Patterns in Mathematics (012-01)
Second Exam
Spring 2013

Please do all work on this paper. Points are written to the left of each problem,

17 pts 1. Fill in the following truth table. Circle the column with the truth value of the entire statement.

P	Q	R	$P \rightarrow (Q \vee R)$
T	T	T	
T	T	F	
T	F	T	
T	F	F	
F	T	T	
F	T	F	
F	F	T	
F	F	F	

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12 pts 2. Use De Morgan's Law to write a statement equivalent to each of the following.

(a) $\sim (P \wedge \sim Q)$

(b) $\sim (P \vee (Q \wedge R))$

20 pts 3. Let S be the statement "*the sun is shining*" and let R be the statement "*it is raining*". Consider the following argument:

If the sun is shining, then it is raining.

It is not raining.

Therefore the sun is not shining.

Use a truth table to determine the validity of this argument. (You will get no points for stating your conclusion without filling in the relevant truth table.)

S	R	
T	T	
T	F	
F	T	
F	F	

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17 pts 4. A coin is tossed three times.

(a) List the elements of the sample space.

(b) What is the probability of getting at least two heads?

17 pts 5. A coin is tossed. If it comes up heads, a die is rolled. If it comes up tails, the coin is tossed again. Draw a tree diagram to represent the possible outcomes of this experiment. (You are not asked to find any probabilities.)

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17 pts 6. Fifteen students are in a room. Five of them are taking both a math class and a physics class. Seven of them are taking a math class. Eight of them are taking a physics class. If you pick a student in the room at random, what is the probability that the student is taking neither a math class nor a physics class?