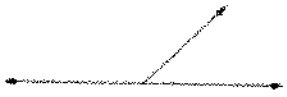
Perpendicular Postulate Through a point not on a given line, you can construct exactly one line perpendicular to the given line.



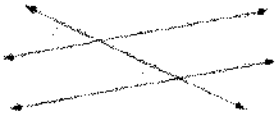
Segment Addition Postulate If point B is on $\overline{AC}$ and between points A and C, then $AB + BC = AC$.

Angle Addition Postulate If point D lies in the interior of $\angle ABC$, then $m\angle ABD + m\angle DBC = m\angle ABC$.

Linear Pair Postulate If two angles are a linear pair, then they are supplementary.



Corresponding Angles Postulate (CA Postulate) If two parallel lines are cut by a transversal, then the corresponding angles are congruent. Conversely, if two coplanar lines are cut by a transversal forming congruent corresponding angles, then the lines are parallel.



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3.4 Equations of Lines Name _____
Geometry

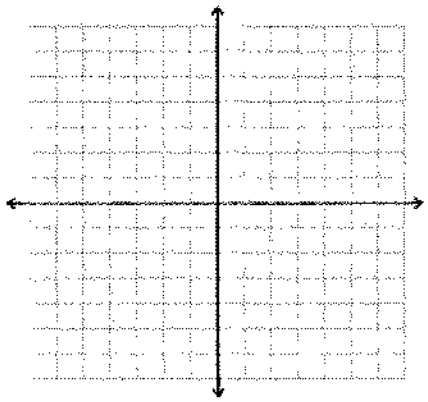
Slope-intercept form: Write it below:

A. Given m and b

that has a y-intercept of -2 and a slope of $\frac{1}{3}$.

☆ m =

☆ b=



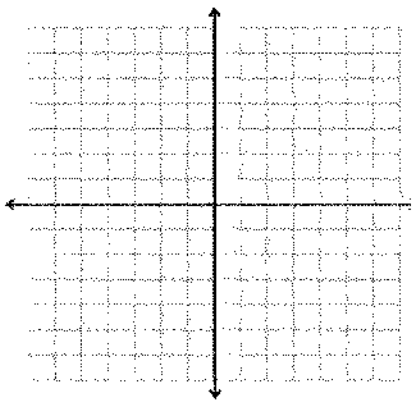
y=

B. Given two points

that passes through points (1, 5) and (4, 2).

Solve for ☆ m

Plug in points and solve for and solve for ☆b



y =

Parallel Lines: Write all you know in the box:

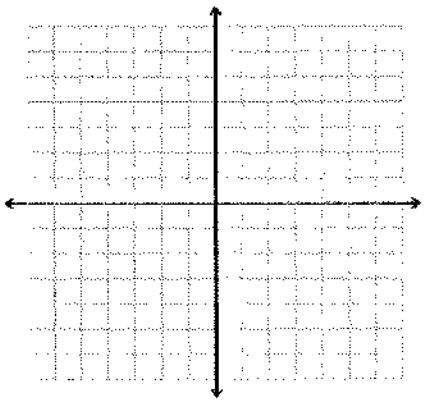
C. Parallel to a line

Find the equation of the line that is parallel to the line y = 2x + 3 and has a y-intercept of -5

☆m (original)=

☆m (needed)=

☆ b=



y=

Perpendicular Lines: Write all you know in the box:

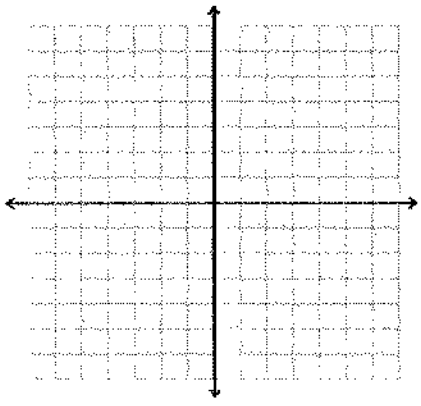
D. Perpendicular to a line

Find the equation of the line that is perpendicular to the line $y = \frac{2}{3}x - 1$ with a y-intercept of 4.

☆m (original)=

☆ m (needed)=

☆ b=



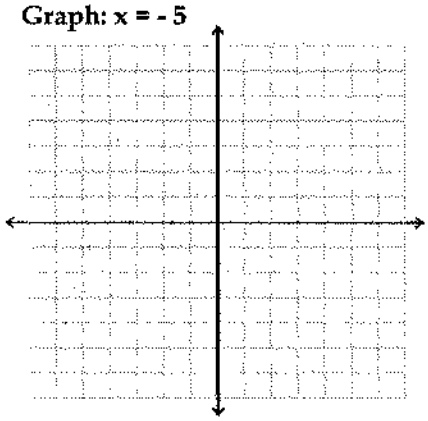
y =

Equations of Horizontal and Vertical Lines

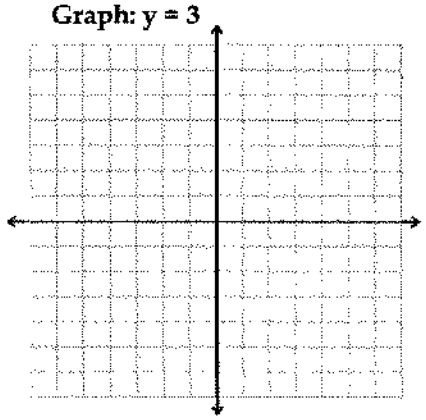
Horizontal Line: Write what you know below:

Vertical Line: Write what you know below:

Graph: x = - 5



Graph: y = 3



Challenges:

1) Write the equation of the line parallel to a line with a slope of $\frac{1}{2}$ and that passes through the point (4, 6)

2) Write the equation of the line parallel to a line with a slope of 4 and that passes through the point (-7, -1)

3) Write the equation of the line perpendicular to a line with a slope of -3 and that passes through the point (3, -2)

4) Write the equation of the line perpendicular to a line with a slope of $\frac{4}{3}$ and that passes through the point (-4, -1)

5) Write the equation of the line parallel to $y = 2x + 3$ that passes through the point (2, -1)

Geometry Name_____ ID: 1

3.4 HW

Date_____ Period____

Find the slope of a line parallel to each given line.

1) $y = \frac{2}{5}x - 1$

2) $y = 2x + 4$

3) $y = \frac{3}{4}x + 2$

4) $y = x - 1$

Find the slope of a line perpendicular to each given line.

5) $y = -3$

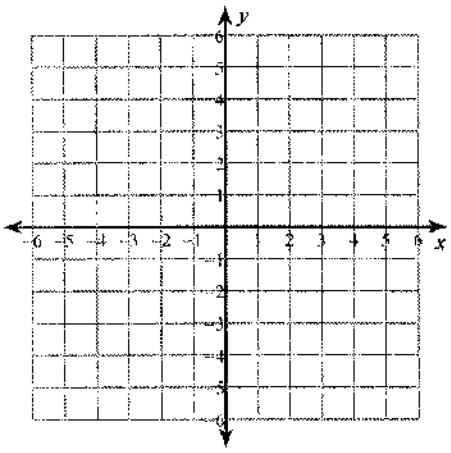
6) $y = \frac{7}{2}x + 2$

7) $y = -\frac{1}{4}x - 2$

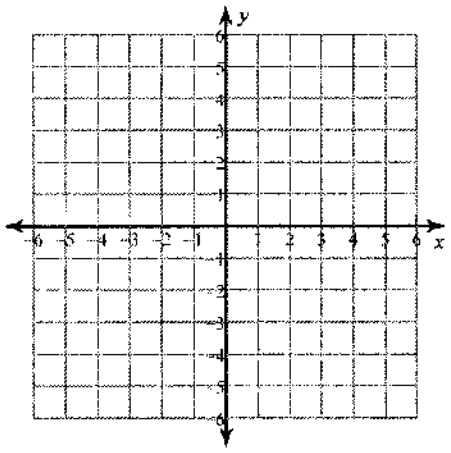
8) $y = \frac{7}{3}x + 5$

Sketch the graph of each line.

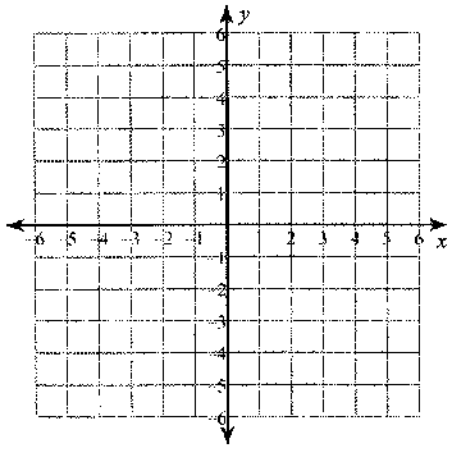
9) $5x - y = 4$



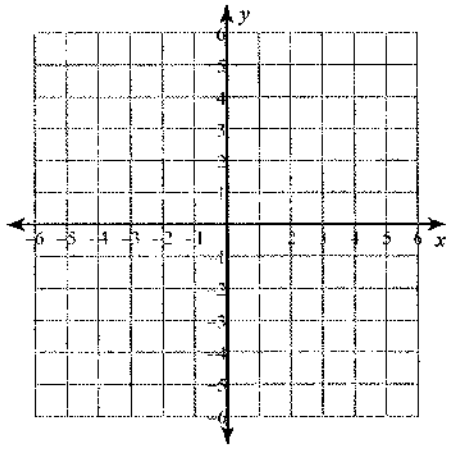
10) $4x + 3y = -3$



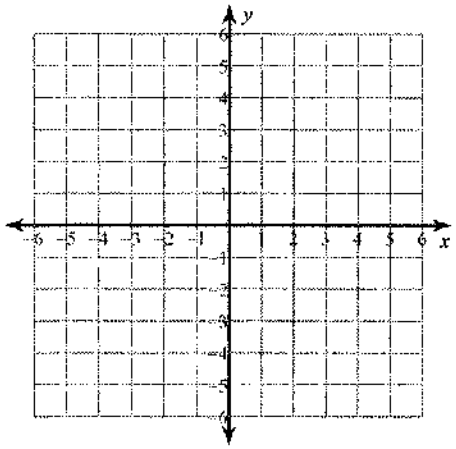
11) $y = \frac{5}{4}x - 4$



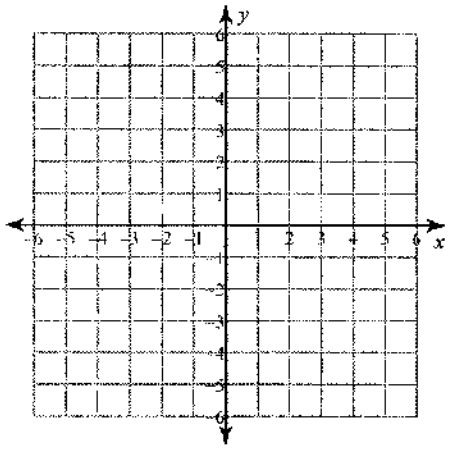
12) $x = -1$



13) $y = \frac{3}{2}x - 5$

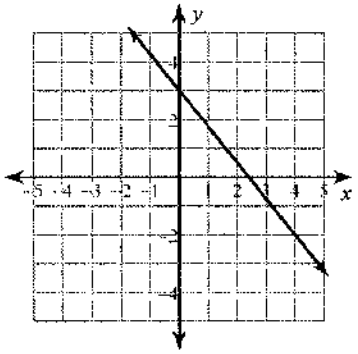


14) $y = -2x - 3$



Write the slope-intercept form of the equation of each line.

15)



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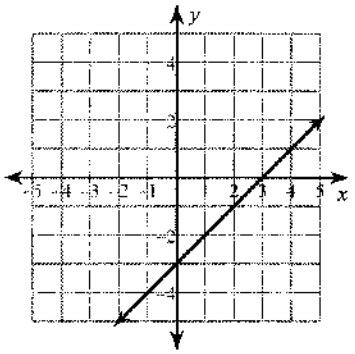

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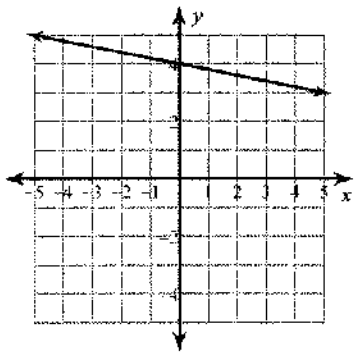

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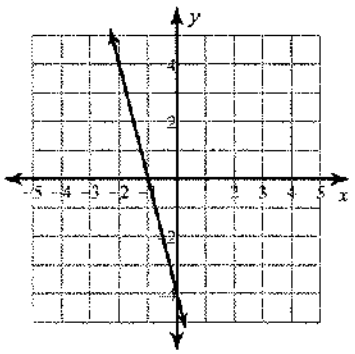


Write the slope-intercept form of the equation of each line given the slope and y-intercept.

19) Slope = 4, y-intercept = 1

20) Slope = $-\frac{3}{2}$, y-intercept = –4

21) Slope = 3, y-intercept = 1

22) Slope = –2, y-intercept = –5

Write the slope-intercept form of the equation of the line through the given points.

23) through: $(-5, 3)$ and $(-1, -5)$

24) through: $(-4, 4)$ and $(0, 5)$

Write the slope-intercept form of the equation of the line described.

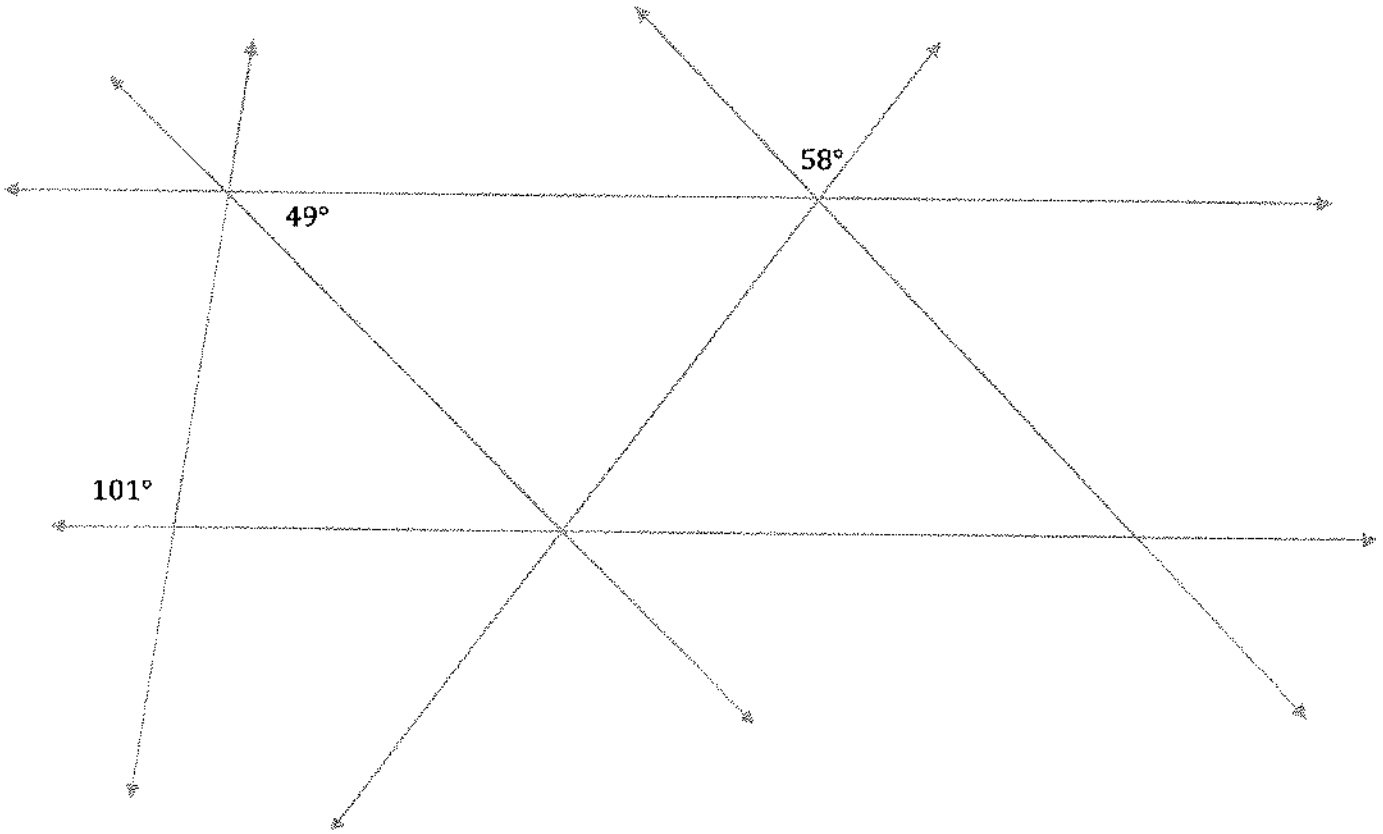
25) through: $(-2, -2)$, parallel to $y = -\frac{1}{2}x - 4$

26) through: $(-4, 1)$, parallel to $y = -x + 5$

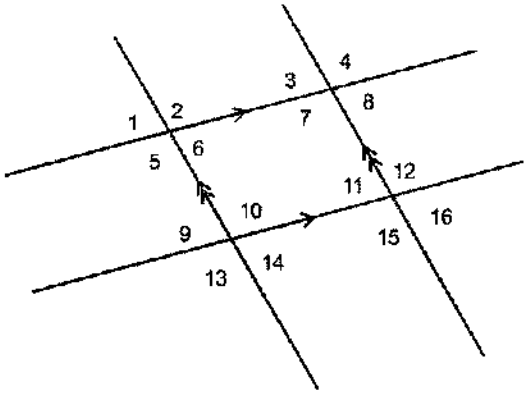
27) through: $(0, 5)$, perp. to $y = \frac{1}{10}x - 5$

28) through: $(-5, -2)$, perp. to $y = 5x - 5$

3.5b) Name_____



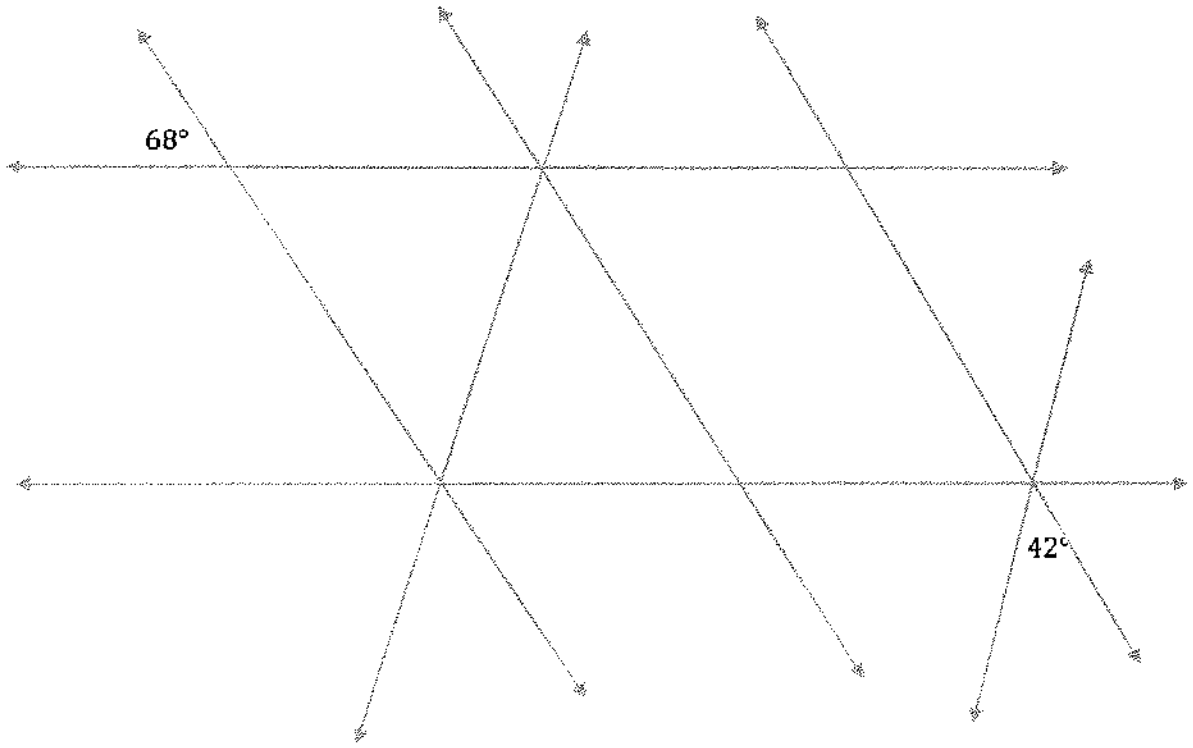
Using the drawing provided, use complete sentences to prove the angles provided are either congruent or supplementary.



- Prove that $< 13 \cong < 4$

- Prove that < 16 *supplementary* < 2

3.5b) Name_____

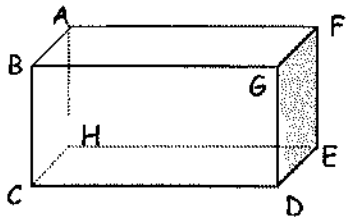


Chapter 3 Review
Geometry

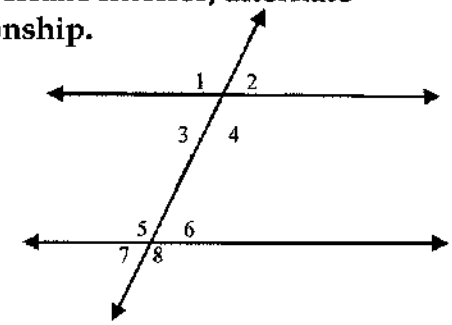
Name _____
Period_____

Use the diagram to complete each statement.

1. All lines parallel to $\overline{FE}$:
2. All lines perpendicular to $\overline{CD}$:
3. All lines skew to $\overline{BC}$:
4. Plane BCG is parallel to plane _____.



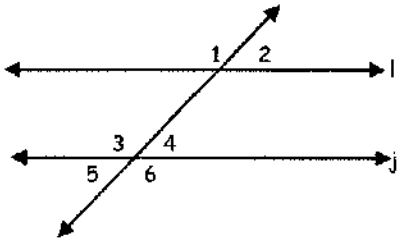
Use the diagram to complete the statement with corresponding, alternate interior, alternate exterior, or consecutive (same-side) interior then circle their relationship.



5. $\angle 3$ and $\angle 5$ are _____ angles.
   Congruent Supplementary
6. $\angle 2$ and $\angle 7$ are _____ angles.
   Congruent Supplementary
7. $\angle 2$ and $\angle 6$ are _____ angles.
   Congruent Supplementary
8. $\angle 4$ and $\angle 5$ are _____ angles.
   Congruent Supplementary
9. $\angle 3$ and $\angle 7$ are _____ angles.
   Congruent Supplementary

Find the measure of each angle Given: m $\angle 1 = 110^\circ$

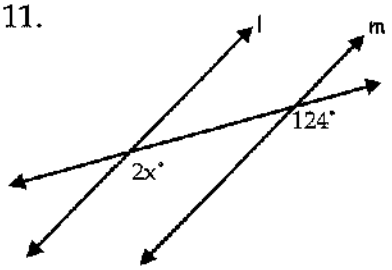
10.



m $\angle 2$ = _____
m $\angle 3$ = _____
m $\angle 4$ = _____
m $\angle 5$ = _____
m $\angle 6$ = _____

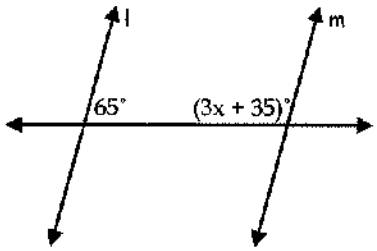
Name the angles and state the relationship. Then find the value of x.

11.



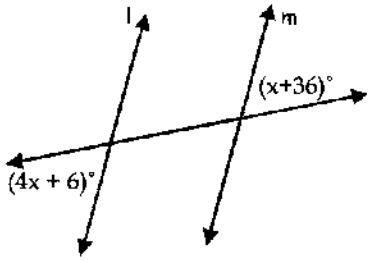
Name:
Relationship:
x = _____

12.



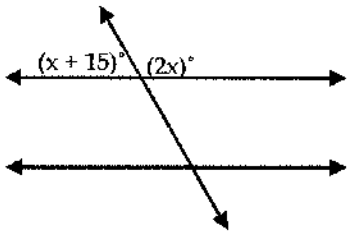
Name:
Relationship:
x = _____

13.



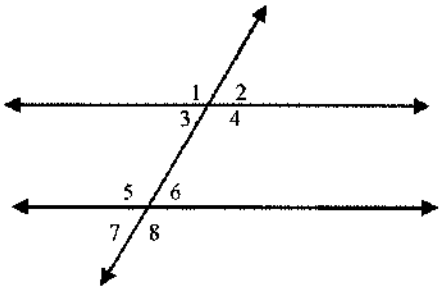
Name:
Relationship:
x = _____

14.



Name:
Relationship:
x = _____

Use the diagram to state whether the given angles are supplementary or congruent.



15. ∠2 and ∠6 are _____.

16. ∠3 and ∠5 are _____.

17. ∠1 and ∠2 are _____.

Find the slope of the line that passes through the given points.

18. Points A(2, 2) and B(-2, -6)

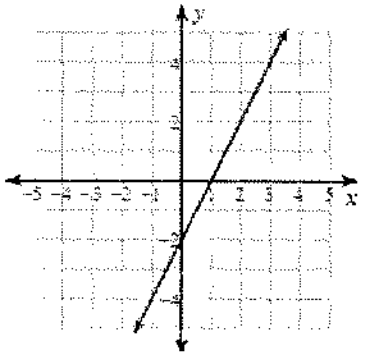
19. Points A(-6, -2) and B(6, 4)

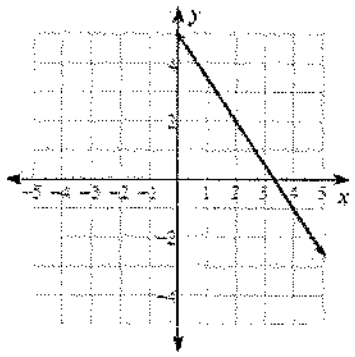
Determine if the following lines are parallel, perpendicular, or neither.

20. Line 1: through (-3, 1) and (-2, -4)
    Line 2: through (8, -6) and (7, -1)

21. Line 1: through (2, 2) and (9, 1)
    Line 2: through (4, 5) and (3, -2)

Find the slope of the line provided. Graph and state the slope of a line parallel and perpendicular.

22. 

23. 

Decide whether the lines with the given equations are perpendicular, parallel, or neither.

24. $m = 4$
    $m = 2$

25. $m = 2$
    $m = -\frac{1}{2}$

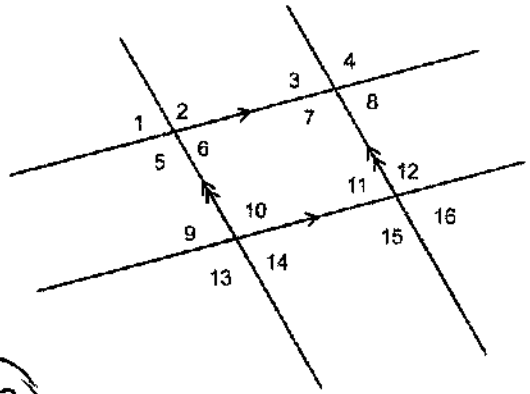
26. $m = 5$
    $m = 5$

27. $m = -\frac{3}{2}$
    $m = -\frac{2}{3}$

Using the drawing provided, write statements that proves the following are true.

28. Prove that < 12 *supplementary* < 1

29. Prove that $< 9 \cong < 3$



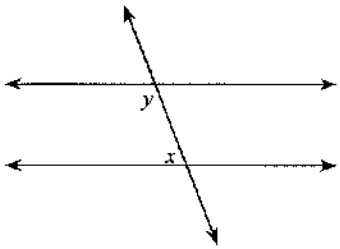
Geometry Name_____

Angle Relationships (EXTRA PRACTICE)

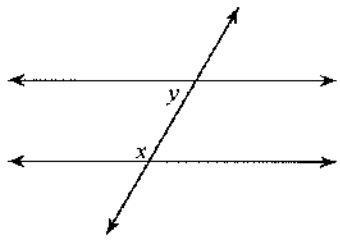
Period____

Identify each pair of angles as corresponding, alternate interior, alternate exterior, consecutive interior, vertical, or linear pair. State their relationship as congruent or supplementary.

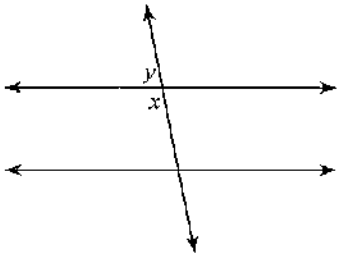
1)



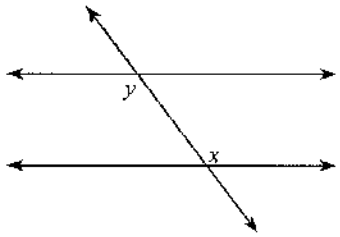
2)



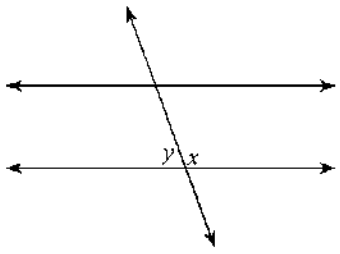
3)



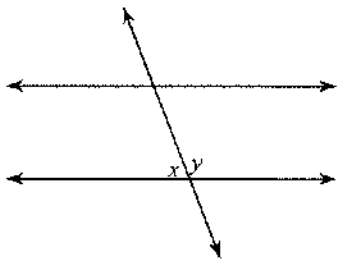
4)



5)

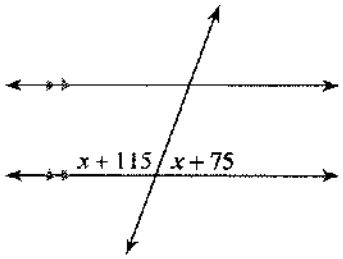


6)

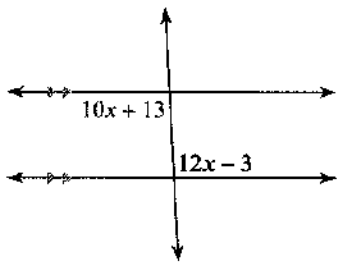


State the relationship and name of the angles. Then find the measure of the angle indicated in bold.

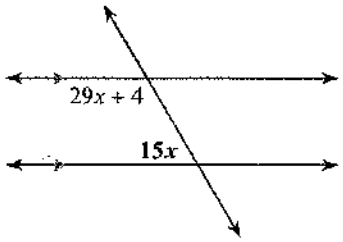
7)



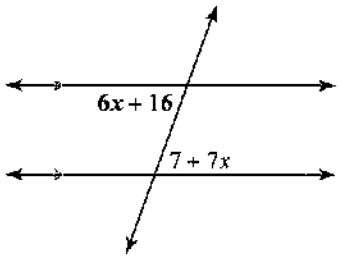
8)



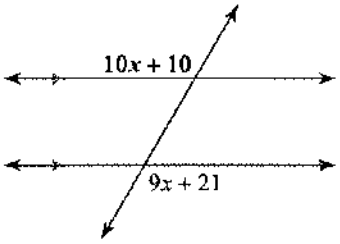
9)



10)



11)



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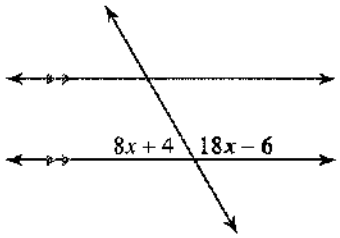
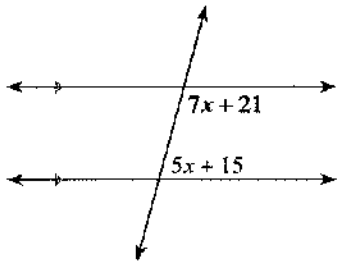


13)



14)