

68 Agricultural Statistics ICAR SEPT 2022

Topic:- GEN KNOW COMMON PHD

1) Colour of the tag used on certified seed bags is[Question ID = 16958][Question Description = 101_221_GKD_SEP22_Q01]

1. Blue [Option ID = 37829]
2. Purple [Option ID = 37830]
3. White [Option ID = 37831]
4. Golden Yellow [Option ID = 37832]

2) Following are the statements regarding the Usar soil -

- A. It is reclaimed by adding lime.
- B. This soil has pH more than seven.
- C. Paddy crop can be grown in this soil.

Choose the *correct* answer from the options given below:

[Question ID = 16959][Question Description = 102_221_GKD_SEP22_Q02]

1. A and B only [Option ID = 37833]
2. B and C only [Option ID = 37834]
3. C only [Option ID = 37835]
4. A only [Option ID = 37836]

3) When total utility of a commodity increases, marginal utility will be

[Question ID = 16960][Question Description = 103_221_GKD_SEP22_Q03]

1. Negative but increasing
[Option ID = 37837]
2. Positive but decreasing
[Option ID = 37838]
3. Constant
[Option ID = 37839]
4. Either positive or negative
[Option ID = 37840]

4) Where is the headquarter of International Fund for Agriculture Development located?

[Question ID = 16961][Question Description = 104_221_GKD_SEP22_Q04]

1. Vienna, Austria
[Option ID = 37841]
2. Rome, Italy
[Option ID = 37842]
3. New York, USA
[Option ID = 37843]
4. Berlin, Germany
[Option ID = 37844]

5) Mid-Oceanic Ridges are one of the important divisions of the ocean floor. In this respect, point out the incorrect statement regarding the 'Mid-Oceanic Ridges'. [Question ID = 16962][Question Description = 105_221_GKD_SEP22_Q05]

1. It is the largest mountain chain on the surface of the earth [Option ID = 37845]
2. It is a series of interconnected chain within the ocean. [Option ID = 37846]
3. It is characterised by a central rift system [Option ID = 37847]
4. The rift system at the crest is the zone of very low volcanic activity. [Option ID = 37848]

6) Consider the following facts about the union territory of India and point out the one which is incorrect in relation to union territory.[Question ID = 16963][Question Description = 106_221_GKD_SEP22_Q06]

1. These are the areas under the direct control of central government. [Option ID = 37849]
2. Also known as the 'centrally administered territories. [Option ID = 37850]

3. These territories constitute a conspicuous departure from the unitary feature of India. [Option ID = 37851]
4. There is no uniformity in their administrative systems. [Option ID = 37852]

7) Variety of flora and fauna are found in the different types of forest in India. In this regard, species of trees like teak, *sal shisham*, *sandalwood*, etc. are found in which of the following type of forests in India?[Question ID = 16964][Question Description = 107_221_GKD_SEP22_Q07]

1. Tropical evergreen forests [Option ID = 37853]
2. Tropical thorn forests [Option ID = 37854]
3. Tropical deciduous forests [Option ID = 37855]
4. Montane forests [Option ID = 37856]

8) The Marginal Preference Theory of consumption behaviour was proposed by

[Question ID = 16965][Question Description = 108_221_GKD_SEP22_Q08]

1. Armstrong
[Option ID = 37857]
2. J.K.Hicks
[Option ID = 37858]
3. Neumann
[Option ID = 37859]
4. Edmund Cannon
[Option ID = 37860]

9) Point out the incorrect statements regarding the service sector in India.[Question ID = 16966][Question Description = 109_221_GKD_SEP22_Q09]

1. It is the highest contributor to GDP [Option ID = 37861]
2. It requires skilled labour [Option ID = 37862]
3. It is the fastest growing sector [Option ID = 37863]
4. It is restricted to very few sectors. [Option ID = 37864]

10) Consider the statements regarding the agriculture sector in India and point out the incorrect statement.[Question ID = 16967][Question Description = 110_221_GKD_SEP22_Q10]

1. Agriculture sector is the largest employer of workforce [Option ID = 37865]
2. It has contributed to the Gross Value Added (GVA) [Option ID = 37866]
3. Growth in allied sectors is the major drivers of overall growth in the sector. [Option ID = 37867]
4. Minimum Support Price (MSP) policy is used as to promote crop uniformity. [Option ID = 37868]

11) In case of related goods, the cross elasticity of demand is[Question ID = 16968][Question Description = 111_221_GKD_SEP22_Q11]

1. Low [Option ID = 37869]
2. High [Option ID = 37870]
3. Zero [Option ID = 37871]
4. Unity [Option ID = 37872]

12) With reference to organic farming in India, consider the following statements :

- A. The National Programme for Organic Production' (NPOP) is operated under the guidelines and directions of the Union Ministry of Rural Development.
- B. The Agricultural and Processed Food Products Export Development Authority' (APEDA) functions as the Secretariat for the implementation of NPOP.
- C. Sikkim has become India's first fully organic state.

Choose the *correct* answer from the options given below:

[Question ID = 16969][Question Description = 112_221_GKD_SEP22_Q12]

1. A and B only
[Option ID = 37873]
2. B and C only
[Option ID = 37874]
3. C only
[Option ID = 37875]
4. A, B and C

[Option ID = 37876]

13) With reference to the circumstances in Indian agriculture, the concept of "Conservation Agriculture" assumes significance. Which of the following falls under the Conservation Agriculture ?

- A. Avoiding the monoculture practices.
- B. Adopting minimum tillage.
- C. Avoiding the cultivation of plantation crops.
- D. Using crop residues to cover soil surface.
- E. Adopting spatial and temporal crop sequencing/ crop rotations.

Choose the *correct* answer from the options given below:

[Question ID = 16970][Question Description = 113_221_GKD_SEP22_Q13]

- 1. A, C and D only [Option ID = 37877]
- 2. B, C, D and E only [Option ID = 37878]
- 3. B, D and E only [Option ID = 37879]
- 4. A, B, C and E only [Option ID = 37880]

14) Consumers are likely to get a variety of goods in which kind of market competition[Question ID = 16971][Question Description = 114_221_GKD_SEP22_Q14]

- 1. Monopoly [Option ID = 37881]
- 2. Duopoly [Option ID = 37882]
- 3. Oligopoly [Option ID = 37883]
- 4. Monopolistic [Option ID = 37884]

15) What is the correct chronological order of the following laws enacted for the conservation and protection of environment ?

- A. Environment (Protection) Act.
- B. Water (Prevention & Control of Pollution) Act.
- C. Air (Prevention & Control of pollution) Act.
- D. National Green Tribunal Act.

Choose the *correct* answer from the options given below:

[Question ID = 16972][Question Description = 115_221_GKD_SEP22_Q15]

- 1. B, C, A, D [Option ID = 37885]
- 2. A, B, C, D [Option ID = 37886]
- 3. C, B, A, D [Option ID = 37887]
- 4. D, C, B, A [Option ID = 37888]

16) The scientific study of soil is[Question ID = 16973][Question Description = 116_221_GKD_SEP22_Q16]

- 1. Earth Study [Option ID = 37889]
- 2. Soil Science [Option ID = 37890]
- 3. Pedology [Option ID = 37891]
- 4. Soil Chemistry [Option ID = 37892]

17) *Triticum aestivum*, the common bread wheat is -

[Question ID = 16974][Question Description = 117_221_GKD_SEP22_Q17]

- 1. Tetraploid
[Option ID = 37893]
- 2. Hexaploid
[Option ID = 37894]
- 3. Haploid
[Option ID = 37895]
- 4. Diploid
[Option ID = 37896]

18) Sectoral inflation refers to[Question ID = 16975][Question Description = 118_221_GKD_SEP22_Q18]

- 1. Running inflation [Option ID = 37897]

2. Comprehensive inflation [Option ID = 37898]
3. Sporadic inflation [Option ID = 37899]
4. Creeping inflation [Option ID = 37900]

19) Keynes Liquidity trap refers to[Question ID = 16976][Question Description = 119_221_GKD_SEP22_Q19]

1. Speculative demand for money [Option ID = 37901]
2. Transactions motive of money is inelastic [Option ID = 37902]
3. Precautionary motive of money is inelastic [Option ID = 37903]
4. Transactions motive of money is constant [Option ID = 37904]

20) A business is solvent if[Question ID = 16977][Question Description = 120_221_GKD_SEP22_Q20]

1. Total receipts exceed total expenditures [Option ID = 37905]
2. Total debt exceeds total equity [Option ID = 37906]
3. Total sales exceed total cash expense [Option ID = 37907]
4. Total assets exceed total liabilities [Option ID = 37908]

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- 1) The mean of a set of 30 observations is 75. If each of the observation is multiplied by a non-zero number λ and then each of them is decreased by 25, their mean remains the same. The λ is equal to

[Question ID = 16708][Question Description = 101_41_COMP_SEP22_Q01]

1. 10/3 [Option ID = 36829]
2. 4/3 [Option ID = 36830]
3. 1/3 [Option ID = 36831]
4. 2/3 [Option ID = 36832]

2) Let X and Y be two random variables. Which one of the following conditions is sufficient for the relation $\text{Var}(X-Y) = \text{Var}(X) + \text{Var}(Y)$ to hold ?[Question ID = 16709][Question Description = 102_41_COMP_SEP22_Q02]

1. X, Y are statistically independent [Option ID = 36833]
2. X, Y are identically distributed [Option ID = 36834]
3. $X = Y$ [Option ID = 36835]
4. For any X and Y [Option ID = 36836]

3) The coefficient of correlation between X and Y is 0.6. Their covariance is 4.8. If the variance of X is 9, then the standard deviation of Y is[Question ID = 16710][Question Description = 103_41_COMP_SEP22_Q03]

1. 7.21 [Option ID = 36837]
2. 5.23 [Option ID = 36838]
3. 3.22 [Option ID = 36839]
4. 2.67 [Option ID = 36840]

4) A random sample of 60 farmers provides 40 fertilizer users. If the standard error of the proportion of fertilizer users in this sample is 0.12, then the 95% confidence limits of the fertilizer users of the population of farmers are

[Question ID = 16711][Question Description = 104_41_COMP_SEP22_Q04]

1. 66%, 89% [Option ID = 36841]
2. 66%, 79% [Option ID = 36842]
3. 50%, 82% [Option ID = 36843]
4. 55%, 79% [Option ID = 36844]

5) Let $(X_1, X_2, X_3, \dots, X_n)$ be a random sample from $N(\mu, \sigma^2)$ distribution, where both μ and σ^2 are unknown. The shortest expected confidence interval length for μ is obtained using

[Question ID = 16712][Question Description = 105_41_COMP_SEP22_Q05]

1. Standard normal distribution [Option ID = 36845]
2. t - distribution [Option ID = 36846]
3. F - distribution [Option ID = 36847]
4. Chi-square distribution [Option ID = 36848]

- 6) If T is an MLE of θ and $\psi(\theta)$ is one-to-one function of θ , then $\psi(T)$ is the MLE of $\psi(\theta)$. This property is known as

[Question ID = 16713][Question Description = 106_41_COMP_SEP22_Q06]

1. Invariance property of MLE [Option ID = 36849]
2. Asymptotic property of MLE [Option ID = 36850]
3. Consistency property of MLE [Option ID = 36851]
4. Regularity property of MLE [Option ID = 36852]

- 7) In a Chi-square test, the contingency table has 4 rows and 4 columns. What is the degrees of freedom?

[Question ID = 16714][Question Description = 107_41_COMP_SEP22_Q07]

1. 3 [Option ID = 36853]
2. 4 [Option ID = 36854]
3. 8 [Option ID = 36855]
4. 9 [Option ID = 36856]

- 8) Chi-square test can be applied to test the

- A. Goodness of fit
- B. Equality of two population variances
- C. Independence of attributes

Choose the *correct* answer from the options given below:

[Question ID = 16715][Question Description = 108_41_COMP_SEP22_Q08]

1. A and B only [Option ID = 36857]
2. B and C only [Option ID = 36858]
3. A and C only [Option ID = 36859]
4. A, B and C only [Option ID = 36860]

- 9) The Bayes' estimator of a parameter under absolute error loss function is [Question ID = 16716][Question Description = 109_41_COMP_SEP22_Q09]

1. Posterior mean [Option ID = 36861]
2. Posterior median [Option ID = 36862]
3. Posterior mode [Option ID = 36863]
4. Posterior variance [Option ID = 36864]

- 10) In a 2-way ANOVA with 6 rows, 5 columns and 3 observations per cell, what are the degrees of freedom for the sum of squares for interaction and error respectively? [Question ID = 16717][Question Description = 110_41_COMP_SEP22_Q10]

1. 20 and 60 [Option ID = 36865]
2. 30 and 50 [Option ID = 36866]
3. 20 and 40 [Option ID = 36867]
4. 15 and 65 [Option ID = 36868]

- 11) In case of Fairfield Smith's variance law in the model $V_x = V_1/x^b$, the coefficient b generally takes the value between (Here the notations have their usual meanings)

[Question ID = 16718][Question Description = 111_41_COMP_SEP22_Q11]

1. $-\infty$ to ∞
[Option ID = 36869]
2. 0 to ∞
[Option ID = 36870]
3. 0 to 1
[Option ID = 36871]
4. -1 to 1
[Option ID = 36872]

- 12) In a strip plot design, the effect of interest is [Question ID = 16719][Question Description = 112_41_COMP_SEP22_Q12]

1. Factor applied to strip 1 [Option ID = 36873]
2. Factor applied to strip 2 [Option ID = 36874]
3. Interaction of factors applied to different strips [Option ID = 36875]

4. All the above [Option ID = 36876]

13) Cluster sampling is better than simple random sampling if the intra-class correlation coefficient is

[Question ID = 16720][Question Description = 113_41_COMP_SEP22_Q13]

1. Positive and less than one [Option ID = 36877]
2. Negative [Option ID = 36878]
3. One [Option ID = 36879]
4. Zero [Option ID = 36880]

14) In stratified sampling with $N_1 = 2N_2$, $S_1 = 2S_2$, the values of n_1 and n_2 obtained under Neyman allocation satisfy (Here the notations have their usual meanings)

[Question ID = 16721][Question Description = 114_41_COMP_SEP22_Q14]

1. $n_1 : n_2 :: 1 : 4$ [Option ID = 36881]
2. $n_1 : n_2 :: 2 : 1$ [Option ID = 36882]
3. $n_1 : n_2 :: 4 : 1$ [Option ID = 36883]
4. $n_1 : n_2 :: 1 : 2$ [Option ID = 36884]

15) Let a population of size $N = 5$ have its mean $\bar{X}_N = 12$ and $S^2 = 100$. A sample of size $n = 2$ is drawn without replacement. If the sample mean is $\bar{X}_n$, then $E(\bar{X}_n^2)$ is

[Question ID = 16722][Question Description = 115_41_COMP_SEP22_Q15]

1. 174 [Option ID = 36885]
2. 144 [Option ID = 36886]
3. 50 [Option ID = 36887]
4. 30 [Option ID = 36888]

16) What would be the heritability estimate if regression of offspring on mother is 0.27, assuming that resemblance due to environment or dominance was negligible ? [Question ID = 16723][Question Description = 116_41_COMP_SEP22_Q16]

1. 0.21 [Option ID = 36889]
2. 0.27 [Option ID = 36890]
3. 0.54 [Option ID = 36891]
4. 0.81 [Option ID = 36892]

17) A maize population was found to be segregating for yellow and white endosperm. Yellow is governed by a dominant allele and white by its recessive allele. A random sample of 1000 kernels revealed that 910 were yellow. Find the frequency estimates of dominant and recessive alleles respectively for this population. [Question ID = 16724][Question Description = 117_41_COMP_SEP22_Q17]

1. 0.9, 0.1 [Option ID = 36893]
2. 0.7, 0.3 [Option ID = 36894]
3. 0.8, 0.2 [Option ID = 36895]
4. 0.1, 0.9 [Option ID = 36896]

18) A population of adult mice has a mean body weight of 30 grams. The average weight of mice selected for breeding purposes is 34 grams. The progeny produced by random mating among the selected parents average 30.5 grams. The genetic gain (in grams) is [Question ID = 16725][Question Description = 118_41_COMP_SEP22_Q18]

1. 0.5 [Option ID = 36897]
2. 2.0 [Option ID = 36898]
3. 3.5 [Option ID = 36899]
4. 4.0 [Option ID = 36900]

19) In relational Algebra, two relation instances are said to be union-compatible if the following conditions hold:
Condition I: They have the same number of the fields

Condition II: Corresponding fields, taken in order from left to right, does not have the same domains.

Choose the correct answer from the options given below:

[Question ID = 16726][Question Description = 119_41_COMP_SEP22_Q19]

1. Condition I is correct. [Option ID = 36901]
2. Condition II is correct. [Option ID = 36902]
3. Both Conditions I and II are correct. [Option ID = 36903]
4. Both Conditions I and II are incorrect. [Option ID = 36904]

20) UPGMA method is used for- [Question ID = 16727][Question Description = 120_41_COMP_SEP22_Q20]

1. Carbohydrate Structure Prediction [Option ID = 36905]
2. Protein Structure Prediction [Option ID = 36906]
3. Phylogenetic Analysis [Option ID = 36907]
4. Primer Designing

[Option ID = 36908]

21) Which of the following is protein sequence database?[Question ID = 16728][Question Description = 121_41_COMP_SEP22_Q21]

1. Sequin [Option ID = 36909]
2. GEO [Option ID = 36910]
3. SWISSPROT [Option ID = 36911]
4. EMBL [Option ID = 36912]

22) DNA is made up of following molecules except

[Question ID = 16729][Question Description = 122_41_COMP_SEP22_Q22]

1. Phosphate

[Option ID = 36913]

2. Pentose Sugar

[Option ID = 36914]

3. Hexose Sugar

[Option ID = 36915]

4. Nitrogenous Bases

[Option ID = 36916]

23) At what position of DNA, amino group is attached?[Question ID = 16730][Question Description = 123_41_COMP_SEP22_Q23]

1. 1' [Option ID = 36917]
2. 2' [Option ID = 36918]
3. 3' [Option ID = 36919]
4. 5'

[Option ID = 36920]

24) Which of the following has 3D structure?[Question ID = 16731][Question Description = 124_41_COMP_SEP22_Q24]

1. mRNA [Option ID = 36921]
2. tRNA [Option ID = 36922]
3. miRNA [Option ID = 36923]
4. siRNA

[Option ID = 36924]

25) Smith Waterman algorithm is designed to find

[Question ID = 16732][Question Description = 125_41_COMP_SEP22_Q25]

1. Global alignment [Option ID = 36925]
2. Local alignment [Option ID = 36926]
3. 2D Structure Prediction [Option ID = 36927]
4. 3D Structure Prediction [Option ID = 36928]

26) Position Specific Scoring Matrices are used to find the[Question ID = 16733][Question Description = 126_41_COMP_SEP22_Q26]

1. Closely related species [Option ID = 36929]
2. Distantly related species [Option ID = 36930]
3. Members of same species [Option ID = 36931]
4. Entirely different species [Option ID = 36932]

27) Which of the following is not a nucleotide sequence database?

[Question ID = 16734][Question Description = 127_41_COMP_SEP22_Q27]

1. EMBL [Option ID = 36933]

2. DDBJ [Option ID = 36934]
3. PDB [Option ID = 36935]
4. GenBank [Option ID = 36936]

28) Consider the following statements regarding Needleman-Wunsch algorithm for global sequence alignment:

- A. For two sequences of length m and n , a scoring matrix of dimensions m and n is created.
- B. The algorithm is based on dynamic programming technique.
- C. The optimal alignment is determined by a trace-back procedure.

Choose the *correct* answer from the options given below.

[Question ID = 16735][Question Description = 128_41_COMP_SEP22_Q28]

1. Only A and B are true [Option ID = 36937]
2. Only B and C are true [Option ID = 36938]
3. Only A and C are true [Option ID = 36939]
4. All A, B and C are true [Option ID = 36940]

29) The number of bifurcating rooted trees for n operational taxonomic units ($n \geq 2$) is given by[Question ID = 16736]

[Question Description = 129_41_COMP_SEP22_Q29]

1. $\frac{(2n-5)!}{2^{n-5}(n-2)!}$
[Option ID = 36941]
2. $\frac{(2n-5)!}{2^{n-3}(n-3)!}$
[Option ID = 36942]
3. $\frac{(2n-3)!}{2^{n-3}(n-2)!}$
[Option ID = 36943]
4. $\frac{(2n-3)!}{2^{n-2}(n-2)!}$
[Option ID = 36944]

30) Match List I with List II

List I	List II
A. Geno3D	I. Program for phylogenetic analysis
B. Chime	II. Protein structure validation program
C. PAUP	III. Molecular viewer
D. PROVE	IV. Protein modelling web server

Choose the correct answer from the options given below:

[Question ID = 16737][Question Description = 130_41_COMP_SEP22_Q30]

1. A - I, B - IV, C - II, D - III [Option ID = 36945]
2. A - IV, B - II, C - I, D - III [Option ID = 36946]
3. A - IV, B - III, C - I, D - II [Option ID = 36947]
4. A - IV, B - I, C - II, D - III [Option ID = 36948]

31) The single-letter amino acid code for tyrosine is[Question ID = 16738][Question Description = 131_41_COMP_SEP22_Q31]

1. T [Option ID = 36949]
2. Y [Option ID = 36950]
3. R [Option ID = 36951]
4. U [Option ID = 36952]

32) Consider the following statements regarding homology modeling of protein structure:

Statement I: Homology modeling requires alignment of a target to a template.

Statement II: The accuracy of homology modeling is independent of the percent identity between the target and the template.

In light of the above statements, choose the *most appropriate* answer from the options given below.

[Question ID = 16739][Question Description = 132_41_COMP_SEP22_Q32]

1. Both Statement I and Statement II are correct [Option ID = 36953]
2. Both Statement I and Statement II are incorrect [Option ID = 36954]
3. Statement I is correct but Statement II is incorrect [Option ID = 36955]
4. Statement I is incorrect but Statement II is correct [Option ID = 36956]

33) A module in Perl is [Question ID = 16740][Question Description = 133_41_COMP_SEP22_Q33]

1. A collection of values of same type [Option ID = 36957]
2. A collection of related subroutines and variables [Option ID = 36958]
3. An array of functions [Option ID = 36959]
4. Hash array [Option ID = 36960]

34) Consider the following statements regarding normalization algorithms:

Statement I: Median normalization scales the samples so that they have the same median.

Statement II: Quantile normalization forces the distribution of the samples to be the same.

In light of the above statements, choose the *most appropriate* answer from the options given below.

[Question ID = 16741][Question Description = 134_41_COMP_SEP22_Q34]

1. Both Statement I and Statement II are correct [Option ID = 36961]
2. Both Statement I and Statement II are incorrect [Option ID = 36962]
3. Statement I is correct but Statement II is incorrect [Option ID = 36963]
4. Statement I is incorrect but Statement II is correct [Option ID = 36964]

35) Which of the following statements is incorrect about workstations? [Question ID = 16742][Question Description = 135_41_COMP_SEP22_Q35]

1. Workstations have higher computation power than personal computers. [Option ID = 36965]
2. They have high resolution graphics terminals and improved input/output capabilities. [Option ID = 36966]
3. Workstations are used in engineering applications and in interactive graphics applications. [Option ID = 36967]
4. In workstations, many nodes are connected via network. [Option ID = 36968]

36) Read the following statements regarding Memory Unit of Computer System.

- A. The memory unit is used to store programs and data.
- B. Usually there are two types of memory devices: primary storage device and secondary storage memory device.
- C. The primary memory, commonly called main memory is a fast memory used for the storage of programs and active data.
- D. The main memory unit consists of a large number of semiconductor storage cells, each capable of storage cells, each capable of storing one bit of information.
- E. These cells are read or written by the central processing unit in a group of fixed size called word.

Choose the *correct* option from the following options

[Question ID = 16743][Question Description = 136_41_COMP_SEP22_Q36]

1. A, B, C and D only [Option ID = 36969]
2. B, C, D and E only [Option ID = 36970]
3. All statements are correct [Option ID = 36971]
4. All statements are incorrect [Option ID = 36972]

37) Which of the following statements is not correct about URL?

[Question ID = 16744][Question Description = 137_41_COMP_SEP22_Q37]

1. The transfer protocol, a method that a computer uses to access this file.
[Option ID = 36973]
2. The address part of the URL is called domain name. It is preceded by two slashes i.e. the text after http:// or https:// [Option ID = 36974]
3. URL is simply an address of a document on the Web or, more accurately, on the Internet. [Option ID = 36975]
4. A URL can look complex and long, it is made up of four basic parts - protocols, hostname, folder name, file name and password - each of which has a specific function.
[Option ID = 36976]

38) Given below are two statements

Statement I: JDBC interface allows Java applets, Servlets and applications to access data in popular database management

systems.

Statement II: ODBC is a microsoft's implementation of Call Level Interface (CLI) which allows the programmer to develop, compile and deploy an application without targeting a specific DBMS.

In light of the above statements, choose the *most appropriate* answer from the options given below

[Question ID = 16745][Question Description = 138_41_COMP_SEP22_Q38]

1. Both Statement I and Statement II are correct [Option ID = 36977]
2. Both Statement I and Statement II are incorrect [Option ID = 36978]
3. Statement I is correct but Statement II is incorrect [Option ID = 36979]
4. Statement I is incorrect but Statement II is correct [Option ID = 36980]

39) What is configuration management in Software Development Life Cycle (SDLC)?

[Question ID = 16746][Question Description = 139_41_COMP_SEP22_Q39]

1. It is a process of tracking and controlling the bugs in software in terms of the running of the product.
[Option ID = 36981]
2. It is a process of tracking and controlling the functionality of the software in terms of its working.
[Option ID = 36982]
3. It is a process of tracking and controlling the changes in software in terms of the requirements, design, functions and development of the product.
[Option ID = 36983]
4. It is a process of tracking and controlling the users of the software in terms of the unusual access.
[Option ID = 36984]

40) Given below are two statements about Binary Relationship and Cardinality

Statement I: A relationship where two entities are participating is called a binary relationship.

Statement II: Cardinality is the number of instance of an entity from a relation that can be associated with the relation.

In light of the above statements, choose the *most appropriate* answer from the options given below

[Question ID = 16747][Question Description = 140_41_COMP_SEP22_Q40]

1. Both Statement I and Statement II are correct [Option ID = 36985]
2. Both Statement I and Statement II are incorrect [Option ID = 36986]
3. Statement I is correct but Statement II is incorrect [Option ID = 36987]
4. Statement I is incorrect but Statement II is correct [Option ID = 36988]

41) Read the following statements about database schema carefully

- A. A database schema is the skeleton structure that represents the logical view of the entire database.
- B. It defines how the data is organized and how the relations among them are associated.
- C. It does not formulate any constraint that is to be applied on the data.
- D. A database schema defines its entities and the relationships among them.
- E. It contains a descriptive detail of the database, which can be depicted by means of schema diagrams. It's the database designers who design the schema to help programmers understand the database and make it useful.

Choose the *incorrect* statement from the options given below

[Question ID = 16748][Question Description = 141_41_COMP_SEP22_Q41]

1. Statement C is incorrect [Option ID = 36989]
2. Statement D is incorrect [Option ID = 36990]
3. Statement A is incorrect. [Option ID = 36991]
4. Statement B is incorrect. [Option ID = 36992]

42) The number of participating entities in a relationship defines which of the relationship?

[Question ID = 16749][Question Description = 142_41_COMP_SEP22_Q42]

1. Entity set [Option ID = 36993]
2. Domain [Option ID = 36994]
3. Degree [Option ID = 36995]
4. Scope [Option ID = 36996]

43) Processes that stay in the background to handle some activity such as web pages, printing, and so on are called

[Question ID = 16750][Question Description = 143_41_COMP_SEP22_Q43]

1. Daemons
[Option ID = 36997]
2. Kernel
[Option ID = 36998]
3. Interrupt vector
[Option ID = 36999]
4. Errno
[Option ID = 37000]

44) The binary search method needs comparisons not more than

[Question ID = 16751][Question Description = 144_41_COMP_SEP22_Q44]

1. $(\log 2n)+1$ [Option ID = 37001]
2. $\log 2n$ [Option ID = 37002]
3. $(\log n)+1$ [Option ID = 37003]
4. $\log n$ [Option ID = 37004]

45) Which of the following statement is not true for "Lists":[Question ID = 16752][Question Description = 145_41_COMP_SEP22_Q45]

1. Lists are flexible structures [Option ID = 37005]
2. Lists can be concatenated together and can be split into sub-lists [Option ID = 37006]
3. Elements cannot be accessed, inserted, or deleted at any position within a list [Option ID = 37007]
4. Lists are applied in information retrieval, programming language translation and simulation [Option ID = 37008]

46) How many cables and ports are required for a star topology?

[Question ID = 16753][Question Description = 146_41_COMP_SEP22_Q46]

1. 10 ports and 5 cables [Option ID = 37009]
2. 20 ports and 5 cables [Option ID = 37010]
3. 30 ports and 5 cables [Option ID = 37011]
4. 50 ports and 5 cables [Option ID = 37012]

47) In X.25 network layer protocol, the data packets normally contain:[Question ID = 16754][Question Description = 147_41_COMP_SEP22_Q47]

1. One octet of header plus data [Option ID = 37013]
2. Two octets of header plus data [Option ID = 37014]
3. Three octets of header plus data [Option ID = 37015]
4. Four octets of header plus data [Option ID = 37016]

48) Compile-time Polymorphism in Java is achieved by:

[Question ID = 16755][Question Description = 148_41_COMP_SEP22_Q48]

1. Dynamic Method Dispatch [Option ID = 37017]
2. Method Overloading [Option ID = 37018]
3. Function Overloading [Option ID = 37019]
4. Operator Overriding [Option ID = 37020]

49) Repeated execution of simple computation may cause compounding of [Question ID = 16756][Question Description = 149_41_COMP_SEP22_Q49]

1. round-off errors [Option ID = 37021]
2. syntax errors [Option ID = 37022]
3. run-time errors [Option ID = 37023]
4. logic errors [Option ID = 37024]

50) Which of the following statements is false about String?

[Question ID = 16757][Question Description = 150_41_COMP_SEP22_Q50]

1. String is immutable [Option ID = 37025]
2. String can be created using new operator [Option ID = 37026]
3. String is a primary data type [Option ID = 37027]
4. String is an infinite sequence of symbols [Option ID = 37028]

1) Weak law of large numbers does not hold good in case of

[Question ID = 16658][Question Description = 101_55_AGS_SEP22_Q01]

1. Binomial distribution [Option ID = 36629]
2. Poisson distribution [Option ID = 36630]
3. Cauchy distribution [Option ID = 36631]
4. Negative Binomial distribution [Option ID = 36632]

2) Let X follows $N_3(0, \Sigma)$, $\Sigma = \begin{pmatrix} 1 & \rho & 0 \\ \rho & 1 & \rho \\ 0 & \rho & 1 \end{pmatrix}$.

Then the joint distribution of $X_1 + X_2 + X_3$ and $X_1 - X_2 - X_3$ is bivariate normal with dispersion matrix

[Question ID = 16659][Question Description = 102_55_AGS_SEP22_Q02]

1. $\begin{pmatrix} 3-4\rho & -1+2\rho \\ -1+2\rho & 3 \end{pmatrix}$

[Option ID = 36633]

2. $\begin{pmatrix} 3+4\rho & -1-2\rho \\ -1-2\rho & 3 \end{pmatrix}$

[Option ID = 36634]

3. $\begin{pmatrix} 3 & 1+2\rho \\ 1+2\rho & 3+4\rho \end{pmatrix}$

[Option ID = 36635]

4. $\begin{pmatrix} 3-4\rho & 1-2\rho \\ 1-2\rho & 3 \end{pmatrix}$

[Option ID = 36636]

3) Consider

A. Test for normality

B. Test for autocorrelation

C. Test for additivity

D. Test for homogeneity of several variances

Which of the following options is correct?

[Question ID = 16660][Question Description = 103_55_AGS_SEP22_Q03]

1. A - Durbin- Watson test, B - Tukey's test, C - Barlett's test, D - Kolmogorov- Smirnov test [Option ID = 36637]
2. A - Tukey's test, B - Barlett's test, C - Kolmogorov- Smirnov test, D - Durbin- Watson test [Option ID = 36638]
3. A - Barlett's test, B - Kolmogorov- Smirnov test, C - Durbin- Watson test, D - Tukey's test [Option ID = 36639]
4. A - Kolmogorov- Smirnov test, B - Durbin- Watson test, C - Tukey's test, D - Barlett's test [Option ID = 36640]

4) Let X and Y be discrete random variables with the joint probability mass function

$$p(x,y) = \frac{1}{25}(x^2 + y^2), \quad x = 1, 2; y = 0, 1, 2.$$

Then $P(Y = 1 | X = 1)$ equals:

[Question ID = 16661][Question Description = 104_55_AGS_SEP22_Q04]

1. 0.25

[Option ID = 36641]

2. 1

[Option ID = 36642]

3. 0.50

[Option ID = 36643]

4. 0.05

[Option ID = 36644]

5) Dual of the linear programming problem

Maximize $Z = 5x_1 - 2x_2 + 3x_3$ subject to the constraints

$$2x_1 + 2x_2 - x_3 \geq 2,$$

$$3x_1 - 4x_2 \leq 3,$$

$$x_2 + 2x_3 \leq 5,$$

$$x_1, x_2, x_3 \geq 0 \text{ is:}$$

[Question ID = 16662][Question Description = 105_55_AGS_SEP22_Q05]

1. Minimize $W = -2y_1 + 3y_2 + 5y_3$ subject to the constraints $-2y_1 + 3y_2 \geq 5$,
 $-2y_1 - 4y_2 + y_3 \geq -2$,

$$y_1 + 2y_3 \geq 3,$$

$$y_1, y_2, y_3 \geq 0$$

[Option ID = 36645]

2. Maximize $W = -2y_1 + 3y_2 + 5y_3$ subject to the constraints $-2y_1 + 3y_2 \geq 5$,
 $-2y_1 - 4y_2 + y_3 \geq -2$,

$$y_1 + 2y_3 \geq 3,$$

$$y_1, y_2, y_3 \geq 0$$

[Option ID = 36646]

3. Minimize $W = 2y_1 + 3y_2 + 5y_3$ subject to the constraints $-2y_1 + 3y_2 \geq 5$,
 $-2y_1 - 4y_2 + y_3 \leq -2$,

$$y_1 + 2y_3 \geq 3,$$

$$y_1, y_2, y_3 \geq 0$$

[Option ID = 36647]

4. Minimize $W = -2y_1 + 3y_2 + 5y_3$ subject to the constraints $-2y_1 + 3y_2 \leq 5$,
 $-2y_1 - 4y_2 + y_3 \leq -2$,

$$y_1 + 2y_3 \leq 3,$$

$$y_1, y_2, y_3 \geq 0$$

[Option ID = 36648]

6) Find the regression curve of Y on X for

$$f(x, y) = 8xy, 0 < x < y < 1$$

$$= 0, \text{ elsewhere.}$$

[Question ID = 16663][Question Description = 106_55_AGS_SEP22_Q06]

1. $\frac{2(1+y+y^2)}{3(1+y)}$

[Option ID = 36649]

2. $\frac{3(1+y+y^2)}{2(1+y)}$

[Option ID = 36650]

3. $\frac{2(1+x+x^2)}{3(1+x)}$

[Option ID = 36651]

4. $\frac{3(1+y+y^2)}{2(1+x)}$

[Option ID = 36652]

7) Let X and Y be two independent random variables having geometric distribution $q^k p$; $k = 0, 1, 2, \dots$. Then the conditional distribution of X given $(X+Y)$ is:

[Question ID = 16664][Question Description = 107_55_AGS_SEP22_Q07]

1. Geometric distribution [Option ID = 36653]
2. Negative Binomial distribution [Option ID = 36654]
3. Uniform distribution [Option ID = 36655]
4. Hypergeometric distribution [Option ID = 36656]

- 8) If X and Y are two independent variates with variances σ_X^2 and σ_Y^2 respectively, the correlation coefficient between X and X-Y is:

[Question ID = 16665][Question Description = 108_55_AGS_SEP22_Q08]

1. $\frac{\sigma_{XY}}{\sqrt{\sigma_X^2 + \sigma_Y^2}}$

[Option ID = 36657]

2. $\frac{\sigma_X}{\sqrt{\sigma_X^2 + \sigma_Y^2}}$

[Option ID = 36658]

3. $\frac{\sigma_Y}{\sqrt{\sigma_X^2 + \sigma_Y^2}}$

[Option ID = 36659]

4. $\frac{\sigma_X \sigma_Y}{\sqrt{\sigma_X^2 + \sigma_Y^2}}$

[Option ID = 36660]

- 9) If X is a Poisson variate with parameter λ and conditional distribution of Y given X is binomial with parameters n and p, then Y follows:[Question ID = 16666][Question Description = 109_55_AGS_SEP22_Q09]

1. Poisson with parameter $n\lambda$ [Option ID = 36661]
2. Poisson with parameter λ [Option ID = 36662]
3. Poisson with parameter np [Option ID = 36663]
4. Poisson with parameter λp [Option ID = 36664]

- 10) In general, which method is considered as best to find initial basic feasible solution of a transportation problem?

[Question ID = 16667][Question Description = 110_55_AGS_SEP22_Q10]

1. Northwest-corner method [Option ID = 36665]
2. Row minimum method [Option ID = 36666]
3. Least-cost method [Option ID = 36667]
4. Vogel's approximation method [Option ID = 36668]

- 11) In Sequential Probability Ratio test with sample size n, probabilities of Type I and Type II errors as α and β respectively, which of the following is/are random?[Question ID = 16668][Question Description = 111_55_AGS_SEP22_Q11]

1. n [Option ID = 36669]
2. α and β [Option ID = 36670]
3. α [Option ID = 36671]
4. β [Option ID = 36672]

- 12) If X follows $\beta_2 \left(\frac{n_1}{2}, \frac{n_2}{2} \right)$, then which of the following is correct?

[Question ID = 16669][Question Description = 112_55_AGS_SEP22_Q12]

1. $\frac{n_1}{n_2} X \sim F_{(n_1, n_2)}$

[Option ID = 36673]

2. $\frac{n_1}{n_2} X \sim F_{(n_2, n_1)}$

[Option ID = 36674]

3. $\frac{1}{X} \sim \frac{n_1}{n_2} F_{(n_2, n_1)}$

[Option ID = 36675]

4. $\frac{1}{X} \sim \frac{n_2}{n_1} F_{(n_2, n_1)}$

[Option ID = 36676]

- 13) Which of the following statements are correct?

- A. Efficient estimators are necessarily consistent
- B. Unbiased estimators are necessarily consistent

C. Minimum Variance Unbiased Estimator is always a function of sufficient statistic

D. Maximum Likelihood Estimators are consistent but not always unbiased

Choose the *correct* answer from the options given below:

[Question ID = 16670][Question Description = 113_55_AGS_SEP22_Q13]

1. A, B and C only [Option ID = 36677]
2. A, B and D only [Option ID = 36678]
3. A, C and D only [Option ID = 36679]
4. B, C and D only [Option ID = 36680]

14) The ratio of a standard normal variate to the square root of an independent chi-square variate divided by its degrees of freedom (say n) follows:

[Question ID = 16671][Question Description = 114_55_AGS_SEP22_Q14]

1. t-distribution with $(n-1)$ degrees of freedom [Option ID = 36681]
2. chi-square distribution with $(n-1)$ degrees of freedom [Option ID = 36682]
3. chi-square distribution with n degrees of freedom [Option ID = 36683]
4. t-distribution with n degrees of freedom [Option ID = 36684]

15) The mean and variance of a standard Cauchy distribution truncated at both ends, with relevant range of variation as $(-B, B)$ is

[Question ID = 16672][Question Description = 115_55_AGS_SEP22_Q15]

1. $1, \frac{\beta}{\tan^{-1}\beta} - 1$
[Option ID = 36685]
2. $1, \frac{\beta}{\tan^{-1}\beta} + 1$
[Option ID = 36686]
3. $0, \frac{\beta}{\tan^{-1}\beta} - 1$
[Option ID = 36687]
4. $0, \frac{\beta}{\tan^{-1}\beta} + 1$
[Option ID = 36688]

16) If in Wilcoxon's Signed rank test the sample size is large, the test statistic is distributed with mean:

[Question ID = 16673][Question Description = 116_55_AGS_SEP22_Q16]

1. $n(n+1)/4$ [Option ID = 36689]
2. $n(n+1)/2$ [Option ID = 36690]
3. $n(2n+1)/4$ [Option ID = 36691]
4. $n(n-1)/4$ [Option ID = 36692]

17) In a sample of 1000 people in Maharashtra, 540 are rice eaters and the rest are wheat eaters. Which of the following test is suitable to test the null hypothesis that both rice and wheat are equally popular in the state?[Question ID = 16674]

[Question Description = 117_55_AGS_SEP22_Q17]

1. Z-test [Option ID = 36693]
2. t-test [Option ID = 36694]
3. Chi-square test [Option ID = 36695]
4. F-test [Option ID = 36696]

18) When $X_{11}, X_{12}, \dots, X_{1n_1}$ be a random sample of size n_1 from $N_p(\mu_1, S)$ and $X_{21}, X_{22}, \dots, X_{2n_2}$ is an independent random sample of size n_2 from $N_p(\mu_2, S)$, then to test $H_0: \mu_1 = \mu_2$ which of the following test statistic is used?

[Question ID = 16675][Question Description = 118_55_AGS_SEP22_Q18]

1. T^2 distributed as $\frac{(n_1 + n_2 - 2)p}{(n_1 + n_2 - p - 1)} F_{p, n_1 + n_2 - p - 1}$
[Option ID = 36697]
2. T^2 distributed as $\frac{(n_1 + n_2 - 2)p}{(n_1 + n_2 - p + 1)} F_{p, n_1 + n_2 - p + 1}$
[Option ID = 36698]

3. T^2 distributed as $\frac{(n_1+n_2-2)(p-1)}{(n_1+n_2-p-1)} F_{p-1, n_1+n_2-p-1}$

[Option ID = 36699]

4. T^2 distributed as $\frac{(n_1+n_2-2)(p-1)}{(n_1+n_2-p-1)} F_{p-1, n_1+n_2-p-1}$

[Option ID = 36700]

19) Let $X_{(1)}, X_{(2)}, X_{(3)}$ be the order statistics of identically and independently distributed random variables X_1, X_2, X_3 with common probability density function

$$f(x) = Be^{-x^B}, x > 0, B > 0$$

$$= 0, \text{ otherwise}$$

Let $Y_1 = X_{(3)} - X_{(2)}$ and $Y_2 = X_{(2)}$. Then

[Question ID = 16676][Question Description = 119_55_AGS_SEP22_Q19]

1. X_1 and X_2 are independent

[Option ID = 36701]

2. Y_1 and Y_2 are independent

[Option ID = 36702]

3. X_1 and Y_1 are independent

[Option ID = 36703]

4. X_1 and X_3 are independent

[Option ID = 36704]

20) Based on k treatments and r blocks, Friedman's F is distributed as Chi-square with degrees of freedom

[Question ID = 16677][Question Description = 120_55_AGS_SEP22_Q20]

1. $(r-1)$ [Option ID = 36705]

2. $(k-1)$ [Option ID = 36706]

3. $r(k-1)$ [Option ID = 36707]

4. $k(r-1)$ [Option ID = 36708]

21) Let $x_1, x_2, \dots, x_n$ be a random sample from a normal population with mean 0 and variance σ^2 . The Minimum Variance Bound estimator for σ^2 is

[Question ID = 16678][Question Description = 121_55_AGS_SEP22_Q21]

1. $\frac{1}{n-1} \sum_{i=1}^n x_i^2$

[Option ID = 36709]

2. $\frac{1}{n} \sum_{i=1}^n x_i^2$

[Option ID = 36710]

3. $\frac{1}{n} \sum_{i=1}^n (x_i - \bar{x})^2$

[Option ID = 36711]

4. $\frac{1}{n-1} \sum_{i=1}^n (x_i - \bar{x})^2$

[Option ID = 36712]

22) Consider the problem of testing $H_0: \theta = 0$ against $H_1: \theta = 0.5$ based on a single observation X from $U(\theta, \theta+1)$ population. The power of the test "Reject H_0 if $X > 2/3$ " is

[Question ID = 16679][Question Description = 122_55_AGS_SEP22_Q22]

1. $1/6$ [Option ID = 36713]

2. $5/6$ [Option ID = 36714]

3. $1/3$ [Option ID = 36715]

4. $2/3$ [Option ID = 36716]

23) Consider

- A. Classifying observations into pre-defined groups,
- B. Combining observations into groups,
- C. Explaining the variance-covariance structure through a few linear combinations of the original variables and
- D. Explaining covariance relationships among original variables in terms of a few underlying, but unobservable, random quantities.

Which of the following options is correct?

[Question ID = 16680][Question Description = 123_55_AGS_SEP22_Q23]

- 1. A - Discriminant Analysis, B - Cluster Analysis, C - Principal Component Analysis, D - Factor Analysis [Option ID = 36717]
- 2. A - Principal Component Analysis, B - Factor Analysis, C - Cluster Analysis, D - Discriminant Analysis [Option ID = 36718]
- 3. A - Discriminant Analysis, B - Principal Component Analysis, C - Factor Analysis, D - Cluster Analysis [Option ID = 36719]
- 4. A - Discriminant Analysis, B - Cluster Analysis, C - Factor Analysis, D - Principal Component Analysis [Option ID = 36720]

24) A study was conducted on the nestlings of Ross's goose, a small Arctic nesting goose. Goslings (baby geese) exist in two colour morphs, grey or yellow. It was reported that a population of geese at Karrack Lake, Canada included 263 yellow goslings and 413 grey goslings, (676 total). Assuming that colour is controlled by two alleles ('A' for 'grey' and 'a' for 'yellow') at a single locus with grey as dominant and that the population is in Hardy-Weinberg equilibrium, given $\sqrt{\frac{263}{676}} = 0.62$, the approximate frequency percentages of all three possible genotypes 'AA', 'Aa' and 'aa' are

[Question ID = 16681][Question Description = 124_55_AGS_SEP22_Q24]

- 1. 0.05, 0.34, 0.61 [Option ID = 36721]
- 2. 0.14, 0.62, 0.34 [Option ID = 36722]
- 3. 0.14, 0.48, 0.38 [Option ID = 36723]
- 4. 0.14, 0.39, 0.47 [Option ID = 36724]

25) Which of the following pairs of parents is most likely to produce a daughter with hemophilia, a sex-linked recessive gene disorder condition?

[Question ID = 16682][Question Description = 125_55_AGS_SEP22_Q25]

- 1. A hemophiliac mother and an unaffected father [Option ID = 36725]
- 2. A carrier mother and an unaffected father [Option ID = 36726]
- 3. A carrier mother and a hemophiliac father [Option ID = 36727]
- 4. An unaffected, non-carrier mother and a hemophiliac father [Option ID = 36728]

26) Consider the population with the case when selection is directed against recessives (with the dominant gene completely dominant to the recessive gene with respect to fitness) while moving to the next generation. Taking the relative fitness of the recessive to be $(1-s) = 0.98$ and the gene frequency of the recessive as $q = 0.50$, the frequency of the recessive gene in the next generation will be

[Question ID = 16683][Question Description = 126_55_AGS_SEP22_Q26]

- 1. $\frac{0.495}{0.995}$
[Option ID = 36729]
- 2. $\frac{0.990}{0.995}$
[Option ID = 36730]
- 3. $\frac{0.250}{0.995}$
[Option ID = 36731]
- 4. $\frac{0.495}{0.990}$
[Option ID = 36732]

27) Consider the following information on additive-dominance model with the effects viz., genotypic, additive genetic and dominance are independent at different loci with the following information:

Genotype	Frequency	Genotypic value	Genotypic value deviated from population mean

A ₁ A ₁	0.49	32	5.16
A ₁ A ₂	0.42	24	-2.84
A ₂ A ₂	0.09	12	-14.84

Then the values of additive genetic effects for the three genotypes A₁A₁, A₁A₂ and A₂A₂ are respectively

[Question ID = 16684][Question Description = 127_55_AGS_SEP22_Q27]

1. 2.53, -1.19, -1.34 [Option ID = 36733]
2. 5.52, -3.68, -12.88 [Option ID = 36734]
3. 3.61, -1.19, -4.45 [Option ID = 36735]
4. 1.77, -0.50, -0.40 [Option ID = 36736]

28) The product moment correlation coefficient between a mother and her child in a random mating population is

[Question ID = 16685][Question Description = 128_55_AGS_SEP22_Q28]

1. $\frac{1}{4}$
[Option ID = 36737]
2. $\frac{1}{2}$
[Option ID = 36738]
3. $\frac{3}{4}$
[Option ID = 36739]
4. 1
[Option ID = 36740]

29) Consider the following statements:

- A. Heritability of individuals in a population is defined as the ratio of the additive genetic variance to the phenotypic variance.
- B. Heritability is the regression of breeding value on phenotypic value of individuals in a population.
- C. The correlation between breeding values and the phenotypic value is equal to heritability
- D. An individual's estimated breeding value is the product of its phenotypic value and the heritability.

Which of the above statements are correct:

[Question ID = 16686][Question Description = 129_55_AGS_SEP22_Q29]

1. A, B and C only [Option ID = 36741]
2. A, B and D only [Option ID = 36742]
3. A, C and D only [Option ID = 36743]
4. B, C and D only [Option ID = 36744]

30) The number of bristles on the ventral surface of the abdominal segments of *Drosophila* flies has been treated as a spatially repeated character and the components of variation in this character have been studied and found as given below:

Source of variation	Males	Females
Total phenotypic variance	4.0	5.0
Between flies (General environment plus genotypic variance)	1.5	2.0
Within flies (Special environment variance)	2.5	3.0

Then the repeatability estimates of the said character for male and female flies are respectively

[Question ID = 16687][Question Description = 130_55_AGS_SEP22_Q30]

1. 0.625 and 0.600 [Option ID = 36745]
2. 0.625 and 0.400 [Option ID = 36746]
3. 0.375 and 0.400 [Option ID = 36747]
4. 0.375 and 0.600 [Option ID = 36748]

31) Consider the following statements:

- A. In general, characters that form an important component of fitness such as reproductive capacity and general vigour tend to exhibit depression as a consequence of inbreeding in a number of lines.
- B. The change in population mean in a number of lines on inbreeding is a function of the difference of genotypic value between homozygotes and heterozygotes.

C. Genes at intermediate frequencies (both close to 0.5) contribute less to a change in population mean due to inbreeding than genes at high or low frequencies, other things being equal.

D. When the loci combine additively, the change of mean on inbreeding is directly proportional to the coefficient of inbreeding.

Which of the above statements are correct?

[Question ID = 16688][Question Description = 131_55_AGS_SEP22_Q31]

1. A, B and C only [Option ID = 36749]
2. A, B and D only [Option ID = 36750]
3. A, C and D only [Option ID = 36751]
4. B, C and D only [Option ID = 36752]

32) Consider the following situation with heterozygote superiority and balanced polymorphism in single locus and two alleles:

Genotype	A ₁ A ₁	A ₁ A ₂	A ₂ A ₂
Relative fitness (or selective) value	1-s ₁	1	1-s ₂
Frequency before selection	p ²	2pq	q ²
Frequency after selection	(1-s ₁)p ²	2pq	(1-s ₂)q ²

Then the gene frequency of A₂ in the next generation will be

[Question ID = 16689][Question Description = 132_55_AGS_SEP22_Q32]

1. $\frac{q(1-s_2q)}{(1-s_1p^2-s_2q^2)}$

[Option ID = 36753]

2. $\frac{(1-s_2q)}{(1-s_1p^2-s_2q^2)}$

[Option ID = 36754]

3. $q(1-s_2q)$

[Option ID = 36755]

4. $\frac{q}{(1-s_1p^2-s_2q^2)}$

[Option ID = 36756]

33) Consider the following statements:

A. ANCOVA requires measurement of the characteristic of primary interest plus the measurement of one or more variables known as covariates for which a functional relationship with the character of primary interest is known beforehand.

B. In ANCOVA, the covariates used should be such that these are not influenced by the application of treatments, otherwise, while adjusting study variable over covariates, it may happen that the variability due to application of treatments may be taken away apart from the variation due to experimental error.

C. In ANCOVA, by measuring the covariate that is known to be linearly related to the characteristic of interest, the source of variation associated with the covariate can be deducted from experimental error and hence the treatment mean is adjusted to a value that it would have had, had there been no differences in the values of the covariate.

D. A strong assumption while fitting ANCOVA is that the regression coefficient is common for all the classes of the treatments as the ANCOVA model assumes usually a linear relationship between the covariate and the mean response with the same slope for each treatment.

Choose the *correct* statements from the options given below:

[Question ID = 16690][Question Description = 133_55_AGS_SEP22_Q33]

1. A, B and C only [Option ID = 36757]
2. A, B and D only [Option ID = 36758]
3. A, C and D only [Option ID = 36759]
4. A, B, C and D [Option ID = 36760]

34) Consider the following statements:

A. A good idea of the nature and extent of fertility variation in land can be obtained from the results of what are known as groups of experiments giving rise to fertility contour map showing lines passing through areas of equal fertility.

B. A uniformity trial consists in growing in a field or piece of land a particular crop with the same treatment, dividing the

field into small units and harvesting and recording the produce from each of these units separately.

C. A good idea of the nature and extent of fertility variation in land can be obtained from the results of what are known as uniformity trials giving rise to fertility contour map showing lines passing through areas of equal fertility.

D. Groups of experiments consist in growing in a field or piece of land a particular crop with the same treatment, dividing the field into small units and harvesting and recording the produce from each of these units separately.

Which of the above statements are correct?

[Question ID = 16691][Question Description = 134_55_AGS_SEP22_Q34]

1. A and B only [Option ID = 36761]
2. B and C only [Option ID = 36762]
3. C and D only [Option ID = 36763]
4. A and D only [Option ID = 36764]

35) A set of groups of experimental trials with randomized blocks (as six replications) in the same season was carried out at n=6 centres in Rajasthan to compare five wheat varieties. The ANOVA of each trial individually provided an Error Mean Squares (MS) based on k=(5-1)(6-1) degrees of freedom as follows:

	Bhilara	Bali	Pali	Khetri	Muknera	Taluji	Sum
Error MS	5776	8028	4516	9526	7056	5535	40437
Log (Error MS)							52.71
	8.66	8.99	8.42	9.16	8.86	8.62	

Assuming correction factor as 1, the value of Barlett's Chi-square statistic for testing homogeneity of error variances is given by

[Question ID = 16692][Question Description = 135_55_AGS_SEP22_Q35]

1. $6 [20 \log_e (40437/6) - 52.71]$ [Option ID = 36765]
2. $20 [6 \log_e (40437/6) - 52.71]$ [Option ID = 36766]
3. $20 [6 \log_e (52.71/6) - 40437]$ [Option ID = 36767]
4. $6 [20 \log_e (52.71/6) - 40437]$ [Option ID = 36768]

36) Let y be the response variable and σ^2 be the variance of y , and also let y' be the transformed variable using appropriate variance stabilizing transformation. Then in the following table, match List I with List II

List I	List II
A. $\sigma^2 \propto \text{constant}$	I. $y' = \sqrt{y}$
B. $\sigma^2 \propto E(y)$	II. $y' = \sin^{-1}(\sqrt{y})$
C. $\sigma^2 \propto E(y)[1 - E(y)]$	III. $y' = \log(y)$
D. $\sigma^2 \propto [E(y)]^2$	IV. $y' = y$

Choose the correct answer from the options given below:

[Question ID = 16693][Question Description = 136_55_AGS_SEP22_Q36]

1. [Option ID = 36769]
2. [Option ID = 36770]
3. [Option ID = 36771]
4. [Option ID = 36772]

37) Consider the following statements:

- A. Replication is a basic principle of design of experiments that can provide a more stable estimate of error variance by resorting to increase in the number of replications even though it cannot be increased indefinitely due to cost considerations.
- B. Randomization not only avoids any type of bias creeping into the experiment but also ensures providing an estimate of error variance.
- C. Local control can aid in reducing the error variance by resorting to formation of homogeneous groups of experimental units.
- D. Replication ensures validity of results.

Choose the *correct* statement from above:

[Question ID = 16694][Question Description = 137_55_AGS_SEP22_Q37]

1. A and B only [Option ID = 36773]
2. B and C only [Option ID = 36774]
3. C and D only [Option ID = 36775]
4. A and C only [Option ID = 36776]

- 38) Consider a nested design, in which factor B is nested in levels of factor A with the following linear model set up:

$$y_{ijk} = \mu + \tau_i + \beta_{j(i)} + \epsilon_{k(ij)} ; i = 1, 2, \dots, a ; j = 1, 2, \dots, b ; k = 1, 2, \dots, n$$

Let A and B both be random effects with the corresponding variances as σ_τ^2 and σ_β^2 respectively apart from the usual error variance σ^2 . Then the expected Mean Squares for the effects A, B(A) and Error are respectively;

[Question ID = 16695][Question Description = 138_55_AGS_SEP22_Q38]

1. [Option ID = 36777]
2. [Option ID = 36778]
3. [Option ID = 36779]
4. [Option ID = 36780]

- 39) In a Randomized Block Design with six treatments, the minimum number of replications required to ensure at least 10 degrees of freedom for the Error source of variation in the ANOVA is [Question ID = 16696][Question Description = 139_55_AGS_SEP22_Q39]

1. 2 [Option ID = 36781]
2. 3 [Option ID = 36782]
3. 4 [Option ID = 36783]
4. not computable and hence cannot be determined [Option ID = 36784]

- 40) In a split plot design set up, if a main plot factor A contains α levels, and within the factor A, a sub-plot factor B contains β levels with the whole experiment conducted in r replications, the degrees of freedom of the Sub-plot errors when units are arranged separately as Randomized Blocks (in Randomized Block Design i.e. RBD) and as Latin Squares (in Latin Square Design i.e. LSD) are respectively

[Question ID = 16697][Question Description = 140_55_AGS_SEP22_Q40]

1. [Option ID = 36785]
2. [Option ID = 36786]
3. [Option ID = 36786]

[Option ID = 36787]

4. [REDACTED]

[Option ID = 36788]

- 41) Consider the following 2^3 factorial experiment (denoting the factors by A, B and C and their level combinations by $a_i b_j c_k$, i being the two levels 0 or 1) laid in blocks of 4 units in three different replications (before randomization) as follows:

Replication I	Block 1	$a_1 b_1 c_1$	$a_1 b_0 c_0$	$a_0 b_1 c_0$	$a_0 b_0 c_1$
	Block 2	$a_1 b_1 c_0$	$a_1 b_0 c_1$	$a_0 b_1 c_1$	$a_0 b_0 c_0$
Replication II	Block 1	$a_1 b_1 c_1$	$a_1 b_0 c_1$	$a_0 b_1 c_0$	$a_0 b_0 c_0$
	Block 2	$a_1 b_1 c_0$	$a_0 b_1 c_1$	$a_1 b_0 c_0$	$a_0 b_0 c_1$
Replication III	Block 1	$a_1 b_1 c_1$	$a_0 b_1 c_1$	$a_1 b_0 c_0$	$a_0 b_0 c_0$
	Block 2	$a_1 b_1 c_0$	$a_1 b_0 c_1$	$a_0 b_1 c_0$	$a_0 b_0 c_1$

Consider the following statements:

A. With the plan given, only the main effects A, B and C are entirely free from block effects and hence are not confounded while all interaction effects AB, AC, BC and ABC are partially confounded.

B. In Replication II, the difference between the totals of blocks 1 and 2 represents the AC interaction and hence AC is confounded in this replication but however, in the other two replications, the estimate of AC is orthogonal with blocks.

C. The effect BC is partially confounded with blocks since an estimate of its effect can be made from 2 out of 3 replications in this experiment.

D. Instead of the given design layout, if Replication I is repeated exactly in the other two replications, then the highest order interaction effect ABC gets completely confounded with block effect and hence cannot be estimated.

Which of the above statements are correct?

[Question ID = 16698][Question Description = 141_55_AGS_SEP22_Q41]

1. A, B, and C only [Option ID = 36789]
2. A, B, and D only [Option ID = 36790]
3. A, C, and D only [Option ID = 36791]
4. B, C, and D only [Option ID = 36792]

- 42) Suppose from a total of $N = 20$ guava clusters each of size 4 in a village, $n = 5$ clusters (of size $M = 4$ trees each) were selected and the (hypothetical) yield (in kgs) is as given in the following table:

Cluster No.	1 st tree	2 nd tree	3 rd tree	4 th tree	Row mean	Deviation SS of mean from overall mean
1	5	4	1	15	6.25	16
2	11	1	4	7	5.75	21
3	36	10	19	11	19.00	76
4	7	15	12	10	11.00	0
5	2	22	8	6	9.50	1
Column mean	12.2	10.4	8.8	9.8	10.30	

Ignoring finite population correction, an approximate estimate of variance of the sample mean is

[Question ID = 16699][Question Description = 142_55_AGS_SEP22_Q42]

1. 5.7 [Option ID = 36793]
2. 4.3 [Option ID = 36794]
3. 17.1 [Option ID = 36795]
4. 28.5 [Option ID = 36796]

43) Consider the following population with population total as 16 consisting of $N = 5$ sampling units. A sample of size $n = 2$ is to be selected employing Probability Proportional to Size With Replacement (PPSWR).

Unit Id.	Probability p_i	Value of unit y_i
U_1	0.4	7
U_2	0.3	4
U_3	0.1	0
U_4	0.1	2
U_5	0.1	3

The inclusion probability for Unit U_1 is

[Question ID = 16700][Question Description = 143_55_AGS_SEP22_Q43]

1. 0.20 [Option ID = 36797]
2. 0.19 [Option ID = 36798]
3. 0.51 [Option ID = 36799]
4. 0.64 [Option ID = 36800]

44) Consider the following table constructed for determining stratification points using Dalenius and Hodges method:

Class No.	Lower Limit	Upper Limit	Frequency	Cumulative square root frequency
1	0	5	3464	58.9
2	5	10	2516	109.0
3	10	15	2157	155.5
4	15	20	1581	195.2
5	20	25	1142	229.0
6	25	30	746	256.3
7	30	35	512	279.0
8	35	40	376	298.3
9	40	45	265	314.6
10	45	50	207	329.0
11	50	55	126	340.2
12	55	60	107	350.6
13	60	65	82	359.6
14	65	70	50	366.7
15	70	75	39	373.0
16	75	80	25	378.0
17	80	85	16	382.0
18	85	90	19	386.3
19	90	95	2	387.7

20	95	100	3	389.5
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To construct five strata for the given data, the Dalenius and Hodges division points and the corresponding stratification points are respectively

[Question ID = 16701][Question Description = 144_55_AGS_SEP22_Q44]

1. (77.9, 155.8, 233.7, 311.6) and (5, 15, 25, 45) [Option ID = 36801]
2. (64.9, 129.8, 194.7, 259.6) and (5, 10, 20, 30) [Option ID = 36802]
3. (77.9, 155.8, 233.7, 311.6) and (10, 15, 30, 45) [Option ID = 36803]
4. (64.9, 129.8, 194.7, 259.6) and (5, 15, 20, 35) [Option ID = 36804]

45) Consider the following table:

Population	Values of population units	Population Mean	Standard Deviation
E	18, 20, 23, 25	21.5	2.69
F	18, 26, 32, 40	29.0	8.06

Population	Deviations of sample means of samples of sizes 2 from population mean	Deviations of sample means of samples of sizes 3 from population mean
E	-2.5, -1.0, 0.0, 0.0, 1.0, 2.5	-1.17, -0.50, 0.50, 1.17
F	-7.0, 4.0, 0.0, 0.0, 4.0, 7.0	-3.67, -1.0, 1.0, 3.67

Consider the following statements:

- A. The greater the sample size, the more closer will be the estimate of the population mean to that population mean irrespective of whether it is for population E or population F.
- B. While comparing the two populations E and F, if there is increase in the variability of the values of the variable under study, there is increase in the difference between the sample estimates and population mean.
- C. Population E is more variable than Population F when their Coefficients of Variations are compared.
- D. The difference between sample means and the true population mean can be attributable to selection of the units in the sample and hence sampling error can be at the most reduced but cannot be completely eliminated.

Which of the above statements are true?

[Question ID = 16702][Question Description = 145_55_AGS_SEP22_Q45]

1. A, B, and D only [Option ID = 36805]
2. B and C only [Option ID = 36806]
3. A, B, C, and D [Option ID = 36807]
4. A and D only [Option ID = 36808]

46) Consider the following statements:

- A. The data collected by complete enumeration in census is free from sampling errors but would not remain free from non-sampling errors.
- B. The data collected through sample surveys can have only sampling errors but not non-sampling errors.
- C. In general, the sampling errors decrease as the sample size increases, whereas non-sampling error increases as the sample size increases.
- D. Sampling error may be higher when the sample used in the study is not representative of the whole population.

Which of the above statements is *incorrect*?

[Question ID = 16703][Question Description = 146_55_AGS_SEP22_Q46]

1. A only [Option ID = 36809]
2. B only [Option ID = 36810]
3. C only [Option ID = 36811]
4. D only [Option ID = 36812]

47) Suppose the N units in the population are serially numbered from 1 to N. Suppose further that N is expressible as a product of two integers n and k, so that $N = nk$. Consider the following statements:

A. If the values of the successive units in a population follow a linear trend, then in case stratified sampling is employed rather than systematic sampling, the former will be more efficient than the latter.

B. Let $N = 30$ and $n = 5$. Suppose, using systematic sampling, the first selected number is 3. Then systematic sample consists of units with following serial numbers: 3, 8, 13, 18, 23.

C. If ρ_c is the intra-class coefficient between the pairs of units within a sample, then systematic sampling will be more precise than simple random sampling only when $\rho_c > \frac{-1}{(kn-1)}$.

D. In the given systematic sampling set up, the selection of every k^{th} time interval for observing the number of fishing craft landing at a center cannot be considered, because the population in question is determined by distribution in time rather than space hence not a natural population that can be serially numbered.

Which of the above statements is correct?

[Question ID = 16704][Question Description = 147_55_AGS_SEP22_Q47]

1. A only [Option ID = 36813]
2. B only [Option ID = 36814]
3. C only [Option ID = 36815]
4. D only [Option ID = 36816]

48) A forest resource manager is interested in estimating the total number of dead trees in a 400-acre area of heavy infestation. She subdivides the area into 200 plots of equal sizes and uses photo counts (x) to find the number of dead trees in 18 randomly sampled plots. The mean of the number of dead trees from these 18 plots came out to be 8.50. She then randomly samples 8 plots out of these 18 plots and conducts a ground count (y) on these 8 plots and gets the following information:

Plot No.	23	5	6	12	15	16	17
x	7	10	7	9	9	10	13
y	9	10	10	11	10	12	17

Using ratio-type estimator for mean under this double sampling set up, the estimate of mean is

[Question ID = 16705][Question Description = 148_55_AGS_SEP22_Q48]

1. 7.08 [Option ID = 36817]
2. 14.12 [Option ID = 36818]
3. 10.20 [Option ID = 36819]
4. 8.50 [Option ID = 36820]

49) Suppose three small towns are under study, having population $N_1 = 50000$, $N_2 = 30000$ and $N_3 = 40000$, respectively. A stratified random sample is to be taken with a total sample size of $n = 600$. It is (roughly) known from a previous survey that the square root of the stratum mean squares of the three towns are respectively 30, 23 and 20.25. Then, assuming cost per unit is same across all strata, the sample sizes to be taken from each town individually using the method of proportional allocation are [Question ID = 16706][Question Description = 149_55_AGS_SEP22_Q49]

1. 250, 150, 200 [Option ID = 36821]
2. 300, 138, 162 [Option ID = 36822]
3. 246, 188, 166 [Option ID = 36823]
4. 150, 250, 200 [Option ID = 36824]

50) Consider the following data set of number of workers in 10 factories and its output.

Factory	No. of workers (X) (in	Industrial production (Y)
---------	------------------------	---------------------------

No.	thousands)	(in metric tons)
1	2	30
2	5	60
3	10	12
4	4	6
5	7	8
6	12	13
7	3	4
8	14	17
9	11	13
10	6	8

While selecting three units among Y using Lahiri's method, the following successive pairs of random numbers (i, j) such that

where M is maximum of sizes X of the N =10 units in the population were obtained: (3, 7), (8, 13), (4, 7), (2, 9), (9, 2).

Then the units selected in the sample of three units using this Probability Proportional to Size With Replacement (PPSWR) procedure are

[Question ID = 16707][Question Description = 150_55_AGS_SEP22_Q50]

1. 12, 17, 6

[Option ID = 36825]

2. 12, 6, 60

[Option ID = 36826]

3. 12, 60, 13

[Option ID = 36827]

4. 12, 17, 13

[Option ID = 36828]