

# The Elegance of Abstraction

## Math homework 2

Set: Week 5, Due: Week 6

If you get stuck, you can talk to me, other students, and the peer math tutor. If you still don't understand after that, write down what you tried and what you didn't understand. I will give you some credit for this.

1. (a) Fill in the following truth table to find the truth values for  $\neg(A \wedge \neg B)$ . Remember  $\neg$  means "not",  $\wedge$  means "and".

$A$	$B$	$\neg B$	$A \wedge \neg B$	$\neg(A \wedge \neg B)$
0	0			
0	1			
1	0			
1	1			

- (b) Try to understand why this is the same as " $A$  implies  $B$ ".
2. This question is about division with remainder. Remember division with remainder is something we can do to divide natural numbers, as if we don't know what fractions are. For example, when doing division with remainder,  $13 \div 3$  is 4 with remainder 1, because 3 goes into 13 four times, with 1 left over. Do the following divisions with remainder.
- (a)  $17 \div 3$   
(b)  $16 \div 6$   
(c)  $21 \div 9$

3. Which of these fractions are the same as each other?

$$\frac{4}{6}, \frac{3}{12}, \frac{4}{16}, \frac{6}{9}, \frac{3}{5}$$

4. (a) Consider a right-angled triangle where the shorter sides have lengths 5 and 12. What is the length of the hypotenuse?  
(b) Find two triangles that are similar to the above triangle, but not congruent. (By "find", I mean: write down the lengths of their sides.)

5. (a) Fill in this grid with the numbers 0, 1, 2, 3, 4 in such a way that each number appears only once in each row and column.

0	1	2	3	4
1				
2				
3				
4				

- (b) You should see a pattern on your grid. Draw some lines to show it.
6. Which of the following are “the same” according to the play-doh sense of sameness: a skirt, a pair of pants, a jacket, a glove, a figure 8, a coffee cup, a wine glass.
7. (a) Look up a list of the platonic solids (and write them down).  
(b) Draw two more flat shapes that fold up into a cube, and two that fold up into a tetrahedron, different from the ones we did in class.