Mth 21, Homework 3 on sections 4.1, 4.2, 7.4

Due by Wed, Oct 15.

Write all your working out and answers neatly by hand on your own notepaper and hand them to me by the date shown. Please use lots of space. You do not need to write the questions, but it is very important that you show clearly any work you had to do to get your answers. Each question is worth 3 points.

Section 4.1 Population, Sample and Data

(1) A survey asked 30 people how many books they had read in the last two weeks. The results were

2	3	0	0	1	4	1	2	4	0
3	0	2	1	1	2	3	4	2	2
2	2	3	4	4	2	0	1	2	1

(a) Make a frequency distribution table showing frequency and relative frequency.

(b) Draw a bar chart (histogram) for this distribution.

(c) Draw a pie chart for it.

(2) The police checked speeds on a highway and got these results for 20 cars (in mph):

70	75	52	64	53	60	76	59	71	68
72	61	67	58	79	65	70	62	63	72

(a) Group the data into 4 categories and make a frequency distribution table showing frequency and relative frequency.

(b) Draw a histogram - it should have 4 bars.

(Hint: Subtract the lowest speed from the highest and then divide by 4 to get the size of each category.)

(3) From your answers in Question 2, what percentage of drivers were going over the speed limit of 65?

Section 4.2 Measures of Central Tendency, Percentiles

(4) Find the mean, median and mode for this data set of highway speeds:

59	72	57	67	81	63	59	80	71	68

(5) The frequency distribution of ages of students in a class is

age x	frequency
$15 \leq x < 20$	8
$20 \leq x < 25$	5
$25 \leq x < 30$	2

Find the mean age. (Your answer should be close to 20.)

(6) Jorge scored 50, 65 and 80 on three exams. What score does he need on the fourth exam so that his average is 70?

(7) A survey asked 50 people how many films they had watched in the last week. The frequency distribution was

number of films	frequency
0	7
1	9
2	15
3	11
4	8

Find the mean, median and mode for this data set.

(8) Add a column for the relative frequency to the table in Question 7. Then answer these:

(a) What is the 14th percentile for films watched in the last week?

(b) What is the 62nd percentile for films watched in the last week?

(Hint: The 14th percentile means that exactly 14% of people watched less than that many films.)

(9) Suppose you scored at the 90th percentile on a test. Does that mean you did well or badly? Explain.

(It does not mean you scored 90% on the test!)

Section 7.4 Prime numbers and perfect numbers

(10) Use the sieve of Eratosthenes to find all the prime numbers between 1 and 40.

(Hint: make a grid 1 to 10, 11 to 20, 21 to 30 and 31 to 40. Cross out 1 and repeat the following procedure: circle the next number and cross out all of its multiples. You don't need to remember which numbers are prime - the sieve finds them all for you.)

(11) Give the prime factorization of 630.

(12) Is the number 541 prime or composite? Explain.

(Hint: see if any of the primes up to $\sqrt{541}$ divide it evenly. If one does it's composite. If none do it's prime.)

(13) Check if the following numbers are abundant, perfect or deficient:

(a) 32

(b) 53

(c) 100

(Hint: add up all the proper factors of each number and compare with the number.)

(14) Compute the fourth perfect number by using Euclid's formula

$$2^{n-1}(2^n - 1)$$

when $n = 7$. (This formula is 2300 years old.)

(15) RSA encryption is a common way for things like credit card numbers to be kept safe online. It works by choosing two very large prime numbers p and q. This pair is the private key and kept secret. The product pq is called the public key and made public. The public key is used to encrypt (hide) the data and the private key is needed to decrypt (reveal) the data.

Suppose 323 is a public key. Break the encryption to get the private key and the steal the data. In other words, try to factor 323 and get p and q.

(In reality the public key would have hundreds of digits and not be so easy to break! See p. 520 of the book for more information.)

If you get stuck on a question or aren't sure if you understand it:

- Go over the relevant class notes and section in the textbook.
- Check if you get the right answer for a similar odd-numbered question in the textbook (answers at the back of the book).
- Ask me about it after class.
- Come to my office hours: Mon 11:30 - 12:30, Wed 11:30 - 12:30 in CP 317.
- Go to the Math Tutorial Lab in-person in CP 303 or online.