

Question 5

(a) If $y = (\cot^{-1} x)^2$, show that $(1+x^2)^2 \frac{d^2y}{dx^2} + 2x(1+x^2) \frac{dy}{dx} = 2$ [5]

(b) Find the maximum volume of the cylinder which can be inscribed in a sphere of radius $3\sqrt{3}$ cm. (Leave the answer in terms of π) [5]

Question 6

(a) Evaluate: $\int \frac{\cos^{-1} x}{x^2} dx$ [5]

(b) Find the area bounded by the curve $y = 2x - x^2$, and the line $y = x$. [5]

Question 7

(a) Find the Karl Pearson's co-efficient of correlation between x and y for the following data: [5]

x	16	18	21	20	22	26	27	15
y	22	25	24	26	25	30	33	14

(b) The following table shows the mean and standard deviation of the marks of Mathematics and Physics scored by the students in a school: [5]

	Mathematics	Physics
Mean	84	81
Standard Deviation	7	4

The correlation co-efficient between the given marks is 0.86. Estimate the likely marks in Physics if the marks in Mathematics are 92.

Question 8

(a) Bag A contains three red and four white balls; bag B contains two red and three white balls. If one ball is drawn from bag A and two balls from bag B, find the probability that:

- One ball is red and two balls are white;
- All the three balls are of the same colour.

2013 Mathematics Question Paper Ecol

**Gangwei Wang, Xiangpeng Xin , Samir
A. El-Tantawy**

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Julio Alvarez, Andres Perez, 2017-06-02 Epidemiology is a discipline intended to systematically investigate and ideally quantify disease dynamics in populations. Perez 2015 Epidemiological assessments may be divided into four large areas, namely: a) identification and characterization of a pathogen; b) development of systems for detection of cases; c) descriptive epidemiology and quantification of disease patterns; and d) advanced analytical methods to design intervention strategies. Briefly, there is an initial need for understanding the pathogenicity of a disease and condition, which may also include experimental studies and development of new models of infection and proliferation under different conditions. Subsequently, such knowledge may be applied to support the identification of cases, which typically includes the design, evaluation and validation of diagnostic tests. Disease may then be quantified in a population, leading to the identification of patterns and application of molecular characterization techniques to understand disease spread and ultimately to identify factors preventing or promoting disease. Finally, those factors may be incorporated into advanced quantitative methods and epidemiological models, which are used to design and evaluate strategies aimed at preventing, controlling or eliminating disease in the population. Recent years have seen a dramatic increase in the application of science, technology, engineering and mathematical STEM tools and approaches intended to enhance such analytical epidemiology process with the ultimate goal of supporting disease prevention, control and eradication. This eBook comprises a series of research articles that, through current state of the art scientific knowledge on the application of STEM tools to the microbiology of infectious diseases, demonstrate their usefulness at the various components of an integral epidemiological approach divided into the four large components of a) experimental studies; b) novel

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