Statistics Exam#1 (2015)

系別：_____ 學號：_____ 姓名：

_____

計算填充題(84%)：需寫出計算過程

1. (5%) Given: The probabilities of three events, A, B, and C, occurring are P(A) = 0.35, P(B) = 0.45, and P(C) = 0.2. Assuming that A, B, or C has occurred, the probabilities of another event, X, occurring are $P(X|A) = 0.8$, $P(X|B) = 0.65$, and $P(X|C) = 0.3$. Find $P(A|X) =$ _____.

2. (5%) A Ph.D. graduate has applied for a job with two universities: *A* and *B*. The graduate feels that she has a 60% chance of receiving an offer from university *A* and a 50% chance of receiving an offer from university *B*. If she receives an offer from university *B*, she believes that she has an 80% chance of receiving an offer from university *A*. What is the probability that at least one university will make her an offer?

   Probability = _____

3. (5%) The monthly sales at a bookstore have a mean of 50,000 and a standard deviation of 6,000. Profits are calculated by multiplying sales by 40% and subtracting fixed costs of 12,000. Find the standard deviation of monthly profits.

Standard deviation of monthly profits = _____

4. (5%) Suppose a disease is present in 3% of population. A diagnostic test for such disease shows 10% false positive and 5% false negative. That is, for a patient having the disease,, the test shows positive (+) with probability 0.95 and negative (-) with probability 0.05. For a patient not having disease, the test shows positive (+) with probability 0.10 and negative (-) with probability 0.90. If a patient's test show (+), what's the probability of his having the disease?

Probability = _____

5. (6%) Throw a dice *n* times fairly and observe the number of dice each time. Assume a random variable X is the frequency that the number of dice is one.
   a. (3%) Write down the probability distribution of random variable
      X= _____
   b. (3%) Assume $n = 5$, $P(X \leq 1 \text{ or } X \geq 5) =$_____

6. (5%) A communication system consists of *n* components, each of which will, independently, function with probability *p*. The total system will be able to operate effectively if at least one-half of its components function. For what values of *p* is a 5-component system more likely to operate effectively than a 3-component system?

   Values of *p* should be _____

7. (6%) Suppose that earthquake occur in the eastern part of Taiwan in accordance with the assumptions for the Poisson probability distribution at a rate of 2 per day.

   a. (3%) Find the probability that at least 3 earthquake occur during the next 2 days = _____
   b. (3%) Find the probability distribution of the time, starting from now, until the next earthquake. _____

8. (5%) Suppose that the proportion of colorblind people in a certain population is 0.005. What is the probability that there will not be more than one colorblind person in a randomly chosen group of 600 people? You can use Poisson distribution to approximate the binomial distribution.

   Probability = _____

9. (5%) Suppose the daily amount of waste generated per person is normally distributed, with mean 3.58 pounds and standard deviation 1.04 pounds. Of the daily amounts of waste generated per person, 67.72% would be greater than what amount? _____

10. (5%) Suppose that customers arrive at a drive through window at an average rate of three customers per minute and that their arrival follow the Poisson model. Use the appropriate distribution to find the probability that the next customer will arrive within 1.5 minutes.

Probability = _____

11. (7%) Suppose that patrons of a restaurant were asked whether they preferred beer or whether they preferred wine. 60% said that they preferred beer. 70% of the patrons were male. 80% of the males preferred beer.

a. (3%) What is the probability a randomly selected patron prefers wine?
Probability = _____

b. (3%) Suppose a randomly selected patron is a female. What is the probability that the patron prefers wine?
Probability = _____

c. (1%) Are gender of patrons and drinking preference independent?
Choose yes or no = _____ Explain below.

12. (5%) Suppose that X is a random variable for which $\mathrm{E}(X) = \mu$ and $\mathrm{Var}(X) = \sigma^2$. Find $\mathrm{E}[X(X-1)] =$_____

13. (5%) Suppose that X and Y are random variables such that $\mathrm{Var}(X) = 9$, $\mathrm{Var}(Y) = 4$, and $\rho(X,Y) = -1/6$. Find $\mathrm{Var}(X - 3Y + 4) =$_____

14. (5%) The average score of all student in an economics class has a mean of 70 and a standard deviation of 3. Suppose a sample of 36 students took the class this semester. Find the probability that the average score of the 36 students exceeded 71.
Probability = _____

15. (5%) The chairman of the statistics department in a certain college believes that 70% of the department's graduate assistantships are given to international students. A random sample of 50 graduate assistants is taken. What is the probability that the sample proportion $\hat{p}$ will be within $\pm.05$ of the population proportion p?
Probability = _____

16. (5%) Suppose that the starting salaries of finance graduates from university *A* are normally distributed with a mean of $36,750 and a standard deviation of $5,320. The starting salaries of finance graduates from university *B* are normally distributed with a mean of $34,625 and a standard deviation of $6,540. If simple random samples of 50 finance graduates are selected from each university, what is the probability that the sample mean of university *A* graduates will exceed that of university *B* graduates?
Probability = _____

選擇題 (16%)

17. Which of the following statements is true?
    a. The sum of the deviation from the arithmetic mean is always zero
    b. The sum of the squared deviations from the arithmetic mean is always zero
    c. The range mean is always smaller than the variance
    d. The standard deviation is always smaller than the variance

18. When studying the simultaneous responses to two categorical questions, we should develop a
    a. contingency table
    b. frequency distribution table
    c. cumulative percentage distribution table
    d. histogram

19. Which of the following statements is true for the following data values: 7, 5, 6, 4, 7, 8, and 12?
    a. The mean, median and mode are all equal
    b. Only the mean and median are equal
    c. Only the mean and mode are equal
    d. Only the median and mode are equal

20. In left-skewed distributions, which of the following is the correct statement?
    a. The distance from Q_1 to Q_2 is smaller than the distance from Q_2 to Q_3
    b. The distance from the smallest observation to Q_1 is larger than the distance from Q_3 to the largest observation
    c. The distance from the smallest observation to Q_2 is smaller than the distance from Q_2 to the largest observation
    d. The distance from Q_1 to Q_3 is twice the distance from Q_1 to Q_2

21. When extreme values are present in a set of data, which of the following descriptive summary measures are most appropriate?
    a. CV and range
    b. Mean and standard deviation
    c. Interquartile range and median
    d. Variance and interquartile range

22. A standard deck of cards is being used to play a game. There are four suits (hearts, diamond, clubs, and spades), each having 13 cards (ace, 2, 3, 4, 5, 6, 7, 8, 9, 10, jack, queen, and king), making a total of 52 cards. This complete deck is thoroughly mixed, and you will receive the first two cards from the deck without replacement. What is the probability that both cards are queens?
a. 12/2652
b. 16/2652
c. 156/2652
d. None of the above

23. Which of the following statements is correct?
a. If $P(A \cap B) = 0$, then A and B are independent events
b. If A and B are independent events, then $P(A) = P(A|B)$
c. If X follows normal distribution, then for any x, $\mathrm{P}(X = x) = 0$
d. If A and B are two events, then $P(A) = P(A \cap B) + P(A \cap B')$

24. Like the normal distribution, the exponential density function $f(x)$
a. is bell-shaped
b. is symmetrical
c. approaches infinity as x approaches zero
d. approaches zero as x approaches infinity

附錄的 Z 表跟課本附的不太一樣，大概是下面這個樣子，記得先熟悉一下

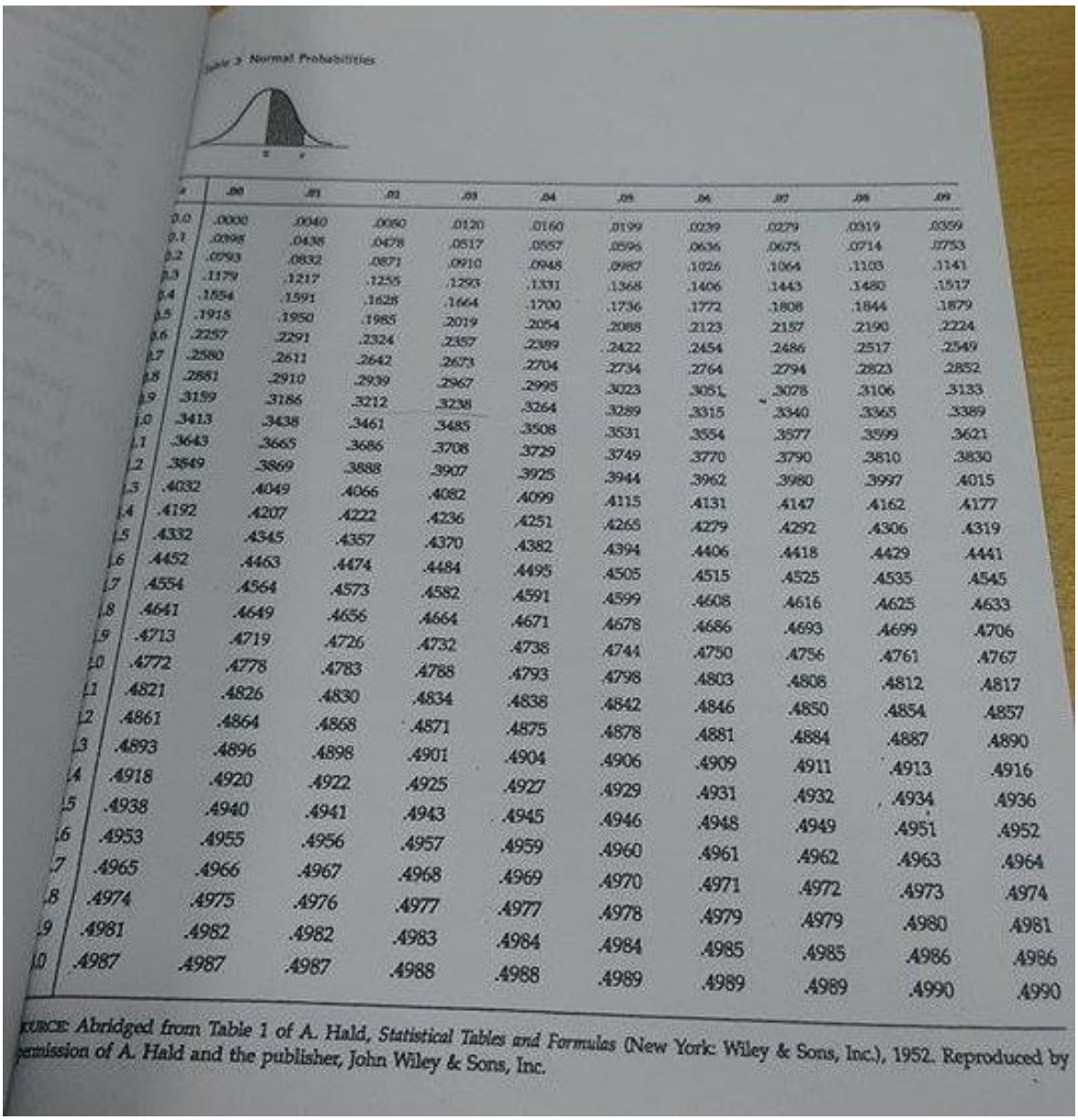

Table 3 Normal Probabilities

z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
0.0	.0000	.0040	.0080	.0120	.0160	.0199	.0239	.0279	.0319	.0359
0.1	.0398	.0438	.0478	.0517	.0557	.0596	.0636	.0675	.0714	.0753
0.2	.0793	.0832	.0871	.0910	.0948	.0987	.1026	.1064	.1103	.1141
0.3	.1179	.1217	.1255	.1293	.1331	.1368	.1406	.1443	.1480	.1517
0.4	.1554	.1591	.1628	.1664	.1700	.1736	.1772	.1808	.1844	.1879
0.5	.1915	.1950	.1985	.2019	.2054	.2088	.2123	.2157	.2190	.2224
0.6	.2257	.2291	.2324	.2357	.2389	.2422	.2454	.2486	.2517	.2549
0.7	.2580	.2611	.2642	.2673	.2704	.2734	.2764	.2794	.2823	.2852
0.8	.2881	.2910	.2939	.2967	.2995	.3023	.3051	.3078	.3106	.3133
0.9	.3159	.3186	.3212	.3238	.3264	.3289	.3315	.3340	.3365	.3389
1.0	.3413	.3438	.3461	.3485	.3508	.3531	.3554	.3577	.3599	.3621
1.1	.3643	.3665	.3686	.3708	.3729	.3749	.3770	.3790	.3810	.3830
1.2	.3849	.3869	.3888	.3907	.3925	.3944	.3962	.3980	.3997	.4015
1.3	.4032	.4049	.4066	.4082	.4099	.4115	.4131	.4147	.4162	.4177
1.4	.4192	.4207	.4222	.4236	.4251	.4265	.4279	.4292	.4306	.4319
1.5	.4332	.4345	.4357	.4370	.4382	.4394	.4406	.4418	.4429	.4441
1.6	.4452	.4463	.4474	.4484	.4495	.4505	.4515	.4525	.4535	.4545
1.7	.4554	.4564	.4573	.4582	.4591	.4599	.4608	.4616	.4625	.4633
1.8	.4641	.4649	.4656	.4664	.4671	.4678	.4686	.4693	.4699	.4706
1.9	.4713	.4719	.4726	.4732	.4738	.4744	.4750	.4756	.4761	.4767
2.0	.4772	.4778	.4783	.4788	.4793	.4798	.4803	.4808	.4812	.4817
2.1	.4821	.4826	.4830	.4834	.4838	.4842	.4846	.4850	.4854	.4857
2.2	.4861	.4864	.4868	.4871	.4875	.4878	.4881	.4884	.4887	.4890
2.3	.4893	.4896	.4898	.4901	.4904	.4906	.4909	.4911	.4913	.4916
2.4	.4918	.4920	.4922	.4925	.4927	.4929	.4931	.4932	.4934	.4936
2.5	.4938	.4940	.4941	.4943	.4945	.4946	.4948	.4949	.4951	.4952
2.6	.4953	.4955	.4956	.4957	.4959	.4960	.4961	.4962	.4963	.4964
2.7	.4965	.4966	.4967	.4968	.4969	.4970	.4971	.4972	.4973	.4974
2.8	.4974	.4975	.4976	.4977	.4977	.4978	.4979	.4979	.4980	.4981
2.9	.4981	.4982	.4982	.4983	.4984	.4984	.4985	.4985	.4986	.4986
3.0	.4987	.4987	.4987	.4988	.4988	.4989	.4989	.4989	.4990	.4990

SOURCE: Abridged from Table 1 of A. Hald, *Statistical Tables and Formulas* (New York: Wiley & Sons, Inc.), 1952. Reproduced by permission of A. Hald and the publisher, John Wiley & Sons, Inc.

計分：強調小數點要取到四位數

1.)沒有過程，不論答案為何不予計分。

2.)計算正確但是未依照指定格式呈現，扣一分。

3.)其餘部分皆以該大題計分為主。

統計學期中考解答

計算填充題

1. 0.4427
2. 0.7
3. 2400
4. 0.2271
5. (a) $\mathrm{B}(\mathrm{n}, \mathrm{p}=\frac{1}{6})$ $\binom{n}{x}\left(\frac{1}{6}\right)^{\mathrm{x}}(\frac{5}{6})^{n-x}, \mathrm{x}=0,1, \ldots, \mathrm{n}$ (b)0.8839
6. $\mathrm{p}>\frac{1}{2}$
7. (a)0.7619 (b)$2e^{-2x}, \mathrm{x} \geq 0$
8. 0.1992
9. 3.1016
10. 0.9889
11. (a)0.4 (b)0.867 (c)No
12. $\sigma^2+\mu^2-\mu$
13. 51
14. 0.0228
15. 0.5588
16. 0.9625

選擇題

aaabc

add