Geometry Mid-Year Test Study Guide
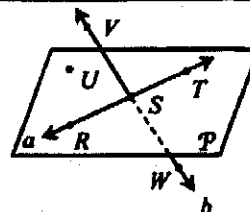
Name: _____

Date: _____ Block: _____

Topic 1: Geometry Basics

1. Use the diagram to the right to answer the questions below.

a. Name a point collinear to points S and T. __R__

b. Give another name for line b. $\overleftrightarrow{VS}, \overleftrightarrow{SW}$, or $\overleftrightarrow{VW}$

c. Name a point non-coplanar to point R, T, and U. __V (or W)__

2. Use the diagram to the right to answer the questions below.

a. Name the intersection of planes JKL and HGL. __$\overline{ML}$__

b. Name a point coplanar to points F, K, and J. __E__

c. Are points E, J, and G coplanar? Explain. __Yes! Plane EJG is invisible__
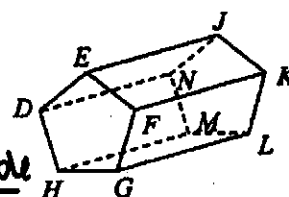
Distance Formula:	Midpoint Formula:
$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$	$M = \left(\dfrac{x_1 + x_2}{2}, \dfrac{y_1 + y_2}{2}\right)$

Use for questions 3-4: Given line segment AB with endpoints $A(-1, 7)$ and $B(11, -1)$

3. Find the length of $\overline{AB}$.

$d = \sqrt{(11+1)^2 + (-1-7)^2}$
$= \sqrt{12^2 + (-8)^2}$
$= \sqrt{144 + 64} = \sqrt{208} \approx \boxed{14.4}$
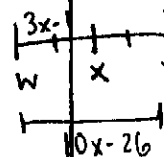
4. Find the midpoint of $\overline{AB}$.

$M = \left(\dfrac{-1+11}{2}, \dfrac{7+(-1)}{2}\right)$
$= \left(\dfrac{10}{2}, \dfrac{6}{2}\right) = \boxed{(5, 3)}$

5. A segment has a midpoint at $(2, -7)$ and an endpoint at $(8, -5)$. What are the coordinates of the other endpoint?

$2 = \dfrac{8 + x_2}{2}$ $\quad -7 = \dfrac{-5 + y_2}{2}$
$4 = 8 + x_2$ $\quad -14 = -5 + y_2$
$x_2 = -4$ $\quad y_2 = -9$ $\boxed{(-4, -9)}$

6. If X is the midpoint of $\overline{WY}$, $WX = 3x - 1$ and $WY = 10x - 26$, find XY.

$WX = XY$ $\quad 10x - 26 = 2(3x - 1)$
$XY = 3(6) - 1$ $\quad 10x - 26 = 6x - 2$
$= \boxed{17}$ $\quad 4x = 24$
$\qquad\qquad x = 6$

7. Find the value of x. $(12x - 18)°$ $(5x + 59)°$

$12x - 18 = 5x + 59$
$7x - 18 = 59$
$7x = 77$
$\boxed{x = 11}$
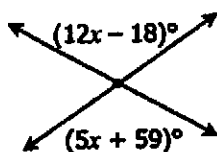
8. If $m\angle LNK = (5x - 27)°$ and $m\angle KNM = (10x - 3)°$, find $m\angle JNM$.

$15x - 30 = 180$
$15x = 210$
$x = 14$

$m\angle JNM = 5(14) - 27 = \boxed{43°}$

9. Find each missing measure.

148°, x°, z°, y°
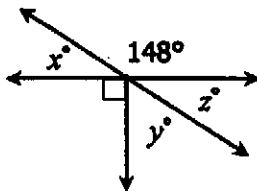
$x = \underline{32°}$
$y = \underline{58°}$
$z = \underline{32°}$

10. If $\overline{QS}$ bisects $\angle PQR$, find $m\angle PQR$.

$4x - 25 = 2x + 7$
$2x - 25 = 7$
$2x = 32$
$x = 16$

$m\angle PQS = 4(16) - 25 = 39$
$m\angle PQR = 2(39) = \boxed{78°}$

P, $(4x-25)°$, Q, S, $(2x+7)°$, R
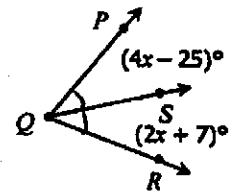
11. $\angle R$ and $\angle S$ are complementary angles. If $m\angle R = (6x - 47)°$ and $m\angle S = (x + 4)°$, find $m\angle S$.

$6x - 47 + x + 4 = 90$
$7x - 43 = 90$
$7x = 133$
$x = 19$
$m\angle S = 19 + 4 = \boxed{23°}$

12. $\angle C$ and $\angle D$ are supplementary angles. If $m\angle D$ is nine less than twice $m\angle C$, find $m\angle D$.

Let $x = m\angle C$
Let $2x - 9 = m\angle D$

$x + 2x - 9 = 180$
$3x - 9 = 180$
$3x = 189$
$x = 63$

$m\angle D = 2(63) - 9 = \boxed{117°}$

Topic 2: Logic Statements

Compound Statements

Conjunction:	$\boxed{p \wedge q}$	Disjunction:	$\boxed{p \vee q}$

- Read as p __AND__ q.
- True when both statements are true.

- Read as p __OR__ q.
- True when at least one statement is true.

13. Use the statements below to determine the truth value of each compound statement.

p: Dallas is in Texas (T)
q: All birds can fly (F)
r: Complementary angles are always congruent (F)

a. $\overset{T \quad F}{p \vee r}$: __T__

b. $\overset{T \quad F}{p \wedge q}$: __F__

c. $\overset{F \quad F}{\sim p \vee q}$: __F__

d. $\overset{T \quad T}{\sim q \wedge \sim r}$: __T__

Conditional Statements

Read as "if p, then q"

Conditional:	Inverse:	Converse:	Contrapositive:
$\boxed{p \rightarrow q}$	$\boxed{\sim p \rightarrow \sim q}$	$\boxed{q \rightarrow p}$	$\boxed{\sim q \rightarrow \sim p}$

Use the following statements to write conditional statements. Determine the truth value.

p: two angles are adjacent; *q*: they form a linear pair

14. Conditional: If two angles are adjacent, then they form a linear pair.   T /Ⓕ

15. Inverse: If two angles are not adjacent, then they do not form a linear pair.   Ⓣ/ F

16. Converse: If two angles form a linear pair, then they are adjacent.   Ⓣ F

17. Contrapositive: If two angles do not form a linear pair, then they are not adjacent.   T /Ⓕ

Bi-Conditional: $$p \longleftrightarrow q$$	**Read as:** *p* if and only if *q* ("iff") **True when both conditional ($p \to q$) and converse ($q \to p$) are true!**

Determine the truth value of the following bi-conditional statements:

18. Lines are perpendicular if and only if they intersect at a right angle. ___T___

19. It is midnight if and only if it is dark outside. ___F___

20. Triangles are congruent if and only if their corresponding parts are congruent. ___T___

Law of Detachment: $$p \to q$$ $$\underline{p}$$ $$\therefore q$$	**Law of Syllogism:** $$p \to q$$ $$q \to r$$ $$\therefore p \to r$$

Determine whether the conclusion was made by the Law of Detachment or the Law of Syllogism. If it's an invalid concusion, write "invalid".

21. Given: If the kicker makes the field goal, then the team will win the game.
Given: If the team wins the game, then they will move on to the playoffs.
Conclusion: If the kicker makes the field goal, then the team will move on to the playoffs.

Valid by: Law of Syllogism

22. Given: If a number is a natural number, then it is a whole number.
Given: *x* is a whole number
Conclusion: *x* is a natural number

Valid by: Invalid

23. Given: If an angle measures more than 90°, then it is obtuse.
Given: $m\angle P = 115°$
Conclusion: $\angle P$ is obtuse

Valid by: Law of Detachment

24. Given: If Max gets an A on his Geometry exam, then he will pass the class.
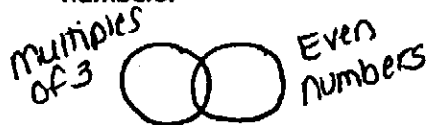**Given:** If Max does not get an A on his Geometry exam, then he will repeat the class.
Conclusion: If Max passes the class, then he will not repeat the class.

Valid by: Invalid

Topic 3: Venn Diagrams

Draw a Venn diagram to represent each relationship.

25. Some multiples of 3 are even numbers.

26. All triangles are polygons.

27. No trapezoids are parallelograms.
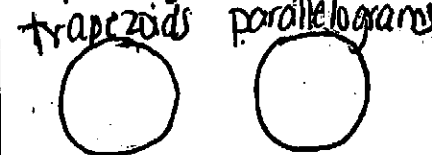
28. The Venn diagram below shows the number of who went on certain ski trails on a recent ski trip.
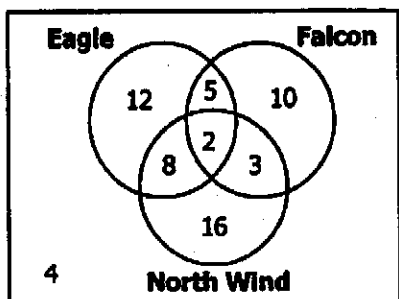
_27_ **a.** How many students went down the Eagle trail?

_5_ **b.** How many students went down the Falcon and North Wind trails?

_40_ **c.** How many students went down the Eagle or Falcon trails?

_2_ **d.** How many students went down all three trails?

_29_ **e.** How many students went down the Falcon or North Wind trail, but not the Eagle trail?

Topic 4: Proof

Write the letter of the property, definition, or postulate that justifies each statement.

_G_ **29.** If $\angle ABC \cong \angle CBD$, then $\angle CBD \cong \angle ABC$

_E_ **30.** If $VW + WY = ZY$, and $VW + WY = XZ$, then $XZ = ZY$

_K_ **31.** If S is between R and T, then $RS + ST = RT$

_B_ **32.** If $JK + KL = MN + KL$, then $JK = MN$

_H_ **33.** If $m\angle A = m\angle C$, and $m\angle C = m\angle D$, then $m\angle A = m\angle D$

_A_ **34.** If $PQ = QT$, then $PQ + RS = QT + RS$

_F_ **35.** $m\angle DEF = m\angle DEF$

_C_ **36.** If $\frac{1}{2}XZ = XY$, then $XZ = 2XY$

_I_ **37.** If $m\angle LMN = m\angle MNP$, then $\angle LMN \cong \angle MNP$

A. Addition Property of Equality
B. Subtraction Property of Equality
C. Multiplication Property of Equality
D. Division Property of Equality
E. Substitution Property
F. Reflexive Property (of = or ≅)
G. Symmetric Property (of = or ≅)
H. Transitive Property (of = or ≅)
I. Definition of Congruence
J. Definition of Midpoint
K. Segment Addition Postulate
L. Angle Addition Postulate

Topic 5: Parallel & Perpendicular Lines

**38.** Use the diagram to the right to answer the questions below.

   a. Name a plane parallel to plane *DEFGH* $\underline{JKLMN}$

   b. Name two segments parallel to $\overline{GL}$ $\underline{\overline{FK},\overline{EJ},\overline{DN},\overline{HM}}$

   c. Name a segment parallel to $\overline{MN}$ $\underline{\overline{DH}}$

   d. Name a segment skew to $\overline{EJ}$ $\underline{\overline{DH},\overline{HG},\overline{FG},\overline{NM},\overline{ML},\overline{KL}}$
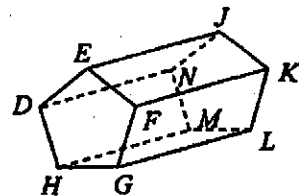
39. Use the diagram below to name each pair of lines.

   a. $\angle 1$ and $\angle 8$ $\underline{Alternate\ Exterior\ \angle's}$

   b. $\angle 6$ and $\angle 7$ $\underline{Consecutive\ Interior\ \angle's}$

   c. $\angle 2$ and $\angle 4$ $\underline{Corresponding\ \angle's}$

   d. $\angle 3$ and $\angle 6$ $\underline{Alternate\ Interior\ \angle's}$
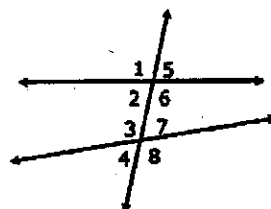
40. If $l \parallel m$, find the measure of each missing angle.

a. $m\angle 1 = 93°$	**e.** $m\angle 5 = 93°$	**i.** $m\angle 9 = 52°$
b. $m\angle 2 = 35°$	**f.** $m\angle 6 = 128°$	**j.** $m\angle 10 = 93°$
c. $m\angle 3 = 52°$	**g.** $m\angle 7 = 52°$	**k.** $m\angle 11 = 87°$
d. $m\angle 4 = 35°$	**h.** $m\angle 8 = 128°$	**l.** $m\angle 12 = 93°$
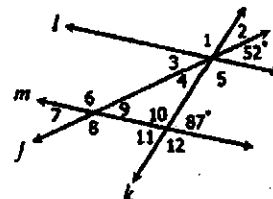
41. If $q \parallel r$, solve for x.

$$9x - 44 = 7x - 10$$
$$2x - 44 = -10$$
$$2x = 34$$
$$\boxed{x = 17}$$
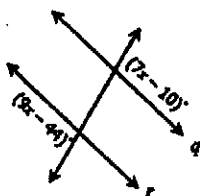
42. If $m \parallel n$, solve for x.

$$21x + 5 + 8x + 1 = 180$$
$$29x + 6 = 180$$
$$29x = 174$$
$$\boxed{x = 6}$$
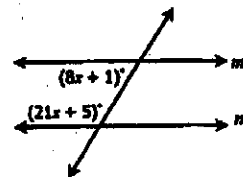
43. Use the diagram to the right to answer the questions below.

   a. If $m\angle 1 = 84°$, what must be $m\angle 5$ in order for $a \parallel b$? $\underline{84°}$

   b. If $m\angle 2 = 109°$, what must be $m\angle 9$ in order for $a \parallel c$? $\underline{71°}$

   c. If $m\angle 5 = 68°$, what must be $m\angle 11$ in order for $b \parallel c$? $\underline{68°}$

   d. If $m\angle 3 = m\angle 9$, what converse proves $a \parallel c$? $\underline{Alternate\ Int.\ \angle's}$

   e. If $m\angle 8 = m\angle 12$, what converse proves $b \parallel c$? $\underline{Corresponding\ \angle's}$

   f. If $m\angle 2 + m\angle 5 = 180°$, what converse proves $a \parallel b$? $\underline{Consecutive\ Int.\ \angle's}$
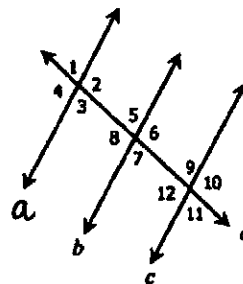
Topic 6: Parallel & Perpendicular Lines in the Coordinate Plane

Slope Formula: $m = \dfrac{y_2 - y_1}{x_2 - x_1}$ Slope-Intercept Form: $y = mx + b$

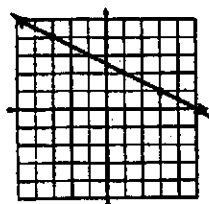Standard Form: $Ax + By = C$ Point-Slope Formula: $y - y_1 = m(x - x_1)$

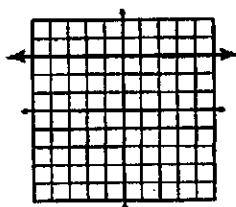| **44.** Describe the slopes of parallel lines:	**45.** Describe the slopes of perpendicular lines:
same!	negative reciprocals!

46. Find the slope of the line on the graph.

$\dfrac{-3}{6} = \boxed{\dfrac{-1}{2}}$

47. Find the slope of the line on the graph.

$\boxed{0}$

48. Find the slope of the line that contains the points (-4, -13) and (8, 5).

$m = \dfrac{5+13}{8+4} = \dfrac{18}{12} = \boxed{\dfrac{3}{2}}$

49. Find the slope of the line that contains the points (-2, 1) and (-2, -9).

$m = \dfrac{-9-1}{-2+2} = \dfrac{-10}{0} = \boxed{\text{Undef.}}$

50. Describe the lines below as parallel, perpendicular, or neither.

$3x + 6y = 42$ and $y = \boxed{2}x - 1$
$\dfrac{-3x \qquad -3x}{}$
$\dfrac{6y = -3x + 42}{6}$
$y = \boxed{-\dfrac{1}{2}}x + 7$

$\boxed{\perp}$

51. Describe the lines below as parallel, perpendicular, or neither.

$2x - 5y = 25$ and $y = \boxed{\dfrac{2}{5}}x + 3$
$\dfrac{-2x \qquad -2y}{}$
$\dfrac{-5y = -2x + 25}{-5}$
$y = \boxed{\dfrac{2}{5}}x - 5$

$\boxed{\parallel}$

52. Write an equation of a line **parallel** to the line $y = \boxed{-2}x + 8$ and passes through the point (-1, -3).

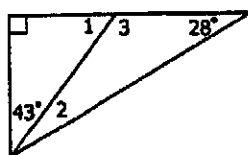$y + 3 = -2(x + 1)$
$y + 3 = -2x - 2$
$\quad -3 \qquad\quad -3$
$\boxed{y = -2x - 5}$

53. Write an equation of a line **perpendicular** to the line $4x - 3y = 15$ and passes through the point (8, -5).

$\dfrac{-3y = -4x + 15}{-3}$
$y = \dfrac{4}{3}x - 5 \curvearrowright \boxed{-\dfrac{3}{4}}$

$y + 5 = -\dfrac{3}{4}(x - 8)$
$y + 5 = -\dfrac{3}{4}x + 6$
$\quad -5 \qquad\qquad -5$
$\boxed{y = -\dfrac{3}{4}x + 1}$

Topic 7: Triangles and Angles

54. Find the measure of each numbered angle.

$m\angle 1 = \underline{47°}$
$m\angle 2 = \underline{19°}$
$m\angle 3 = \underline{133°}$

55. Find the value of x.

$(19x - 23)°$
$(4x - 1)°$
$(2x + 29)°$

$25x + 5 = 180$
$25x = 175$
$\boxed{x = 7}$
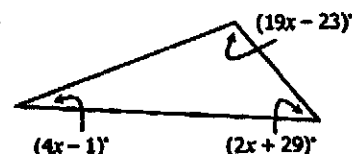
56. Find m∠S.

$9x-14=7x+6$
$2x-14=6$
$2x=20$
$x=10$

R $76°$ $(7x+6)°$
S
T $(9x-14)°$
$76°$

$\boxed{m\angle S = 28°}$
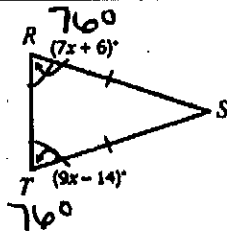
57. Find the value of x.

$5x-7+2x+2=10x-41$
$7x-5=10x-41$
$-3x-5=-41$
$-3x=-36$

$(5x-7)°$
$(10x-41)°$
$(2x+2)°$

$\boxed{x=12}$
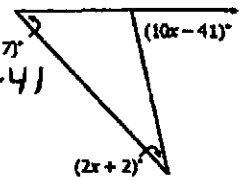
Topic 8: Congruent Triangles

58. If △ABC ≅ △DEF, solve for x and y.

$8x-11=21$
$8x=32$
$\boxed{x=4}$

$5y-3=32$
$5y=35$
$\boxed{y=7}$

A $(5y-3)°$ E $29°$ F
$119°$ $8x-11$
21 $32°$
C $119°$ B D
23
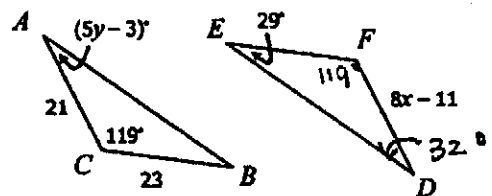
59. What are the methods to prove triangles are congruent?

SSS, SAS, ASA, AAS, HL

**60.** Determine if the triangles below are congruent. If yes, state which method.

a. $\boxed{SAS}$

b. $\boxed{AAS}$

c. $\boxed{ASA}$

d. $\boxed{HL}$

e. $\boxed{Not \cong}$

f. $\boxed{SSS}$
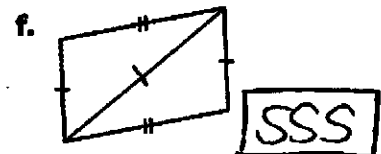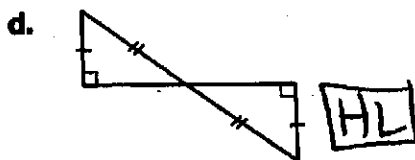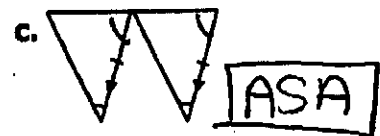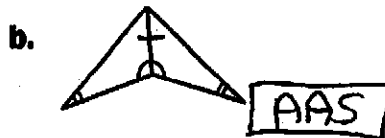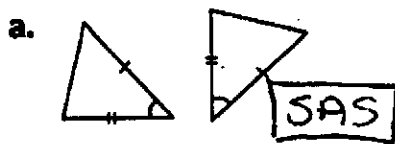
Complete the proofs using the most appropriate method.

61. Given: K is the midpoint of $\overline{JN}$ and $\overline{LM}$
Prove: △JKL ≅ △NKM
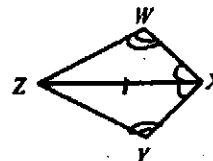
J M
K
L N
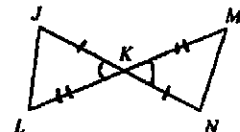
Statements	Reasons
1. K is the midpoint of $\overline{JN}$ and $\overline{LM}$	1. Given
2. $\overline{JK} \cong \overline{KN}$; $\overline{LK} \cong \overline{KM}$	2. Defn. of midpoint
3. ∠JKL ≅ ∠MKN	3. Vertical ∠'s
4. △JKL ≅ △NKM	4. SAS

62. Given: $\overline{DE} \parallel \overline{GF}, \overline{EF} \parallel \overline{GH}, \overline{DF} \cong \overline{FH}$
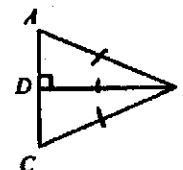**Prove:** $\triangle DEF \cong \triangle FGH$
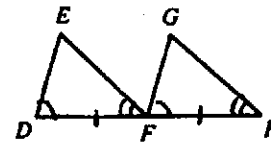
Statements	Reasons
1. $\overline{DE} \parallel \overline{GF}, \overline{EF} \parallel \overline{GH}$	1. Given
2. $\angle EDF \cong \angle GFH$; $\angle EFD \cong \angle GHF$	2. Corresponding <'s
3. $\overline{DF} \cong \overline{FH}$	3. Given
4. $\triangle DEF \cong \triangle FGH$	4. ASA

63. Given: $\overline{ZX}$ bisects $\angle WXY$, $\angle ZWX \cong \angle ZYX$
Prove: $\triangle ZWX \cong \triangle ZYX$

Statements	Reasons
1. $\overline{ZX}$ bisects $\angle WXY$	1. Given
2. $\angle WXZ \cong \angle YXZ$	2. Defn. of Angle Bisector
3. $\angle ZWX \cong \angle ZYX$	3. Given
4. $\overline{ZX} \cong \overline{ZX}$	4. Reflexive Property
5. $\triangle ZWX \cong \triangle ZYX$	5. AAS

64. Given: $\triangle ADB$ and $\triangle CDB$ are right triangles, $\overline{AB} \cong \overline{BC}$
Prove: $\triangle ADB \cong \triangle CDB$

Statements	Reasons
1. $\triangle ADB$ and $\triangle CDB$ are right triangles	1. Given
2. $\overline{AB} \cong \overline{BC}$	2. Given
3. $\overline{DB} \cong \overline{DB}$	3. Reflexive Property
4. $\triangle ADB \cong \triangle CDB$	4. HL