QUIZ #1 Solutions

Write in a neat and organized fashion. Use a pencil. Show all work to get credit.

1) Write the converse, inverse, and contrapositive of the following statement.

You cannot comprehend geometry if you do not know how to reason deductively .

$P \to Q$: If you do not know how to reason deductively, then you cannot comprehend geometry.

Converse
$Q \to P$ If you cannot comprehend geometry, then you do not know how to reason deductively.

Inverse
$\sim P \to \sim Q$ If you know how to reason deductively, then you can comprehend geometry.

Contrapositive
$\sim Q \to \sim P$ If you can comprehend geometry, then you know how to reason deductively.

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2) If P is true, Q is false, and R is true, find the truth value of

$$(\sim P \wedge Q) \to (Q \vee R)$$
$$(\sim T \wedge F) \to (F \vee T)$$
$$(F \wedge F) \to T$$
$$F \to T$$
$$T$$

So the statement is true.

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3) Complete the following to make valid arguments:

a) Premise 1: $A \to B$
Premise 2: $\sim B$
Conclusion: $\sim A$

b) Premise 1: $P \to Q$
Premise 2: $Q \to R$
Conclusion: $P \to R$

c) Premise 1: $M \vee N$
Premise 2: $\sim M$
Conclusion: N

d) Premise 1: $C \to D$
Premise 2: C
Conclusion: D

4) a) Write the negation of $P \wedge Q$; that is, complete the statement: $\sim (P \wedge Q) \equiv \sim P \vee \sim Q$

b) Prove the above law using a truth table. Explain in words why the table shows that the two statements are equivalent.

P	Q	$\sim (P \wedge Q)$	$\sim P \vee \sim Q$
T	T	F T	F F F
T	F	T F	F T T
F	T	T F	T T F
F	F	T F	T T T

The two statements are logically equivalent because their truth values are the same for all possible true/false combinations of their components.

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5) State whether each argument is VALID or INVALID:

a) All contractors use cell phones.
b) Doug does not use a cell phone.

Doug is not a contractor.

Valid.

a) All people who apply for a loan must pay for a title search.
b) Cindy paid for a title search.

Cindy applied for a loan.

Invalid.

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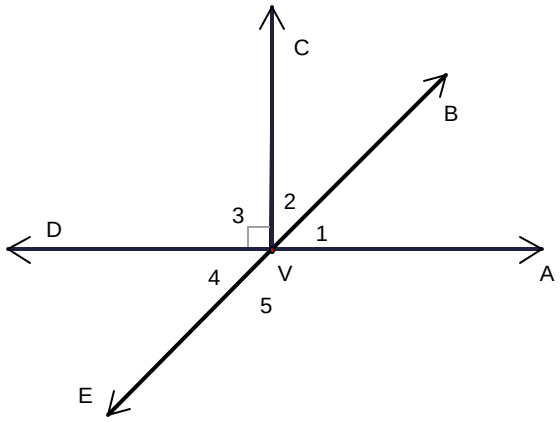
6) Given the figure, name:



a) three acute angles
$\angle 1, \angle 2, \angle 4$

b) Two right angles
$\angle 3, \angle AVC$

c) One obtuse angle
$\angle EVA$ (or DVB, EVC)

d) One straight angle
$\angle EVB$ (or DVA)

e) Two complementary angles
$\angle 1$ and $\angle 2$

f) Two supplementary angles
$\angle 1$ and $\angle 5$

g) Two adjacent angles
$\angle 3$ and $\angle 4$

h) Two nonadjacent angles
$\angle 1$ and $\angle 3$

i) Two opposite rays
$\overrightarrow{VA}, \overrightarrow{VD}$ (or $\overrightarrow{VE}, \overrightarrow{VB}$)

j) Three noncollinear points.
D, V, B

k)) Two vertical angles
$\angle 1$ and $\angle 4$

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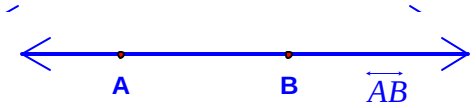
7) a) Draw a line. Name it using math notation.



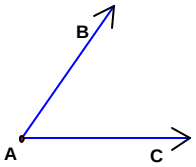
$\overleftrightarrow{AB}$

b) Draw a line segment. Name it using math notation.

$\overline{AB}$

c) Draw an angle. Name it using math notation.

$\angle BAC$



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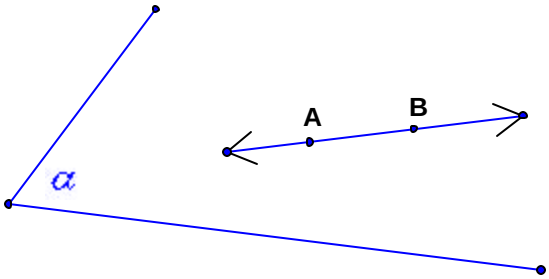
8) Complete the following *Postulates* and make a drawing to illustrate each one.

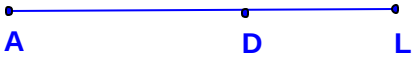
a) Two distinct points determine a line.

b) Given two distinct points in a plane,
the line through these points is in the plane.



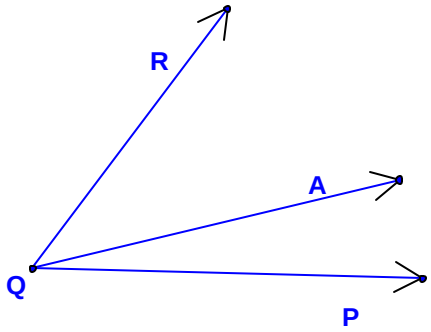
c) *Segment – Addition Postulate:*

If D is a point on a segment AL, then $AD + DL = AL$



d) *Angle – Addition Postulate:*

If A is a point in the interior of the angle PQR,
then $m\angle PQA + m\angle AQP = m\angle PQR$



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9) State the hypothesis and conclusion for each statement.

a) If a triangle is isosceles, then the triangle has two congruent sides.

Hypothesis: A triangle is isosceles.
Conclusion: The triangle has two congruent sides.

b) Two angles are congruent if they are both right angles.
If two angles are right angles, then they are congruent.

Hypothesis: Two angles are right angles
Conclusion: The two angles are congruent.

c) Vertical angles are congruent.
If two angles are vertical, then they are congruent.

Hypothesis: Two angles are vertical.
Conclusion: The angles are congruent.

d) Two equal supplementary angles are right angles.
If two angles are equal and supplementary, then they are right angles.

Hypothesis: Two angles are equal and supplementary.
Conclusion: The angles are right angles.

e) Complements of equal angles are equal in measure.
If two angles are equal in measure, then their complements are equal, too.

Hypothesis: Two angles are equal in measure
Each angle has a given complement.
Conclusion: The complements are equal in measure.

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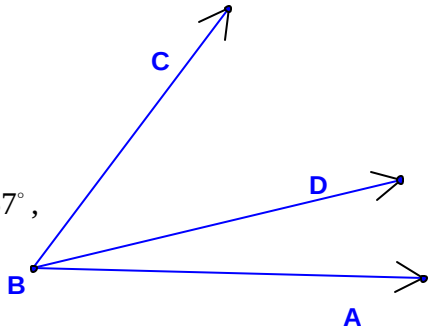
10) a) Do the following:
- Draw an angle ABC.
- Let D a point in the interior of the given angle.
- Draw ray BD.

b) If $m\angle ABD = 2x+9$, $m\angle DBC = 3x-2$, and $m\angle ABC = 67^\circ$, find x (formal proof: two column proof).



Proof

Statements	Reasons
1. $\angle ABC, D \in \text{int}\angle ABC$	1. Given
2. $m\angle ABD + m\angle DBC = m\angle ABC$	2. Angle-Addition Postulate
3. $m\angle ABD = 2x+9$, $m\angle DBC = 3x-2$, $m\angle ABC = 67^\circ$	3. Given
4. $2x+9+3x-2=67$ (2,3)	4. Substitution
5. $5x+7=67$	5. Simplifying (combining like terms or distributive property)
6. $5x=60$	6. Addition/Subtraction property for equality
7. $x=12$	7. Multiplication/Division property for equality
Q.E.D.	