

MATH 55 - WORKSHEET 1 (MONDAY)

1 Which of these sentences are propositions? What are the truth value of those that are propositions?

a Boston is the capital of Massachusetts.

b Argentina is in Europe.

c $2 + 3 = 5$.

d $5 + 7 = 10$.

e $x + 2 = 11$.

f Answer this question.

2 Let p be the proposition, "I bought a lottery ticket this week" and q the proposition, "I won the million dollar jackpot". Express each of the following propositions as an English sentence.

a $\neg p$

b $p \vee q$

c $p \rightarrow q$

d $p \wedge q$

d $p \leftrightarrow q$

4 Consider an island with two kinds of inhabitants: Knights, who always tell the truth, and their opposites, knaves, who always lie. You encounter two people, A and B . Determine, if possible, what A and B are if they address you in the ways described. If you cannot determine what these two people are, can you draw any conclusions?

a A says "At least one of us is a knave" and B says nothing.

b A says "The two of us are both knights" and B says "A is a knave."

c A says "I am a knave or B is a knight" and B says nothing.

d Both A and B say "I am a knight."

3 Construct a truth table for each of the compound propositions

a $p \rightarrow (\neg q \vee r)$

b $\neg p \rightarrow (q \rightarrow r)$

c $(p \rightarrow q) \vee (\neg p \rightarrow r)$

d $(p \rightarrow q) \wedge (\neg p \rightarrow r)$

e $(p \leftrightarrow q) \vee (\neg q \leftrightarrow r)$

f $(\neg p \leftrightarrow \neg q) \leftrightarrow (q \leftrightarrow r)$