

# Assignment 1 part 1

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Wednesday, January 6, 2016 2:42 PM

5a. 1024 is the smallest four digit number that is a perfect square.

TRUE and is a STATEMENT

5b. She is a mathematics major

NOT A STATEMENT

(pg 25: "Considered on its own, however, the sentence is neither true nor false...")

5c.  $128 = 2^6$

FALSE and is a STATEMENT

5d.  $x = 2^6$

NOT A STATEMENT

(pg 25 because some values of  $x$  the sentence is true, whereas others it is false)

10  $p = \text{DATAENDFLAG} = \text{OFF}$

$q = \text{ERROR} = 0$

$r = \text{SUM} < 1000$

a.  $p \wedge q \wedge r$

b.  $p \wedge \sim q$

c.  $p \wedge (\sim q \vee \sim r)$

d.  $\sim p \wedge q \wedge \sim r$

e.  $(\sim p \vee (q \wedge r)) \wedge \sim(\sim p \wedge (q \wedge r))$  or  $\sim p \oplus (q \wedge r)$  or  $\sim p \text{ XOR } (q \wedge r)$

De Morgan's law

$$\sim(p \wedge q) \equiv \sim p \vee \sim q$$

$$\sim(p \vee q) \equiv \sim p \wedge \sim q$$

25 Hal is a math major and Hal's sister is a computer science major

$$\sim(p \wedge q) \equiv \sim p \vee \sim q$$

Hal is not a math major or Hal's sister is not a computer science major

26 Sam is an orange belt and Katie is a red belt

$$\sim(p \wedge q) \equiv \sim p \vee \sim q$$

Sam is not an orange belt or Katie is not a red belt.

27 The connector is loose or the machine is unplugged

$$\sim(p \vee q) \equiv \sim p \wedge \sim q$$

The connector is not loose and the machine is not unplugged.

28 The unit digits of  $4^{67}$  is 4, or it is 6.

$$\sim(p \vee q) \equiv \sim p \wedge \sim q$$

The unit digits of  $4^{67}$  is not 4 and it is not 6

29. The computer program has a logic error in the first ten lines, or it is being run with an incomplete data set

$$\sim(p \vee q) \equiv \sim p \wedge \sim q$$

The computer program does not have a logic error in the first ten lines and it is not being run with an incomplete data set.

30. The dollar is at an all time high and the stock market is at a record low

$$\sim(p \wedge q) \equiv \sim p \vee \sim q$$

The dollar is not at an all time high or the stock market is not at a record low.

31. The train is late or my watch is fast.

$$\sim(p \vee q) \equiv \sim p \wedge \sim q$$

The train is not late and my watch is not fast.

$$52. \sim(p \vee \sim q) \vee (\sim p \wedge \sim q) \equiv \sim p$$

$$\sim p \wedge \sim(\sim q) \vee (\sim p \wedge \sim q)$$

$$\sim p \wedge q \vee (\sim p \wedge \sim q)$$

$$\sim p \wedge (q \vee \sim q)$$

$$\sim p \wedge t$$

$$\sim p$$

De Morgan's Law

Double negative law

Distributive Law

Negation Law

Identity Law

$$54. (p \wedge (\sim(\sim p \vee q))) \vee (p \wedge q) \equiv p$$

$$p \wedge (\sim(\sim p) \wedge \sim q) \vee (p \wedge q)$$

$$p \wedge (p \wedge \sim q) \vee (p \wedge q)$$

$$(p \wedge p) \wedge \sim q \vee (p \wedge q)$$

$$(p \wedge \sim q) \vee (p \wedge q)$$

$$p \wedge (\sim q \vee q)$$

$$p \wedge t$$

$$p$$

De Morgan's Law

Double negative law

Associative Law

Idempotent Law

Distributive Law

Negation Law

Identity Law