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6. (i) A random variable X is such that $X \sim B\left(10, \frac{2}{5}\right)$. Find the values of

(a) $P(X = 2)$,

(b) $P(X \geq 1)$.

(ii) The masses of mangoes from a certain orchard are normally distributed with a mean of 225.2 grams and standard deviation 16.89 grams. A random sample of 100 mangoes selected from this orchard had a mean mass of 220.8 grams.

Stating clearly, the null and alternative hypotheses, perform a hypothesis test at 5% level of significance to find out if this sample provides significant evidence of a reduction in the population mean mass.

7. The probability density function, f , of a continuous random variable X , is defined as

$$f(x) = \begin{cases} \frac{4x}{81}(k - x^2), & \text{for } 0 \leq x \leq 3, \\ 0, & \text{elsewhere.} \end{cases}$$

Find (a) the value of the constant k ,

(b) the mean and variance of X .

Given that the median of this distribution is m , show that $2m^3 - 36m^2 + 81 = 0$.

8. The table below shows the inflation rate, x percent, and the unemployment rate, y percent, for 10 different countries in the month of December 2010.

Inflation rate, x ,	13.9	21.4	9.6	1.5	31.7	23.1	18.4	34.4	27.6	5.6
Unemployment rate, y ,	2.9	11.3	5.2	6.1	9.0	8.8	5.9	15.6	9.8	3.7

Calculate, correct to three decimal places,

(a) the product moment correlation coefficient for this data.

(b) the least squares regression line of inflation rate on unemployment rate.

(c) the Kendall's coefficient of rank correlation between inflation rate and unemployment rate.

You may use $\sum x = 187.2$, $\sum x^2 = 4599.12$, $\sum y = 78.3$, $\sum y^2 = 746.69$, $\sum xy = 1766.18$

1. The table below shows the distribution of marks obtained by some candidates in an examination.

Marks, x	0-9	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90-99
Number, f	10	26	42	68	83	71	52	30	14	6

- Calculate to two decimal places, the mean mark of the distribution.
 - By using 1 cm to represent 20 candidates on the vertical axis and 2 cm to represent 10 marks on the horizontal axis, draw a cumulative frequency curve for this distribution.
 - Using your curve, estimate the number of candidates who passed in this examination, if the pass mark is at least 40.
 - Estimate, also, the percentage of candidates who passed the examination.
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2. There are 1500 male and 2000 female students in a certain university. It is known that 5% of the male students and 0.75% of the female students wear reading glasses. A student X is chosen at random from this university. Find the probability that X
- wears reading glasses.
 - is a female student, given that X wears reading glasses.
 - is a male student or X wears reading glasses.
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3. A bank auditor finds out that a particular bookkeeping department makes, on average, 1 error per week. Find the probability that in a period of one week,
- exactly 4 errors will be made.
 - at most 7 errors will be made.
 - at least 5 errors will be made.
- Calculate, also, to 4 decimal places, the probability that in a 5-week period, no error will be made.
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4. A random sample of 120 measurements is taken from a normal population. From the sample data given below:
- $$\sum x = 1008, \sum (x - \bar{x})^2 = 172.8$$
- Calculate,
- the unbiased estimates for the population mean and variance.
 - a 97% confidence interval for the population mean.
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5. The probability mass function, P , of a discrete random variable, X , is defined by
- $$P(x) = \begin{cases} kx, & \text{for } x = 1, 2, 3, 4, 5, \\ k(10 - x), & \text{for } x = 6, 7, 8, 9. \end{cases}$$
- Calculate
- the value of the constant k .
 - the mean and the variance of X .
 - $P(2X - 5)$ and $\text{Var}(2X - 5)$.