

Using unlined paper, begin with each 'given' and perform the indicated construction.
 Organize your work so that it can be graded.
 ALSO – prepare for a test on Logic and Geometric Constructions next week.

1. Given a line l and a point A on l , construct a perpendicular to l through A .
2. Given a line l and a point P outside of l , construct a perpendicular to l through P .
3. Given length a , construct an equilateral triangle with side a
4. Given length a , construct a regular hexagon with side a
5. Given three lengths a, b, c , construct a triangle with sides a, b, c
6. Given a circle, find its center.
7. Given a triangle ABC , construct a circle inscribed in the triangle.
8. Construct a truth table for: $\sim P \wedge (P \rightarrow Q)$
9. Prove that the following statement is a tautology: $(P \rightarrow Q) \vee (Q \rightarrow P)$
10. Use DeMorgan's Law to write the negation of the following statement, simplifying so that only simple statements are negated: "Calvin is not home or Bonzo is at the movies."
11. Replace the following statement with its contrapositive: "If x and y are rational, then $x + y$ is rational."
12. Which rule of inference is used in each argument below?

inference rule	tautology	name
$\frac{p}{p \rightarrow q}$ $\therefore q$	$(p \wedge (p \rightarrow q)) \rightarrow q$	Modus ponens (mode that affirms)
$\frac{\neg q}{p \rightarrow q}$ $\therefore \neg p$	$(\neg q \wedge (p \rightarrow q)) \rightarrow \neg p$	Modus tollens (mode that denies)
$\frac{p \rightarrow q}{q \rightarrow r}$ $\therefore p \rightarrow r$	$((p \rightarrow q) \wedge (q \rightarrow r)) \rightarrow (p \rightarrow r)$	hypothetical syllogism
$\frac{p \vee q}{\neg p}$ $\therefore q$	$((p \vee q) \wedge (\neg p)) \rightarrow q$	disjunctive syllogism

$\frac{p}{p \vee q}$ $\therefore p \vee q$	$p \rightarrow (p \vee q)$	addition
$\frac{p \wedge q}{p}$ $\therefore p$	$(p \wedge q) \rightarrow p$	simplification
$\frac{p}{q}$ $\therefore p \wedge q$	$((p) \wedge (q)) \rightarrow (p \wedge q)$	conjunction
$\frac{p \vee q}{\neg p \vee r}$ $\therefore q \vee r$	$((p \vee q) \wedge (\neg p \vee r)) \rightarrow (q \vee r)$	resolution

- a) Alice is a Math major. Therefore, Alice is either a Math major or a CSI major.
- b) Jerry is a Math major and a CSI major. Therefore, Jerry is a Math major.
- c) If it is rainy, then the pool will be closed. It is rainy. Therefore, the pool is closed.
- d) If it snows today, the university will close. The university is not closed today. Therefore, it did not snow today.
- e) If I go swimming, then I will stay in the sun too long. If I stay in the sun too long, then I will sunburn. Therefore, if I go swimming, then I will sunburn.
- f) I go swimming or eat an ice cream. I did not go swimming. Therefore, I eat an ice cream.