GEOMETRY 21 MID-TERM EXAM REVIEW

Name: ANSWERS Period: 2014

Note to student: This packet should be used as practice for the Geometry 21 midterm exam. This should not be the only tool that you use to prepare yourself for the exam. You must go through your notes, re-do homework problems, class work problems, formative assessment problems, and questions from your tests and quizzes throughout the year thus far. The sections from the book that are covered on the midterm exam are:

Chapter 1	
1-1	Visualizing Geometry
1-2	Points, Lines, and Planes
1-3	Measuring Segments
1-4	Measuring Angles
1-5	Angle pairs
1-6	Basic Constructions
Chapter 2	
2-2	Conditional Statements
2-3	Biconditionals and Definitions
2-4	Deductive Reasoning
2.5	Reflexive, symmetric, etc
2-6	Proving Angles Congruent
Chapter 3	
3-1	Lines and Angles
3-2	Properties of Parallel Lines
3-3	Proving Lines Parallel
3-4	Parallel and Perpendicular Lines
3-5	Parallel Lines and Triangles
3-6	Constructing Parallel and Perpendicular Lines
Chapter 4	
4-1	Define congruent figures
4-2	Triangle Congruence by SSS and SAS
4-3	Triangle Congruence by ASA and AAS
4-4	Using Corresponding Parts of Congruent Triangles
4-5	Isosceles and Equilateral Triangles
4-6	Congruence in Right Triangles
4-7	Congruence in Overlapping Triangles
Chapter 5	
5-1	Midsegments of Triangles
5-2	Perpendicular and Angle Bisectors
5-3	Bisectors in Triangles
5-4	Medians and Altitudes
5-5	Indirect proofs
5-6	Inequalities in one triangle
Chapter 6	
6-1	The Polygon-Angle Sum Theorems
6-2	Properties of Parallelograms
6-3	Proving that a Quadrilateral Is a Parallelogram
GOOD LUCK!	

Suppose J is between H and K. Use the segment Addition Postulate to solve for the given variable and find the length of each segment.

H J K

1. $HJ = 3(x + 2)$ (27)
   $JK = 3x - 4$ (17)
   $KH = 44$ (x=7)
   $3(x+2) + 3x - 4 = 44$
   $3x+6+3x-4$
   $6x+2=44$
   $6x=42$

2. $HJ = 8x - 3$ (45)
   $JK = 12x - 5$ (67)
   $KH = 112$
   $8x-3+12x-5=112$
   $20x-8=112$
   $20x=120$
   $x=6$

3. $HJ = \frac{1}{3}x + 4$ ($7\frac{2}{3}$)
   $JK = 2x + \frac{2}{3}$ ($22\frac{2}{3}$)
   $KH = 2\frac{2}{3}x + 1$ ($30\frac{1}{3}$) (x=11)
   $\frac{1}{3}x+4+2x+\frac{2}{3} = 2\frac{2}{3}x+1$
   $2\frac{1}{3}x+4\frac{2}{3} = 2\frac{2}{3}x+1$
   $3\frac{2}{3} = \frac{1}{3}x$

Let Q be in the interior of ∠POR. Use the Angle Addition Postulate to solve for x. Find the measure of each angle.

4. $m\angle POQ = (x + 4)°$ (12°)
   $m\angle QOR = (2x - 2)°$ (14°)
   $m\angle POR = 26°$
   $x+4+2x-2=26$
   $3x+2=26$
   $3x=24$ (x=8)

5. $m\angle POQ = (3x + 7)°$ (28°)
   $m\angle QOR = (5x - 2)°$ (33°)
   $m\angle POR = 61°$
   $3x+7+5x-2=61$
   $8x+5=61$
   $8x=56$ (x=7)

6. $m\angle POQ = (\frac{1}{3}x + \frac{1}{3})°$ ($2\frac{2}{3}°$)
   $m\angle QOR = (2x + \frac{4}{3})°$ ($3\frac{1}{3}°$)
   $m\angle POR = (5x - 1)°$ (4°)
   $\frac{1}{3}x+\frac{1}{3}+2x+\frac{4}{3} = 5x-1$
   $2\frac{1}{3}x+\frac{5}{3} = 5x-1$
   $\frac{8}{3} = 2\frac{2}{3}x$ (x=1)

7. $\overrightarrow{MO}$ bisects ∠LMN. If $m\angle LMO = (x^2 + 4x - 5)°$ and $m\angle LMN = (9x + 5)°$, solve for x and find $m\angle NMO$.

$2(x^2+4x-5) = 9x+5$
$2x^2+8x-10 = 9x+5$
$2x^2-x-15=0$
$(2x+5)(x-3)=0$
$x = -\frac{5}{2}, 3$

$x=3$
$m\angle NMO = 16°$

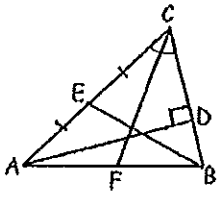
8. Through any two points there is exactly one line.

9. The intersection point of the perpendicular bisectors of a triangle is the center of the circumscribed circle of the triangle.

For questions 10 and 11, refer to the figure at the right.

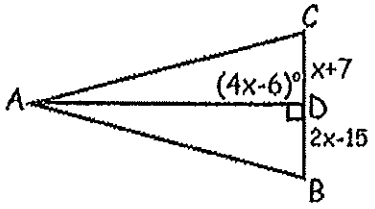
10. $\overline{EB}$ is a median of ΔABC

11. $\overline{AD}$ is an altitude of ΔABC.



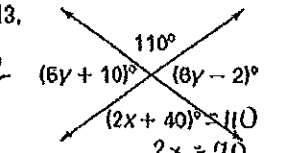
12. Find the value of x if $\overline{AD}$ is an altitude of ΔABC.

$4x-6=90$
$4x=96$
$x=24$



Find the value(s) of the variable(s).

13.



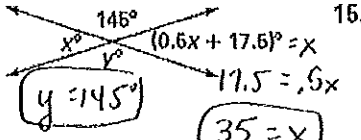
$5y+10=6y-2$

$12=y$

$2x=70$

$x=35°$

14.

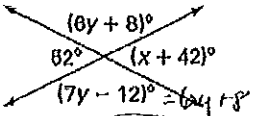


$y=145°$

$17.5=.5x$

$35=x$

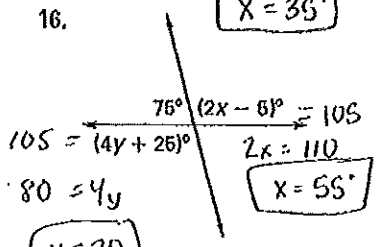
15.



$x=10$

$y=20$

16.



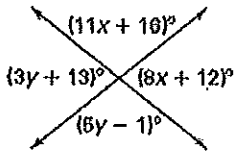
$2x=110$

$x=55°$

$80=4y$

$y=20$

17.



$3y+13+5y-1=180$

$8y+12=180$

$8y=168$

$y=21$

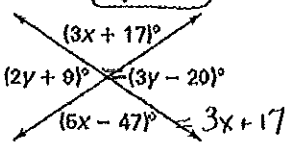
$11x+8x+12=180$

$19x+28=180$

$19x=152$

$x=8$

18.



$2x=64$

$x=32$

$y=29$

In Exercises 19 and 20, assume that $\angle A$ is supplementary to $\angle B$ and complementary to $\angle C$. Determine $m\angle A$, $m\angle B$, and $m\angle C$.

19. $m\angle A = (x + 10)°$, $m\angle B = (12x + 1)°$, $m\angle C = (5x + 2)°$

$x+10+12x+1=180$

$13x+11=180$

$13x=169$

$x=13$

$x+10+5x+2=90$

$6x+12=90$

$6x=78$

$x=13$

$m\angle A=23°$

$m\angle B=157°$

$m\angle C=67°$

20. $m\angle A = (2.5x + 17)°$, $m\angle B = (21x - 25)°$, $m\angle C = (8x - 11)°$

$2.5x+17+21x-25=180$

$23.5x+\overline{-}8=180$

$23.5x=188$

$x=8$

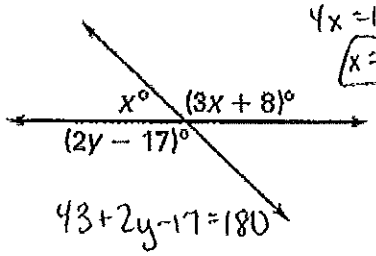
$m\angle A=37°$

$m\angle B=143°$

$m\angle C=53°$

Find the values of the variables.

21.



$4x+8=180$

$4x=172$

$x=43$

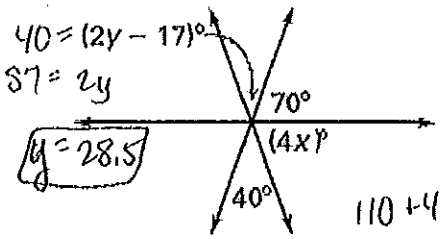
$43+2y-17=180$

$26+2y=180$

$2y=154$

$y=77$

22.



$57=2y$

$y=28.5$

$110+4x=180$

$4x=70$

$x=17.5$

Write the conditional and converse of the statement, and determine if the converse is true. If it is not, write a counterexample.

23. If an angle measure is 32 degrees, then it is an acute angle.

If an $\angle$ is acute, then the $\angle$ measures 32°

False [40° is acute also.]

24. A right triangle has two acute angles.

If a $\triangle$ is right, then it has 2 acute $\angle$s. TRUE

If a $\triangle$ has 2 acute $\angle$s, then it is right. FALSE

→ obtuse $\triangle$s also have 2 acute $\angle$s

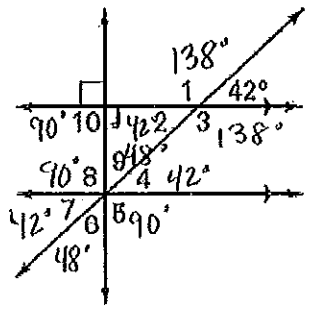
25. When $x = 3, x^2 = 9$

If $x = 3$, then $x^2 = 9$ True

If $x^2 = 9$, then $x = 3$ False [x could be -3]

Find the measure of all labeled angles in the diagram.

26.



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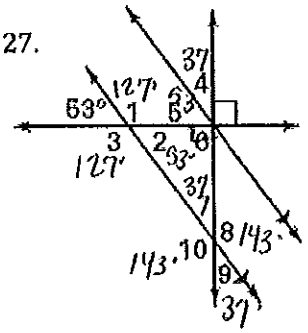
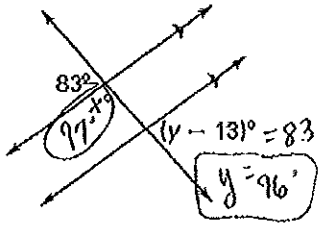


Find the value of x and y.

28.



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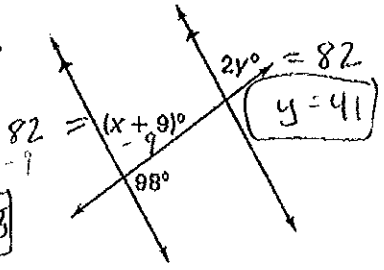

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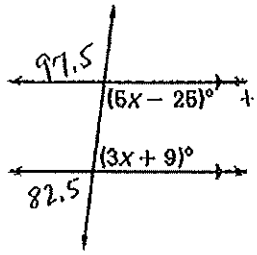


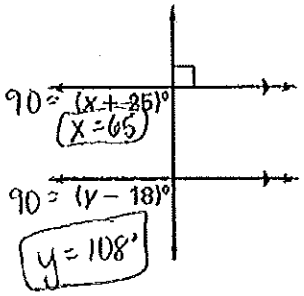
3x + 9 = 180

8x − 16 = 180

8x = 196

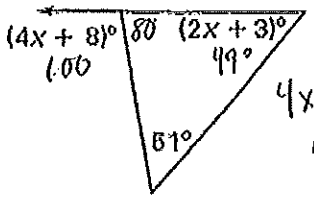
x = 24.5

31.



Solve for the given variable and find the angle measures.

32.



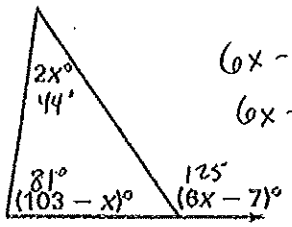
$4x+8=2x+3+51$

$4x+8=2x+54$

$2x=46$

$x=23$

33.



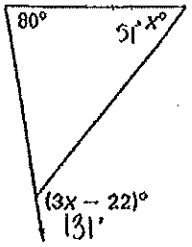
$6x-7=2x+103-x$

$6x-7=x+103$

$5x=110$

$x=22$

34.

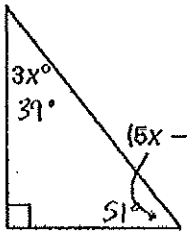


$3x-22=80+x$

$2x=102$

$x=51°$

35.



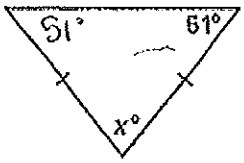
$(5x-14)°+3x=90$

$8x-14=90$

$8x=104$

$x=13$

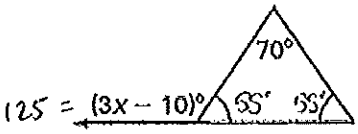
36.



$102+x=180$

$x=78$

37.

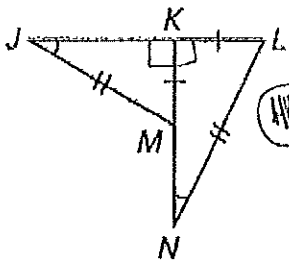


$135=3x$

$45=x$

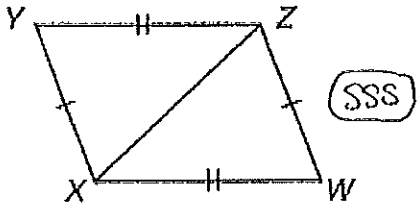
Name which triangle congruence theorem or postulate you would use to prove the triangles congruent.

38.



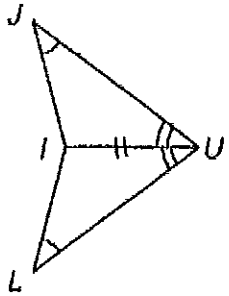
HL or AAS

39.



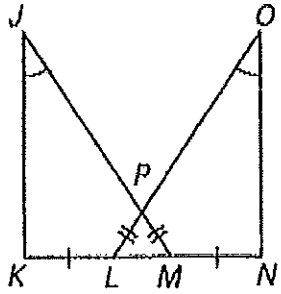
SSS

40.



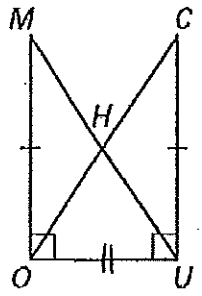
AAS

41.



AAS

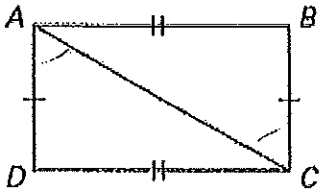
42.



SAS

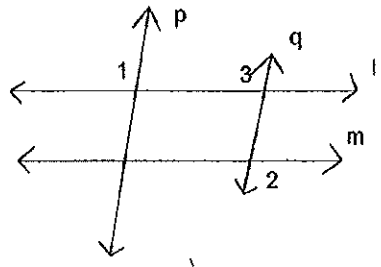
Write a two-column proof for each of the following.

43. Given: $\overline{AD} \cong \overline{BC}$; $\overline{AB} \cong \overline{DC}$
Prove: $\overline{AD} \parallel \overline{BC}$



S	R
① $\overline{AD} \cong \overline{BC}$; $\overline{AB} \cong \overline{DC}$	① Given
② $\overline{AC} \cong \overline{CA}$	② Reflexive
③ $\triangle ABC \cong \triangle CDA$	③ SSS
④ $\angle DAC \cong \angle BCA$	④ CPCTC
⑤ $\overline{AD} \parallel \overline{BC}$	⑤ Converse of Alt. Int. $\angle$s thm.

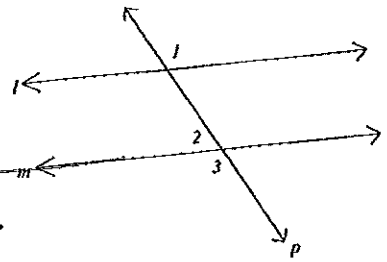
44. Given: $p \parallel q$; $\angle 1 \cong \angle 2$
Prove: $l \parallel m$



S	R
① $p \parallel q$; $\angle 1 \cong \angle 2$	① Given
② $\angle 3 \cong \angle 1$	② Corresp $\angle$'s thm
③ $\angle 1 \cong \angle 2$	③ Given
④ $\angle 3 \cong \angle 2$	④ transitive
⑤ $l \parallel m$	⑤ Converse of alt. int. $\angle$s thm

45. Given: $l \| m$

Prove: $\angle 1$ and $\angle 2$ are supplementary

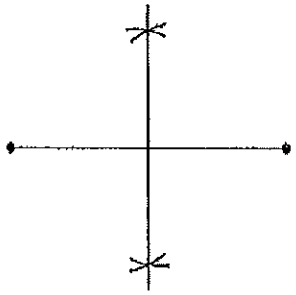


S R

1) $l \| m$	1) Given
2) $\angle 2$ & $\angle 3$ supplem.	2) $\angle$s Pr. Prop.
3) $m\angle 2 + m\angle 3 = 180$	3) Defn. supplem.
4) $\angle 1 \cong \angle 3$	4) alt. ext $\angle$s thm
5) $m\angle 1 = m\angle 3$	5) Defn $\cong$
6) $m\angle 2 + m\angle 1 = 180$	6) substitution
7) $\angle 1$ & $\angle 2$ are supplem.	7) Defn. supplem.

46. What is being constructed in the figure to the right?

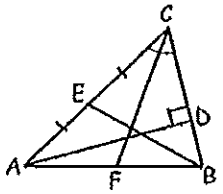
a) Perpendicular bisector
b) Parallel lines
c) Circle
d) Copy of an angle



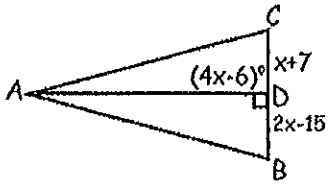
Complete. Refer to the figure at the right.

47. a.) $\overline{EB}$ is a median of ΔABC

b.) $\overline{AD}$ is an altitude of ΔABC.



48. Find the value of x if $\overline{AD}$ is an altitude of ΔABC.

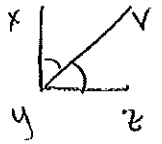


$4x - 6 = 90$

$4x = 96$

$x = 24$

49. $\overline{YV}$ is an angle bisector of ΔXYZ. Determine $m\angle ZYV$ and $m\angle XYZ$ if $m\angle XYZ = 8x - 6$ and $m\angle XYV = 2x + 7$.



$8x - 6 = 2(2x + 7)$

$8x - 6 = 4x + 14$

$4x = 20$

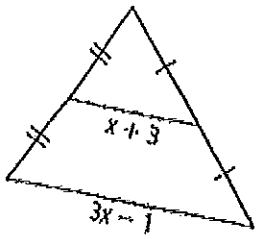
$x = 5$

$m\angle ZYV = 17°$

$m\angle XYZ = 34°$

Solve for x.

50.

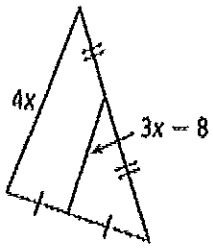


$2(x+3) = 3x-1$

$2x+6 = 3x-1$

$7 = x$

51.



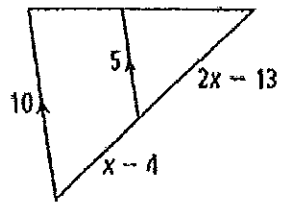
$2(3x-8) = 4x$

$6x-16 = 4x$

$2x = 16$

$x = 8$

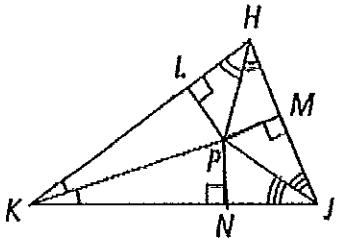
52.



$2x-13 = x-4$

$x = 9$

53. $PM = 4x + 7$ and $PN = 12x - 5$
Find PL.



$4x+7 = 12x-5$

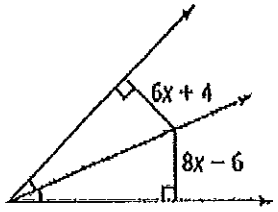
$12 = 8x$

$x = \frac{12}{8} = \frac{3}{2}$

$x = 1.5$

$PL = 13$

54. Solve for x.



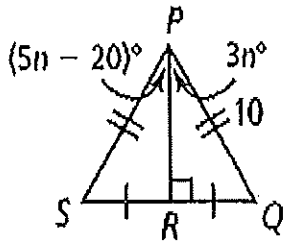
$6x+4 = 8x-6$

$10 = 2x$

$x = 5$

55. According to the diagram, what are the lengths of $\overline{PQ}$ and $\overline{PS}$? 10

a.) How is $\overline{PR}$ related to $\angle SPQ$? angle bisector



b.) Find the value of n.

$5n-20 = 3n$

$-20 = -2n$

$n = 10$

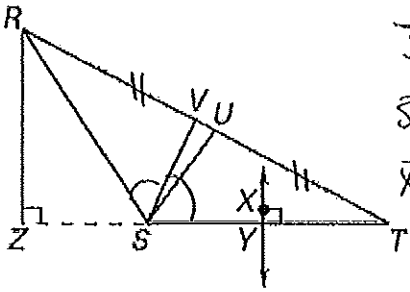
c.) Find $m\angle SPR$ and $m\angle QPR$.

30°

Use the diagram shown and the given information to name each line or segment as the altitude, median, angle bisector, or perpendicular bisector of a triangle.

$\angle RSV = m\angle TSV$, $RU = UT$ and $SY = TY$

56.



$\overline{SV}$ = ∠ bisector

$\overline{SU}$ = median

$\overline{XY}$ = ⊥ bisector

$\overline{RZ}$ = Altitude

Find the possible measures for $\overline{XY}$ in ΔXYZ.

57. XZ = 6 and YZ = 6

$0 < XY < 12$

58. XZ = 9 and YZ = 5

$4 < XY < 14$

59. XZ = 11 and YZ = 6

$5 < XY < 17$

60. List the 6 properties of parallelograms.

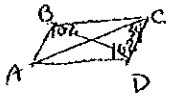
opps. sides ≅

opps ∠s ≅

consecutive ∠'s supplem.

diagonals bisect. each other

In parallelogram ABCD, m∠DAB = 11x + 1, m∠ABC = 2(7x + 2), m∠CDB = 6x + 1, m∠DCA = 5x − 1. Find the following measures.



61. x =

$11x+1+2(7x+2)=180$

$11x+1+14x+4=180$

$25x+5=180$

$25x=175$

$x=7$

62. $m\angle DAB$ =

43

$39-1$

(34)

$11x+1$

$11(7)+1$ = (78°)

63. $m\angle DCB$ =

$11x+1$

$11(7)+1$ = (78°)

64. $m\angle ADC$ =

$2(7x+2)$

$14x+4$

$14(7)+4$ (102°)

65. $m\angle ACB$ = $m\angle DCB - m\angle DCA$

$78 - 34$

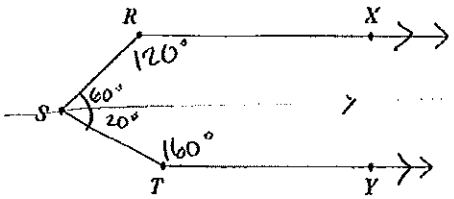
(44°)

66. $m\angle ADB$ = $m\angle ADC - m\angle CDB$

$102 - 43$

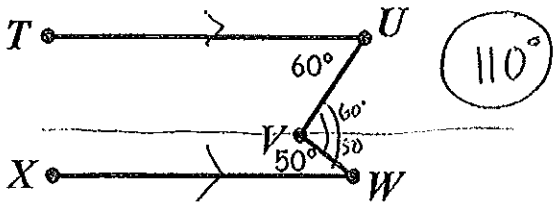
(59°)

67. Find the measure of ∠RST given $\overline{RX} \parallel \overline{TY}$, m∠SRX = 120°, m∠STY = 160°



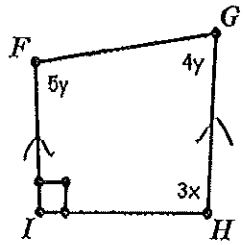
80°

68. Find m∠UVW given $\overline{TU} \parallel \overline{XW}$.



110°

69. Solve for x and y. $\overline{FI} \parallel \overline{GH}$.



$5y + 4y = 180$

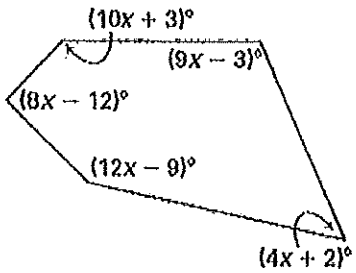
$9y = 180$

$y = 20$

$3x = 90$

$x = 30$

70. Solve for x.



$180(5-2)$

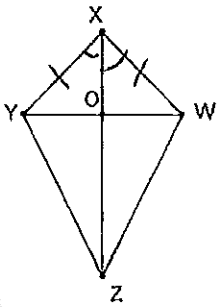
$540 = 10x + 3 + 9x - 3 + 4x + 12 + 12x - 9 + 8x - 12$

$43x - 19 = 540$

$43x = 559$

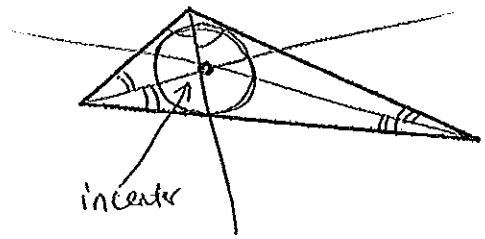
$x = 13$

71. Given: $\overline{XY} \cong \overline{XW}$, $\overline{XZ}$ bisects $\angle YXW$
Prove: $\Delta ZYX \cong \Delta ZWX$

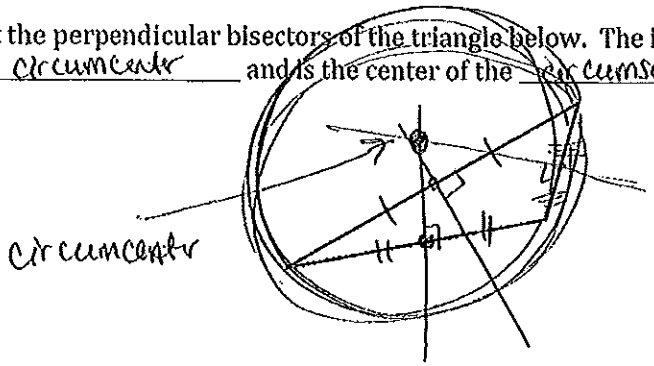


S	R
1) $\overline{XY} \cong \overline{XW}$, $\overline{XZ}$ bisects $\angle YXW$	1) Given
2) $\angle YXZ \cong \angle WXZ$	2) Defn. bisect
3) $\overline{XZ} \cong \overline{XZ}$	3) Reflexive
4) $\Delta ZYX \cong \Delta ZWX$	4) SAS

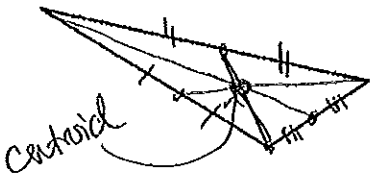
72. Construct the angle bisectors of the triangle below. The intersection of these angle bisectors is called the incenter and is the center of the inscribed circle. (sketch the circle)



73. Construct the perpendicular bisectors of the triangle below. The intersection of these perpendicular bisectors is called the circumcentr and is the center of the circumscribed circle. (sketch the circle)

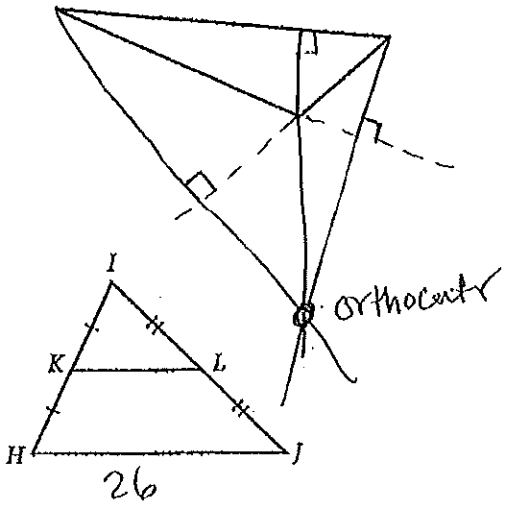


. Construct the medians of the triangle to the right.



The intersection of these medians is called the centroid

75. Construct the altitudes of the triangle to the right.



The intersection of these altitudes is called the orthocentr

76. If HJ = 26, then KL = 13

. If HJ = 3x – 1 and KL = x + 1, then HJ =

$3x-1 = 2(x+1)$

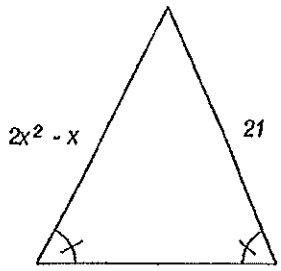
$3x-1 = 2x+2$

$x = 3$

$HJ = 3(3)-1$

$HJ = 8$

78. Solve for the missing variable(s).



$2x^2 - x = 21$

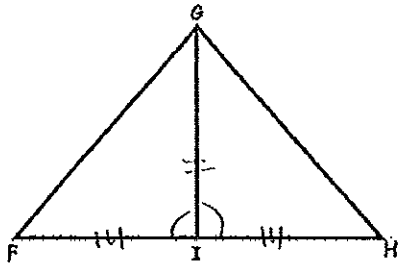
$2x^2 - x - 21 = 0$

$(x+3)(2x-7) = 0$

$x = -3$ or $7/2$

79. Prove Indirectly:

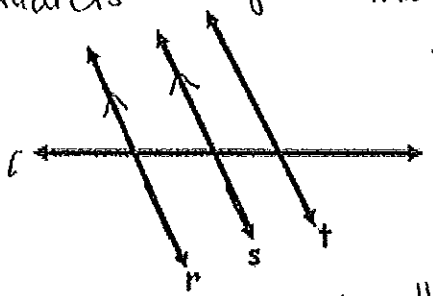
Given: ΔGHF is not isosceles; $\angle GIF \cong \angle GIH$
Prove: $\overline{GI}$ is not a median



Assume $\overline{GI}$ is the median

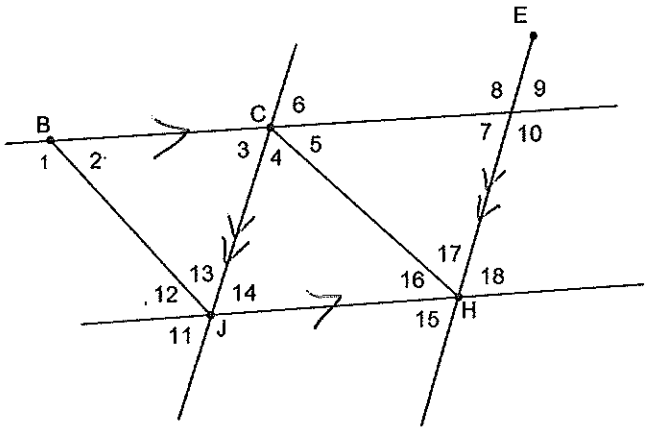
Then point I is the midpoint of $\overline{FH}$ by defn. of median. This makes $\overline{FI} \cong \overline{HI}$ by defn. of midpoint. We are given that $\angle GIF \cong \angle GIH$ and we also know that $\overline{GI} \cong \overline{GI}$ by reflexive property of congruence. Therefore $\Delta FIG \cong \Delta HIG$ by SAS and $\overline{FG} \cong \overline{HG}$ by CPCTC. This would make ΔGHF isosceles by defn. However, this contradicts our given that ΔGHF is not isosceles. Therefore our assumption must be false and $\overline{GI}$ is not a median.

80. Prove Indirectly.
Given: r || s, s || t
Prove: r || t



Assume r || t. We are given that r || s. Therefore t || s because 2 lines parallel to same line are || to each other. However this contradicts the given that s || t. Therefore our assumption must be false and r || t.

In the figure to the right, $\overleftrightarrow{BC} \| \overleftrightarrow{JH}$, $\overleftrightarrow{CJ} \| \overleftrightarrow{EH}$. Decide whether the following pairs of angles are congruent. If yes, state the postulate or theorem to support your answer. If no, explain why not. *(4 pts each)*



1. $\angle 2$ *and* $\angle 12$ yes
alt int. ∠ thm

2. $\angle 7$ *and* $\angle 3$ yes
Corresp ∠ thm.

3. $\angle 12$ *and* $\angle 16$ (NO)
b/c we don't know that $\overline{BJ} \| \overline{CH}$

4. $\angle 9$ *and* $\angle 15$ yes
Alt. ext. ∠ Thm

Given the following relationships and using the figure above, which lines (if any) can be proven parallel? Give the postulate or theorem to support your answer. *(4 pts each)*

5. $\angle 14 \cong \angle 18$

6. $\angle 13 \cong \angle 4$

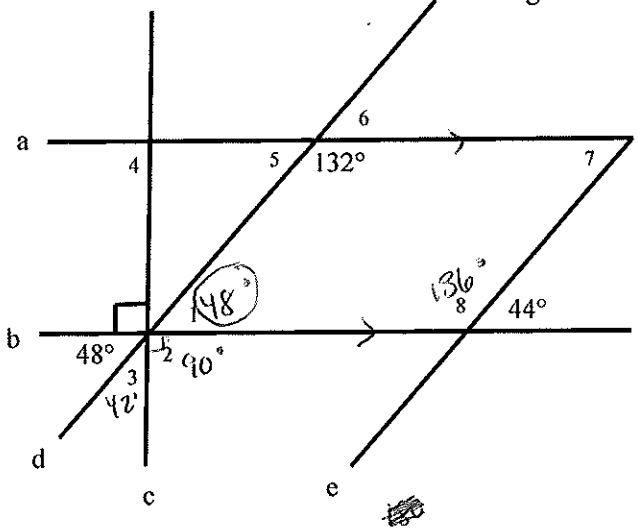
$\overline{CJ} \| \overline{EH}$; Converse of Corresp ∠ thm $\overline{BJ} \| \overline{CH}$; Conv. of alt. int ∠ Thm

7. $\angle 10$ *and* $\angle 18$ are supplementary

8. $\angle 11 \cong \angle 18$

$\overline{BC} \| \overline{JH}$; Conv. of SSI ∠ thm $\overline{CJ} \| \overline{EH}$; Conv. of alt. ext. ∠ thm

9. Find the measures of each of the numbered angles in the figure below. *(1 pt each)*



1 = 48° 2 = 90°

3 = 42° 4 = 90°

5 = 48° 6 = 48°

7 = 44° 8 = 136°

180 − 136 = 44

180 − 44 = 136

Is a∥b? yes Is d∥e? No

132 + 48 = 180

36) Given the point and its image, determine the scale factor.

a) A(3,6) A'(4.5, 9) (1.5)
$3x = 4.5$ $6x = 9$
$x = 4.5/3$ $x = 9/6 = 3/2$

b) G'(3,6) G(1.5,3) (1/2)
$6x = 3$
$x = 3/6$

c) B(2,5) B'(1,2.5) (1/2)
$2x = 1$
$x = 1/2$

37) The sides of one right triangle are 6, 8, and 10. The sides of another right triangle are 10, 24, and 26. Determine if the triangles the second one is a dilation of the first. If so, what is the scale factor?

$6x = 10$ $8x = 24$ No, not a dilation
$x = 10/6 = 1.6\overline{7}$ $x = 3$

38) Circle the transformation that matches the rule.

	Reflection	Rotation	Translation	Dilation
a) G (x,y) ----------> (-y, x)		(Rotation)		
b) H (x,y) ----------> (x + 2,y + 10)			(Translation)	
c) F (x,y) ----------> (-x, -y)		(Rotation)		
d) N (x,y) ----------> (3x,3y)				(Dilation)

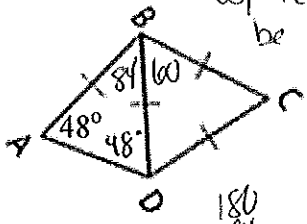
39) Mia is able to move triangle *A* to triangle *A'* using the flowing sequence of basic transformations:

1. Reflection across the x-axis
2. Reflection across the y-axis
3. Translation two units to the right

ex. * start w/ (5,6) reflect over x-axis → (5,-6) reflect (-5,-6)
then translate 2 units up (3,-6)
* start w/ (5,6) translate 2 right (7,6) reflect (7,-6) reflect (-7,-6) end

Brittany claims that the same three transformations, done in any order, will always produce the same result. Explain why Brittany's claim is incorrect. When it involves a translation mixed w/ reflections, the coordinates will be changed by the translation.

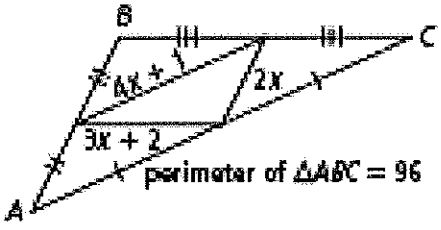
40. Find the measure of angle ABC. *(4 points)*



$84 + 60$
m<ABC= 144°

$180 - 96 = 84$

41. solve for x.



$4x + 1 + 2x + 3x + 2 = \frac{96}{2}$

$9x + 3 = 48$
$9x = 45$ $x = 5$

42. Can the following be the side lengths of a triangle?

a) 32, 50, $\sqrt{350} = 18.71$
$+32$
$50.71 > 50$ (yes)

b) 20, 12, 8
$8 + 12 = 20$ (No)
$20 = 20$

c) 122, 106, 100
$106 + 100 = 206$
$206 > 122$ (yes)

43. Explain the difference between parallel, intersecting, and skew lines.
Skew and parallel never intersect but skew on different planes.