MATH 1040

REVIEW (EXAM II)

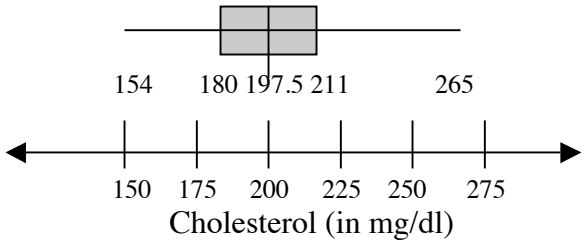
Section 2.5

1. The following data set lists the midterm scores received by 50 students in a chemistry class:

45	85	92	99	37	68	67	78	81	25
97	100	82	49	54	78	89	71	94	87
21	77	81	83	98	97	74	81	39	77
99	85	85	64	92	83	100	74	68	72
65	84	89	72	61	49	56	97	92	82

Find the first, second, and third quartiles of the midterms scores.
Find the interquartile range. What can you conclude from this?
Draw a box-and-whisker plot that represents this data.

2.



Interpret the given box-ad-whisker plot.

3. Find the z score for the value 88, when the mean is 95 and the standard deviation is 5.

4. The birth weights for twins are normally distributed with a mean of 2353 grams and the standard deviation of 647 grams. (assume the bell-shaped distribution)
a) Use the z-score that corresponds to each birth weight to determine which birth weight could be considered unusual: 3690 gr, 1200 gr, 2000 gr, 2353 gr.
b) The birth weight of 2 randomly selected newborn twins are 1706 gr. and 3647 gr. Using the Empirical Rule, find the percentile that corresponds to each birth weight.

5. In a data set with a minimum value of 54.5 and a maximum value of 98.6 with 300 observations, there are 186 data entries with values less than 81.2. Find the percentile for 81.2.

6. For the data given in #1, find the percentile that corresponds to score 81. What score represents the 72^{nd} percentile.

SOLUTIONS:

1. min=21
   max=100
   Q1=67
   Q2=81
   Q3=89
   IQR=22
   Outliers: 21, 25
   About 25% data between 81 and 89.

2. min=154, max=265
   Q1=180, Q2=197.5, Q3=211
About 50% of the data are between 180 and 211.

3. –1.4
4. a) 3690 gr (z score is 2.07)
   b) 16^{th} and 97.5^{th} percentile
5. 62^{nd} percentile
6. score 81 – 48^{th} percentile
   74^{th} percentile – score 89

Chapter 3 - Probability

1. Assume that the probability of having a boy is 0.5, and the probability of having a girl is 0.5. In a family with 4 children, find the probability that:

a) all the children are girls
b) all the children are the same sex
c) there is at least 1 boy

2. In a survey of college students, 125 said that they are considering taking the next semester off, and 1,030 students said that they staying in school next semester.

a) If one college student is selected at random, find the probability that the student is considering taking the next semester off?
b) If 2 students are selected (without replacement), what is the probability that both are considering taking the next semester off?
c) If 5 students are selected (without replacement), what is the probability that at least 1 will be considering taking the semester off?

3. The distribution of blood types for 200 Americans is:

Blood type	O+	O-	A+	A-	B+	B-	AB+	AB-
Number	76	14	65	13	19	4	7	2

a) If one donor is selected at random, find the probability that he/she has the blood type A+ or A-.
b) If 2 donors are selected (w/o replacement) find the probability that both donors are type AB-.
c) If 3 donors are selected (with replacement) find the probability that at least 1 donor is type O-.

4. The Heights (in inches) of all males enrolled in a section of sociology class:

6	5 5 6 6 6 8 9 9 9 9
7	0 0 1 2 2 2 3 4 4 5 5 6 6 7

If a male student is selected at random, find the probability that his height is:

a) at least 68 in
b) between 69 in and 73 in (inclusive)
c) not 65 in

5. If you roll a 6 sided die 8 times, find the probability that you will roll an odd number at least once.

6. Four people are selected at random. Find the probability:

a) all 4 are born on the same day of the week

b) all 4 are born on a different day of the week

7. Find the probability that at least 2 people in a class of 92 have the same birthday.

8. A 3-person jury must be selected at random (without replacement) from a pool of 12 people that has 6 men and 6 women. Find the probability of selecting an all-female jury.

9. You purchase 15 lottery tickets for which the probability of winning some prize on a single ticket is 1 in 12. What is the probability that you have at least 1 winning ticket among the 15 tickets?

10. Find the probability of drawing 3 diamonds in a row from a regular deck of cards
    a) the drawn card is returned to the deck each time
    b) the drawn card is not returned to the deck each time

11. Refer to problem #10. Find the probabilities if you are drawing 3 fives in a row.

12. Of campus professors 60% are male, and of these, 15% work for College of Humanities. Find the following probabilities:

    a) randomly selected professor is a male and works for College of Humanities.
    b) randomly selected professor is a male and does not work for College of Humanities.
    c) randomly selected professor is a female and works for College of Humanities.

13. At a random hospital, 55% of doctors are female. 70% of these female doctors are married. If 60% of male doctors are married, what is the probability that a randomly selected doctor is married.

14. One card is selected from a standard deck of 52 playing cards. What is the probability that the card is either a heart or a ten? What is the probability that the card is either an ace or a black card? What is the probability that the card is either a seven or a queen?

15. According to the World Factbook website, as of July 2008, 67.1% of the U.S. population was 15-64 years old. Suppose that in a survey, 15 people were chosen at random from the population. What is the probability that all 15 were not 15-64 years old? What is the probability that at least one person is 15-64 years old?

16. A random number generator selects 6 integers from 1 to 50. What is the probability that all 6 integers are less than or equal to 8?

17. Two hundred people were asked if they favor the death penalty. Of the 75 that answered "yes" to the question, 38 were male. Of the 125 that answered "no" to the question, 39 were male. If one person is selected at random, find the probability that:
    a) this person answered "yes" or was a female.
    b) this person answered "no" or was a female.

c) If two people were selected at random, find the probability that both were males and both answered "yes".

d) If 5 people were selected at random, find the probability that at least one person answered "yes" and was a male.

18. A delivery route must include stops at 7 cities (A, B, C, D, E, F, and G). How many different routes are possible? If a route is randomly selected, find the probability that the cities are arranged in alphabetical order.

19. The representatives from the State Office is making a schedule to visit 12 universities/colleges within the state. In how many different ways can they visit 5 of these institutions within the next week?

20. How many ways can a group of five women and three men be selected from fifteen women and eleven men?

21. How many different permutations of the letter in the word PROBABILITY are there?

22. If a couple has 3 boys and 2 girls, how many gender sequences are possible? Write all the sequences.

23. How many ways can 6 people, a, b, c, d, e, and f, sit in a raw at a town meeting if c and d must sit together?

24. A shipment of 15 dishwashers contains 3 defective units. The contractor has ordered 4 of these 15 units, and since each is identically packaged, the selection will be at random. In how many ways can the contractor buy 4 units, and a) receive no defective units, b) receive 1 defective unit, c) receive at least 2 non-defective unit .
Find the probability that the contractor will buy at least 2 defective units.

25. The Scholarship Committee has five awards for top students. They are considering 28 applicants, and 15 of the candidates are majoring in mathematics.

a) What is the probability that all five awards are given to students majoring in mathematics?
b) What is the probability that none of the five recipients are majoring in mathematics?

SOLUTIONS:

1. a) 0.0625
   b) 0.125
   c) 0.9375
2. a) 0.1028
   b) 0.01163
   c) 0.4366
3. a) 0.39
   b) 0.0000503
   c) 0.1966
4. a) 0.7917
   b) 0.4583
   c) 0.9167
5. 0.9961
6. a) 0.00292
   b) 0.3499
7. $1-\frac{365}{365}\cdot\frac{364}{365}\cdot\frac{363}{365}\cdots\frac{274}{365}$
8. 0.0909
9. 0.7289
10. a) 0.0156
    b) 0.0129
11. a) 0.00046
    b) 0.000181
12. a) 0.09
    b) 0.51
    c) insufficient info.
13. 0.655
14. a) 0.3077
    b) 0.5385
    c) 0.1538
15. a) $(0.329)^{15}$ b) 0.99999 (almost 1)
16. 0.0000168
17. a) 0.805 b) 0.81
    c) 0.0353 d) 0.6555
18. 7! = 5,040, P = 1/(7!) = 0.0002
19. 95,040
20. ${}_{15}C_5 \cdot {}_{11}C_3 = 495{,}495$
21. 9,979,200
22. $\frac{5!}{3!\cdot 2!} = 10$
23. $5! \cdot 2 = 240$
24. a) ${}_{12}C_4 = 495$ b) ${}_{12}C_3 \cdot {}_3C_1 = 660$
    c) ${}_{12}C_2 \cdot {}_3C_2 + {}_{12}C_3 \cdot {}_3C_1 + {}_{12}C_4 \cdot {}_3C_0 = 1{,}353$
    d) $\frac{{}_{12}C_2 \cdot {}_3C_2 + {}_{12}C_1 \cdot {}_3C_3}{{}_{15}C_4} = 210$
25. a) $\frac{{}_{15}C_5}{{}_{28}C_5} = 0.0306$ b) $\frac{{}_{13}C_5}{{}_{28}C_5} = 0.0131$