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NKUHLU DEPARTMENT FOR ACCOUNTING STUDIES

Financial Management

AFM 121/ AFM121 E

2nd Semester

JANUARY SUPPLEMENTARY EXAMINATION 2019

Total: 150 marks

Time: 3 hours

- Write your name and student number in the appropriate spaces.
- This paper consists of 11 pages - This includes 1 answer sheet, 1 information sheet, 1 stat tables and a rough work sheet
- Answer ALL the questions. Number the answers correctly according to the numbering system used in this question paper
- Clearly show **ALL** calculations, diagrams, graphs, etc, which you have used to solve the problems.
- Unless stated otherwise, **round all answers to TWO decimal places.**
- Silent non-programmable calculators may be used.

Examiner(s): S Msakatya

Moderator: L Funnell

PLEASE HAND BACK THE QUESTION PAPER !!!

QUESTION 1**21 marks (25mins)**

- 1.1 An amount of money was invested and earned simple interest of R1 800 over a 55 month period at which time the total final amount was R6 350, 25. Determine the annual rate of *simple* interest. (5)
- 1.2 Dumisani inherits R42 000 from his grandmother, which he invests in a savings account. *Eight* months after this investment, he withdraws R5 000 to pay for repairs on his car. *Fifteen* months after his initial investment, his company gives him a bonus of R27 000, which he immediately invests in the same account. The account is open for a total of two years.
For the first year, the account earns interest at 4,62% per annum, compounded monthly. At the start of the second year, the interest is changed to 4,8% per annum, compounded quarterly.
- 1.2.1 Draw a timeline that represents the above situation. Indicate all changes relating to money and interest rates. Clearly indicate the time at which these changes occur. (6)
- 1.2.2 Calculate the final balance of the account at the end of the two years. (10)

QUESTION 2**31marks (37mins)**

- 2.1 You won a university investment challenge sponsored by JSE and Liberty life which has paid you R25 000. At 20, you have decided to invest this amount of money for 30 years until you turn 50. During this time your account will earn 15%, compounded annually. As soon as you turn 50, you will start withdrawing from the fund on a monthly basis for 30 years, but you are investing more conservatively at 8% compounded monthly. How much can you withdraw each year starting from the time you turn 50? (5)
- 2.2.1 Nthabi borrows R420 000 to start a small business. She agrees to repay the loan over a period of five years, from the time the loan is granted. The first payment, however, will be nine months after the granting of the loan. The interest rate is 15% p.a. compounded monthly. Determine the monthly instalments. (6)
- 2.2.2 How much interest (*to the nearest Rand*) will Sihle pay in total? (3)

- 2.2 Grace invests R20 000. She wishes to withdraw 24 equal quarterly instalments until completion of the investment. Withdrawals will however only start at the end of 6 months. The interest on the investment is 19% per annum.
- 2.2.1 What is the nominal quarterly interest rate? (1)
- 2.2.2 Determine the value of the quarterly withdrawals (5)
- 2.2.3 If Grace decides she would rather invest the R20 000 into a perpetuity at 19% p.a., what will her annual perpetuity be? (2)
- 2.4 Dr Tom purchases a bus for the UFH soccer club for R1 050 000. They plan to use it for 6 years and then trade it in for a new model. Inflation is estimated at 9% p.a. whilst the value of the bus after 6 years is expected to be 45% of the original purchase price. The club sets up a sinking fund in order to purchase a new bus in 6 years' time. The interest payable for the sinking fund is calculated at 10,5 % p.a., compounded monthly.
- 2.4.1 What will the cost of a new bus be in 6 years' time? (3)
- 2.4.2 Determine the monthly payment into the sinking fund if payments start *immediately* and finish at the *end* of 6 years. (6)

QUESTION 3**34 marks (41mins)**

- 3.1 A retail analyst records the numbers of loaves of white bread bought by a *sample* of shoppers in a supermarket.

Number of loaves	0	1	2	3	4	5
Frequency	37	23	11	3	0	1

- 3.1.1 Calculate the mean and standard deviation of the numbers of loaves bought per person. (2)
- 3.1.2 Each loaf costs R10,40. Calculate the mean and standard deviation of the amount spent on the loaves per person. (2)
- 3.1.3 A second sample also recording 75 loaves of brown bread bought by shoppers, has a mean number of loaves of 1,1 per person and a standard deviation of 1,5. Use these statistics to compare the preference of shoppers for white and brown bread. (2)

3.2 The heights, to the nearest cm, of 180 people were measured. Below are the results

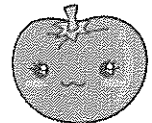
Heights (cm)	160-<165	165-<170	170-<175	175-<180	180-<185	185-<190	190-<195	195-<200
No. of people	2	12	29	37	x	31	15	5

- 3.2.1 Determine the value of x (1)
- 3.2.2 Write down the modal interval (1)
- 3.2.2 Calculate the median for these heights (3)
- 3.2.3 Use the diagram sheet to complete the table to find, x , and the cumulative frequency for this data and then plot the cumulative frequency polygon (ogive) (5)
- 3.2.4 Use your graph to determine down the inter-quartile range (3)
- 3.2.5 The two shortest people appear to be much shorter than the other people that were measured. Determine whether or not these people may be considered to be outliers. (2)

3.3 A biologist assumes that there is a linear relationship between the amount of fertilizer supplied to tomatoes plants and the actual number of tomatoes (yield) produced. Eight tomatoes plants were planted at random and treated with fertilizer in which x grams of fertilizer was dissolved in water. The yield of y kilograms of tomatoes were recorded

Plant	A	B	C	D	E	F	G	H
x (g)	1	1,5	2	2,5	3	3,5	4	4,5
y (kg)	3,9	4,4	5,8	6,6	7	7,1	7,3	7,7

- 3.3.1 Determine the equation of the least square regression line. (3)
- 3.3.2 Calculate the coefficient of determination. (2)
- 3.3.3 Explain the meaning of "b" in the equation. (2)
- 3.3.4 Estimate the yield of a plant treated weekly with 3,2g of fertilizer. (2)
- 3.3.5 Indicate why it may not be appropriate to use the equation in 3.3.1 to predict the yield of a plant treated weekly with 20g of fertilizer. (1)

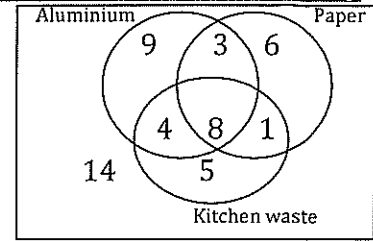


3.4 The best fit linear equation of motor cars of the same model is given as $\hat{y} = a - 0,512x$, where the mileage is in *thousands* of kilometres (x) and the selling price in *thousands* of rands (y). The estimated selling price for a used car of this model with an odometer reading (mileage) of 80 000 km is given as R95 000. Find the value of a in the regression equation (3)

QUESTION 4

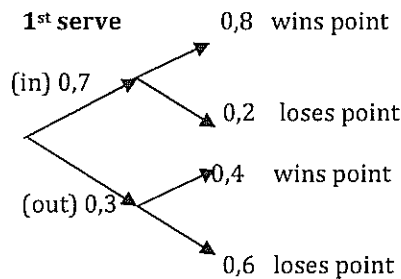
29 marks (35mins)

4.1 A local council has introduced a recycling scheme for aluminium, paper and kitchen waste. 50 residents are asked which of these materials they recycle. This is shown in the Venn diagram alongside. One of the residents is selected at random.



- 4.1.1 Find the probability that this resident recycles
 - A. all three of the materials (1)
 - B. exactly one of the materials. (2)
- 4.1.2 Given that a resident recycles aluminium, find the probability that this resident also recycles paper. (2)
- 4.1.3 Two residents are now selected at random. Find the probability that exactly one of them recycles kitchen waste. (4)

4.2 A tennis player is allowed two serves. The probability that Nadal's *first* serve is in will be 0,7 . He has a probability of 0,8 of winning the point when his first serve is in. Otherwise his probability of winning the first point is only 0,4. This is shown in the tree diagram below.



- 4.2.1 Find the probability that he wins a point when he serves. (3)
- 4.2.2 If that he wins the point, find the probability that the first serve was in. (3)
- 4.2.3 Determine the probability that he wins the game on the second serve (2)

4.3 The table below shows the probability distribution of the random variable X.

x	-2	-1	0	1	2
P(X=x)	1/4	1/5	k	2/5	1/10

- 4.3.1 Find the value of the constant k. (2)
- 4.3.2 Calculate the values of E(X) and Var(X). (5)

4.4 Suppose the number of babies born during an 8-hour shift at a hospital's maternity wing follows a Poisson distribution with a mean of 3 babies an hour. Find the probability that at least 2 babies are born during a particular 2-hour period in this maternity wing. (5)

QUESTION 5**35 marks (42mins)**

- 5.1 60% of passengers who travel by train love pizza. A certain train has 12 compartments and there are 10 passengers in each compartment.
- 5.1.1 What is the mean number of passengers that loves pizza in one compartment? (2)
- 5.1.2 What is the probability that exactly 5 of the passengers in *one* compartment love pizza? (3)
- 5.1.3 What is the probability that the *third* compartment is the first one to have exactly 5 passengers that love pizza? (3)
- 5.2 Assume that the hourly wage rate earned by a worker in a clothing factory (based on a pay system that is piecemeal) is normally distributed with mean R5,10 and standard deviation R0,40.
- 5.2.1 Define a random variable for the hourly wage rate earned by a worker in a clothing factory. (2)
- 5.2.2 Find the probability that a worker's hourly rate exceeds R3,80. (3)
- 5.3 In order to ensure efficient usage of the computer server at UFH, it is necessary to estimate the mean number of all users. According to records, the sample mean and sample standard deviation of number of users at 100 randomly selected times is 37,7 and 9,2, respectively.
- 5.3.1 Construct a 98% confidence interval for the mean number of all users. (5)
- 5.3.2 Do you agree with the claim that $\mu = 40$? Choose either TRUE or FALSE (1)
- 5.4 Last year Gareth found that his journey to work took on average 45,7 minutes with a standard deviation of 3,2 minutes. Gareth wishes to test whether his travel time has *increased* this year. He notes the time, in minutes, for a random sample of eight journeys this year, with the following results.
- 46,2 41,7 49,2 47,1 47,2 48,4 53,7 45,5**
- It may be assumed that the population of this year's journey times is normally distributed also with a standard deviation of 3,2 minutes.
- 5.4.1 Determine the sample average time for his 8 journeys. (1)
- 5.4.2 State whether Gareth should use a one-tailed or a two-tailed hypothesis test. (1)
- 5.4.3 Determine whether the sample provides significant evidence, at the 5% level of significance, that Gareth's travel time has increased this year. Specifically mention the conclusion of Gareth's findings. (Use the z-table) (7)
- 5.5 In a survey of cars parked at a soccer match, 200 cars out of a random sample of 250 cars have been fitted with a tracking device. If $H_0: p = 0,75$ and $H_1: p \neq 0,75$ - is there sufficient evidence to suggest that the all cars are fitted with a tracking device at the 0,04 level of significance? (7)

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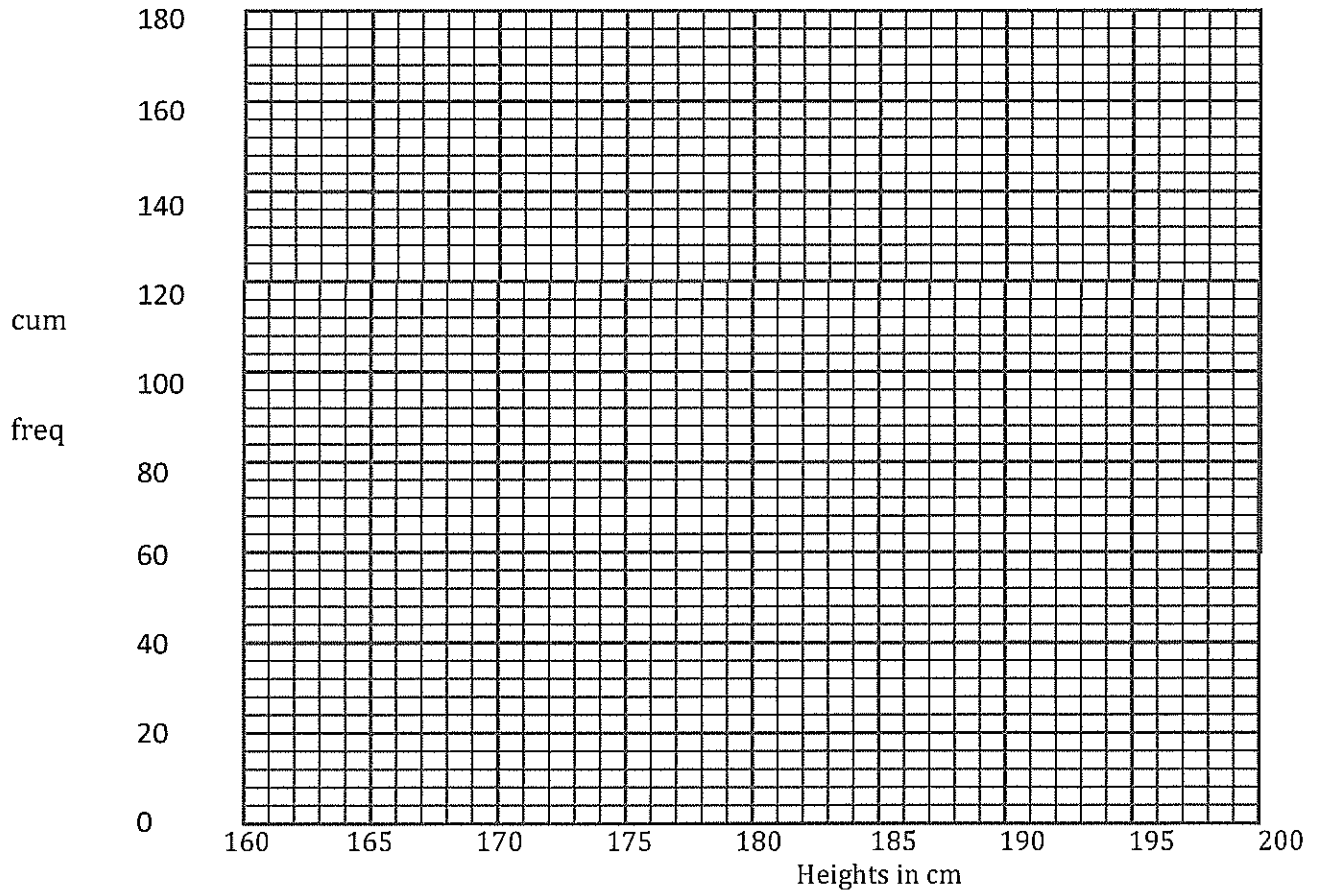
Name:

Student number:

3.2.3

Heights (cm)	160-<165	165-<170	170-<175	175-<180	180-<185	185-<190	190-<195	195-<200
No. of people	2	12	29	37	x	31	15	5
cum freq								

Relative cumulative frequency polygon of the heights in cm



Note: Vertical: Each block = 4 units Horizontal: Each block = 1

AFM 121/AFM121E - INFORMATION SHEET

Financial Mathematics

$$\begin{aligned}
 FV &= PV(1+in) & FV &= PV(1+i)^n & i &= \left(\frac{FV}{PV}\right)^{\frac{1}{n}} - 1 & 1+i_{\text{eff}} &= \left(1+\frac{i}{n}\right)^n \\
 FV_A &= \frac{PMT[(1+i)^n - 1]}{i} & PV_A &= \frac{PMT[1 - (1+i)^{-n}]}{i} \\
 FV_{AD} &= \frac{PMT[(1+i)^n - 1]}{i}(1+i) & PV_{AD} &= \frac{PMT[1 - (1+i)^{-n}]}{i}(1+i) & PV_{AP} &= \frac{PMT}{i} \\
 FV &= PV(1-in) & FV &= PV(1-i)^n & i &= 1 - \left(\frac{FV}{PV}\right)^{\frac{1}{n}}
 \end{aligned}$$

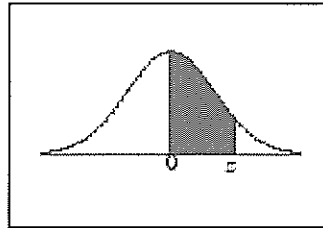
Statistics

$$\begin{aligned}
 \bar{x} &= \frac{\sum x}{n} & \bar{x} &= \frac{\sum f \times x}{n} & \text{Outlier: Lower} &= Q_1 - 1.5 \times IQR \\
 & & & & \text{Upper} &= Q_3 + 1.5 \times IQR \\
 \text{median} &= l + \frac{(u-l)\left(\frac{n}{2} - F_{\text{previous}}\right)}{f} & SD &= s = \sqrt{\frac{\sum (x-\bar{x})^2}{n-1}} & SD &= s = \sqrt{\frac{\sum f(x-\bar{x})^2}{n-1}} \\
 \hat{y} &= a + bx & a &= \bar{y} - b\bar{x} \\
 r &= \frac{\sum (x-\bar{x})(y-\bar{y})}{\sqrt{\sum (x-\bar{x})^2 \sum (y-\bar{y})^2}} & b &= \frac{\sum (x-\bar{x})(y-\bar{y})}{\sum (x-\bar{x})^2} & R &= 1 - \frac{6 \sum d^2}{n(n^2 - 1)}
 \end{aligned}$$

Probability and Probability Distributions

$$\begin{aligned}
 P(E) &= \frac{n(E)}{n(S)} & P(A \text{ or } B) &= P(A) + P(B) - P(A \text{ and } B) & P(A \text{ and } B) &= P(A) \times P(B|A) \\
 P(A|B) &= \frac{P(A \text{ and } B)}{P(B)} & E(X) &= \sum_x xP(X=x) & \text{var}(X) &= E(X^2) - [E(X)]^2 \\
 P(X=x) &= {}^n C_x p^x (1-p)^{n-x} & \mu &= E(X) = np & \text{var}(X) &= np(1-p) \\
 P(X=x) &= \frac{\lambda^x e^{-\lambda}}{x!} & E(X) &= \text{var}(X) = \lambda & z &= \frac{x-\mu}{\sigma} \\
 C.I. &= \bar{x} \pm z \times \frac{\sigma}{\sqrt{n}} & C.I. &= \bar{x} \pm t \times \frac{s}{\sqrt{n}}; \text{ with } (n-1)d.f. \\
 z &= \frac{\bar{x} - \mu}{\left(\frac{\sigma}{\sqrt{n}}\right)} & t &= \frac{\bar{x} - \mu}{\left(\frac{s}{\sqrt{n}}\right)}; \text{ with } (n-1)d.f. & z &= \frac{\hat{p} - p}{\sqrt{\frac{p(1-p)}{n}}} \text{ where } \hat{p} = \frac{x}{n}
 \end{aligned}$$

Standard Normal Distribution Table



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
3.1	.4990	.4991	.4991	.4991	.4992	.4992	.4992	.4992	.4993	.4993
3.2	.4993	.4993	.4994	.4994	.4994	.4994	.4994	.4995	.4995	.4995
3.3	.4995	.4995	.4995	.4996	.4996	.4996	.4996	.4996	.4996	.4997
3.4	.4997	.4997	.4997	.4997	.4997	.4997	.4997	.4997	.4997	.4998
3.5	.4998	.4998	.4998	.4998	.4998	.4998	.4998	.4998	.4998	.4998

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ROUGH WORKINGS
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