King Fahd University of Petroleum & Minerals
Department of Math and Stat

Semester 132 *Math 131, Final Exam* *May 19, 2014*

Name : *I.D. #* *CODE #* .

1. On January 1, 2010, Khalid borrowed \$6,000 from a bank. On January 1, 2011, he paid the bank \$2,000. On January 1, 2014, he again borrowed \$3,000. On January 1, 2015, he wants to pay the bank all his remaining balance. If the interest rate is 12% compounded monthly, how much will he pay on January 1, 2015?

   a) \$12,810.3 b) \$11,056.2 c) \$10,893.7 d) \$9,999.9 e) \$7,000.0

2. For ten years, an investor deposits an amount of money at the end of each quarter in a fund that pays 8% compounded quarterly. If the fund has \$15,000 at the end of 10 years, how much is the quarterly payment?

   a) \$375.0 b) \$266.5 c) \$248.3 d) \$173.9 e) \$120.7

3. A shop sells shirts for \$27 each. Each shirt costs \$12 and the shop has weekly fixed costs of \$855. How many shirts must be sold every week for the shop to break even?

   a) 40 b) 50 c) 52 d) 57 e) 60

4. The demand for a product is given by $p = 200 - 2q$, where p is the price per unit and q is the quantity demanded. The manufacturer's maximum revenue is

   a) 2000 b) 2900 c) 4270 d) 5000 e) 5999

5. An interest rate of 10% compounded continuously is equivalent to an effective rate of

   a) 10.52% b) 10.31% c) 10.23% d) 10.17% e) 9.95%

6. One hundred people are checked for hearing loss. Forty of them have no hearing loss. Thirty of them have hearing loss in the right ear. Ten of them have hearing loss in both ears. How many of them have hearing loss in the left ear?

   a) 10 b) 20 c) 30 d) 35 e) 40

7. The mode and the median of the list of numbers 21, 32, 46, 51, 32, 49, 32, 49 ***respectively*** are

   a) 21, 32 b) 32, 32 c) 49, 32 d) 32, 46 e) 32, 39

8. Suppose that E and F are two events with positive probabilities. Which of the following statements is true?

a) E and F are independent if their probabilities equal 1/2 each.
b) E and F are mutually exclusive if there is only one common sample point.
c) If E and F are independent then they are mutually exclusive.
d) If E and F are mutually exclusive then $P(E \mid F) = P(E)$.
e) If E and F are mutually exclusive then they are dependent.

9. A coin is tossed seven times. In how many ways can four heads and three tails occur?

a) 12 b) 35 c) 210 d) 840 e) 5040

10. In how many ways can you arrange five of seven different books on a bookshelf?

a) 2520 b) 42 c) 5040 d) 120 e) 21

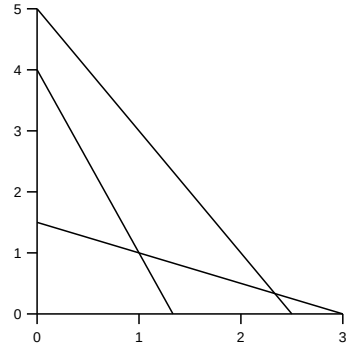
11. Find the **minimum** value of $P = +2x_1 + 5x_2 - 4x_3$

subject to
$$6x_1 + 3x_2 - 3x_3 \le 10$$
$$x_1 - x_2 + x_3 \le 1$$
$$-2x_1 + x_2 - 2x_3 \ge -12$$
$$x_1, x_2, x_3 \ge 0$$

a) -6 b) 6 c) -4 d) 4 e) 0

12. Find the **maximum** value of $Z = 3x + 2y$

subject to
$$2x + y \le 5$$
$$3x + y \le 4$$
$$x + 2y \ge 3$$
$$x, y \ge 0$$



a) 3 b) 4 c) 5 d) 8 e) 10

13. On a 5-question multiple-choice examination, there are 3 choices for each question, only one of which is correct. If a student answers each question in a random fashion, find the probability that the student answers exactly 3 questions correctly.

a) $\frac{10}{243}$ b) $\frac{40}{243}$ c) $\frac{8}{25}$ d) $\frac{81}{125}$ e) $\frac{3}{125}$

14. A random variable X has the following distribution. Find $Var(X)$.

x	$P(X = x)$
2	0.18
3	????
5	0.25
9	0.16

a) 6.4 b) 5.3 c) 4.4 d) 3.8 e) 3.1

15. The table below shows the frequency distribution of the waiting time of customers in a bank. Find the mean waiting time.

Waiting Time (in minutes)	Frequency (Number of Customers)
0-4	8
5-9	20
10-14	12
15-19	7
20-24	3

a) 12.3 b) 12.0 c) 9.7 d) 8.8 e) 7.0

16. Given the sample space $S = \{1, 2, 3, 4, 5\}$ and the events $E = \{1, 2, 3\}$ and $G = \{3, 4\}$. Find $P = (E \mid G')$.

a) $\frac{2}{3}$ b) $\frac{1}{2}$ c) $\frac{1}{3}$ d) $\frac{2}{5}$ e) $\frac{1}{5}$

17. Box 1 contains three red and two white balls. Box 2 contains two red, four white, and four blue balls. Box 3 contains one red, one white, and one blue ball. A box is chosen at random and then a ball is chosen at random from it. Find the probability that the ball is white.

a) $\frac{2}{15}$ b) $\frac{7}{18}$ c) $\frac{17}{45}$ d) $\frac{1}{9}$ e) $\frac{1}{15}$

18. The probability that Khalid passes an exam is $\frac{7}{8}$, and the probability that Fahd passes the same exam is $\frac{2}{3}$. Find the probability that exactly one of them will pass the exam.

a) $\frac{7}{12}$ b) $\frac{7}{24}$ c) $\frac{1}{24}$ d) $\frac{3}{8}$ e) $\frac{3}{4}$

19. If E and F are independent with $P(E) = \frac{1}{3}$ and $P(F) = \frac{3}{4}$, find $P(F' \cup E)$.

a) $\frac{1}{6}$ b) $\frac{3}{12}$ c) $\frac{1}{4}$ d) $\frac{1}{3}$ e) $\frac{1}{2}$

20. The yearly income for a group of 30,000 people is normally distributed with mean $\mu = \$60,000$ and $\sigma = \$5,000$. How many of these people have yearly income between \$55,000 and \$70,000?

a) 20,400 b) 22,425 c) 24,450 d) 28,500 e) 29,925

21. A national achievement test was taken by 991 students. If the scores are normally distributed with $\mu = 60$ and $\sigma = 10$, then we can say that only 327 students scored more than

a) 70.1 b) 67.3 c) 65.0 d) 64.4 e) 61.3

22. In a large production lot of electronic devices, it is believed that one-fourth are defective. If a sample of three is randomly selected, find the probability that no more than one device will be defective.

a) $\frac{27}{32}$ b) $\frac{5}{32}$ c) $\frac{27}{64}$ d) $\frac{9}{64}$ e) $\frac{51}{64}$

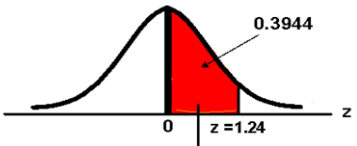
23. Suppose X is a binomially distributed random variable such that $\mu = 2$ and $\sigma^2 = \frac{3}{2}$. Find $P(X = 1)$.

a) $\frac{8}{3^{11}}$ b) $\frac{3}{4}$ c) $\frac{3^7}{2^{11}}$ d) $\frac{3}{2^{11}}$ e) $\frac{3^7}{2^{13}}$

$$a_{\overline{n}|r} = \frac{1-(1+r)^{-n}}{r}$$

$$s_{\overline{n}|r} = \frac{(1+r)^{n}-1}{r}$$

Standard Normal Distribution Table



Z	0	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.0000	0.0040	0.0080	0.0120	0.0160	0.0199	0.0239	0.0279	0.0319	0.0359
0.1	0.0398	0.0438	0.0478	0.0517	0.0557	0.0596	0.0636	0.0675	0.0714	0.0753
0.2	0.0793	0.0832	0.0871	0.0910	0.0948	0.0987	0.1026	0.1064	0.1103	0.1141
0.3	0.1179	0.1217	0.1255	0.1293	0.1331	0.1368	0.1406	0.1443	0.1480	0.1517
0.4	0.1554	0.1591	0.1628	0.1664	0.1700	0.1736	0.1772	0.1808	0.1844	0.1879
0.5	0.1915	0.1950	0.1985	0.2019	0.2054	0.2088	0.2123	0.2157	0.2190	0.2224
0.6	0.2257	0.2291	0.2324	0.2357	0.2389	0.2422	0.2454	0.2486	0.2517	0.2549
0.7	0.2580	0.2611	0.2642	0.2673	0.2704	0.2734	0.2764	0.2794	0.2823	0.2852
0.8	0.2881	0.2910	0.2939	0.2967	0.2995	0.3023	0.3051	0.3078	0.3106	0.3133
0.9	0.3159	0.3186	0.3212	0.3238	0.3264	0.3289	0.3315	0.3340	0.3365	0.3389
1.0	0.3413	0.3438	0.3461	0.3485	0.3508	0.3531	0.3554	0.3577	0.3599	0.3621
1.1	0.3643	0.3665	0.3686	0.3708	0.3729	0.3749	0.3770	0.3790	0.3810	0.3830
1.2	0.3849	0.3869	0.3888	0.3907	0.3925	0.3944 ←	0.3962	0.3980	0.3997	0.4015