

REVISION EXERCISE APPLIED MATHEMATICS P425/2 2020 AUG 2

1. The table below shows the number of female and male students admitted at a university to offer ten different courses A, B, C, ..., J.

Course	A	B	C	D	E	F	G	H	I	J
Female	66	54	60	70	62	46	70	58	80	58
Male	50	38	54	68	60	32	68	70	69	64

Calculate a rank correlation coefficient for the above data and comment on your result.

2. A and B are two events for which $P(A) = \frac{2}{3}$, $P\left(\frac{\bar{B}}{A}\right) = \frac{3}{4}$ and $P\left(\frac{B}{A}\right) = \frac{1}{3}$. Find:

(i) $P(B)$

(ii) $P\left(\frac{A}{\bar{B}}\right)$

3. A random variable X is binomially distributed with a mean 2 and variance 1.6. Find $P(X < 6)$.

4. Using the trapezium rule with seven ordinates, estimate $\int_0^\pi \sin^2 \frac{x}{2} dx$ correct to three decimal places. Suggest how the accuracy of your result can be improved.

5. (a) Given the equation $xe^{-x} - 2x + 5 = 0$, show by plotting suitable graphs on the same co-ordinate axes that there is only one positive real root.

- (b) Using Newton Raphson's method, find the root of the equation in (a) correct to two decimal places.

6. The continuous random variable X has a p.d.f
- $$f(x) = \begin{cases} \frac{x-2}{3} & 2 \leq x \leq 3 \\ \alpha & 3 \leq x \leq 5 \\ 2-\beta x & 5 \leq x \leq 6 \\ 0 & \text{otherwise} \end{cases}$$

Given that $E(X) = 4$, find:

(i) the values of α and β .

(ii) $F(x)$ and sketch it. (ii) $P(2 \leq x \leq 3.5)$

7. The masses of articles produced in a particular workshop are normally distributed with mean μ and standard deviation σ . Given that 5% of the articles have a mass greater than 85 g and 10% have a mass less than 25 g, find;

(i) the values of μ and σ .

(ii) the range symmetrical about the mean within which 75% of the masses lie.

8. (a) Show that Newton's iterative formula for solving the equation

$$x^5 - 3x^2 + 1 = 0 \text{ is } x_{n+1} = \frac{x_n \left(4x_n^3 - 3 - \frac{1}{x_n^2} \right)}{5x_n^3 - 6}.$$

(b) Taking the first approximation to the largest positive root as

1.5, draw a flow chart diagram which reads and prints the number of iterations and the root with an error of less than 0.001. Carry out a dry run of the flow chart.

9. The marks of 500 candidates in an examination are normally distributed with a mean 45 and standard deviation 20 marks. Given that the pass mark is 42, estimate the number of candidates who passed the examination.
10. The volume of a certain drink bottled by a company is approximately normally distributed with mean 300 ml and standard deviation 2ml. Determine the probability that in a sample of 10 bottles, at least two contain less than 299.4 ml.
11. In an examination 30% of the candidates failed and 10% obtained distinctions. If the pass mark was 42 and the minimum mark required for a distinction was 77, estimate the mean mark and the standard deviation.