

**INSTITUTE OF BANKERS IN MALAWI**

**DIPLOMA IN BANKING EXAMINATION**

**SUBJECT: INTRODUCTION TO BUSINESS STATISTICS (IOBM – D212)**

**Date: Wednesday, 17th May 2017**

**Time Allocated: 3 hours (08:00 – 11:00 Hours)**

**INSTRUCTIONS TO CANDIDATES**

1 This paper consists of **TWO** Sections, A and B.

2 Section A consists of 4 questions, each question carries 15 marks.

Answer **ALL** questions.

3 Section B consists of 4 questions, each question carries 20 marks. Answer **ANY TWO** questions.

4 You will be allowed **10 minutes** to go through the paper before the start of the examination, you may write on this paper but not in the answer book.

5 Begin each answer on a new page.

6 **Please write your examination number on each answer book used. Answer books without examination numbers will not be marked.**

7 All persons writing examinations without payment will risk expulsion from the Institute.

8 If you are caught cheating, you will be automatically disqualified in all subjects seated this semester.

9 DO NOT open this question paper until instructed to do so.

**SECTION A (60 MARKS)**

Answer **ALL** questions from this section.

**QUESTION 1**

1. Give any **three** conditions of a binomial experiment. *(3 marks)*
2. Which of the following is continuous random variables
3. The time that an individual logged onto the internet during a given week.
4. The number of ATM breakdowns reported per day by the faults department.
5. The daily bank lending rate as recommended by the Reserve Bank of Malawi. *(1 mark)*
6. A government reports states that the mean amount spent per capita for police protection for cities exceeding 150,000 in population is K5,000 and the standard deviation is K750. A criminal justice research study found that for 40 such randomly selected cities, the average amount spent per capita for this sample for police protection is K4,650.

**Required:**

If the government report is correct, find the probability of getting a sample mean that is below the national average. *(5 marks)*

1. Calculate 7 yearly moving averages for the following data of the number of ATM breakdowns of Consumer Bank during 2001 to 2016. *(6 marks)*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Year | No of failure |  | Year | No of failure |
| 2001  2002  2003  2004  2005  2006  2007  2008 | 23  26  28  32  20  12  12  10 |  | 2009  2010  2011  2012  2013  2014  2015  2016 | 9  13  11  14  12  9  3  1 |

**QUESTION 2**

1. What happens to the width of an interval estimate when the sample size is increased?  *(2 marks)*
2. A national survey of 500 bank customers found that 62% are savings account holders.

**Required:**

Find a 90% confidence interval for p, the proportion of all bank customers who are savings account holders. *(4 marks)*

1. In a certain bank

65% of the staff work full time,

55% of the staff are female,

35% of the staff are male and work full time.

**Required:**

Find the probability that a member of staff chosen from the bank is female and works part time. *(4 marks)*

1. The wholesale price index in PP shop is made up of the prices of three items. The price index and weighting in 2009 and 2010 for each item are as follows.

Price and weight information for PP shop

|  |  |  |  |
| --- | --- | --- | --- |
| Item | Price, 2009 | Price, 2015 | Weight |
| Bread  Tea  Cookies | K200  K1000  K200 | K400  K1200  K250 | 60  20  40 |

Required:

Calculate an index for prices of PP shop for year 2015. *(5 marks)*

**(Total 15 marks)**

**QUESTION 3**

1. Define the term Capital investment. *(2 marks)*
2. Consider these two simplified projects:

|  |  |  |
| --- | --- | --- |
| Year | Project S (MK billion) | Project B (MK billion) |
| 0 | (150) | (250) |
| 1 | 50 | 110 |
| 2 | 75 | 110 |
| 3 | 88 | 115 |

Both projects last exactly three years, have an initial investment in year zero (today) and generate income at the end of years 1 to 3. The cash flows in each year are net cash flows, that is income less any costs.

**Required:**

1. Work out Net Present Value (NPV) of Project S, using a discount rate of 10% and 20%. *(6 marks)*
2. Work out Net Present Value (NPV) of Project B, using a discount rate of 10% and 20%. *(5 marks)*
3. Give your conclusion on both projects with respect to the choice of the discount rate. *(2 marks)*

**Note:** Remember to ask for discount factors tables from the invigilator.

**(Total 15 marks)**

**QUESTION 4**

1. A bank reported that 75% of the customers prefer opening a savings account, 20% prefer other accounts and 5% are not sure of their preference. A survey is conducted to test the hypothesis that the distribution is different from that reported by the bank.

**Required:**

State the null and alternative hypotheses.  *(2 marks)*

1. A telemarketing company administers an aptitude test consisting of 25 problems to potential bank employees. A variable of interest to the company is X, the number of problems worked correctly.

**Required:**

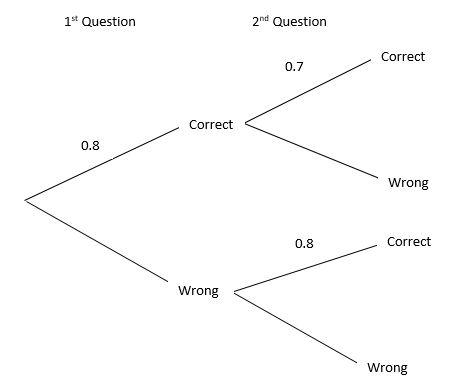
How many different values are possible for X? *(2 marks)*

1. In a survey of 900 bank customers, 360 responded “yes” to the question “Do you use Internet banking?”.

**Required:**

Determine the 90% confidence interval for p, the proportion of all customers that use internet banking. *(5 marks)*

1. A computer program generates random questions in arithmetic that children have to answer within a fixed time. The probability of the first question being answered correctly is 0.8. Whenever a question is answered correctly, the next question generated is more difficult, and the probability of a correct answer being given is reduced to 0.1. Whenever a question is answered wrongly, the next question is of the same standard, and the probability of a correct answer being given remains unchanged. The following tree diagram shows this information for the first two questions generated.



**Required:**

Using a tree diagram, or otherwise, find the probability that the second question is answered correctly given that the third question is answered correctly. *(6 marks)*

**(Total 15 marks)**

**SECTION B 40 MARKS**

Answer **ANY TWO** questions from this section

**QUESTION 5**

1. Classify each of the following as a lower-tailed, upper-tailed, or two-tailed test:

1. *(3 marks)*
2. The mean weekly wage for new bank employees is K32,000. The mean weekly wage for a sample of 750 new bank employees is K31,895.

**Required:**

1. Identify the population, population mean and the sample mean. *(3 marks)*
2. Identify the parameter and the point estimate of the parameter. *(2 marks)*
3. The world output of bicycles in 2016 was 114 million. China produced 41 million bicycles in 2016.

**Required:**

What proportion of the world’s new bicycles in 2016 were produced by China?

*(2 marks)*

1. A study involving several cities across the country involving crime was conducted. The cities were divided into the regions: South, Northeast, North Central, and West. Based on the interviews, crime was classified as a major concern, a minor concern, or of no concern for each individual interviewed. The results are shown in the table below.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Concern | South | Northeast | North Central | West |
| Major  Minor  No concern | 25  65  15 | 40  45  10 | 35  40  15 | 40  40  20 |

**Required:**

1. Find the expected frequencies for the 12 cells. *(5 marks)*
2. At the level of significance =0.05, test the hypothesis that opinion regarding crime is independent of the region of the country.  *(5 marks)*

**(Total 20 marks)**

**QUESTION 6**

1. It is known from census data that for a particular income group,10% of households have no children, 25% have one child, 50% have two children, 10% have three children, and 5% have four children.

**Required:**

If X represents the number of children per household for this income group, determine the probability distribution for the number of children.  *(3 marks)*

1. Which of the following binomial distributions is the normal approximation to the binomial distribution appropriate?

* 1. n=15, p= 0.2
  2. n=40, p= 0.1
  3. n=500, p= 0.05
  4. n=50, p= 0.3 *(2 marks)*

1. A sample of size 50 is taken from a population having a mean equal to 90 and a standard deviation equal to 15. A second sample of size 70 and independent of the first sample is selected from another population having a mean equal to 75 and standard deviation equal to 10. The mean of the sample of size 50 is represented by and the mean of the sample of size 70 is represented by .

**Required:**

1. What type of distribution does ( - ) have? *(1 mark)*
2. What is the expected value of ( - )? *(3 marks)*
3. Prepare a simple aggregative price index number from the following data:

|  |  |  |  |
| --- | --- | --- | --- |
| Commodity | Rate Unit | Price (MK) (2005) | Price (MK) (2014) |
| Wheat | per 10 kg | 100 | 140 |
| Rice | per 10 kg | 200 | 250 |
| Pulses | per 10 kg | 250 | 350 |
| Sugar | per kg | 14 | 20 |
| Oil | per litre | 40 | 50 |

*(5 marks)*

1. The following table relates to the number of ATM break-ins during the period 2010 to 2016.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Years: | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
| Number of break-ins | 18 | 20 | 23 | 25 | 24 | 28 | 30 |

**Required:**

Fit a straight-line trend using the method of least squares. *(4 marks)*

Estimate the number of break-ins that are likely to occur in the year 2020.

*(2 marks)*

**(Total 20 marks)**

**QUESTION 7**

1. Is it possible to give a probability value to each individual value of a continuous random variable? Give a reason for your answer. *(2 marks)*
2. Two projects, X and Y give cash flows in kwacha in the table below.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Year | Project X | Cumulative  Net Cash flow (Project X) | Project Y | Cumulative  Net Cash flow (Project Y) |
| 0 | (50,000) | (50,000) | (80,000) | (80,000) |
| 1 | 25,000 | (25,000) | 45,000 | (35,000) |
| 2 | 20,000 | (5,000) | 35,000 | 0 |
| 3 | 20,000 | 15,000 | 17,000 | 17,000 |
| 4 | 15,000 | 30,000 | 15,000 | 32,000 |
| 5 | 10,000 | 40,000 |  |  |

**Required:**

1. Calculate the payback for both projects. *(6 marks)*
2. Explain which project should be selected if payback is the only criterion used and why. *(3 marks)*
3. Calculate Accounting Rate of Return for both projects. *(6 marks)*
4. The business has a cut-off or criterion rate of 11% for all new projects. Would either project be acceptable with this restriction? *(3 marks)*

**(Total 20 marks)**

**QUESTION 8**

1. Five hundred arrest records were randomly selected and the records were categorized according to age and type of violent crime. The results are shown in the table below:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Crime Type | 18 - 25 | 26 - 33 | 34 - 40 | Over 40 |
| Murder  Rape  Robbery  Assault | 11  21  120  147 | 15  26  85  42 | 4  11  3  5 | 2  3  2  3 |

**Required:**

1. Find the table of expected frequencies assuming independence, and comment whether it is appropriate to perform the chi-square test of independence. *(5 marks)*
2. Combine the categories "34 - 40" and "Over 40" into a new category called "Over 33" and perform the chi-square independence test. *(5 marks)*
3. In a study of internet ned for a group of college graduates as well as a group of non-college graduates. The results of the study are shown in the table below.

|  |  |  |  |
| --- | --- | --- | --- |
| Group of graduates | Sample Size | Mean | Standard Deviation |
| College  Non-college | 14  12 | 8.6 hours  6.3 hours | 1.1 hour  2.7 hours |

**Required:**

Assuming that the times are normally distributed, at a level of significance =0.05, test the hypothesis that the mean for college graduates is greater than the mean for non-college graduates. *(5 marks)*

1. Using simple average of Price Relative Method, find the price index for 2011, taking 2006 as base year from the following data.  *(5 marks)* **(Total 20 marks)**

**END OF EXAMINATION PAPER**