

Instructions

- Write all answers in capital letters in the spaces provided on the next page!
- Do not remove this answer sheet from the rest of the exam.
- All problems are worth the same amount.
- Problems marked with (EC) are extra credit.
- There is no penalty for guessing however no credit will be given unless some work supporting your answer is shown.
- Problems marked with (*) are those where partial credit will be given if it is clear from the work that you understand how to do the problem but you choose the wrong answer.
- Good Luck!

Math 170
Homework 6
Due October 23, 2008

Name _____

TA _____ Section Number _____

1. _____

7. _____

2. _____

8. _____

3. _____

9. _____

(*) 4. _____

(*) 10. _____

5. _____

(*) 11. _____

6. _____

(1) What is $\sum_{i=0}^4 i^2$?

(2) Consider the following list of properties

- (a) (+ is Commutative) For all numbers X and Y , $X + Y = Y + X$
- (b) (Distributivity) For all numbers X , Y and Z , $X * (Y + Z) = X * Y + X * Z$
- (c) (Multiplicative Inverse) For all X not equal to 0 there is a Y such that $X * Y = Y * X = 1$
- (d) (Additive Identity) There is a number 0 such that $X + 0 = 0 + X = X$.

Which of these properties hold of the Natural Numbers?

(3) What is $\phi(7 \times 11 \times 13)$?

- (4) Use the extended Euclid's Algorithm to find $\gcd(21, 33)$ as well as x, y such that $21x + 33y = \gcd(21, 33)$?

(5) What does $(11^2 + 8 \times 4 + 12^2) \bmod 10$ equal?

- (6) If the following are the first 11 digits of a bar code, what is the 12 (or check) digit?

2 2 2 2 2 2 2 2 2 2 2

(7) What does $4^{42} \bmod 11$ equal? What is $\phi(11)$?

(8) What is $\phi(33) = \phi(3 \times 11)$? What does $2^{64} \bmod 33$ equal?

- (9) What is the greatest common divisor of $3960 = 2^3 \cdot 3^2 \cdot 5 \cdot 11$ and $185,328 = 2^4 \cdot 3^4 \cdot 11 \cdot 13$?

Consider the following substitution code

<i>A</i>	<i>B</i>	<i>C</i>	<i>D</i>	<i>E</i>	<i>F</i>	<i>G</i>	<i>H</i>	<i>I</i>	<i>J</i>	<i>K</i>	<i>L</i>	<i>M</i>
↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
<i>T</i>	<i>H</i>	<i>E</i>	<i>Q</i>	<i>U</i>	<i>I</i>	<i>C</i>	<i>K</i>	<i>B</i>	<i>R</i>	<i>O</i>	<i>W</i>	<i>N</i>
<i>N</i>	<i>O</i>	<i>P</i>	<i>Q</i>	<i>R</i>	<i>S</i>	<i>T</i>	<i>U</i>	<i>V</i>	<i>W</i>	<i>X</i>	<i>Y</i>	<i>Z</i>
↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
<i>F</i>	<i>X</i>	<i>J</i>	<i>M</i>	<i>P</i>	<i>D</i>	<i>V</i>	<i>L</i>	<i>A</i>	<i>Z</i>	<i>Y</i>	<i>G</i>	<i>S</i>

(10) What do you get when you encode the phrase

HOMEWORK IS FUN!

(11) Consider the following three numbers:

$$- \frac{5! \cdot 7!}{6! \cdot 6!}$$

$$- \frac{6! \cdot 6!}{7! \cdot 5!}$$

$$- \frac{3! \cdot 3!}{4 \cdot 4}$$

List them in order from smallest to largest.