

GEOMETRY 22 MID-TERM EXAM REVIEW

Name: Key

Period: _____

Note to student: This packet should be used as practice for the Geometry 22 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
5-6	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!	

$$2x - 3 + 32 = 5x - 7$$

1. If $CD = 5x - 7$, find the indicated values.



$$2x + 29 = 5x - 7$$

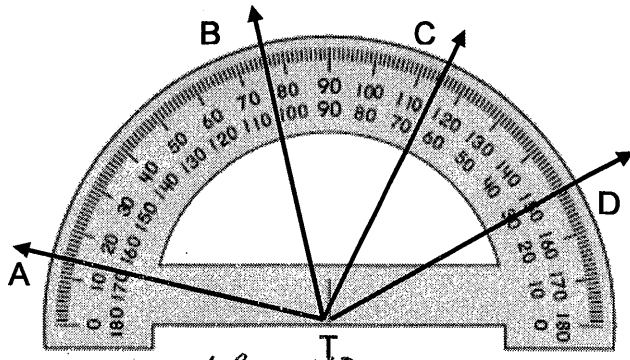
$$36 = 3x$$

$$x = 12$$

a) $x =$ 12 b) $CE =$ 21 c) $CD =$ 53

2. a) What is $m\angle DTB$?

$$105 - 30 = 75^\circ$$



b) What is $m\angle BTC$?

$$105 - 65 = 40^\circ$$

3. If $m\angle EFG = 43^\circ$, what is the measure of its supplement?

$$180 - 43 = 137^\circ$$

4. In the figure below, $m\angle DAF = 18x - 3$. Find the indicated measures.

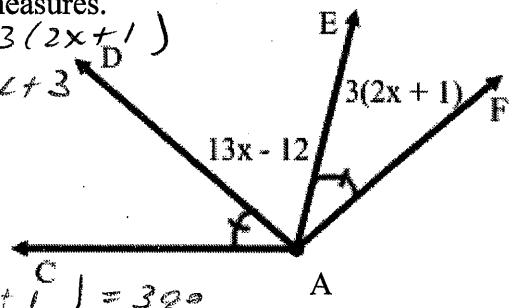
a) $x =$ 6

$$18x - 3 = 13x - 12 + 3(2x + 1)$$

$$18x - 3 = 13x - 12 + 6x + 3$$

$$18x - 3 = 19x - 9$$

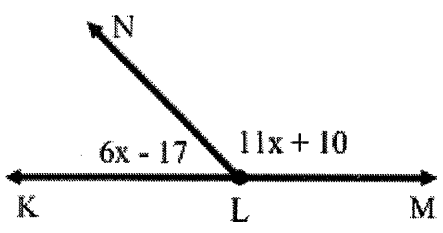
$$x = 6$$



b) $m\angle FAE =$ 39°

$$3(2x + 1) = 3(12 + 1) = 39^\circ$$

5. In the figure below, find the indicated measures.



a) $x =$ 11

$$6x - 17 + 11x + 10 = 180$$

b) $m\angle KLN =$ 49°

$$17x - 7 = 180$$

$$17x = 187$$

$$x = 11$$

$$6x - 17 = 6(11) - 17$$

$$66 - 17 = 49^\circ$$

6. Refer to the statement: "All rectangles are parallelograms."

a) Rewrite the statement as a conditional.

If a figure is a rectangle, then it is a parallelogram.

b) Identify the hypothesis and conclusion of the conditional.

Hypothesis: *a figure is a rectangle*

Conclusion: *it is a parallelogram*

c) Draw a Venn to illustrate the statement.

diagram



d) Write the converse of the conditional.

If a figure is a parallelogram, then it is a rectangle.

e) If the converse is false, give a counterexample:

False. A rhombus is a parallelogram but is not a rectangle.

7. Refer to the statement: "A square is a figure with four congruent sides."

a) Rewrite the statement as a conditional.

If a figure is a square, then it has four congruent sides.

b) Write the converse.

If a figure has four congruent sides, then it is a square.

c) Write the biconditional.

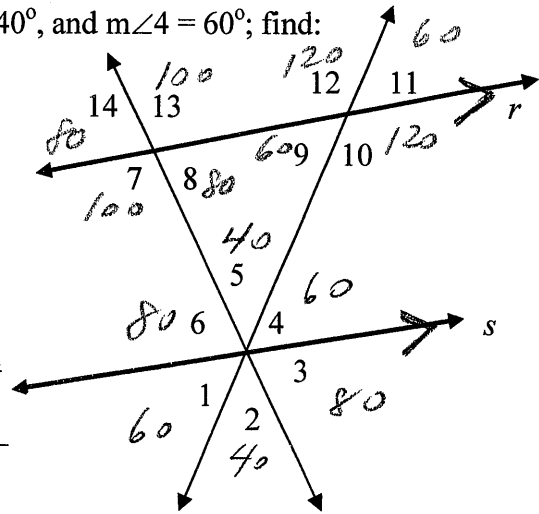
A figure is a square iff it has four congruent sides.

d) Decide whether the statement is a definition. Explain your reasoning.

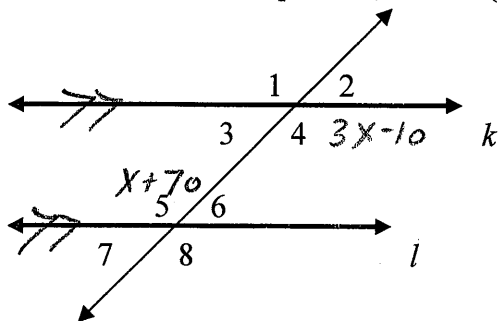
No. It is not a definition because the converse is false. It can be a rhombus.

8. In the figure at right, lines r and s are parallel, $m\angle 2 = 40^\circ$, and $m\angle 4 = 60^\circ$; find:

- a) $m\angle 1$ 60° b) $m\angle 3$ 80°
 c) $m\angle 5$ 40° d) $m\angle 6$ 80°
 e) $m\angle 7$ 100° f) $m\angle 8$ 80°
 g) $m\angle 9$ 60° h) $m\angle 10$ 120°
 i) $m\angle 11$ 60° j) $m\angle 12$ 120°
 k) $m\angle 13$ 100° l) $m\angle 14$ 80°



9. If lines k and l are parallel, $m\angle 4 = (3x - 10)^\circ$ and $m\angle 5 = (x + 70)^\circ$; find:



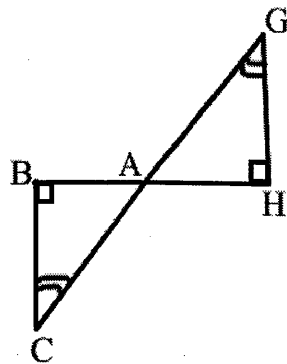
- a) $m\angle 8$ 110°
 b) $m\angle 6$ 70°
 c) $m\angle 3$ 70°
 d) $m\angle 7$ 70°

$$\begin{aligned} 3x - 10 &= x + 70 \\ 2x &= 80 \\ x &= 40 \\ 3x - 10 &= 110 \\ x + 70 &= 110 \end{aligned}$$

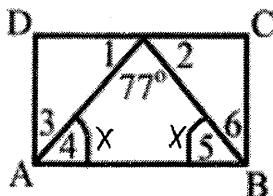
10. If $m\angle HAG = (7x + 4)^\circ$, and $m\angle CAB = (9x - 10)^\circ$, find the following:

- a) $x = \underline{7}$
 b) $m\angle GAH = \underline{53^\circ}$
 c) $m\angle CAB = \underline{53^\circ}$
 d) $m\angle G = \underline{37^\circ}$

$$\begin{aligned} 7x + 4 &= 9x - 10 \\ -2x &= -14 \\ x &= 7 \\ 7x + 4 &= 53^\circ \\ 9x - 10 &= 53^\circ \\ m\angle G &= 90 - 53 = 37^\circ \end{aligned}$$



11. Quadrilateral ABCD is a rectangle. Find:



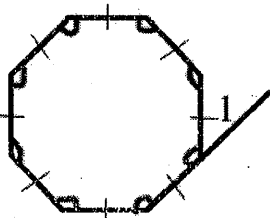
- a) $m\angle 1 = \underline{51.5^\circ}$ b) $m\angle 2 = \underline{51.5^\circ}$
 c) $m\angle 3 = \underline{38.5^\circ}$ d) $m\angle 4 = \underline{51.5^\circ}$
 e) $m\angle 5 = \underline{51.5^\circ}$ f) $m\angle 6 = \underline{38.5^\circ}$

$$\begin{aligned} 2x + 77 &= 180 \\ 2x &= 103 \\ x &= 51.5^\circ \\ 90 - 51.5 &= 38.5^\circ \end{aligned}$$

12. The interior angle sum of a regular polygon is 1980° . How many sides does the polygon have?

13. Find $m\angle 1 = \underline{45^\circ}$

$$\frac{360}{8} = 45^\circ$$

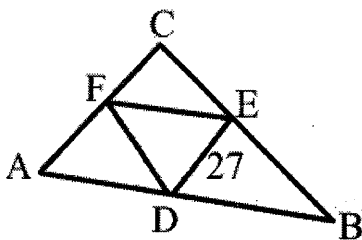


$$\begin{aligned} \frac{180(n-2)}{180} &= \frac{1980}{180} \\ n-2 &= 11 \\ n &= 13 \end{aligned}$$

14. An exterior angle of a regular polygon is 24° . Find the number of sides in the polygon.

$$\frac{360}{n} = 24 \quad 24n = 360 \quad n = \frac{360}{24} \quad \boxed{n = 15}$$

15. In the diagram below F, E, and D are midpoints.

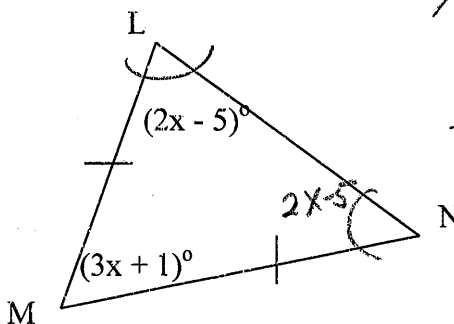


AC = 54 If AB = 55, then FE = 27.5

$$\begin{aligned} 2(2x-5) + (3x+1) &= 180 \\ 4x-10 + 3x+1 &= 180 \end{aligned}$$

$$\begin{aligned} 7x &= 189 \\ x &= 27 \end{aligned}$$

16. $x = \underline{27}$
 $m\angle N = \underline{49^\circ}$



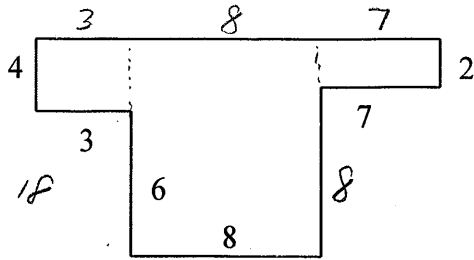
$$\begin{aligned} m\angle N &= 2x-5 \\ &= 2(27)-5 \\ &= 49^\circ \end{aligned}$$

17. Can 8, 12 and 16 be the sides of a triangle? Explain.

$8 + 12 > 16$ ✓
 Yes because the sum of any two sides is greater than the third side.

18. Perimeter = 56

Area = 106



Perimeter = $4 + 3 + 6 + 8 + 8 + 7 + 2 + 4 = 56$

Area = $(4)(3) + (6)(8) + (2)(7) = 12 + 48 + 14 = 74$

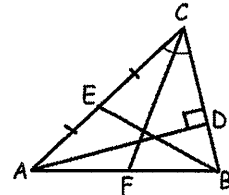
19. Through any two points there is exactly one line.

20. The intersection point of the perpendicular bisectors of a triangle is the circumcenter.

For questions 21 and 22, refer to the figure at the right.

21. \overline{EB} is a median of $\triangle ABC$

22. \overline{AD} is an altitude of $\triangle ABC$.

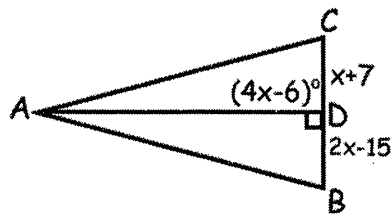


23. Find the value of x if \overline{AD} is an altitude of $\triangle ABC$.

$4x - 6 = 90$

$4x = 96$

$x = 24$



24. Determine $m\angle A$, $m\angle B$, and $m\angle C$ if $\angle A$ is supplementary to $\angle B$ and complementary to $\angle C$.

$m\angle A = (x + 10)^\circ$, $m\angle B = (12x + 1)^\circ$, $m\angle C = (5x + 2)^\circ$

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

$13x + 11 = 180$

$13x = 169$

$x = 13$

$m\angle A = 23^\circ$ $m\angle B = 157^\circ$ $m\angle C = 67^\circ$

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

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

Conditional

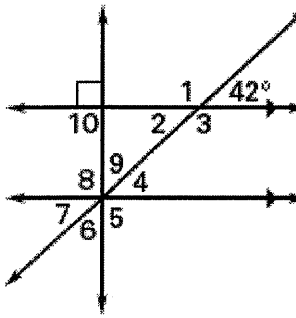
Converse → If an angle is an acute angle, then its measure is 32 degrees.

Converse is false.

Counterexample → A 45° angle is acute and does not equal 32.

Find the measure of all labeled angles in the diagram.

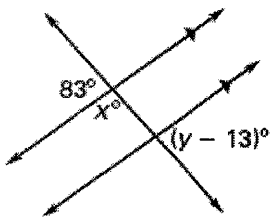
26.



$$\begin{aligned} m\angle 1 &= 138^\circ \\ m\angle 2 &= 42^\circ \\ m\angle 3 &= 138^\circ \\ m\angle 4 &= 42^\circ \\ m\angle 5 &= 90^\circ \\ m\angle 6 &= 48^\circ \\ m\angle 7 &= 42^\circ \\ m\angle 8 &= 90^\circ \\ m\angle 9 &= 48^\circ \\ m\angle 10 &= 90^\circ \end{aligned}$$

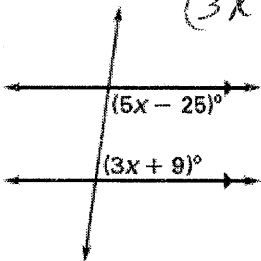
Find the value of x and y.

28.



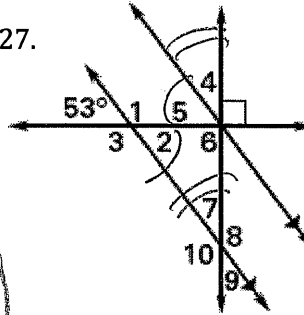
$$\begin{aligned} x &= 97 \\ y - 13 &= 83 \\ y &= 96 \end{aligned}$$

30.



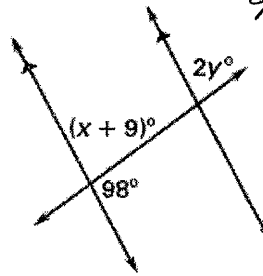
$$\begin{aligned} (3x+9) + (5x-25) &= 180 \\ 8x - 16 &= 180 \\ 8x &= 196 \\ x &= 24.5 \end{aligned}$$

27.



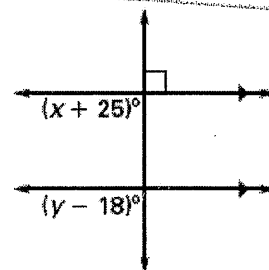
$$\begin{aligned} m\angle 1 &= 127^\circ \\ m\angle 2 &= 53^\circ \\ m\angle 3 &= 127^\circ \\ m\angle 4 &= 37^\circ \\ m\angle 5 &= 53^\circ \\ m\angle 6 &= 90^\circ \\ m\angle 7 &= 37^\circ \\ m\angle 8 &= 143^\circ \\ m\angle 9 &= 37^\circ \\ m\angle 10 &= 143^\circ \end{aligned}$$

29.



$$\begin{aligned} 98 + (x+9) &= 180 \\ x+9 &= 82 \\ x &= 73 \\ 2y &= x+9 \\ 2y &= 73+9 \\ 2y &= 82 \\ y &= 41 \end{aligned}$$

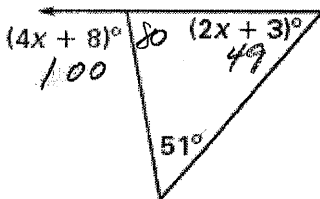
31.



$$\begin{aligned} x+25 &= 90 \\ x &= 65 \\ y-18 &= 90 \\ y &= 108 \end{aligned}$$

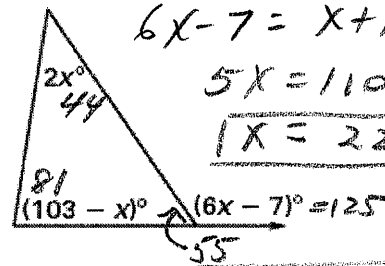
Solve for the given variable and find the angle measures.

32.



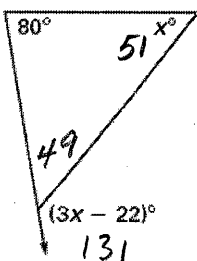
$$\begin{aligned} 4x+8 &= 2x+3+51 \\ 4x+8 &= 2x+54 \\ 2x &= 46 \\ x &= 23 \end{aligned}$$

33.



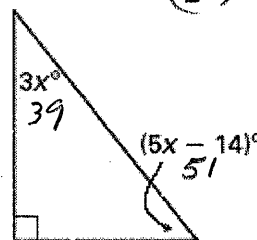
$$\begin{aligned} 6x-7 &= 2x+(103-x) \\ 6x-7 &= x+103 \\ 5x &= 110 \\ x &= 22 \end{aligned}$$

34.



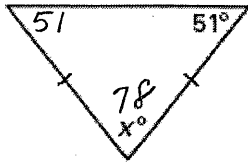
$$\begin{aligned} 3x-22 &= 80+x \\ 2x &= 102 \\ x &= 51 \end{aligned}$$

35.



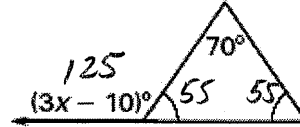
$$\begin{aligned} (5x-14) + 3x &= 90 \\ 8x &= 104 \\ x &= 13 \end{aligned}$$

36.



$x = 78$

37.



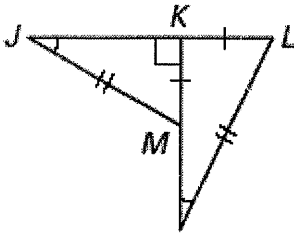
$3x - 10 = 180 - 55$

$3x = 135$

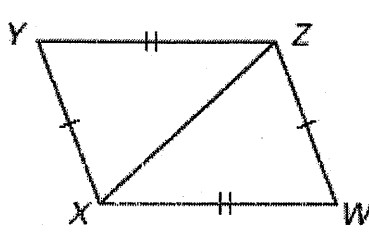
$x = 45$

For 38-40, name which triangle congruence theorem or postulate you would use to prove the triangles congruent.

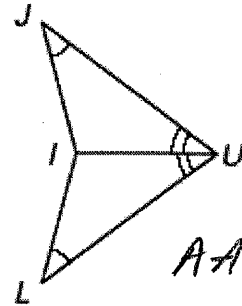
38.



39.



40.

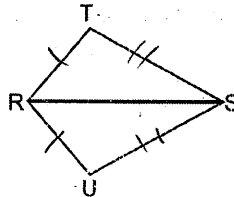


Any of the following:
HL, AAS, or SAS

SSS

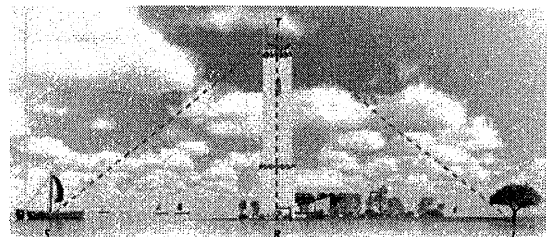
AAS

41. Given: $\overline{RT} \cong \overline{RU}$, $\overline{TS} \cong \overline{US}$
Prove: $\triangle TRS \cong \triangle URS$



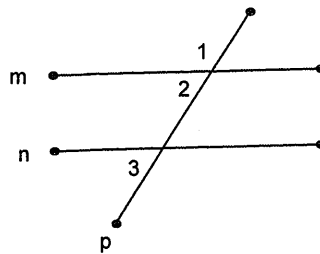
Statements	Reasons
1. $\overline{RS} \cong \overline{RS}$	1. Reflexive POC
2. $\overline{RT} \cong \overline{RU}$	2. Given
3. $\overline{TS} \cong \overline{US}$	3. Given
4. $\triangle TRS \cong \triangle URS$	4. SSS

42. Given: $\angle TRS$ and $\angle TRL$ are right angles, $\angle RTS \cong \angleRTL$
Prove: $\overline{RS} \cong \overline{RL}$



Statements	Reasons
1. $\angle RTS \cong \angleRTL$	1. Given
2. $\overline{TR} \cong \overline{TR}$	2. Reflexive POC
3. $\angle TRS$ and $\angle TRL$ are right angles	3. Given
4. $\angle TRS \cong \angleTRL$	4. All right \angle s are \cong
5. $\triangle TRS \cong \triangle TRL$	5. ASA
6. $\overline{RS} \cong \overline{RL}$	6. Corresp. parts of $\cong \triangle$ s are \cong (CPCTC)

43. Given: $\angle 1$ and $\angle 3$ are supplementary
 Prove: $m \parallel n$

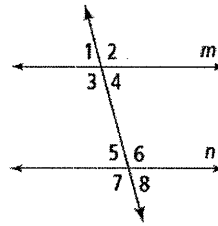


<u>Statements</u>	<u>Reasons</u>
1) $\angle 1$ and $\angle 3$ are supplementary; transversal p	1) Given
2) $m\angle 1 + m\angle 3 = 180^\circ$	2) definition of supplementary
3) $\angle 1$ and $\angle 2$ are a linear pair	3) definition of <u>Linear Pair</u>
4) $\angle 1$ and $\angle 2$ are supplementary	4) <u>Linear Pair Postulate</u>
5) $m\angle 1 + m\angle 2 = 180$	5) definition of <u>Supplementary</u>
6) $m\angle 1 + m\angle 3 = m\angle 1 + m\angle 2$	6) <u>Transitive POE</u>
7) $m\angle 3 = m\angle 2$	7) <u>Subtraction POE</u>
8) $\angle 3 \cong \angle 2$	8) <u>Defn. angle Congruence</u>
9) $m\angle 3 = m\angle 2$ $\angle 3$ & $\angle 2$ are corresp \angle s	9) <u>Defn corresp angles</u>

10) $m \parallel n$

10) Converse Corresp Angles thm (CCAT)

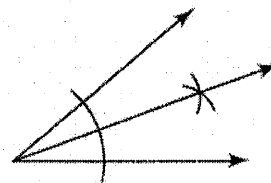
44. Given: $m \parallel n$
 Prove: $m\angle 1 + m\angle 7 = 180$



<u>Statements</u>	<u>Reasons</u>
1. $m \parallel n$	1. Given
2. $\angle 1$ and $\angle 5$ are Corresp. Angles	2. <u>Defn. Corresp angles</u>
3. $\angle 1 \cong \angle 5$	3. <u>Corresp. Angles thm</u>
4. $m\angle 1 = m\angle 5$	4. <u>Defn angle. congruence</u>
5. $\angle 5$ and $\angle 7$ are a Linear Pair	5. <u>Defn Linear Pair</u>
6. $\angle 5 + \angle 7$ are supplementary	6. <u>Linear Pair Postulate</u>
7. $m\angle 5 + m\angle 7 = 180$	7. <u>Defn. of supplementary</u>
8. $m\angle 1 + m\angle 7 = 180$	8. <u>Substitution POE</u>

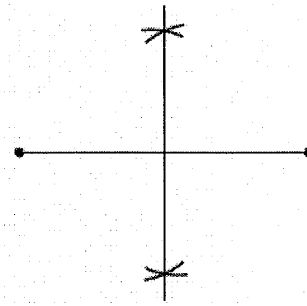
45. Describe what is being constructed in the figure at right.

angle bisector



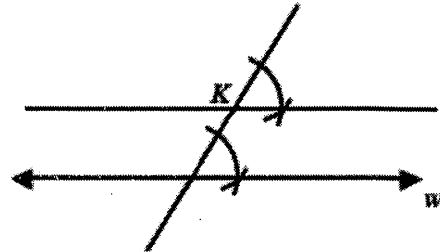
46. Describe what is being constructed in the figure at right.

perpendicular bisector



47. Describe what is being constructed in the figure at right.

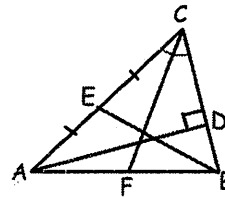
a line parallel to a given line through a given point



Complete. Refer to the figure at the right.

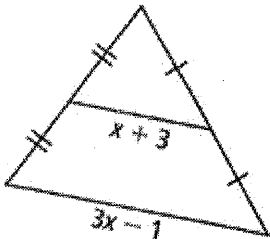
48. a.) \overline{EB} is a median of $\triangle ABC$

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



Solve for x .

49.

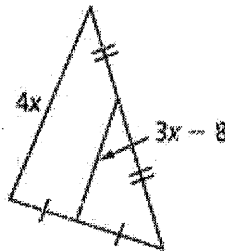


$$3x-1 = 2(x+3)$$

$$3x-1 = 2x+6$$

$$\boxed{x=7}$$

50.



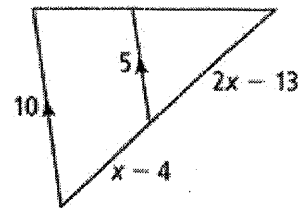
$$2(3x-8) = 4x$$

$$6x-16 = 4x$$

$$2x = 16$$

$$\boxed{x=8}$$

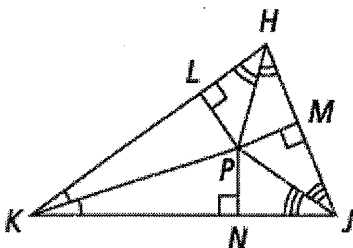
51.



$$2x-13 = x-4$$

$$\boxed{x=9}$$

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



$$12x-5 = 4x+7$$

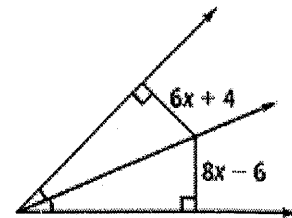
$$8x = 12$$

$$x = 1.5$$

$$PL = 4x+7$$

$$\boxed{PL = 13}$$

53. Solve for x .



$$8x-6 = 6x+4$$

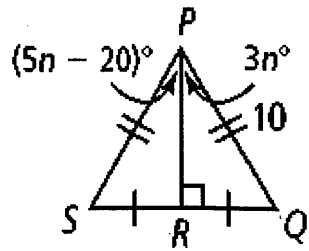
$$2x = 10$$

$$\boxed{x=5}$$

54. a.) According to the diagram, what are the lengths of \overline{PQ} and \overline{PS} ? 10

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

\overline{PR} is the angle bisector of $\angle SPQ$.



c.) Find the value of n .

$$\begin{aligned} 5n - 20 &= 3n \\ 2n &= 20 \\ \underline{1n} &= \underline{10} \end{aligned}$$

$$\begin{aligned} m\angle SPR &= 5n - 20 \\ &= 5(10) - 20 = 30 \end{aligned}$$

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

$$m\angle SPR = 30^\circ \quad m\angle QPR = 30^\circ$$

Find the range of possible measures for \overline{XY} in $\triangle XYZ$.

55. $XZ = 6$ and $YZ = 6$



$$0 < XY < 12$$

56. $XZ = 9$ and $YZ = 5$



$$4 < XY < 14$$

57. $XZ = 11$ and $YZ = 6$



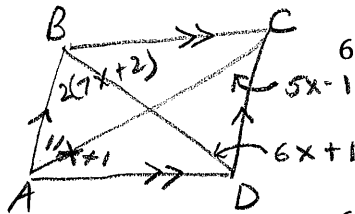
$$5 < XY < 17$$

58. List the 6 properties of parallelograms.

1. Is a quadrilateral (has 4 sides)
2. Opposite sides are parallel
3. Opposite sides are \cong
4. Opposite angles are \cong
5. Consecutive angles are supplem.
6. Diagonals bisect each other

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

$$\begin{aligned} 59. x &= \\ 2(7x + 2) + (11x + 1) &= 180 \\ 25x &= 175 \\ \underline{1x} &= \underline{7} \end{aligned}$$



$$60. m\angle DAB = 11x + 1 = 11(7) + 1 = 78^\circ$$

61. $m\angle DCB =$

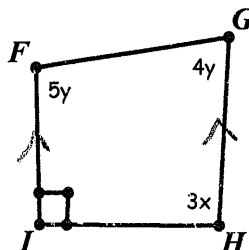
$$= m\angle DAB = 78^\circ$$

$$62. m\angle ADC = 180 - 78 = 102^\circ$$

$$\begin{aligned} 63. m\angle ACB &= 78 - (5x - 1) \\ &= 78 - 5(7) + 1 \\ &= 44^\circ \end{aligned}$$

$$\begin{aligned} 64. m\angle ADB &= 102 - (6x + 1) \\ &= 102 - 6(7) - 1 \\ &= 59^\circ \end{aligned}$$

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

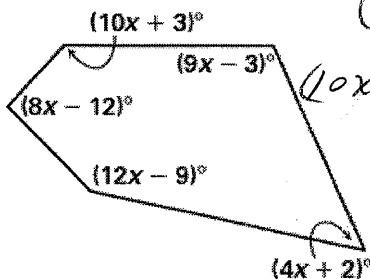


$$\begin{aligned} 4y + 5y &= 180 \\ 9y &= 180 \\ \underline{y} &= \underline{20} \end{aligned}$$

$$\begin{aligned} 3x + 90 &= 180 \\ 3x &= 90 \\ \underline{x} &= \underline{30} \end{aligned}$$

66. Solve for x.

5 sides
n = 5



$$(n-2)(180) = 3(180) = 540$$

$$(10x+3) + (9x-3) + (4x+2) + (12x-9) + (8x-12) = 540$$

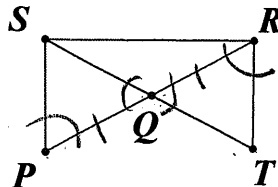
$$43x - 19 = 540$$

$$43x = 559$$

$$x = 13$$

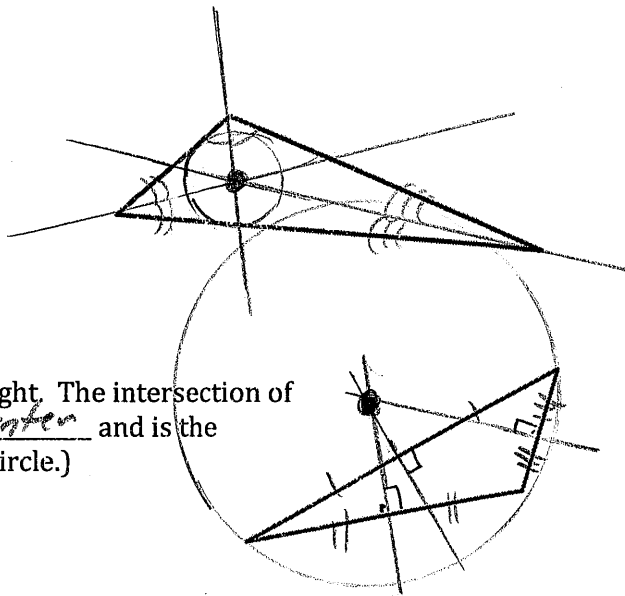
67. Given: Q is the midpoint of \overline{PR} , $\angle P \cong \angle QRT$

Prove: $\triangle SQP \cong \triangle TQR$

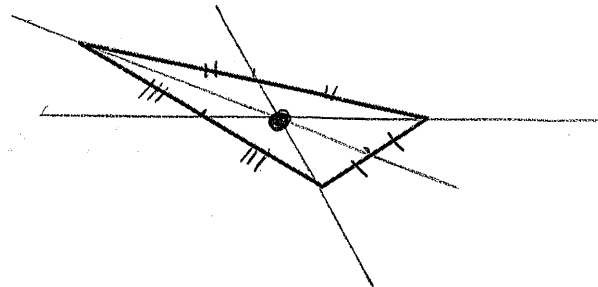


Statements	Reasons
1. Q is the midpoint of \overline{PR}	1. Given
2. $\overline{PQ} \cong \overline{RQ}$	2. Defn. Midpoint
3. $\angle P \cong \angle QRT$	3. Given
4. $\angle SQP$ and $\angle TQR$ are vertical angles	4. Defn. Vert. \angle s
5. $\angle SQP \cong \angle TQR$	5. VAT
6. $\triangle SQP \cong \triangle TQR$	6. ASA

68. Draw the angle bisectors of the triangle at right. The intersection of these angle bisectors is called the incenter and is the center of the inscribed circle. (Sketch the circle.)



69. Draw the perpendicular bisectors of the triangle at right. The intersection of these perpendicular bisectors is called the circumcenter and is the center of the circumscribed circle. (Sketch the circle.)

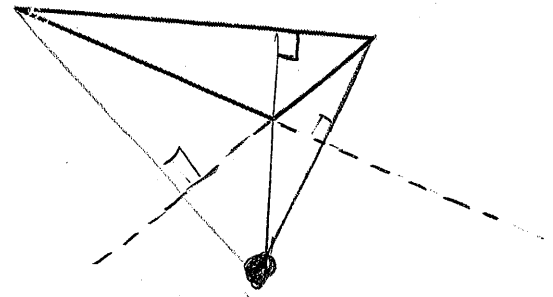


70. Draw the medians of the triangle at right.

The intersection of these medians is called the centroid

71. Draw the altitudes of the triangle at right.

The intersection of these altitudes is called the orthocenter



72. If $HJ = 26$, then $KL = 13$

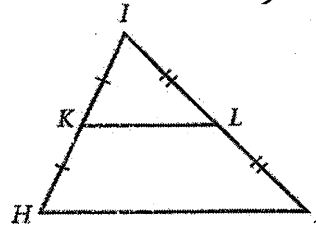
73. If $HJ = 3x - 1$ and $KL = x + 1$, then $HJ =$

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

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

$$x = 3$$

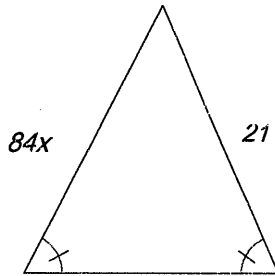
$$HJ = 3(3) - 1 = 8$$



74. Solve for x.

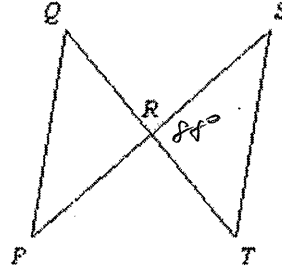
$$\frac{84x}{84} = \frac{21}{84}$$

$$x = .25$$



75. Given: $m\angle SRT = 88^\circ$, $m\angle Q = 49^\circ$

Prove: $m\angle P = 43^\circ$



Statements	Reasons
1. $m\angle SRT = 88^\circ$, $m\angle Q = 49^\circ$	1. Given
2. $\angle PRQ$ and $\angle SRT$ are vertical angles	2. Defn. Vertical Angles
3. $\angle PRQ \cong \angle SRT$	3. Vertical Angle Theorem
4. $m\angle PRQ = m\angle SRT$	4. Defn. Angle Congruence
5. $m\angle PRQ = 88^\circ$	5. Transitive POE (or Substitution POE)
6. $m\angle P + m\angle Q + m\angle PRQ = 180^\circ$	6. Triangle Sum Thm
7. $m\angle P + 49^\circ + 88^\circ = 180^\circ$	7. Substitution POE
8. $m\angle P + 137^\circ = 180^\circ$	8. Combine Like Terms
9. $m\angle P = 43^\circ$	9. Subtraction Property of Equality