INSTRUCTION:- *Read questions carefully. For each wrong answer, one-third (0.883) of the marks assigned to that question will be deducted. Each question contains (2.5) marks.* / प्रश्नों को ध्यानपूर्वक पढ़िए। प्रत्येक गलत उत्तर के लिए, दिए x, vidk e[l s,d&frgkb l¼0-**883**) अंक काटे जायेंगे। प्रत्येक प्रश्न (2-5½ vid dk g½

1. Let S be the set all persons living in Delhi. We say that x, y in S are related if they were born in Delhi on the same day. Which one of the following is correct? /eku yhft, fd fnYyh esa jgus okys lHkh 0;fDr;ka dk ,d lePp; S g½ ge dgrs g½ fd S ds x, y ,d&nwljs l s EcfU/kr g½ ;fn mudk tUe fnYyh esa ,d gh fnu gqvk FkkA fuEufyf[kr esa l s dkSu&lk I k l gh g½

   (a) The relation is an equivalent relation/; g I EcU/k ,d rqY; I EcU/k g½

   (b) The relation is not reflexive but it is symmetric and transitive /; g I EcU/k Lor¨Y; ugha g½ yfdu I efer o I Økbed g½

   (c) The relation is not symmetric but it is reflexive and transitive /; g I EcU/k I efer ugha g½ yfdu Lor¨Y; o I Økbed g½

   (d) The relation is not transitive but it is reflexive and symmetric /; g I EcU/k I Økbed ugha g½ yfdu Lor¨Y; o I efer g½

2. Let $A = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$. Then the number of subsets of A containing two or three elements is /eku yhft, fd $A = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$ g½ rks A ds mi lePp;ka dh la[;k ftuesa nks ;k rhu vo;o g½ D; k g½

   (a) 45   (b) 120
   (c) 165   (d) 330

3. The value of $i^{2n} + i^{2n+1} + i^{2n+2} + i^{2n+3}$, where $i = \sqrt{-1}$, is / $i^{2n} + i^{2n+1} + i^{2n+2} + i^{2n+3}$, tgkj $i = \sqrt{-1}$ g½ dk eku D;k g½

   (a) 0   (b) 1
   (c) i (d) $-i$

4. If the difference between the roots of the equation $x^2 + kx + 1 = 0$ is strictly less than $\sqrt{5}$, where $|k| \geq 2$, then k can be any element of the interval /;fn lehdj.k $x^2 + kx + 1 = 0$ ds ewyka ds chp dk vUrj n<r% $\sqrt{5}$ l s de g½ tgkj $|k| \geq 2$ g½ rks k fdl vUrjky dk dkbZ vo; o gks I drk g½

   (a) $(-3, -2) \cup [2, 3)$
   (b) (-3, 3)
   (c) $[-3, -2] \cup [2, 3]$
   (d) None of the above /mi;Dr esa l s dkbZ ughaa

5. If the roots of the equation $x^2 + px + q = 0$ are in the same ratio as those of the equation $x^2 + lx + m = 0$, then which one of the following is correct? /;fn lehdj.k $x^2 + px + q = 0$ ds ewyka dk vuqikr ogh g½ tks lehdj.k $x^2 + lx + m = 0$ ds ewyka dk g½ rks fuEufyf[kr esa l s dkSu&l k I gh g½

   (a) $p^2m = l^2q$ (b) $m^2p = l^2q$
   (c) $m^2p = q^2l$ (d) $m^2p^2 = l^2q$

6. The value of $\left(\frac{-1+i\sqrt{3}}{2}\right)^n + \left(\frac{-1-i\sqrt{3}}{2}\right)^n$ where n is not a multiple of 3 and $i = \sqrt{-1}$, is / $\left(\frac{-1+i\sqrt{3}}{2}\right)^n + \left(\frac{-1-i\sqrt{3}}{2}\right)^n$ tgkj n, 3 dk xq.kt ugha g½ vkSj $i = \sqrt{-1}$ g½ dk eku D; k g½

   (a) 1   (b) -1
   (c) i (d) $-i$

7. Three-digit numbers are formed from the digits 1, 2 and 3 in such a way that the digits are not repeated. What is the sum of such three-digit numbers? /vad 1] 2 o 3 l s rhu&vadh; la[; k,a bl çdkj cukbZ xbZ g½ fd vad nkgjk, ugha x, g½ bl çdkj dh rhu&vadh; la[; kvka dk ; ksx fdl ds cjkcj g½

   (a) 1233   (b) 1322
   (c) 1323   (d) 1332

8. What is the sum of the series $0.3 + 0.33 + 0.333 + \cdots \ldots n$ terms? /Js.kh $0.3 + 0.33 + 0.333 + \cdots \ldots n$ ds inka dk ;ksx fdl ds cjkcj g½

   (a) $\frac{1}{3}\left[n - \frac{1}{9}\left(1 - \frac{1}{10^n}\right)\right]$

   (b) $\frac{1}{3}\left[n - \frac{2}{9}\left(1 - \frac{1}{10^n}\right)\right]$

   (c) $\frac{1}{3}\left[n - \frac{1}{3}\left(1 - \frac{1}{10^n}\right)\right]$

   (d) $\frac{1}{3}\left[n - \frac{1}{9}\left(1 + \frac{1}{10^n}\right)\right]$

9. If $1, \omega, \omega^2$ are the cube roots of unity, then $(1 + \omega)(1 + \omega2 1 + \omega 3(1 + \omega + \omega 2)$ is equal to /;fn bdkbZ ¼1¾ fuVh¼½ ds ?kuewy g½ rks $(1 + \omega)(1 + \omega^2)(1 + \omega^3)(1 + \omega + \omega^2)$ fdl ds cjkcj g½

   (a) -2   (b) -1
   (c) 0   (d) 2

10. If the sum of m terms of an AP is n and the sum of n terms is m, then the sum of $(m + n)$ terms is /;fn ,d lekarj Js.kh (AP) ds m inka dk ;ksx n g½ o n inka dk ;ksx m g½ rks $(m + n)$ inka dk ;ksx fdl ds cjkcj g½

   (a) mn (b) $m + n$
   (c) $2(m + n)$ (d) $-(m + n)$

11. The modulus and principal argument of the complex number $\frac{1+2i}{1-(1-i)^2}$ are respectively /l fEeJ la[; k $\frac{1+2i}{1-(1-i)^2}$ ds ekikad o eq[; dks.kkad g½ क्रमश:

   (a) 1, 0   (b) 1, 1

    (c) 2, 0   (d) 2, 1

12. If the graph of a quadratic polynomial lies entirely above x-axis, then which one of the following is correct? /; fn ,d f}?kkrh; cgqin dk vkys[k lEiw](kr% $x-$v{k ds Åij fLFkr g§ rks fuEufyf[kr esa ls dkSu&lk I g] g\

    (a) Bothe the roots are real /nksuksa ey okLrfod g§

    (b) One root is real and the other is complex /,d ey okLrfod o ,d I fEeJ g§

    (c) Both the roots are complex /nksuksa gh ey I fEeJ g§

    (d) Cannot say /dgk ugha tk l drk

13. If $|z + 4| \leq 3$, then the maximum value of $|z + 1|$ is /; fn $|z + 4| \leq 3$ g§ rks $|z + 1|$ dk vf/kdre eku D;k g\

    (a) 0   (b) 4

    (c) 6   (d) 10

14. The number of roots of the equation $z^2 = 2\bar{z}$ is /l ehdj.k ds eyksa dh la[;k fdruh g\

    (a) 2   (b) 3

    (c) 4   (d) zero / शून्य

15. If $\cot\alpha$ and $\cot\beta$ are the roots of the equation $x^2 + bx + c = 0$ with $b \neq 0$, then the value of $\cot(\alpha + \beta)$ is /; fn $x^2 + bx + c = 0$ l ehdj.k tgka $b \neq 0$ ds ey $\cot\alpha$ o $\cot\beta$ g§ rks $\cot(\alpha + \beta)$ fdl ds cjkcj g\

    (a) $\frac{c-1}{b}$ (b) $\frac{1-c}{b}$

    (c) $\frac{b}{c-1}$ (d) $\frac{b}{1-c}$

16. The sum of the roots of the equation $x^2 + bx + c = 0$ (where b and c are non-zero) is equal to the sum of the reciprocals of their squares. Then $\frac{1}{c}, b, \frac{c}{b}$ are in / l ehdj.k $x^2 + bx + c = 0$ tgka b vkSj c शून्येत्तर हैं के eyksa dk ;ksx muds oxksZ ds O;qRØeksa ds ;ksx ds cjkcj g§ rks $\frac{1}{c}, b, \frac{c}{b}$ fdl Jskh esa g\

    (a) AP

    (b) GP

    (c) HP

    (d) None of the above /mi;qZDr esa ls dkbZ ugha

17. The sum of the roots of the equation $ax^2 + x + c = 0$ (where a and c are non-zero) is equal to the sum of the reciprocals of their squares. Then a, ca^2, c^2 are in /l ehdj.k $ax^2 + x + c = 0$ (tgka a vkSj c शून्येत्तर है½ ds eyksa dk ;ksx muds oxksZ ds O;qRØeksa ds ;ksx cjkcj g§ rks a, ca^2, c^2 fdl Jskh esa g\

    (a) AP

    (b) GP

    (c) HP

    (d) None of the above /mi;qZDr esa ls dkbZ ugha

18. The value of $[C(7,0) + C(7,1)] + [C(7,1) + C(7,2)] + \cdots\ldots. + [C(7,6) + C(7,7)]$ is / $[C(7,0) + C(7,1)] + C(7,1) + C(7,2)] + \cdots\ldots. + [C(7,6) + C(7,7)]$ fdl ds cjkcj g\

    (a) 254   (b) 255

    (c) 256   (d) 257

19. The number of different words (eight letter words) ending and beginning with a constant which can be made out of the letters of the word 'EQUATION' is /शब्द 'EQUATION' ds o.kksZa ls cuk, tk l dus okys vkB o.kksZ ds विभिन्न शब्दों की संख्या क्या होगी जिनका आरम्भ व अंत एक 0;atu l s gksrk g\

    (a) 5200   (b) 4320

    (c) 3000   (d) 2160

20. The fifth term of an AP of n terms, whose sum is $n^2 - 2n$, is / n inksa dh ,d l ekarj Jskh (AP) ftl dk ;ksx $n^2 - 2n$ g§ dk ikapok¡ in fdl ds cjkcj g\

    (a) 5   (b) 7

    (c) 8   (d) 15

21. The sum of all the two-digit odd numbers is /nks&vadh; lHkE विषम संख्याओं का योग किसके बराबर है\

    (a) 2475   (b) 2530

    (c) 4905   (d) 5049

22. The sum of the first n terms of the series $\frac{1}{2} + \frac{3}{4} + \frac{7}{8} + \frac{15}{16} + \cdots\ldots..$ is equal to /Jskh $\frac{1}{2} + \frac{3}{4} + \frac{7}{8} + \frac{15}{16} + \cdots\ldots..$ ds çFke n inksa dk ;ksx fdl ds cjkcj g\

    (a) $2^n - n - 1$ (b) $1 - 2^{-n}$

    (c) $2^{-n} + n - 1$ (d) $2^n - 1$

23. Consider the following in respect of sets A and B : /l ecp/ka A o B ds l EcU/k esa fuEufyf[kr ij fopkj dhft,%

1. $(A - B) \cup B = A$

2. $(A - B) \cup A = A$

3. $(A - B) \cap B = \Phi$

4. $A \subseteq B \Rightarrow A \cup B = B$

Which of the above are correct? /mi;qZDr esa ls dkSu&lk l gh g\

    (a) 1, 2 and 3 /1, 2 vkS 3

    (b) 2, 3 and 4 /2, 3 vkS 4

    (c) 1, 3 and 4 /1, 3 vkS 4

    (d) 1, 2 and 4 /1, 2 vkS 4

24. In the binary equation $(1p101)_2 + (10q1)_2 = (100r00)_2$ where p, q and r are binary digist, what are the possible values of p, q and r respeicitvely? /,d f}vk/kkjh l ehdj.k $(1p101)_2 + (10q1)_2 = (100r00)_2$ tgka p, q o r f}vk/kkjh vad g§ esa p, q vkS r ds l Hkkfor eku क्रमशः किसके बराबर हैं\

    (a) 0, 1, 0

    (b) 1, 1, 0

    (c) 0, 0, 1

    (d) 1, 0, 1

25. If $S = \{x : x^2 + 1 = 0, x \text{ is real}\}$, then S is /; fn $S = \{x : x^2 + 1 = 0, x \text{ okLrfod g}\}$ rks S fdl ds cjkcj g\

    (a) {-1}

    (b) {0}

    (c) {1}

    (d) an empty set /,d fjDr lePp;

26. The expansion of $(x - y)^n, n \geq 5$ is done in the descending powers of x. If the sum of the fifth and sixth terms is zero, then $\frac{x}{y}$ is equal to / $(x - y)^n, n \geq 5$ dk çl kj x dh ?kVrh ds voji kgh Øe esa fd;k x;k gA ;fn ik¡posa o छठें पदों का योग शून्य है, तो $\frac{x}{y}$ fdl ds cjkcj g\

    (a) $\frac{n-5}{6}$ (b) $\frac{n-4}{5}$

    (c) $\frac{5}{n-4}$ (d) $\frac{6}{n-5}$

27. If $A = \begin{bmatrix} \alpha & 2 \\ 2 & \alpha \end{bmatrix}$ and $\det(A^3) = 125$, then α is equal to /

; fn $A = \begin{bmatrix} \alpha & 2 \\ 2 & \alpha \end{bmatrix}$ vkSj $\det(A^3) = 125$ gS rks α fdl ds

cjkcj gS\

(a) ± 1 (b) ± 2

(c) ± 3 (d) ± 5

28. If B is a non-singular matrix and A is a square matrix, then the value of $\det(B^{-1}AB)$ is equal to / ; fn B , d

0;RØe.kh; vkØ;wg gS vkSj A , d oxZ vkØ;wg gS rks

$\det(B^{-1}AB)$ dk eku fdl ds cjkcj gS\

(a) $\det(B)$ (b) $\det(A)$

(c) $\det(B^{-1})$ (d) $\det(A^{-1})$

29. If $a \neq b \neq c$, then one value of x which satisfies the

equation $\begin{vmatrix} 0 & x-a & x-b \\ x+a & 0 & x-c \\ x+b & x+c & 0 \end{vmatrix} = 0$ is given by/ ; fn

$a \neq b \neq c$ gS rks x dk , d ,slk eku] tks lehdj.k

$\begin{vmatrix} 0 & x-a & x-b \\ x+a & 0 & x-c \\ x+b & x+c & 0 \end{vmatrix} = 0$ को संतुष्ट करता है, किसके

cjkcj gS\

(a) a (b) b

(c) c (d) 0

30. If $A = \begin{bmatrix} \cos\alpha & \sin\alpha \\ -\sin\alpha & \cos\alpha \end{bmatrix}$ then what is AA^T equal to (where A^T is the transpose of A) ? /; fn $A = \begin{bmatrix} \cos\alpha & \sin\alpha \\ -\sin\alpha & \cos\alpha \end{bmatrix}$ gS rks AA^T fdl ds cjkcj gS%tgk¡ A^T, A dk ifjorZ gS%\

(a) Null matrix/ शून्य आव्यूह

(b) Identity matrix /rRle ed vkØ;wg

(c) A

(d) $-A$

31. The equations $\begin{matrix} x + 2y + 3z = 1 \\ 2x + y + 3z = 2 \\ 5x + 5y + 9z = 4 \end{matrix}$ / lehdj.k

$x + 2y + 3z = 1$

$2x + y + 3z = 2$ fdl çdkj ds gS\

$5x + 5y + 9z = 4$

(a) have the unique solution /budk vf}rh; gy gS

(b) have infinitely many solutions /buds vuarr% vusd gy gS

(c) are inconsistent / ; s vlaxr gS

(d) None of the above / mi ; Dr eSl ls dkbZ ughа

32. $A = \begin{bmatrix} x+y & y \\ x & x-y \end{bmatrix}$, $B = \begin{bmatrix} 3 \\ -2 \end{bmatrix}$ and $C = \begin{bmatrix} 4 \\ -2 \end{bmatrix}$. If $AB = C$, then what is A^2 equal to?

/ $A = \begin{bmatrix} x+y & y \\ x & x-y \end{bmatrix}$, $B = \begin{bmatrix} 3 \\ -2 \end{bmatrix}$ vkSj $C = \begin{bmatrix} 4 \\ -2 \end{bmatrix}$ gSA ; fn

$AB = C$ gS rks A^2 fdl ds cjkcj gS\

(a) $\begin{bmatrix} 4 & 8 \\ -4 & -16 \end{bmatrix}$ (b) $\begin{bmatrix} 4 & -4 \\ 8 & -16 \end{bmatrix}$

(c) $\begin{bmatrix} -4 & -8 \\ 4 & 12 \end{bmatrix}$ (d) $\begin{bmatrix} -4 & -8 \\ 8 & 12 \end{bmatrix}$

33. What is the value of the determinant

$\begin{vmatrix} 1 & 1 & 1 \\ 1 & 1+xyz & 1 \\ 1 & 1 & 1+xyz \end{vmatrix}$? / lkjf.kd

$\begin{vmatrix} 1 & 1 & 1 \\ 1 & 1+xyz & 1 \\ 1 & 1 & 1+xyz \end{vmatrix}$ fdl ds cjkcj gS\

(a) $1 + x + y + z$

(b) $2xyz$

(c) $x^2 y^2 z^2$

(d) $2x^2 y^2 z^2$

34. If $\begin{vmatrix} x & y & 0 \\ 0 & x & y \\ y & 0 & x \end{vmatrix} = 0$, then which one of the following is

correct? / ; fn $\begin{vmatrix} x & y & 0 \\ 0 & x & y \\ y & 0 & x \end{vmatrix} = 0$ gS rks fuEufyf[kr eSa ls

dkSu&lk lgh gS\

(a) $\frac{x}{y}$ is one of the cube roots of unity /$\frac{x}{y}$, bdkbZ ds ?kuewyksa eSa ls ,d gS

(b) x is one of the cube roots of unity / x, bdkbZ ds ?kuewyksa eSa ls ,d gS

(c) y is one of the cube roots of unity / y, bdkbZ ds ?kuewyksa eSa ls ,d gS

(d) $\frac{x}{y}$ is one of the cube roots of -1 /$\frac{x}{y}$, -1 ds ?kuewyksa eSa ls ,d gS

35. Consider the set A of all matrices of order 3×3 with entries 0 or 1 only. Let B be the subset of A consisting of all matrices whose determinant is 1. Let C be the subset of A consisting of all matrices whose determinant is -1. Then which one of the following is correct? /dkfV ¼vkMZj½ 3×3 ds lHkh vkØ;wgksa ftudh प्रविष्टियाa doy 0 vFkok 1 gS ds lePpp; A ij fopkj dhft, A eku yhft, fd B, A dk , d ,slk milePpp; gS ftl eSa lose lHkh vkØ;wg gS ftuds fu/kkZjdk dk eku 1 gS A eku yhft, fd C, A dk , d ,slk milePpp; gS ftl ds lHkh vkØ;wgksa ds fu/kZjdks dk eku -1 gS rks fuEufyf[kr eSa ls dkSu&lk lgh gS\

(a) C is empty / C fjDr gS

(b) B has as many elements as C / B eSa mrus gh vo; o gS ftrus fd C eS

(c) $A = B \cup C$

(d) B has thrice as many elements as C / B eSa C ls rhu xuk vo; o gS

36. If $A = \begin{bmatrix} \cos\theta & \sin\theta \\ -\sin\theta & \cos\theta \end{bmatrix}$, then what is A^3 equal to?/; fn If $A = \begin{bmatrix} \cos\theta & \sin\theta \\ -\sin\theta & \cos\theta \end{bmatrix}$ gS rks A^3 fdl ds cjkcj gS\

(a) $\begin{bmatrix} \cos 3\theta & \sin 3\theta \\ -\sin 3\theta & \cos 3\theta \end{bmatrix}$

(b) $\begin{bmatrix} \cos^3\theta & \sin^3\theta \\ -\sin^3\theta & \cos^3\theta \end{bmatrix}$

(c) $\begin{bmatrix} \cos 3\theta & -\sin 3\theta \\ \sin 3\theta & \cos 3\theta \end{bmatrix}$

(d) $\begin{bmatrix} \cos^3\theta & -\sin^3\theta \\ \sin^3\theta & \cos^3\theta \end{bmatrix}$

37. What is the order of $[x \quad y \quad z]\begin{bmatrix} a & h & g \\ h & b & f \\ g & f & c \end{bmatrix}\begin{bmatrix} x \\ y \\ z \end{bmatrix}$?

/$[x \quad y \quad z]\begin{bmatrix} a & h & g \\ h & b & f \\ g & f & c \end{bmatrix}\begin{bmatrix} x \\ y \\ z \end{bmatrix}$ dh dkfV ¼vkMZj½ D;k gS\

(a) 3×1 (b) 1×1

(c) 1×3 (d) 3×3

38. If $A = \begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$, then the value of A^4 is /; fn $A = \begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$ gS rks A^4 dk eku D;k gS\

(a) $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ (b) $\begin{bmatrix} 1 & 1 \\ 0 & 0 \end{bmatrix}$

(c) $\begin{bmatrix} 0 & 0 \\ 1 & 1 \end{bmatrix}$ (d) $\begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$

39. If $\sin A = \frac{3}{5}$, where $450° < A < 540°$, then $\cos\frac{A}{2}$ is equal to /; fn $\sin A = \frac{3}{5}$ gS tgkj $450° < A < 540°$ gS rc $\cos\frac{A}{2}$ fdl ds cjkcj gS\

(a) $\frac{1}{\sqrt{10}}$

(b) $-\sqrt{\frac{3}{10}}$

(c) $\frac{\sqrt{3}}{\sqrt{10}}$

(d) None of the above /mi;ZDr esa ls dksbZ ugha

40. What is $\frac{1}{\sin 10°} - \frac{\sqrt{3}}{\cos 10°}$ /$\frac{1}{\sin 10°} - \frac{\sqrt{3}}{\cos 10°}$ fdl ds cjkcj gS\

(a) 0   (b) 1

(c) 2   (d) 4

41. From the top of a lighthouse, 100 m high, the angle of depression of a boat is $\tan^{-1}\left(\frac{5}{12}\right)$. What is the distance between the boat and the lighthouse? /$100\ m$ ÅapkbZ ds ,d प्रकाश–स्तम्भ के शीर्ष से एक नाव का अवनमन–कोण $\tan^{-1}\left(\frac{5}{12}\right)$ gSA uko vkSj प्रकाश–स्तम्भ के बीच की दूरी कितनी gS\

(a) 120 m   (b) 180 m

(c) 240 m   (d) 360 m

42. The maximum value of $\sin\left(x + \frac{\pi}{6}\right) + \cos\left(x + \frac{\pi}{6}\right)$ in the interval $\left(0, \frac{\pi}{2}\right)$ is attained at /$\sin\left(x + \frac{\pi}{6}\right) + \cos\left(x + \frac{\pi}{6}\right)$ dk vf/kdre eku] $\left(0, \frac{\pi}{2}\right)$ ds vrjky esa fdl fLFkfr esa çkIr gksrk gS\

(a) $\frac{\pi}{12}$ (b) $\frac{\pi}{6}$

(c) $\frac{\pi}{3}$ (d) $\frac{\pi}{2}$

43. If $K = \sin\left(\frac{\pi}{18}\right)\sin\left(\frac{5\pi}{18}\right)\sin\left(\frac{7\pi}{18}\right)$, then what is the value of K? /; fn $K = \sin\left(\frac{\pi}{18}\right)\sin\left(\frac{5\pi}{18}\right)\sin\left(\frac{7\pi}{18}\right)$ gS rks K fdl ds cjkcj gS\

(a) $\frac{1}{2}$ (b) $\frac{1}{4}$

(c) $\frac{1}{8}$ (d) $\frac{1}{16}$

44. The expression $\frac{\sin\alpha + \sin\beta}{\cos\alpha + \cos\beta}$ is equal to /0;atd $\frac{\sin\alpha + \sin\beta}{\cos\alpha + \cos\beta}$ fdl ds cjkcj gS\

(a) $\tan\left(\frac{\alpha+\beta}{2}\right)$ (b) $\cot\left(\frac{\alpha+\beta}{2}\right)$

(c) $\sin\left(\frac{\alpha+\beta}{2}\right)$ (d) $\cos\left(\frac{\alpha+\beta}{2}\right)$

45. If $\sin\theta = 3\sin(\theta + 2\alpha)$, then the value of $\tan(\theta + \alpha) + 2\tan\alpha$ is equal to /; fn $\sin\theta = 3\sin(\theta + 2\alpha)$ gS rks $\tan(\theta + \alpha) + 2\tan\alpha$ dk eku fdl ds cjkcj gS\

(a) -1   (b) 0

(c) 1   (d) 2

46. What is the value of $\tan 18°$? / $\tan 18°$ fdl ds cjkcj gS\

(a) $\frac{\sqrt{5}-1}{\sqrt{10+2\sqrt{5}}}$ (b) $\frac{\sqrt{5}-1}{\sqrt{10+\sqrt{5}}}$

(c) $\frac{\sqrt{10+2\sqrt{5}}}{\sqrt{5}-1}$ (d) $\frac{\sqrt{10+\sqrt{5}}}{\sqrt{5}-1}$

47. Let x, y, z be positive real numbers such that x, y, z are in GP and $\tan^{-1}x$, $\tan^{-1}y$ and $\tan^{-1}z$ are in AP. Then which one of the following is correct? /eku yhft, fd x, y, z /kukRed okLrfod la[;k,¡ bl çdkj gSa fd os GP esa gSa vkSj $\tan^{-1}x$, $\tan^{-1}y$ rFkk rhuksa AP esa gSa rks fuEufyf[kr esa ls dkSu&lk lgh gS\

(a) $x = y = z$

(b) $xz = 1$

(c) $x \neq y$ and $y = z$ /$x \neq y$ vkSj $y = z$

(d) $x = y$ and $y \neq z$ /$x = y$ vkSj $y \neq z$

48. If $\tan(\alpha + \beta) = 2$ and $\tan(\alpha - \beta) = 1$, then $\tan(2\alpha)$ is equal to /; fn $\tan(\alpha + \beta) = 2$ vkSj $\tan(\alpha - \beta) = 1$ gS rks $\tan(2\alpha)$ fdl ds cjkcj gS\

(a) -3   (b) -2

(c) $-\frac{1}{3}$ (d) 1

49. Consider the following for triangle ABC: /f=Hkqt ABC ds fy, fuEufyf[kr ij fopkj dhft, %

1. $\sin\left(\frac{B+C}{2}\right) = \cos\left(\frac{A}{2}\right)$

2. $\tan\left(\frac{B+C}{2}\right) = \cot\left(\frac{A}{2}\right)$

3. $\sin(B + C) = \cos(A)$

4. $\tan(B + C) = -\cot(A)$

Which of the above are correct? /mi;ZDr esa ls dkSu&ls lgh gS\

(a) 1 and 3 /1 vkSj 3

(b) 1 and 2 /1 vkSj 2

(c) 1 and 4 /1 vkSj 4

(d) 2 and 3 /2 vkSj 3

50. If $\sec\theta - \csc\theta = \frac{4}{3}$, then what is $(\sin\theta - \cos\theta)$ equal to? /; fn $\sec\theta - \csc\theta = \frac{4}{3}$ gS rks $(\sin\theta - \cos\theta)$ fdl ds cjkcj gS\

(a) -2 only /dsoy -2

(b) $\frac{1}{2}$ only / dsoy $\frac{1}{2}$

(c) Both -2 and $\frac{1}{2}$ /-2 vkSj $\frac{1}{2}$ nksuksa

(d) Neither $\frac{1}{2}$ nor -2 /u rks $\frac{1}{2}$ u gh -2

51. If a vertex of a triangle is (1, 1) and the midpoints of two sides of the triangle through this vertex are (-1, 2) and (3, 2), then the centroid of the triangle is /; fn fdlh त्रिभुज का एक शीर्ष (1, 1) है और इस शीर्ष से होकर जाने वाली nksuksa Hkqtkvksa ds e/; fcanq (-1, 2) o (3, 2) gS rks f=Hkqt dk dsUæd gksxk

(a) $\left(-\frac{1}{3}, \frac{7}{3}\right)$ (b) $\left(-1, \frac{7}{3}\right)$

(c) $\left(\frac{1}{3}, \frac{7}{3}\right)$ (d) $\left(1, \frac{7}{3}\right)$

52. The incentre of the triangle with vertices $A(1,\sqrt{3})$, $B(0,0)$ and $C(2,0)$ is /यदि त्रिभुज, जिसके शीर्ष $A(1,\sqrt{3})$, $B(0,0)$ और $C(2,0)$ है, का अंतःकेन्द्र गकxg

(a) $\left(1,\frac{\sqrt{3}}{2}\right)$ (b) $\left(\frac{2}{3},\frac{1}{\sqrt{3}}\right)$

(c) $\left(\frac{2}{3},\frac{\sqrt{3}}{2}\right)$ (d) $\left(1,\frac{1}{\sqrt{3}}\right)$

53. If the three consecutive vertices of a parallelogram are $(-2,-1),(1,0)$ and $(4,3)$, then what are the coordinates of the fourth vertex? /यदि एक समांतर चतुर्भुज के तीन क्रमागत शीर्ष $(-2,-1),(1,0)$ और $(4,3)$ है, तो चौथे शीर्ष का निर्देशांक क्या है\

(a) (1, 2) (b) (1, 0)

(c) (0, 0) (d) (1, -1)

54. The two circles $x^2 + y^2 = r^2$ and $x^2 + y^2 - 10x + 16 = 0$ intersect at two distinct points. Then which one of the following is correct? /दोनों वृत्त $x^2 + y^2 = r^2$ और $x^2 + y^2 - 10x + 16 = 0$ दो भिन्न बिन्दुओं पर प्रतिच्छेदन करते है, तो निम्नलिखित में से कौन&सा सही है\

(a) 2<r<8 (b) r=2 or r=8

(c) r<2 (d) r>2

55. What is the equation of the circle which passes through the points (3, -2) and (-2, 0) and having its centre on the line $2x - y - 3 = 0$? /एक वृत्त, जो बिन्दु (3, -2) और (-2, 0) से गुजरता है और जिसका केन्द्र रेखा $2x - y - 3 = 0$ पर स्थित है, का समीकरण क्या है\

(a) $x^2 + y^2 + 3x + 2 = 0$

(b) $x^2 + y^2 + 3x + 12y + 2 = 0$

(c) $x^2 + y^2 + 2x = 0$

(d) $x^2 + y^2 = 5$

56. What is the ratio in which the point $C\left(-\frac{2}{7},\frac{20}{7}\right)$ divides the line joining the points $A(-2,-2)$ and $B(2,-4)$? /दो बिन्दुओं $A(-2,-2)$ और $B(2,-4)$ के जोडनेवाली रेखा को बिन्दु $C\left(-\frac{2}{7},\frac{20}{7}\right)$ किस अनुपात में विभाजित करता है\

(a) 1 : 3 (b) 3 : 4

(c) 1 : 2 (d) 2 : 3

57. What is the equation of the ellipse having foci $(\pm 2, 0)$ and the eccentricity $\frac{1}{4}$? /एक दीर्घवृत्त जिसकी नाभि $(\pm 2, 0)$ व उत्केन्द्रता $\frac{1}{4}$ है, का समीकरण कौन&सा है\

(a) $\frac{x^2}{64} + \frac{y^2}{60} = 1$

(b) $\frac{x^2}{60} + \frac{y^2}{64} = 1$

(c) $\frac{x^2}{20} + \frac{y^2}{24} = 1$

(d) $\frac{x^2}{24} + \frac{y^2}{20} = 1$

58. What is the equation of the straight line parallel to $2x + 3y + 1 = 0$ and passes through the point $(-1, 2)$? /एक सीधी रेखा जो $2x + 3y + 1 = 0$ के समांतर है व बिन्दु $(-1, 2)$ से गुजरती है, का समीकरण क्या है\

(a) $2x + 3y - 4 = 0$

(b) $2x + 3y - 5 = 0$

(c) $x + y - 1 = 0$

(d) $3x - 2y + 7 = 0$

59. What is the acute angle between the pair of straight lines $\sqrt{2}x + \sqrt{3}y = 1$ and $\sqrt{3}x + \sqrt{2}y = 2$? /सीधी रेखाओं के युग्म $\sqrt{2}x + \sqrt{3}y = 1$ और $\sqrt{3}x + \sqrt{2}y = 2$ के बीच न्यूनकोण क्या है\

(a) $\tan^{-1}\left(\frac{1}{2\sqrt{6}}\right)$ (b) $\tan^{-1}\left(\frac{1}{\sqrt{2}}\right)$

(c) $\tan^{-1}(3)$ (d) $\tan^{-1}\left(\frac{1}{\sqrt{3}}\right)$

60. If the centroid of a triangle formed by $(7, x), (y, -6)$ and $(9, 10)$ is $(6, 3)$, then the values of x and y are respectively /यदि एक त्रिभुज जो $(7, x), (y, -6)$ और से बना है, का केन्द्रक है, तो क्रमशः किसके बराबर ह\

(a) 5, 2 (b) 2, 5

(c) 1, 0 (d) 0, 0

61. A straight line with direction cosines $\langle 0, 1, 0 \rangle$ is /एक सीधी रेखा जिसका दिक्-कोज्या $\langle 0, 1, 0 \rangle$ है

(a) parallel to x-axis / x-अक्ष के समांतर है

(b) parallel to y -axis / y -अक्ष के समांतर है

(c) parallel to z-axis / z-अक्ष के समांतर है

(d) equally inclined to all the axes / सभी अक्षों की ओर बराबर >कुी हुई है

62. $(0, 0, 0), (a, 0, 0), (0, b, 0)$ and $(0, 0, c)$ are four distinct points. What are the coordinates of the point which is equidistant from the four points? / $(0, 0, 0), (a, 0, 0), (0, b, 0)$ और $(0, 0, c)$ चार विभिन्न बिन्दु है। उस बिन्दु का निर्देशांक, जो इन चारों बिन्दुओं से एकसमान दूरी पर है, क्या है\

(a) $\left(\frac{a+b+c}{3},\frac{a+b+c}{3},\frac{a+b+c}{3}\right)$

(b) (a, b, c)

(c) $\left(\frac{a}{2},\frac{b}{2},\frac{c}{2}\right)$

(d) $\left(\frac{a}{3},\frac{b}{3},\frac{c}{3}\right)$

63. The points $P(3, 2, 4), Q(4, 5, 2), R(5, 8, 0)$ and $S(2, -1, 6)$ are /बिन्दु $P(3, 2, 4), Q(4, 5, 2), R(5, 8, 0)$ और $S(2, -1, 6)$

(a) vertices of rhombus which is not a square / एक समचतुर्भुज, जो एक वर्ग नहीं है, के शीर्ष—बिन्दु हैं

(b) non-coplanar/ असमतलीय है

(c) collinear / संरेख है

(d) coplanar but not collinear/ समतलीय है किन्तु संरेख नहीं है

64. The line passing through the points (1, 2, -1) and (3, -1, 2) meets the yz-plane at which one of the following points? / बिन्दुओं (1, 2, -1) और (3, -1, 2) से गुजरनेवाली रेखा yz-तल से निम्नलिखित बिन्दुओं में से किस पर मिलती है\

(a) $\left(0, -\frac{7}{2}, \frac{5}{2}\right)$ (b) $\left(0, \frac{7}{2}, \frac{1}{2}\right)$

(c) $\left(0, -\frac{7}{2}, -\frac{5}{2}\right)$ (d) $\left(0, \frac{7}{2}, -\frac{5}{2}\right)$

65. Under which one of the following conditions are the lines $x = ay + b; z = cy + d$ and $x = ey + f; z = gy + h$ perpendicular? /निम्नलिखित में से कौन&सी एक स्थिति के अंतर्गत रेखाएं, $x = ay + b; z = cy + d$ और $x = ey + f; z = gy + h$ लंब है\

(a) $ae + cg - 1 = 0$

(b) $ae + bf - 1 = 0$

(c) $ae + cg + 1 = 0$

(d) $ag + ce + 1 = 0$

66. If $\vec{a} = \hat{\imath} - \hat{\jmath} + \hat{k}$, $\vec{b} = 2\hat{\imath} + 3\hat{\jmath} + 2\hat{k}$ and $\vec{c} = \hat{\imath} + m\hat{\jmath} + n\hat{k}$ are three coplanar vectors and $|\vec{c}| = \sqrt{6}$, then which one of the following is correct? / ;fn $\vec{a} = \hat{\imath} - \hat{\jmath} + \hat{k}$, $\vec{b} = 2\hat{\imath} + 3\hat{\jmath} + 2\hat{k}$ vkSj $\vec{c} = \hat{\imath} + m\hat{\jmath} + n\hat{k}$ rhu lewyh; lfn'k gSa vkSj $|\vec{c}| = \sqrt{6}$ gS rks fuEufyf[kr esa ls dkSu&lk ,d lgh gSA

(a) $m = 2$ and $n = \pm 1$ / $m = 2$ vkSj $n = \pm 1$

(b) $m = \pm 2$ and $n = -1$ / $m = \pm 2$ vkSj $n = -1$

(c) $m = 2$ and $n = -1$ / $m = 2$ vkSj $n = -1$

(d) $m = \pm 2$ and $n = 1$ /) $m = \pm 2$ vkSj $n = 1$

67. Let $ABCD$ be a parallelogram whose diagonals intersect at P and let O be the origin. What is $\overrightarrow{OA} + \overrightarrow{OB} + \overrightarrow{OC} + \overrightarrow{OD}$ equal to? / eku yhft, fd $ABCD$,d lekarj prqHkqZt gS ftl ds fod.kZ P ij çfrPNsn djrs gSa rFkk eku yhft, fd O ewyfcUnq gS rks fdl ds cjkcj gSA

(a) $2\overrightarrow{OP}$ (b) $4\overrightarrow{OP}$

(c) $6\overrightarrow{OP}$ (d) $8\overrightarrow{OP}$

68. $ABCD$ is a quadrilateral whose diagonals are AC and BD. Which one of the following is correct? / $ABCD$,d prqHkqZt gS ftl dk fod.kZ AC vkSj BD gSA fuEufyf[kr esa ls dkSu&lk ,d lgh gSA

(a) $\overrightarrow{BA} + \overrightarrow{CD} = \overrightarrow{AC} + \overrightarrow{DB}$

(b) $\overrightarrow{BA} + \overrightarrow{CD} = \overrightarrow{BD} + \overrightarrow{CA}$

(c) $\overrightarrow{BA} + \overrightarrow{CD} = \overrightarrow{AC} + \overrightarrow{BD}$

(d) $\overrightarrow{BA} + \overrightarrow{CD} = \overrightarrow{BC} + \overrightarrow{AD}$

69. If $\vec{a} \times \vec{b} = \vec{c}$ and $\vec{b} \times \vec{c} = \vec{a}$, then which one of the following is correct? / ;fn $\vec{a} \times \vec{b} = \vec{c}$ vkSj $\vec{b} \times \vec{c} = \vec{a}$ gS rks fuEufyf[kr esa ls dkSu&lk ,d lgh gSA

(a) $\vec{a}, \vec{b}, \vec{c}$ are orthogonal in pairs and $|\vec{a}| = |\vec{c}|$ and $|\vec{b}| = 1$ / $\vec{a}, \vec{b}, \vec{c}$;qXeka esa yEcdks.kh; gSa vkSj $|\vec{a}| = |\vec{c}|$ rFkk $|\vec{b}| = 1$

(b) $\vec{a}, \vec{b}, \vec{c}$ are non-orthogonal to each other / $\vec{a}, \vec{b}, \vec{c}$ ijLij vyEcdks.kh; gSa

(c) $\vec{a}, \vec{b}, \vec{c}$ are orthogonal in pairs but $|\vec{a}| \neq |\vec{c}|$ / $\vec{a}, \vec{b}, \vec{c}$;qXeka esa yEcdks.kh; gSa fdUrq $|\vec{a}| \neq |\vec{c}|$

(d) $\vec{a}, \vec{b}, \vec{c}$ are orthogonal in pairs but $|\vec{b}| \neq 1$ / $\vec{a}, \vec{b}, \vec{c}$;qXeka esa yEcdks.kh; gSa fdUrq $|\vec{b}| \neq 1$

70. If $\vec{a} = 2\hat{\imath} + 3\hat{\jmath} + 4\hat{k}$ and $\vec{b} = 3\hat{\imath} + 2\hat{\jmath} - \lambda\hat{k}$ are perpendicular, then what is the value of λ ? / ;fn $\vec{a} = 2\hat{\imath} + 3\hat{\jmath} + 4\hat{k}$ vkSj $\vec{b} = 3\hat{\imath} + 2\hat{\jmath} - \lambda\hat{k}$ yEc gSa rks λ dk eku D;k gSA

(a) 2   (b) 3

(c) 4   (d) 5

71. What is $\lim_{x \to 0} \frac{e^x - (1+x)}{x^2}$ equal to? / $\lim_{x \to 0} \frac{e^x - (1+x)}{x^2}$ fdl ds cjkcj gSA

(a) 0   (b) $\frac{1}{2}$

(c) 1   (d) 2

72. What is $\int_0^{\frac{\pi}{2}} \frac{d\theta}{1 + \cos\theta}$ equal to? / $\int_0^{\frac{\pi}{2}} \frac{d\theta}{1 + \cos\theta}$ fdl ds cjkcj gSA

(a) $\frac{1}{2}$ (b) 1

(c) $\sqrt{3}$ (d) None of the above

73. What is $\int \frac{dx}{x(x^7+1)}$ equal to? / $\int \frac{dx}{x(x^7+1)}$ fdl ds cjkcj gSA

(a) $\frac{1}{2} \ln \left| \frac{x^7 - 1}{x^7 + 1} \right| + c$

(b) $\frac{1}{7} \ln \left| \frac{x^7 + 1}{x^7} \right| + c$

(c) $\ln \left| \frac{x^7 - 1}{7x} \right| + c$

(d) $\frac{1}{7} \ln \left| \frac{x^7}{x^7 + 1} \right| + c$

74. The function $f : X \to Y$ defined by $f(x) = \cos x$, where $x \in X$, is one-one and onto if X and Y are respectively equal to / X vkSj Y ds Øe'k% fdu ekuka ds fy, ,Qyu $f : X \to Y$ tks $f(x) = \cos x$ }kjk fu'pr gS] tgka $x \in X$ gS] ,dSdh vkSj vkPNknd gksxk\

(a) $[0, \pi]$ and $[-1, 1]$ / $[0, \pi]$ vkSj $[-1, 1]$

(b) $\left[-\frac{\pi}{2}, \frac{\pi}{2} \right]$ and [-1, 1] / $\left[-\frac{\pi}{2}, \frac{\pi}{2} \right]$ vkSj [-1, 1]

(c) $[0, \pi]$ and $(-1, 1)$ / $[0, \pi]$ vkSj $(-1, 1)$

(d) $[0, \pi]$ and $[0, 1]$ / $[0, \pi]$ vkSj $[0, 1]$

75. If $f(x) = \frac{x}{x-1}$, then what is $\frac{f(a)}{f(a+1)}$ equal to? / ;fn $f(x) = \frac{x}{x-1}$ gS rks $\frac{f(a)}{f(a+1)}$ fdl ds cjkcj gSA

(a) $f\left(-\frac{a}{a+1} \right)$ (b) $f(a^2)$

(c) $f\left(\frac{1}{a} \right)$ (d) $f(-a)$

76. What is $\int \frac{(x^{e-1} + e^{x-1})dx}{x^e + e^x}$ equal to?/ $\int \frac{(x^{e-1} + e^{x-1})dx}{x^e + e^x}$ fdl ds cjkcj gSA

(a) $\frac{x^2}{2} + c$

(b) $\ln(x + e) + c$

(c) $\ln(x^e + e^x) + c$

(d) $\frac{1}{e} \ln(x^e + e^x) + c$

77. Let $f : [-6, 6] \to \mathbf{R}$ be defined by $f(x) = x^2 - 3$. Consider the following: / eku yhft, fd $f : [-6, 6] \to \mathbf{R}$ gS tks fd $f(x) = x^2 - 3$ }kjk fu'pr gSA fuEufyf[kr ij fopkj dhft,%

1. $(f \circ f \circ f)(-1) = (f \circ f \circ f)(1)$

2. $(f \circ f \circ f)(-1) - 4(f \circ f \circ f)(1) = (f \circ f)(0)$

Which of the above is/are correct? / mi;qZDr esa ls dkSu&lk@ls lgh gS@gSA

(a) 1 Only / dsoy 1

(b) 2 Only / dsoy 2

(c) Both 1 and 2 / 1 vkSj 2 nksuks

(d) Neither 1 nor 2 / u rks 1] u gh 2

78. Let $f(x) = px + q$ and $g(x) = mx + n$. Then $f(g(x)) = g(f(x))$ is equivalent to / eku yhft, fd $f(x) = px + q$ vkSj $g(x) = mx + n$ gS rks fdl ds rqY; gSA

(a) $f(p) = g(m)$ (b) $f(q) = g(n)$

(c) $f(n) = g(q)$ (d) $f(m) = g(p)$

79. If $F(x) = \sqrt{9 - x^2}$, then what is $\lim_{x \to 1} \frac{F(x) - F(1)}{x - 1}$ equal to?/ ;fn $F(x) = \sqrt{9 - x^2}$ gS rks $\lim_{x \to 1} \frac{F(x) - F(1)}{x - 1}$ fdl ds cjkcj gSA

(a) $-\frac{1}{4\sqrt{2}}$ (b) $\frac{1}{8}$

(c) $-\frac{1}{2\sqrt{2}}$ (d) $\frac{1}{2\sqrt{2}}$

80. What is $\frac{d^2x}{dy^2}$ equal to? / $\frac{d^2x}{dy^2}$ fdl ds cjkcj g\

(a) $-\left(\frac{d^2y}{dx^2}\right)^{-1}\left(\frac{dy}{dx}\right)^{-3}$

(b) $\left(\frac{d^2y}{dx^2}\right)^{-1}\left(\frac{dy}{dx}\right)^{-2}$

(c) $-\left(\frac{d^2y}{dx^2}\right)\left(\frac{dy}{dx}\right)^{-3}$

(d) $\left(\frac{d^2y}{dx^2}\right)^{-1}$

81. Let $f(x): \begin{cases} x, & x \text{ is rational} \\ 0, & x \text{ is irrational} \end{cases}$ and

$g(x): \begin{cases} 0, & x \text{ is rational} \\ x, & x \text{ is irrational} \end{cases}$. If $f: R \to R$ and $g: R \to R$,

then $(f - g)$ is / eku yhft, $f(x): \begin{cases} x, & x \text{ is rational} \\ 0, & x \text{ is irrational} \end{cases}$

vkS $g(x): \begin{cases} 0, & x \text{ is rational} \\ x, & x \text{ is irrational} \end{cases}$;fn $f: R \to R$ vkS

$g: R \to R$ g\ rks $(f - g)$ g\

(a) one-one and into / ,dSdh vkS bu-Vq

(b) neither one-one nor onto /u rks ,dSdh] u gh vkPNknd

(c) many-one and onto / cgq&,d vkS vkPNknd

(d) one-one and onto / ,dSdh vkS vkPNknd

82. What is the length of the longest interval in which the function $f(x) = 3 \sin x - 4 \sin^3 x$ is increasing? / ,d nh?kZre varjky dh yEckbZ D;k g\ ftlesa Qyu $f(x) = 3 \sin x - 4 \sin^3 x$ o/kZeku g\

(a) $\frac{\pi}{3}$ (b) $\frac{\pi}{2}$

(c) $\frac{3\pi}{2}$ (d) π

83. If $x\,dy = y(dx + ydy); y(1) = 1$ and $y(x) > 0$, then what is $y(-3)$ equal to? / ;fn $x\,dy = y(dx + ydy); y1=1$ vkS $yx>0$ g\ rks $y(-3)$ fdl ds cjkcj g\

(a) 3 (b) 2

(c) 1 (d) 0

84. What is the maximum value of the function $f(x) = 4 \sin^2 x + 1$? / Qyu $f(x) = 4 \sin^2 x + 1$ dk vf/kdre eku D;k g\

(a) 5 (b) 3

(c) 2 (d) 1

85. Let $f(x)$ be an indefinite integral of $\sin^2 x$. Consider the following statements: / मान लीजिए का एक निश्चित समाकल g\ fuEufyf[kr dFkuksa ij fopkj dhft,%

Statement 1: The function $f(x)$ satisfies $f(x + \pi) = f(x)$ for all real x. / Qyu $f(x)$ संतुष्ट करता है $f(x + \pi) = f(x)$ dks lHkh okLrfod x ds fy, A

Statement 2: $\sin^2(x + \pi) = \sin^2 x$ for all real x. / lHkh okLrfod x ds fy, A

Which one of the following is correct in respect of the above statements? / mi;qZr dFkuksa ds lnHkZ esa fuEufyf[kr esa ls dkSu&lk ,d lgh g\

(a) Both the statements are true and Statement 2 is the correct explanation of Statement 1. / nksuks dFku l gh gS और कथन 2, कथन 1 का सही स्पष्टीकरण है

(b) Both the statements are true but Statement 2 is not the correct explanation of Statement 1 / nksuks dFku l gh gS, किन्तु कथन 2, कथन 1 का सही स्पष्टीकरण नहीं है

(c) Statement 1 is true but Statement 2 is false / dFku 1 l gh gS fdUrq dFku 2 xyr gS

(d) Statement 1 is false but Statement 2 is true / dFku 1 xyr gS fdUrq dFku 2 l gh gS

86. What are the degree and order respectively of the differential equation $y = x\left(\frac{dy}{dx}\right)^2 + \left(\frac{dx}{dy}\right)^2$? / vody lehdj.k $y = x\left(\frac{dy}{dx}\right)^2 + \left(\frac{dx}{dy}\right)^2$ dh fMxzh vkS dksfV क्रमशः D;k g\

(a) 1, 2 (b) 2, 1

(c) 1, 4 (d) 4, 1

87. What is the differential equation corresponding to $y^2 - 2ay + x^2 = a^2$ by eliminating a? / a dk foykiu djus ij $y^2 - 2ay + x^2 = a^2$ dk laxr vody lehdj.k D;k g\

(a) $(x^2 - 2y^2)p^2 - 4pxy - x^2 = 0$

(b) $(x^2 - 2y^2)p^2 + 4pxy - x^2 = 0$

(c) $(x^2 + 2y^2)p^2 - 4pxy - x^2 = 0$

(d) $(x^2 + 2y^2)p^2 - 4pxy + x^2 = 0$ where $p = \frac{dy}{dx}$

88. What is the general solution of the differential equation $ydx - (x + 2y^2)dy = 0$ / vody lehdj.k $ydx - (x + 2y^2)dy = 0$ dk 0;kid gy D;k g\

(a) $x = y^2 + cy$

(b) $x = 2cy^2$

(c) $x = 2y^2 + cy$

(d) none of the above / mi;qZr esa ls dksbZ ugh

89. Let $f(x + y) = f(x)f(y)$ for all x and y. Then what is $f'(5)$ equal to [where $f'(x)$ is the derivative of $f(x)$]? / eku yhft, fd lHkh x vkS y ds fy,, $f(x + y) = f(x)f(y)$ g\ rks $f'(5)$ fdl ds cjkcj g\ [tgk $f'(x)$] dk vodyt $f(x)$ g\?

(a) $f(5)f'(0)$

(b) $f(5) - f'(0)$

(c) $f(5)f(0)$

(d) $f(5) + f'(0)$

90. If $f(x)$ and $g(x)$ are continuous functions satisfying $f(x) = f(a - x)$ and $g(x) + g(a - x) = 2$, then what is $\int_0^a f(x)g(x)\,dx$ equal to? / ;fn $f(x)$ vkS $g(x)$] $g(x) = f(a - x)$ और को संतुष्ट करने वाले संतत फलन हैं, rks $\int_0^a f(x)g(x)\,dx$ fdl ds cjkcj g\

(a) $\int_0^a g(x)\,dx$ (b) $\int_0^a f(x)\,dx$

(c) $2\int_0^a f(x)\,dx$ (d) 0

91. What is the solution of the differential equation $\ln\left(\frac{dy}{dx}\right) - a = 0$ / vody lehdj.k $\ln\left(\frac{dy}{dx}\right) - a = 0$ dk gy D;k g\

(a) $y = xe^a + c$ (b) $x = ye^a + c$

(c) $y = \ln x + c$ (d) $x = \ln y + c$

92. Let $f(x)$ be defined as follows:
$f(x) = \begin{cases} 2x+1 & -3 < x < -2 \\ x-1 & -2 \le x < 0 \\ x+2 & 0 \le x < 1 \end{cases}$ /eku yhft, fd

fuEukuqlkj fu/kkZfjr g% $f(x) = \begin{cases} 2x+1 & -3 < x < -2 \\ x-1 & -2 \le x < 0 \\ x+2 & 0 \le x < 1 \end{cases}$

Which one of the following statements is correct in respect of the above function? / उपर्युक्त फलन के सम्बन्ध में निम्नलिखित कथनों में से कौन-सा एक सही है\

(a) It if discontinuous at $x = -2$ but continuous at every other point. / यह $x = -2$ पर असतत है, यक्तिन प्रत्येक अन्य बिन्दु पर सतत है\

(b) It is continuous only in the interval $(-3, -2)$ / यह केवल अंतराल $(-3, -2)$ में सतत है\

(c) It is discontinuous at $x = 0$ but continuous at every other point. / यह $x = 0$ पर असतत है, यक्तिन प्रत्येक अन्य बिन्दु पर सतत है\

(d) It is discontinuous at every point. / यह प्रत्येक बिन्दु पर असतत है\

93. Consider the following statements: / निम्नलिखित कथनों पर विचार कीजिए%

1. If $\lim_{x \to a} f(x)$ and $\lim_{x \to a} g(x)$ both exist, then $\lim_{x \to a}\{f(x)g(x)\}$ exists. / यदि $\lim_{x \to a} f(x)$ और $\lim_{x \to a} g(x)$ नौनों विद्यमान हैं तो $\lim_{x \to a}\{f(x)g(x)\}$ विद्यमान है\

2. If $\lim_{x \to a}\{f(x)g(x)\}$ exists, then both $\lim_{x \to a} f(x)$ and $\lim_{x \to a} g(x)$ must exist. / यदि $\lim_{x \to a}\{f(x)g(x)\}$ विद्यमान है तो $\lim_{x \to a} f(x)$ और $\lim_{x \to a} g(x)$ दोनों अवश्य विद्यमान हैं\

Which of the above statements is/are correct? / उपर्युक्त कथनों में से कौन-सा/से सही है/हैं\

(a) 1 only / केवल 1

(b) 2 only / केवल 2

(c) Both 1 and 2 / 1 और 2 नौनों

(d) Neither 1 nor 2 / न तो 1 न ही 2

94. Which one of the following functions is neither even nor odd? / निम्नलिखित फलनों में से कौन-सा एक न तो सम है न ही विषम\

(a) $x^2 - 1$

(b) $x + \frac{x}{3}$

(c) $|x|$

(d) $x^2(x - 3)$

95. What is the derivative of $\log_{10}(5x^2 + 3)$ with respect to x ? / $\log_{10}(5x^2 + 3)$ का x के सापेक्ष अवकलज क्या है\

(a) $\frac{x \log_{10} e}{5x^2 + 3}$

(b) $\frac{2x \log_{10} e}{5x^2 + 3}$

(c) $\frac{10x \log_{10} e}{5x^2 + 3}$

(d) $\frac{10x \log_e 10}{5x^2 + 3}$

96. Let $f(a) = \frac{a-1}{a+1}$. Consider the following: / मान लीजिए कि $f(a) = \frac{a-1}{a+1}$ है\

1. $f(2a) = f(a) + 1$

2. $f\left(\frac{1}{a}\right) = -f(a)$

Which of the above is/are correct? / उपर्युक्त में से कौन-सा/से सही है/हैं\

(a) 1 only / केवल 1

(b) 2 only / केवल 2

(c) both 1 and 2 / 1 और 2 नौनों

(d) neither 1 nor 2 / न तो 1 न ही 2

97. What is the maximum area of a triangle that can be inscribed in a circle of radius a ? / a त्रिज्या वाले वृत्त के अंदर अंतर्लिखित किए जा सकने वाले त्रिभुज का अधिकतम क्षेत्रफल क्या है\

(a) $\frac{3a^2}{4}$

(b) $\frac{a^2}{2}$

(c) $\frac{3\sqrt{3}a^2}{4}$

(d) $\frac{\sqrt{3}a^2}{4}$

98. Let $f(x) = x + \frac{1}{x}$, where $x \in (0, 1)$. Then which one of the following is correct? / मान लीजिए, कि $f(x) = x + \frac{1}{x}$ है जहां $x \in (0, 1)$ है तो निम्नलिखित में से कौन-सा एक सही है\

(a) $f(x)$ fluctuates in the interval / अंतराल में ?दोलित<रता है\

(b) $f(x)$ increases in the interval / अंतराल में वर्धमान है\

(c) $f(x)$ decreases in the interval /अंतराल में ह्रासमान है\

(d) None of the above/ उपर्युक्त में से कोई नहीं\

99. Suppose the function $f(x) = x^n$, $n \neq 0$ is differentiable for all x. Then n can be any element of the interval / मान लीजिए, कि फलन $f(x) = x^n$, $n \neq 0$ प्रत्येक x के लिए, अवकलनीय है तो n किसी अंतराल का कोई सदस्य अव्व हो सकता है\

(a) $[1, \infty)$

(b) $(0, \infty)$

(c) $\left(\frac{1}{2}, \infty\right)$

(d) None of the above

100. What is $\int_{e^{-1}}^{e^2} \left|\frac{\ln x}{x}\right| dx$ equal to? / $\int_{e^{-1}}^{e^2} \left|\frac{\ln x}{x}\right| dx$ किस के बराबर है\

(a) $\frac{3}{2}$

(b) $\frac{5}{2}$

(c) 3

(d) 4

101. The variance of 20 observations is 5. If each observation is multiplied by 3, then what is the new variance of the resulting observations? / 20 प्रेक्षणों का प्रसरण 5 है; यदि प्रत्येक प्रेक्षण को 3 से गुणा किया जाए तो परिणामी प्रेक्षणों का नया प्रसरण क्या होगा\

(a) 5

(b) 10

(c) 15

(d) 45

102. The mean of a group of 100 observations was found to be 20. Later it was found that four observations were incorrect, which were recorded as 21, 21, 18 and 20. What is the mean if the incorrect observations are omitted? /100 प्रेक्षणों के एक समूह का माध्य 20 ज्ञात हुआ था बाद में यह पाया गया कि चार प्रेक्षण गलत थे, जिन्हें 21] 21] 18 और 20 दर्ज किया गया था; यदि गलत प्रेक्षणों को छोड़ दिया जाए तो माध्य क्या है\

(a) 18

(b) 20

(c) 21

(d) 22

103. A committee of two persons is constituted from two men and two women. What is the probability that the committee will have only women? / दो पुरुषों और दो महिलाओं में से नो व्यक्तियों की एक समिति बनाई जाती है; क्या प्रायिकता है कि समिति में केवल महिलाएं होंगी\

(a) $\frac{1}{6}$

(b) $\frac{1}{3}$

(c) $\frac{1}{2}$

(d) $\frac{2}{3}$

104. A question is given to three students A, B and C whose chances of solving it are $\frac{1}{2}, \frac{1}{3}$ and $\frac{1}{4}$ respectively. What is the probability that the question will be solved? / तीन विद्यार्थियों और को एक प्रश्न दिया गया है, जिसे हल करने की सम्भावनाएं क्रमशः और हैं। क्या प्रायिकता है कि प्रश्न हल हो जाएगा\

(a) $\frac{1}{24}$

(b) $\frac{1}{4}$

(c) $\frac{3}{4}$

(d) $\frac{23}{24}$

105. The mean weight of 150 students in a certain class is 60 kg. The mean weight of boys in the class is 70 kg and that of girls is 55 kg. What is the number of boys in the class? / fdl h d{kk esa 150 fo|kfFkZ;ksa dk ek/; out 60 fdxzk gSA d{kk esa yM+dksa dk ek/; out 70 fdxzk gS vkSj yM+fd;ksa dk 55 fdxzk gSA d{kk esa yM+dksa dh la[;k fdruh gS\

(a) 50 (b) 55
(c) 60 (d) 100

106. For two dependent events A and B, it is given that $P(A) = 0.2$ and $P(B) = 0.5$. If $A \subseteq B$, then the values of conditional probabilities $P(A|B)$ and $P(B|A)$ are respectively / nks vkfJr ?kVukvksa A vkSj B ds fy,, ;g fn;k x;k gS fd $P(A) = 0.2$ vkSj $P(B) = 0.5$ gSA ;fn $A \subseteq B$ gS rks l çfrca/k çkf;drkvksa $P(A|B)$ vkSj $P(B|A)$ ds eku क्रमशः क्या है\

(a) $\frac{2}{5}, \frac{3}{5}$

(b) $\frac{2}{5}, 1$

(c) $1, \frac{2}{5}$

(d) Information is insufficient / lpquk vi;kZIr gS

107. A point is chosen at random inside a circle. What is the probability that the point is closer to the centre of the circle than to its boundary? / fdl h oRr ds vUnj ,d fcUnq ;knf PNd : i ls puk tkrk gSA D;k çkf;drk gS fd og fcUnq mldh lhek dh vis{kk mlds dsUæ ds vf/kd lehi gks\

(a) $\frac{1}{5}$ (b) $\frac{1}{4}$
(c) $\frac{1}{3}$ (d) $\frac{1}{2}$

108. If two regression lines between height (x) and weight (y) are $4y - 15x + 410 = 0$ and $30x - 2y - 825 = 0$, then what will be the correlation coefficient between height and weight? / ;fn $4y - 15x + 410 = 0$ vkSj $30x - 2y - 825 = 0$ Å¡pkbZ (x) vkSj (y) Hkkj ds chp l ekuJ;.k js[kk,¡ gSa rks Å¡pkbZ vkSj Hkkj ds chp l gl EcU/k xq.kkad D;k gksxk\

(a) $\frac{1}{3}$ (b) $\frac{1}{2}$
(c) $\frac{2}{3}$ (d) $\frac{3}{4}$

109. In a examination, 40% of candidates got second class. When the date are represented by a pie chart, what is the angle corresponding to second class? /fdl h ijh{kk esa 40% vH;fFkZ;ksa us f}rh; Js.kh çkIr dhA ;fn vkdMksa dks ,d oRrjs[k esa fu: fir fd;k x;k gS rks f}rh; Js.kh ds l axr dks.k dk eku D;k gS\

(a) 40° (b) 90°
(c) 144° (d) 320°

110. Consider the following statements: /fuEufyf[kr dFkuksa ij fopkj dhft,%

Statement 1: Range is not a good measure of dispersion. / ijkl] ifj{ksi.k dk ,d vPNk eki ughagSA

Statement 2: Range is highly affected by the existence of extreme values. / ijkl] pje ekuksa ds vfLrRo ls cgqr vf/kd çHkkfor gksrk gSA

Which one of the following is correct in respect of the above statements? /mi;ZqDr dFkuksa ds l nHkZ esa fuEufyf[kr esa l dkSu&l k lgh gS\

(a) Both Statement 1 and Statement 2 are correct and Statement 2 is the correct explanation of Statement 1 /dFku 1 vkSj dFku 2 nksuksa l gh gS vkSj dFku 2] dFku 1 dk सही स्पष्टीकरण है

(b) Both Statement 1 and Statement 2 are correct but Statement 2 is not the correct explanation of Statement 1 /dFku 1 vkSj dFku 2 nksuksa l gh gS ysfdu कथन 2, कथन 1 का सही स्पष्टीकरण नहीं है

(c) Statement 1 is correct but Statement 2 is not correct /dFku 1 l gh gS ysfdu dFku 2 xyr gS

(d) Statement 2 is correct but Statement 1 is not correct /dFku 2 l gh gS ysfdu dFku 1 xyr gS

111. A card is drawn from a well-shuffled ordinary deck of 52 cards. What is the probability that it is an ace? /vPNh rjg l s Qsa Vh xbZ 52 पत्तों की साधारण ताश की एक गड्डी esa l s ,d iRrk fudkyk tkrk gSA bl ckr dh D;k çkf;drk gS fd og bDdk gS\

(a) $\frac{1}{13}$ (b) $\frac{2}{13}$
(c) $\frac{3}{13}$ (d) $\frac{1}{52}$

112. If the data are moderately non-symmetrical, then which one of the following empirical relationships is correct? /;fn nRr l ar[fyr : i ls vl efer gS rks fuEufyf[kr vkuqHkfod l EcU/kksa esa ls dkSu&l k ,d l gh gS\

(a) 2 × Standard deviation = 5 × Mean deviation / 2 × ekud fopyu = 5 × vkSl r fopyu

(b) 5 × Standard deviation = 2 × Mean deviation/ 5 × ekud fopyu = 2 × vkSl r fopyu

(c) 4 × Standard deviation = 5 × Mean deviation / 4 × ekud fopyu = 5 × vkSl r fopyu

(d) 5 × Standard deviation = 4 × Mean deviation/ 5 × ekud fopyu = 4 × vkSl r fopyu

113. Data can be represented in which of the following forms? /fuEufyf[kr esa l s fdl : i dks çLrqr fd;k tk l drk gS\

1. Textual form /शाब्दिक रूप
2. Tabular form /l kj.khc) : i
3. Graphical form /vkys[kh : i

Select the correct answer using the code given below. /uhps fn, x, dksV dk ç;ksx dj l gh mRrj pquu, A

(a) 1 and 2 only /dsoy 1 vkSj 2
(b) 2 and 3 only / dsoy 2 vkSj 3
(c) 1 and 3 only/ dsoy 1 vkSj 3
(d) 1, 2 and 3 / 1] 2 vkSj 3

114. For given statistical data, the graphs for less than ogive and more than ogive are drawn. If the point at which the two curves intersect is P, then abscissa of point P gives the value of which one of the following measures of central tendency? /fn, x, l akf[;dh; vkadMksa ds fy,] vkstkbo l de ds fy,, vkSj vkstkbo l s vf/kd ds fy,, xzkQ [khaps x, gSa A ;fn nksoØksa dk çfrPNsnu fcUnq P gS rks fcUnq P dk Hkqt] dsUæh; çoRr ds fuEu ekiksa esa l s dkSu&l k eku nsrk gS\

(a) Median /ekf/; dk
(b) Mean/ek/;
(c) Mode/cgqyd

(d) Geometric mean /ग़ुणोत्तर मा/;

115. Consider the following statements: /निम्नलिखित कथनों
पर विचार कीजिए,%

1. Two events are mutually exclusive if the occurrence of one event prevents the occurrence of the other. /दो
घटनाएं,परस्परिक : परस्पर अपवर्ती हैं ;दि ,क घटना का
घटित होना] नसरी घटना के घटित होना को़ं़ रोकता है।

2. The probability of the union of two mutually exclusive events is the sum of their individual probabilities. /दो परस्परिक : परस्पर अपवर्ती घटनाओं के
संमिलन की प्रायिकता] उनकी परिक-प्रायिकताओं के ;ोग के
बराबर है।

Which of the above statements is/are correct? /उप ;ुक्त
कथनों ेंस कौन&सा@से सही है@हैं\

(a) 1 only/केवल 1

(b) 2 only/केवल 2

(c) Both 1 and 2 /1 और 2 नोनों

(d) neither 1 nor 2/न तो 1] न ही 2

116. If the regression coefficient of x on y and y on x are $-\frac{1}{2}$ and $-\frac{1}{8}$ respectively, then what is the correlation coefficient between x and y?/;दि x का y पर rFkk y का
x पर समाश्र;ण ग़ुणांक क्रमशः $-\frac{1}{2}$ और $-\frac{1}{8}$ हैं तो x और y
के चप सहसंबंध ग़ुणांक D; k है\

(a) $-\frac{1}{4}$

(b) $-\frac{1}{16}$

(c) $\frac{1}{16}$

(d) $\frac{1}{4}$

117. A sample of 5 observations has mean 32 and median 33. Later it is found that an observation was recorded incorrectly as 40 instead of 35. If we correct the data, then which one of the following is correct? /5 प्ऱक्षणों के
,क प्रतिदर्श का माध्य 32 तथा माध्यिका 33 है। बाद में यह
पा;ा ग;ा कि ,क प्ऱक्षण ग़लती स 35 के LFkku पर 40 नतल दर्ज
कि ि;ा ग;ा था। ;दि हम नत्र को ठीक कररें तो निम्नलिखित
ेंस कौन&सा सही है\

(a) The mean and median remain the same /माध्य और
माध्य/; का नोनों बस जगरे हैं

(b) The median remains the same but the mean will decrease /माध्य/; का नोनों जगरी है किंतु माध्य; कम होा जाता है

(c) The mean and median both will decrease / माध्य और
माध्य/; का नोनों कम हो जारे हैं

(d) The mean remains the same but median will decrease /माध्य; नोनों जगरा है किंतु माध्य/; का कम हो जारी है

118. If two fair dice are thrown, then what is the probability that the sum is neither 8 nor 9? /;दि नो़ मफचर पासे को़ं
जारे हैं] रो D; k प्रा;िकता है कि ;ोग न तो 8 हो न ही 9\

(a) $\frac{1}{6}$

(b) $\frac{1}{4}$

(c) $\frac{3}{4}$

(d) $\frac{5}{6}$

119. Let A and B are two mutually exclusive events with $P(A) = \frac{1}{3}$ and $P(B) = \frac{1}{4}$. What is the value of $P(\bar{A} \cap \bar{B})$? /माना ;हीं, कि A और B नो़परस्परिक अपवर्ती
घटनाएं,़ हैं़ जगकि $P(A) = \frac{1}{3}$ और $P(B) = \frac{1}{4}$ है। $P(\bar{A} \cap \bar{B})$
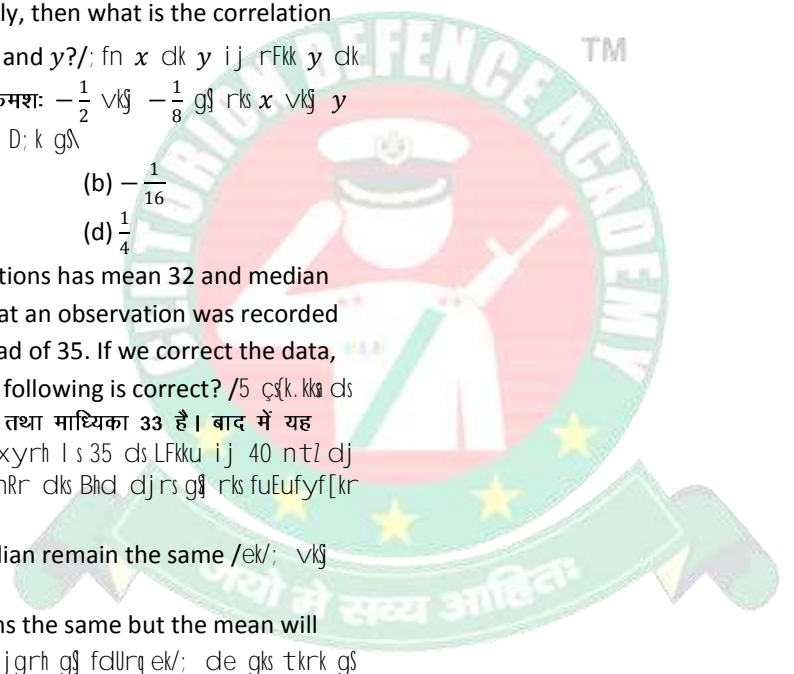का मान D; k है\

(a) $\frac{1}{6}$

(b) $\frac{1}{4}$

(c) $\frac{1}{3}$

(d) $\frac{5}{12}$

120. The mean and standard deviation of a binomial distribution are 12 and 2 respectively. What is the number of trials? /किसी ि द्विपन बं.टन का माध्य; और मानक
विचलन क्रमशः 12 और 2 है। अफीकः़ परीक्षणों की संख्या का परी ि़षण्र की संख्या
D; k है\

(a) 2

(b) 12

(c) 18

(d) 24

NDA MATH MODEL TEST

ANSWER KEY

1.	A	**31.**	A	**61.**	B	**91.**	A
2.	C	**32.**	D	**62.**	C	**92.**	C
3.	A	**33.**	C	**63.**	C	**93.**	A
4.	A	**34.**	D	**64.**	D	**94.**	D
5.	A	**35.**	B	**65.**	C	**95.**	C
6.	B	**36.**	A	**66.**	D	**96.**	B
7.	D	**37.**	B	**67.**	B	**97.**	C
8.	A	**38.**	A	**68.**	B	**98.**	C
9.	C	**39.**	D	**69.**	A	**99.**	A
10.	D	**40.**	D	**70.**	B	**100.**	B
11.	A	**41.**	C	**71.**	B	**101.**	D
12.	C	**42.**	A	**72.**	B	**102.**	B
13.	C	**43.**	C	**73.**	D	**103.**	A
14.	C	**44.**	A	**74.**	A	**104.**	C
15.	B	**45.**	B	**75.**	B	**105.**	A
16.	C	**46.**	A	**76.**	D	**106.**	B
17.	A	**47.**	A	**77.**	C	**107.**	B
18.	A	**48.**	A	**78.**	C	**108.**	B
19.	B	**49.**	B	**79.**	C	**109.**	C
20.	B	**50.**	B	**80.**	C	**110.**	A
21.	A	**51.**	D	**81.**	D	**111.**	A
22.	C	**52.**	D	**82.**	A	**112.**	C
23.	B	**53.**	A	**83.**	A	**113.**	D
24.	A	**54.**	A	**84.**	A	**114.**	A
25.	D	**55.**	B	**85.**	D	**115.**	C
26.	B	**56.**	B	**86.**	D	**116.**	A
27.	C	**57.**	A	**87.**	A	**117.**	B
28.	B	**58.**	A	**88.**	C	**118.**	C
29.	D	**59.**	A	**89.**	A	**119.**	D
30.	B	**60.**	A	**90.**	B	**120.**	C