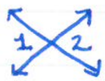
*Please name angles with 3 points when possible!

U4A
Day 1

4A.1 Properties of Parallel Lines, Triangles, Angles

Vertical Angles
Definition:
two angles whose sides form opposite rays



Theorem:
Vertical Angles are Congruent.

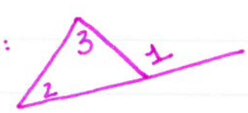
$\angle 1 \cong \angle 2$ b/c vertical angles are congruent.

Complementary Angles
Definition:
two angles whose measures have sum 90°

Supplementary Angles
Definition:
two angles whose measures have sum 180°

Triangle Sum Theorem:
The sum of the measures of the angles of a triangle is 180°. $m\angle A + m\angle B + m\angle C = 180°$

Triangle Exterior Angle Theorem:
The measure of each exterior angle of a triangle equals the sum of the measures of its two remote interior angles.

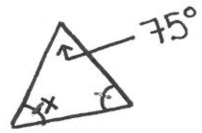
ex:


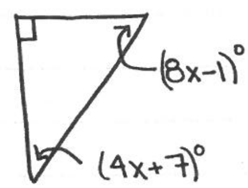
$m\angle 1 = m\angle 2 + m\angle 3$

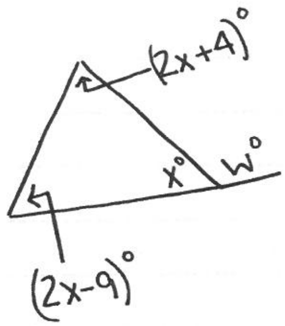
*side note: an exterior angle is formed when 1 side of the triangle is extended :)

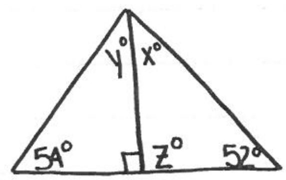
U4A
Day 1

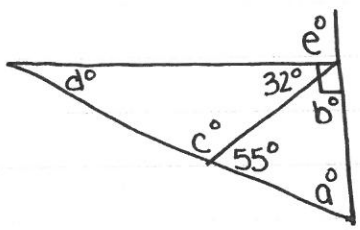
examples:

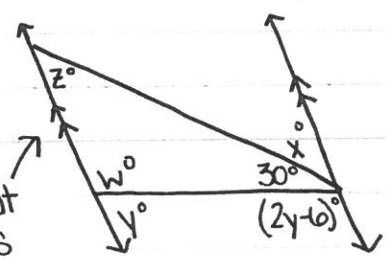
① 

② 

③ 

④ 

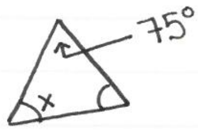
⑤ 

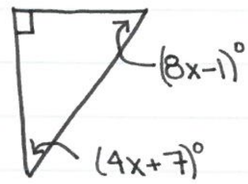
⑥ 

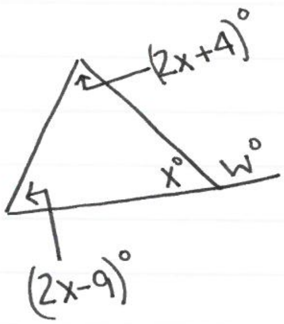
what does this mean?

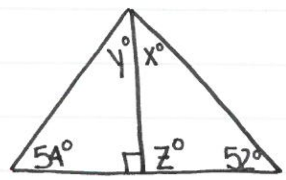
U4A
Day 1

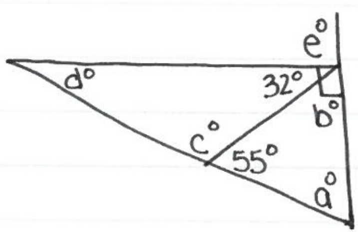
examples:

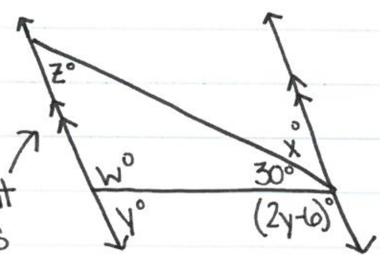
① 

② 

③ 

④ 

⑤ 

⑥ 

What does this mean?

1. $x + x + 75 = 180$
$2x = 105$
$x = 52.5$

2. $8x - 1 + 4x + 7 + 90 = 180$
$12x = 84$
$x = 7$

3. $x + 2x - 9 + 2x + 4 = 180$
$5x = 185$
$x = 37$
$w = 143$

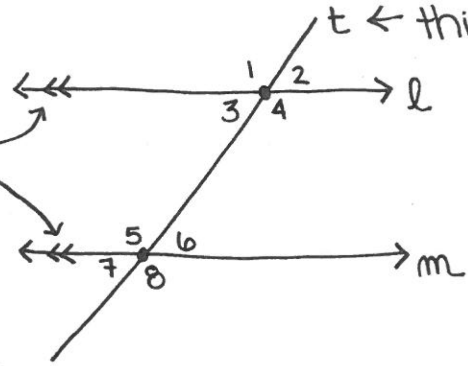
4. $z = 90$
$x = 38$
$y = 36$

5. $a = 67°$
$b = 58°$
$c = 125°$
$d = 23°$
$e = 90°$

6. $y + 2y - 6 = 180$
$y = 62$
$w = 118°$
$x = 32°$
$z = 32°$

U4A
Day 2

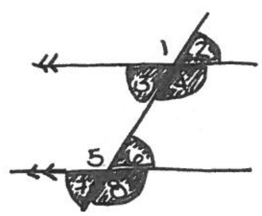
4A.2 Properties of Parallel Lines



t ← this is a transversal (a line that intersects 2 other lines at 2 distinct points)

these tell me that l is parallel to m or $l \parallel m$

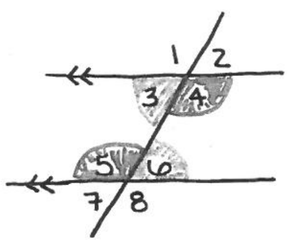
Corresponding Angles:



$\angle 1 \cong \angle 5$
$\angle 2 \cong \angle 6$
$\angle 3 \cong \angle 7$
$\angle 4 \cong \angle 8$

In Parallel Lines cut by a transversal,
Theorem: Corresponding Angles are congruent

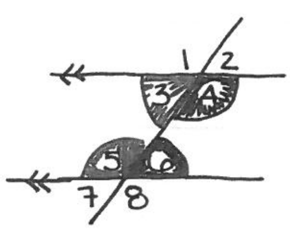
Alternate Interior Angles:



$\angle 3 \cong \angle 6$
$\angle 4 \cong \angle 5$

In Parallel Lines cut by a transversal,
Theorem: Alternating Interior Angles are Congruent

Same Side Interior Angles:

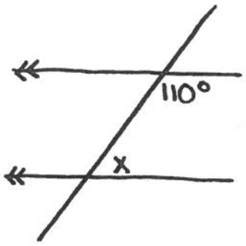


$\angle 3 \cong \angle 5$
$\angle 4 \cong \angle 6$

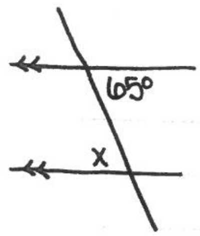
In Parallel Lines cut by a transversal,
Theorem: Same side Interior angles are Supplementary

U4-A
Day 2
Practice

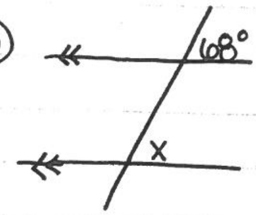
Solve for x:

1.


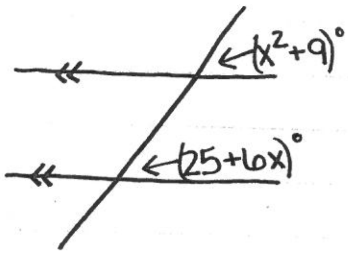
X = ______

2.


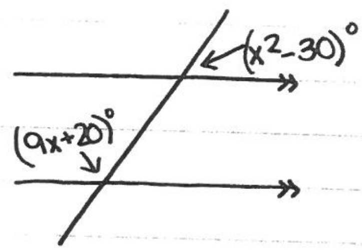
X = ______

3.


X = ______

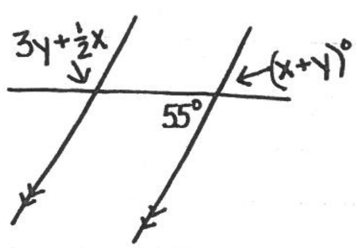
4.


X = ______

5.


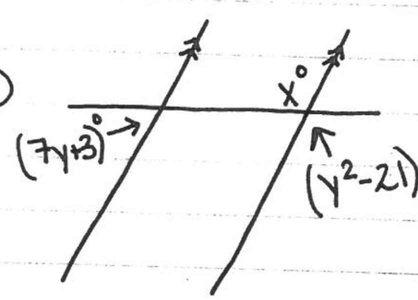
X = ______

Solve for x & y:

6.


X = ______

y = ______

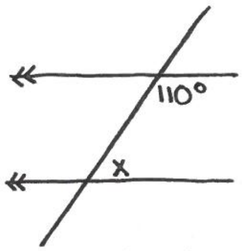
7.


X = ______

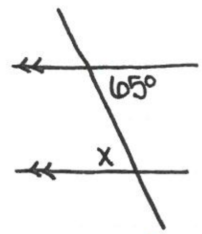
y = ______

U4-A
Day 2
Practice

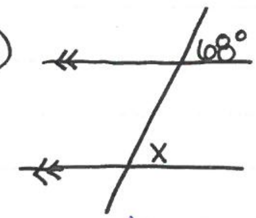
Solve for x:

① 

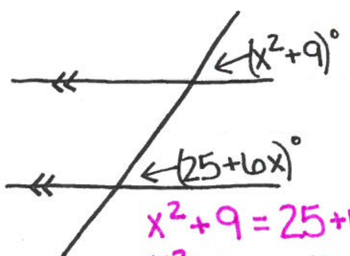
x = $70°$

② 

x = $65°$

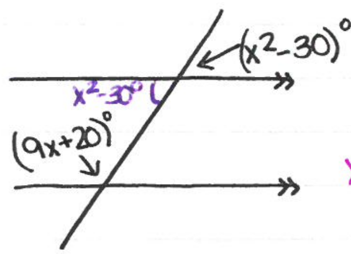
③ 

x = ~~112°~~ $68°$

④ 

$x^2+9=25+6x$
$x^2-6x-16=0$
$(x-8)(x+2)=0$

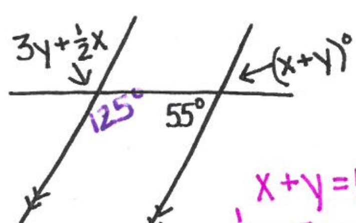
x = $x=8,-2$

⑤ 

$x^2-30+9x+20=180$
$x^2+9x-190=0$
$(x+19)(x-10)=0$

x = 10

Solve for x & y:

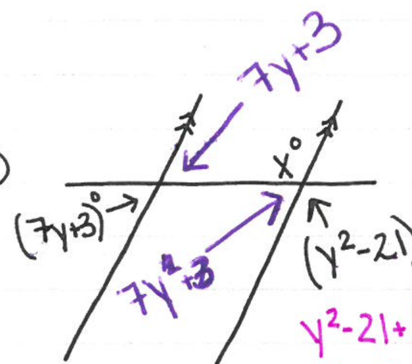
⑥ 

$x+y=55$
$\frac{1}{2}x+3y=125$

x = 16

y = 39

$-x-y=-55$
$x+6y=250$
$5y=195$

⑦ 

$y^2-21+7y+3=180$
$y^2+7y-198=0$
$(y+18)(y-11)=0$
$y=11$

x = 100

y = 11

Unit 4A
Day 3

Properties of Equality:

① Addition/Subtraction P.O.E → If $a=b$, then $a+c=b+c$.
If $a=b$, then $a-c=b-c$.

② Multiplication/Division P.O.E → If $a=b$, then $ac=bc$
If $a=b$, then $\frac{a}{c}=\frac{b}{c}$ $(c\neq 0)$

③ Reflexive
$a=a$

④ Symmetric
If $a=b$, then $b=a$

⑤ Transitive
If $a=b$ ∴ $b=c$
then $a=c$

⑥ The distributive property: $a(b+c)=ab+ac$
also $ab+ac=a(b+c)$

Properties of Congruence:

⑦ Reflexive:
$\overline{AB}\cong\overline{AB}$
or
$\angle A\cong\angle A$

⑧ Symmetric:
If $\overline{AB}\cong\overline{CD}$, then $\overline{CD}\cong\overline{AB}$
or
If $\angle A\cong\angle B$, then $\angle B\cong\angle A$

⑨ Transitive:
If $\overline{AB}\cong\overline{CD}$ and $\overline{CD}\cong\overline{EF}$, then $\overline{AB}\cong\overline{EF}$.
or
If $\angle A\cong\angle B$ and $\angle B\cong\angle C$, then $\angle A\cong\angle C$.

Unit 4A
Day 3

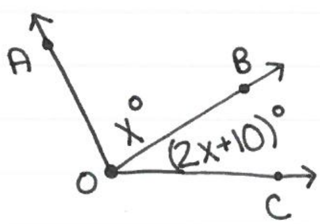
"Justifying" your steps in an equation

① $\frac{1}{3}x - 5 = 10$ given
$\frac{1}{3}x = 15$ addition p.o.e
$x = 45$ mult. p.o.e

② $2(x-3) = 10$ given
$2x - 6 = 10$ distributive property
$2x = 16$ addition p.o.e
$x = 8$ division p.o.e

③ $3x + 5(x-2) + 7 = 6x + 3$ given
$3x + 5x - 10 + 7 = 6x + 3$ distributive p.o.e
$8x - 3 = 6x + 3$ substitution/simplify
$2x - 3 = 3$ subtraction p.o.e
$2x = 6$ add. p.o.e
$x = 3$ division p.o.e

④ Given:
$m\angle AOC = 139$



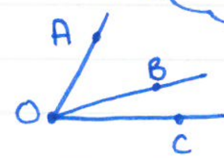
See next page...

$m\angle AOB + m\angle BOC = m\angle AOC$ Angle Addition Postulate
$x + 2x + 10 = 139$ substitution
$3x + 10 = 139$ simplify
$3x = 129$ subtraction p.o.e
$x = 43$ division p.o.e

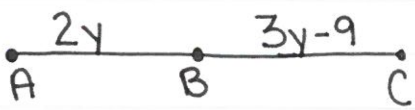
U4A
Day 3

Segment Addition Postulate:
If 3 points are collinear and B is between A and C, then $AB + BC = AC$

Angle Addition Postulate:
If B is a point on the interior of $\angle AOC$, then $m\angle AOB + m\angle BOC = m\angle AOC$



5



$AC = 21$

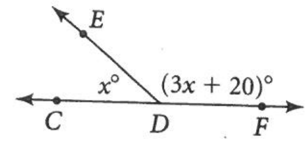
$AB + BC = AC$	Seg. Add. Post.
$2y + 3y - 9 = 21$	Substitution
$5y - 9 = 21$	Simplify
$5y = 30$	Add POE
$y = 6$	Division POE

you try...

Day 5

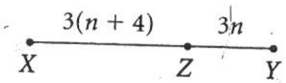
Algebra **Fill in the reason that justifies each step.**

1. Solve for x.



$m\angle CDE + m\angle EDF = 180$	**a.** ?
$x + (3x + 20) = 180$	**b.** ?
$4x + 20 = 180$	**c.** ?
$4x = 160$	**d.** ?
$x = 40$	**e.** ?

2. Solve for n.



Given: $XY = 42$

$XZ + ZY = XY$	**a.** ?
$3(n + 4) + 3n = 42$	**b.** ?
$3n + 12 + 3n = 42$	**c.** ?
$6n + 12 = 42$	**d.** ?
$6n = 30$	**e.** ?
$n = 5$	**f.** ?

Algebra **Give a reason for each step.**

3.

$\frac{1}{2}x - 5 = 10$	Given
$2\left(\frac{1}{2}x - 5\right) = 20$	**a.** ?
$x - 10 = 20$	**b.** ?
$x = 30$	**c.** ?

4.

$5(x + 3) = -4$	Given
$5x + 15 = -4$	**a.** ?
$5x = -19$	**b.** ?
$x = -\frac{19}{5}$	**c.** ?

Name the property that justifies each statement.

5. $\angle Z \cong \angle Z$
6. $2(3x + 5) = 6x + 10$
7. If $12x = 84$, then $x = 7$.
8. If $\overline{ST} \cong \overline{QR}$, then $\overline{QR} \cong \overline{ST}$.
9. If $m\angle A = 15$, then $3m\angle A = 45$.
10. $XY = XY$
11. If $3x + 14 = 80$, then $3x = 66$.
12. If $KL = MN$, then $MN = KL$.
13. If $2x + y = 5$ and $x = y$, then $2x + x = 5$.
14. If $AB - BC = 12$, then $AB = 12 + BC$.
15. If $\angle 1 \cong \angle 2$ and $\angle 2 \cong \angle 3$, then $\angle 1 \cong \angle 3$.

Use the given property to complete each statement.

16. Addition Property of Equality
If $2x - 5 = 10$, then $2x =$?.

17. Subtraction Property of Equality
If $5x + 6 = 21$, then ? $= 15$.

18. Symmetric Property of Equality
If $AB = YU$, then ?.

19. Symmetric Property of Congruence
If $\angle H \cong \angle K$, then ? $\cong \angle H$.

20. Reflexive Property of Congruence
$\angle PQR \cong$?

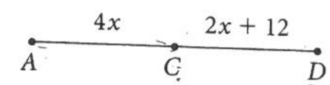
21. Distributive Property
$3(x - 1) = 3x -$?

22. Substitution Property
If $LM = 7$ and $EF + LM = NP$, then ? $= NP$.

23. Transitive Property of Congruence
If $\angle XYZ \cong \angle AOB$ and $\angle AOB \cong \angle WYT$, then ?.

24. Multiplication Property of Equality
If $\frac{1}{3}TR = UW$, then ?.

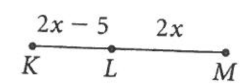
27. **Algebra** Fill in the reason that justifies each step.



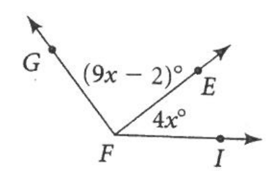
Given: C is the midpoint of $\overline{AD}$.

C is the midpoint of $\overline{AD}$.	**a.** ?
$AC = CD$	**b.** ?
$4x = 2x + 12$	**c.** ?
$2x = 12$	**d.** ?
$x = 6$	**e.** ?

28. **Algebra** In the figure at the right, $KM = 35$.
a. Solve for x. Justify each step.
b. Find the length of $\overline{KL}$.



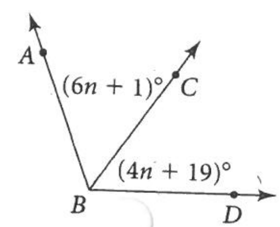
29. **Algebra** In the figure at the right, $m\angle GFI = 128$.
a. Solve for x. Justify each step.
b. Find $m\angle EFI$.



30. **Algebra** Fill in the reason that justifies each step.

Given: $\overrightarrow{BC}$ bisects $\angle ABD$.

$\overrightarrow{BC}$ bisects $\angle ABD$.	**a.** ?
$m\angle ABC = m\angle CBD$	**b.** ?
$6n + 1 = 4n + 19$	**c.** ?
$2n = 18$	**d.** ?
$n = 9$	**e.** ?



4A-4... Proving Lines Parallel   U4A day 4

Converse of Corresponding Angles Postulate:
If 2 lines & a transversal form corresponding angles that are congruent,
then the two lines are parallel.

Converse of the Alternate Interior Angles Theorem:
If 2 lines & a transversal form alternate interior angles that are congruent,
then the two lines are parallel.

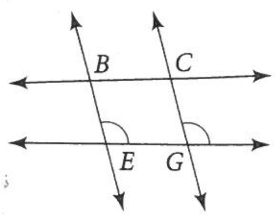
Converse of the Same Side Interior Angles Theorem:
If 2 lines & a transversal form same-side interior angles that are supplementary,
then the two lines are parallel.

thm:
If 2 lines are ∥ to the same line, then they are ∥ to each-other.

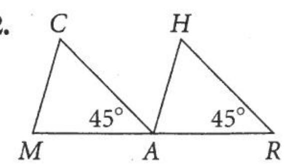
thm:
If (in a plane) 2 lines are ⊥ to the same line, then they are ∥ to eachother.

Developing Proof **Which lines or segments are parallel? Justify your answer with a theorem or postulate.**

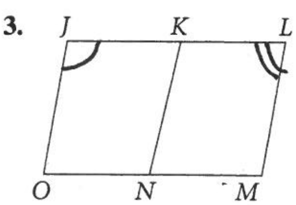
1.



2.



3.



$m\angle J + m\angle L = 180$

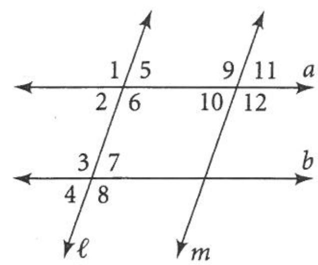
1. $\overleftrightarrow{BE} \parallel \overleftrightarrow{CG}$
conv of corr. ∠'s thm

2. $\overleftrightarrow{CA} \parallel \overleftrightarrow{HR}$
conv of corr ∠'s thm

3. $\overleftrightarrow{JO} \parallel \overleftrightarrow{LM}$
conv of same side int ∠'s thm

U4A day 4

Developing Proof **Using the given information, which lines, if any, can you conclude are parallel? Justify each conclusion with a theorem or postulate.**



4. $\angle 2$ is supplementary to $\angle 3$.

5. $\angle 6$ is supplementary to $\angle 7$.

6. $\angle 4$ is supplementary to $\angle 8$.

7. $m\angle 7 = 70, m\angle 9 = 110$

8. $\angle 1 \cong \angle 3$ **9.** $\angle 9 \cong \angle 12$

10. $\angle 3 \cong \angle 6$ **11.** $\angle 2 \cong \angle 10$

12. $\angle 1 \cong \angle 6$ **13.** $\angle 8 \cong \angle 6$ **14.** $\angle 11 \cong \angle 7$ **15.** $\angle 5 \cong \angle 10$

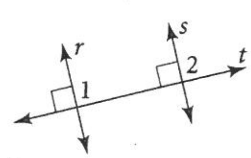
4. a ∥ b - conv of s.s.i ∠'s thm
5. a ∥ b - conv of ssi ∠'s thm
6. none
7. none
8. a ∥ b - conv of cor. ∠'s post
9. none
10. a ∥ b - conv of a.i. ∠'s thm
11. ℓ ∥ m - conv of cor. ∠'s post
12. none
13. a∥b - conv. of. corr ∠'s post.
14. none
15. ℓ ∥ m - conv. of alt int ∠'s thm

16. Developing Proof Complete this flow proof of Theorem 3-6.

In a plane, if two lines are perpendicular to the same line, then they are parallel to each other.

Given: $r \perp t, s \perp t$

Prove: $r \parallel s$



$r \perp t$ (Given) → $\angle 1$ is a right angle. (**a.** ?) → $\angle 1 \cong \angle 2$ (**c.** ?) → $r \parallel s$ (**d.** ?)

$s \perp t$ (**b.** ?) → $\angle 2$ is a right angle. (Definition of perpendicular lines) → $\angle 1 \cong \angle 2$

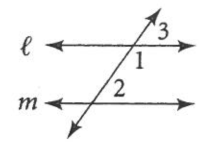
a. ⊥ lines form 4 rt angles
b. given
c. right ∠'s are ≅
d. conv of corr ∠'s post.

17. Developing Proof Complete this paragraph proof of Theorem 3-4.

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

Given: $\angle 1$ and $\angle 2$ are supplementary.

Prove: $\ell \parallel m$



Proof: $\angle 2$ is a supplement of **a.** _?_ and $\angle 3$ is a supplement of **b.** _?_. Since supplements of the same angle are congruent, **c.** _?_ $\cong$ **d.** _?_. Since $\angle 2$ and $\angle 3$ are also corresponding angles, $\ell \parallel m$ by the **e.** _?_ Postulate.

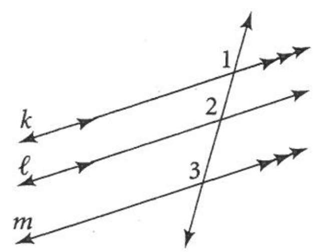
a. <1
b. <1
c. <3
d. <4
e. conv. of the corr. <'s

26. Developing Proof Copy and complete the paragraph proof of Theorem 3-5 for three coplanar lines.

If two lines are parallel to the same line, then they are parallel to each other.

Given: $\ell \parallel k$ and $m \parallel k$

Prove: $\ell \parallel m$



Proof: $\ell \parallel k$ means that $\angle 2 \cong \angle 1$ by the **a.** _?_ Postulate. $m \parallel k$ means that **b.** _?_ $\cong$ **c.** _?_ for the same reason. By the Transitive Property of Congruence, $\angle 2 \cong \angle 3$. By the **d.** _?_ Postulate, $\ell \parallel m$.

a. corr <'s
b. <1
c. <3
d. conv of the corr. <'s

● **Lesson 2-4 Algebra You are given that $2c^2 = 2bc + \frac{ac}{2}$ with $c \neq 0$. Show that $4b = 4c - a$ by filling in the blanks.**

13. a. $2c^2 = 2bc + \frac{ac}{2}$ — **a.** Given

b. $4c^2 = 4bc + ac$ — **b.** _?_ and _?_ ← Multiplication POE. ← Distributive Prop.

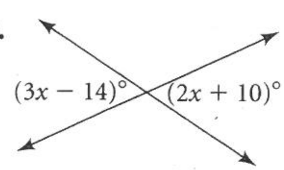
c. $4c = 4b + a$ — **c.** _?_ and Distributive Property Division

d. 4c - a = 4b — **d.** Subtraction Property

e. $4b = 4c - a$ — **e.** _?_ Symmetric

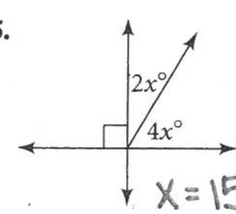
● **Lesson 2-5 Algebra Find the value of x.**

14.



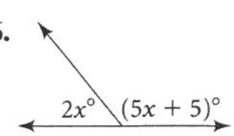
X = 24

15.



X = 15

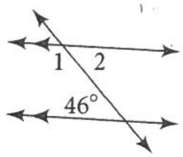
16.



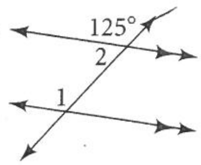
X = 25

Lesson 3-1 Find $m\angle 1$ and then $m\angle 2$. State the theorems or postulates that justify your answers.

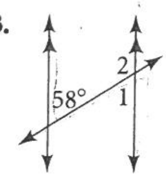
1.



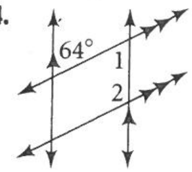
2.



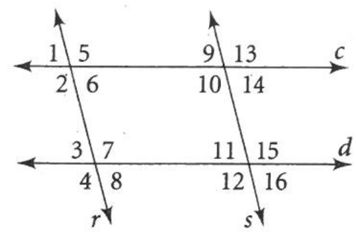
3.



4.



Lesson 3-2 Refer to the diagram at the right. Use the given information to determine which lines, if any, must be parallel. If any lines are parallel, use a theorem or postulate to tell why.



5. $\angle 9 \cong \angle 14$

6. $\angle 1 \cong \angle 9$

7. $\angle 2$ is supplementary to $\angle 3$.

8. $\angle 7 \cong \angle 14$

9. $m\angle 6 = 60, m\angle 13 = 120$

10. $\angle 4 \cong \angle 13$

11. $\angle 3$ is supplementary to $\angle 10$.

12. $\angle 10 \cong \angle 15$

1. m∠1 = 134° SSI∠ thm
   m∠2 = 46° AI∠'s thm

2. m∠1 = 125° Corr ∠'s Post.
   m∠2 = 55° Linear Pair

3. m∠1 = 58° AI∠'s thm
   m∠2 = 122° SSI∠ thm

4. m∠1 = 64° AI∠'s thm
   m∠2 = 116° SSI∠'s thm

5. none
6. r ∥ s corr ∠'s post.
7. c ∥ d a.i. ∠'s thm
8. none
9. r ∥ s linear pair & corr ∠'s post.
10. none
11. none
12. c ∥ d a.i. ∠'s thm

4A.5 - Proving Δ's similar

From the past:

Solve: ① $\frac{x}{6} = \frac{6}{9}$

$9x = 36$

$x = 4$

② $\frac{x+3}{5} = \frac{8}{2x+8}$

$(x+3)(2x+8) = 40$

$2x^2 + 14x + 24 = 40$

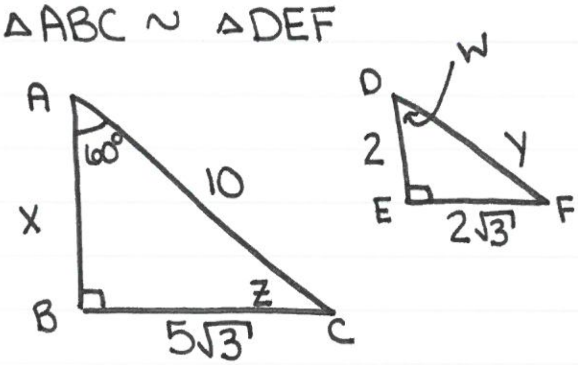
$x^2 + 7x - 8 = 0$

$(x+8)(x-1) = 0$

$x = -8 \quad x = 1$

Find x, y, z, w:

ΔABC ~ ΔDEF



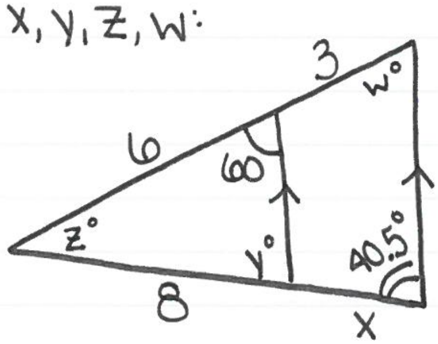
$\frac{5\sqrt{3}}{2\sqrt{3}} = \frac{x}{2}$

$\boxed{5 = x}$

$\frac{5}{2} = \frac{10}{y}$ $\boxed{y = 4}$

$\boxed{\begin{gathered} w = 60° \\ z = 30° \end{gathered}}$

Find x, y, z, w:



$\frac{6}{3} = \frac{8}{x}$ $\boxed{x = 4}$

$\boxed{\begin{gathered} y = 40.5° \\ w = 60° \\ z = 79.5° \end{gathered}}$

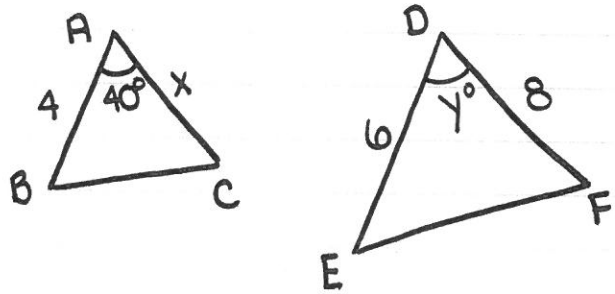
4A.5 - Proving Triangles are Similar

"Similar" - two polygons are similar if corresponding angles are congruent and corresponding sides are proportional

$\sim$ means "similar to"

* in a dilation, the preimage and the image are similar.

ex. find the values of the variables:



given:
$\triangle ABC \sim \triangle DEF$

$x =$ ______

$y =$ ______

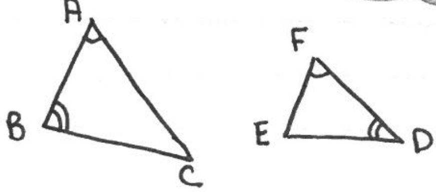
When triangles are similar, there are
3 pairs of congruent angles ← "A"
AND
3 pairs of proportional sides ← "S"

To PROVE two triangles are similar, we don't need all 6 pairs from above.

AA$\sim$ SSS$\sim$ SAS$\sim$

AA$\sim$ Postulate: If 2 ∠'s of 1 △ are ≅ to 2 ∠'s of another △, then the triangles are similar.

ex:

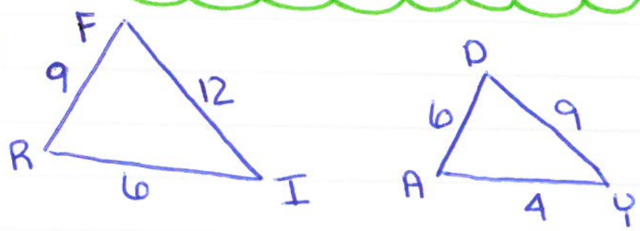


$\triangle ABC \sim \triangle$ ______

by ∠ ______

SSS ~ Theorem: If the corresponding sides of 2 △'s are proportional, then the triangles are similar.

ex:



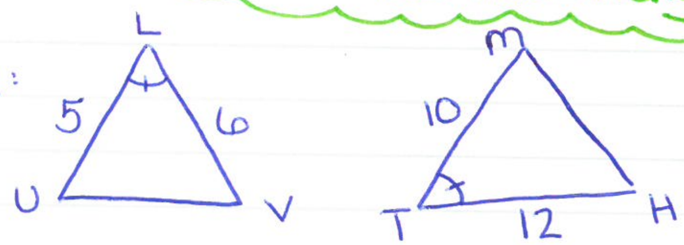
$\triangle FRI \sim \triangle \underline{DAY}$

by $\underline{\text{SSS} \sim}$

(scale factor is $\frac{2}{3}$)

SAS ~ Theorem: If one angle of one triangle is congruent to an angle of a second triangle, AND the sides "including" the two angles are proportional, then the two triangles are similar.

ex:



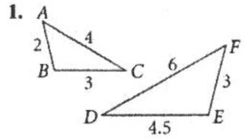
$\triangle LUV \sim \triangle \underline{TMH}$

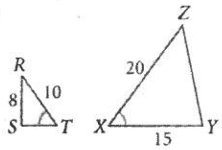
by $\underline{\text{SAS} \sim}$

(scale factor is 2)

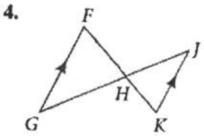
Unit 4A
Day 5

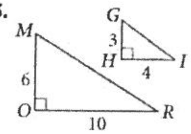
Can you conclude the triangles are similar? If so, write a similarity statement and name the postulate or theorem you used. If not, explain.

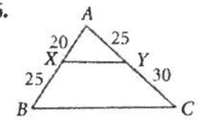
1.


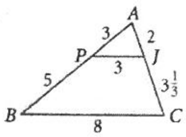
2.


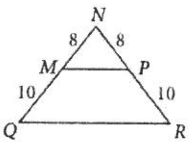
Are the triangles similar? If so, write a similarity statement and name the postulate or theorem you used. If not, explain.

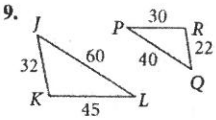
4.


5.


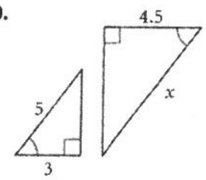
6.


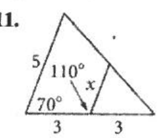
7.


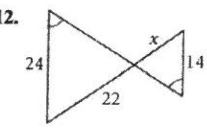
8.


9.


Algebra Explain why the triangles are similar. Then find the value of x.

10.


11.


12.


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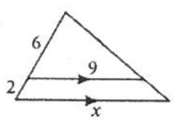
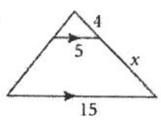
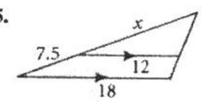
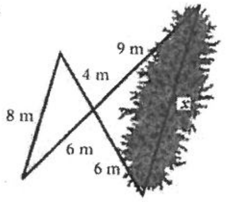
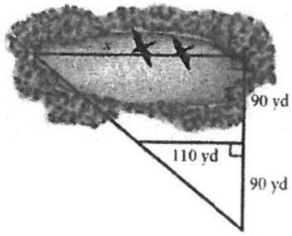


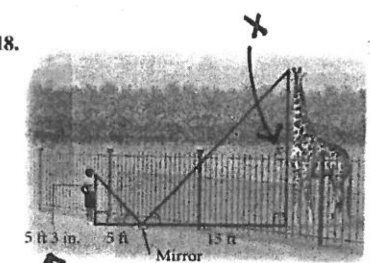
14.


15.


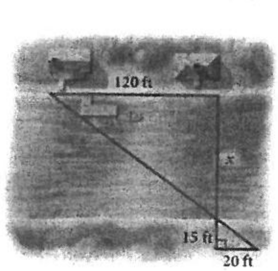
Indirect Measurement Explain why the triangles are similar. Then find the distance represented by x.

16.


17.


18.


5.25

19.


1. $\triangle ABC \sim \triangle FED$; SSS~
2. no
4. $\triangle FGH \sim \triangle KJH$; AA~
5. no
6. no
7. $\triangle APJ \sim \triangle ABC$; SSS~
8. $\triangle NMP \sim \triangle NQR$; SAS~
9. no

10. AA~ $\frac{x}{5} = \frac{4.5}{3}$ $\boxed{x=7.5}$

11. AA~ $\frac{3}{6} = \frac{x}{5}$ $\boxed{x=2.5}$

12. AA~ $\frac{x}{22} = \frac{14}{24}$ $\boxed{x=\frac{77}{6}}$

13. $\frac{6}{8} = \frac{9}{x}$ $\boxed{x=12}$ AA~

14. AA~ $\frac{4}{5} = \frac{4+x}{15}$ $\boxed{x=8}$

15. AA~ $\frac{x}{x+7.5} = \frac{12}{18}$ $\boxed{x=15}$ $3x = 2x + 15$

16. SAS~ $\frac{4}{6} = \frac{8}{x}$ $\boxed{x=12}$

17. AA~ $\frac{90}{110} = \frac{180}{x}$ $\boxed{x=220}$

18. AA~ x = 15ft 9in
19. AA~ x = 90ft