NDA I 2017 Math (Previous year Paper)

1.The mean and standard deviation of a binomial distribution are 12 and 2 respectively. What is the number of trials?

A. 2
B. 12
C. 18
D. 24

2.Let *A* and *B*are two mutually exlusive events with $P(A)=\frac{1}{3}$ and $P(B)=\frac{1}{4}$ .What is the value of $P(\overline{A}\cap\overline{B})$?

A. $\frac{1}{6}$
B. $\frac{1}{4}$
C. $\frac{1}{3}$
D. $\frac{5}{12}$

3.If two fair dice are thrown, then what is the probability that the sum is neither 8 nor 9?

A. $\frac{1}{16}$
B. $\frac{1}{4}$
C. $\frac{3}{4}$
D. $\frac{5}{6}$

4.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?

A. The mean and median remain the same
B. The median remains the same but the mean will decrease
C. The mean and median both will decrease

D. The mean remains the same but median will decrease

5.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*?

A. $-\frac{1}{4}$
B. $-\frac{1}{16}$
C. $\frac{1}{16}$
D. $\frac{1}{4}$

6.Consider the following statements:

1) Two events are mutually exclusive if the occurrence of one event prevents the occurrence of the other.

2) The probability of the union of two mutually exclusive events is the sum of their individual probabilities.

Which of the above statements is/are correct?

A. 1 only
B. 2 only
C. Both 1 and 2
D. Neither 1nor 2

7.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?

A. Median
B. Mean
C. Mode
D. Geometric mean

8.Data can be represented in which of the following forms?

1) Textual form

2) Tabular form

3) Graphical form

Select the correct answer using the code given below.

A. 1 and 2 only
B. 2 and 3 only
C. 1 and 3 only
D. 1, 2 and 3

9.If the data are moderately non-symmetrical, then which one of the following empirical relationships is correct?

A. 2 × Standard deviation = 5 × Mean deviation
B. 5 × Standard deviation = 2 ×Mean deviation
C. 4 × Standard deviation = 5 ×Mean deviation
D. 5 × Standard deviation = 4 ×Mean deviation

10.A card is drawn from a well-shuffled ordinary deck of 52 cards. What is the probability that it is an ace?

A. $\frac{1}{13}$
B. $\frac{2}{13}$
C. $\frac{3}{13}$
D. $\frac{1}{52}$

11.Consider the following statements:

Statement 1: Range is not a good measure of dispersion.

Statement 2: Range is highly affected by the existence of extreme values.

Which one of the following is correct in respect of the above statements?

A. Both Statement 1 and Statement 2 are correct and Statement 2 is the correct explanation of Statement 1
B. Both Statement 1 and Statement 2 are correct but Statement 2 is not the correct explanation of Statement 1
C. Statement 1 is correct but Statement 2 is not correct

D. Statement 2 is correct but Statement 1 is not correct

12.In an examination, 40% of candidates got second class. When the date are represented by a pie chart, what is the angle corresponding to second class?

A. 40Â
B. 90Â
C. 144Â
D. 320Â

13.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?

A. $\frac{1}{3}$
B. $\frac{1}{2}$
C. $\frac{2}{3}$
D. $\frac{3}{4}$

14.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?

A. $\frac{1}{5}$
B. $\frac{1}{4}$
C. $\frac{1}{3}$
D. $\frac{1}{2}$

15.For two dependent events *A*and *B*, it is given that $P(A)=0\cdot2$ and $P(B)=0\cdot5$. If $A\subseteq B$,then the values of conditional probabilities $P(A\mid B)$ and $P(B\mid A)$ are respectively

A. $\frac{2}{5}, \frac{3}{5}$

B. $\frac{2}{5}, 1$

C. $1, \frac{2}{5}$

D. Information is insufficient

16.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?

A. 50
B. 55
C. 60
D. 100

17.A question is given to three students *A*, *B*and *C* whose chance 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?

A. $\frac{1}{24}$

B. $\frac{1}{4}$

C. $\frac{3}{4}$

D. $\frac{23}{24}$

18.A committee of two persons is constituted from two men and two women. What is the probability that the committee will have only women?

A. $\frac{1}{6}$

B. $\frac{1}{3}$

C. $\frac{1}{2}$

D. $\frac{2}{3}$

19.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?

A. 18
B. 20
C. 21
D. 22

20.The variance of 20 observations is 5. If each observation is multiplied by 3, then what is the new variance of the resulting observations?

A. 5
B. 10
C. 15
D. 45

21.What is $\int_{e^{-1}}^{e^2} \left|\frac{\ln x}{x}\right| dx$ equal to?

A. $\frac{3}{2}$
B. $\frac{5}{2}$
C. 3
D. 4

22.Suppose the function $f(x) = x^n$, $n \neq 0$ is differentiable for all x.Then n can be any element of the interval

A. $(1, \infty)$
B. $(0, \infty)$
C. $\left(\frac{1}{2}, \infty\right)$
D. None of the above

23.Let $f(x) = x + \frac{1}{x}$, where $x \in (0,1)$. Then which one of the following is correct?

A. $f(x)$ fluctuate in the interval
B. $f(x)$ increases in the interval
C. $f(x)$ decreases in the interval
D. None of the above

24.What is the maximum area of a triangle that can be inscribed in a circle of radius *a*?

A. $\frac{3a^2}{4}$
B. $\frac{a^2}{2}$
C. $\frac{3\sqrt{3}a^2}{4}$
D. $\frac{\sqrt{3}a^2}{4}$

25.Let $f(a)=\frac{a-1}{a+1}$.

Consider the following:

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

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

Which of the above is/are correct?

A. 1 only
B. 2 only
C. Both 1 and 2
D. Neither 1 nor 2

26.What is the derivative of $\log_{10}(5x^2+3)$ with respect to *x*?

A. $\frac{x\log_{10}e}{5x^2+3}$
B. $\frac{2x\log_{10}e}{5x^2+3}$
C. $\frac{10\log_{10}e}{5x^2+3}$

D. $\frac{10x\log_e 10}{5x^2+3}$

27.Which one of the following functions is neither even nor odd?

A. x^2-1

B. $x+\frac{3}{x}$

C. $|x|$

D. $x^2(x-3)$

28.Consider the following statements:

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.

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.

Which of the above statements is/are correct?

A. 1 only
B. 2 only
C. Both 1 and 2
D. Neither 1 nor 2

29.Let $f(x)$ be defined as follows:

$$f(x)=\begin{cases}2x+1, & -3<x<-2\\ x-1, & -2\le x<0\\ x+2, & 0\le x<1\end{cases}$$

Which one of the following statements is correct in respect of the above function?

A. It is discontinuous at x = -2 but continuous at every other point.
B. It is continuous only the interval (-3, -2).
C. It is discontinuous at x = 0 but continuous at every other point.
D. It is discontinuous at every point.

30.What is the solution of the differential equation

$\ln\left(\frac{dy}{dx}\right)-a=0$?

A. $y=xe^{a}+c$
B. $x=ye^{a}+c$
C. $y=\ln x+c$
D. $y=\ln y+c$

31.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?

A. $\int_0^a g(x)dx$
B. $\int_0^a f(x)dx$
C. $2\int_0^a f(x)dx$
D. 0

32.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 $f(x)$]?

A. $f(5)f'(0)$
B. $f(5)-f'(0)$
C. $f(5)f(0)$
D. $f(5)+f'(0)$

33.What is the general solution of the differential equation

$ydx-\left(x+2y^{2}\right)dy=0$

A. $x=y^{2}+cy$
B. $x=2cy^{2}$
C. $x=2y^{2}+cy$
D. None of the above

34.What is the differential equation corresponding to $y^{2}-2ay+x^{2}=a^{2}$ by eliminating a?

where $p = \frac{dy}{dx}$

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

35.What are the degree and order respectively of the differential equation $y = x\left(\frac{dy}{dx}\right)^2 + \left(\frac{dx}{dy}\right)^2$?

A. 1, 2
B. 2, 1
C. 1, 4
D. 4, 1

36.Let $f(x)$ be an indefinite integral of $\sin^2 x$.

Consider the following statements:

Statement 1: The function $f(x)$ satisfies $f(x + \pi) = f(x)$ for all real x.

Statement 2: $\sin^2(x + \pi) = \sin^2 x$ for all real x.

Which one of the following is correct in respect of the above statements?

A. Both the statements are true and Statement 2 is the correct explanation of Statement 1
B. Both the statements are true but Statement 2 is not the correct explanation of Statement 1
C. Statement 1 is true but Statement 2 is false
D. Statement 1 is false but Statement 2 is true?

37.What is the maximum value of function $f(x) = 4\sin^2 x + 1$?

A. 5

B. 3

C. 2

D. 1

38.If $x\,dy = y\,(dx + y dy);\ y\,(1) = 1$ and $y\,(x) > 0$, then what is $y(-3)$ to?

A. 3

B. 2

C. 1

D. 0

39.What is the length of the longest interval in which the function

$f\,(x) = 3\sin x - 4\sin^3 x$

is increasing?

A. $\frac{\pi}{3}$

B. $\frac{\pi}{2}$

C. $\frac{3\pi}{2}$

D. p

40.Let

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

and

$$g(x): \begin{cases} 0, & x \text{ is rational} \\ x, & x \text{ is irrational} \end{cases}$$

$f : \mathbb{R} \to \mathbb{R}\ g : \mathbb{R} \to \mathbb{R}$, then $(f - g)$ is

A. one-one and into

B. neither one-one nor onto

C. many-one and onto

D. one-one and onto

41.What is $\frac{d^2x}{dy^2}$ equal to?

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

42.If $F(x)=\sqrt{9-x^2}$, then what is $\lim_{x\to 1}\frac{F(x)-F(1)}{x-1}$ equal to?

A. $-\frac{1}{4\sqrt{2}}$

B. $\frac{1}{8}$

C. $-\frac{1}{2\sqrt{2}}$

D. $\frac{1}{2\sqrt{2}}$

43.Let $f(x)=px+q$ and $g(x)=mx+n$. Then $f(g(x))=g(f(x))$ is equivalent to

A. $f(p)=g(m)$

B. $f(q)=g(n)$

C. $f(n)=g(q)$

D. $f(m) = g(p)$

44.Let $f : [-6, 6] \to \mathbb{R}$ be defined by $f(x) = x^2 - 3$. Consider the following:

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

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

3) Which of the above is/are correct?

A. 1 only
B. 2 only
C. Both 1 and 2
D. Neither 1 nor 2

45.What is $\int \frac{\left(x^{e-1} + e^{x-1}\right) dx}{x^e + e^x}$ equal to?

A. $\frac{x^2}{2} + c$

B. $1n\ (x + e) + c$

C. $1n\ \left(x^e + e^x\right) + c$

D. $\frac{1}{e}\, 1n\ \left(x^e + e^x\right) + c$

46.If $f(x) = \frac{x}{x-1}$, then what is $\frac{f(a)}{f(a+1)}$ equal to?

A. $f\left(-\frac{a}{a+1}\right)$

B. $f\left(a^2\right)$

C. $f\left(\frac{1}{a}\right)$

D. $f(-a)$

47.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

A. $[0, \pi]$ $[-1, 1]$

B. $\left[-\frac{\pi}{2}, \frac{\pi}{2}\right]$ and $[-1, 1]$

C. $[0, \pi]$ and $(-1, 1)$

D. $[0, \pi]$ and $[0, 1]$

48.What is $\int \frac{dx}{x\left(x^7+1\right)}$ equal to?

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. $\frac{1}{7} \ln \left|\frac{x^7}{x^7+1}\right| + c$

49.What is $\int_0^{\frac{\pi}{2}} \frac{d\theta}{1+\cos\theta} d\theta$ equal to?

A. $\frac{1}{2}$

B. 1

C. $\sqrt{3}$
D. None of the above

50.What is $\lim_{x \to 0} \frac{e^x - (1+x)}{x^2}$ equal to?

A. 0
B. $\frac{1}{2}$
C. 1
D. 2

51.If $\vec{a} = 2\hat{i} + 3\hat{j} + 4\hat{k}$ and $\vec{b} = 3\hat{i} + 2\hat{j} - \lambda\hat{k}$ are perpendicular, then what is the value of l?

A. 2
B. 3
C. 4
D. 5

52.If $\vec{a} \times \vec{b} = \vec{c}$ and $\vec{b} \times \vec{c} = \vec{a}$, then which one of the following is correct?

A. $\vec{a}, \vec{b}, \vec{c}$ are orthogonal in pairs and $|\vec{a}| = |\vec{c}|$ and $|\vec{b}| = 1$
B. $\vec{a}, \vec{b}, \vec{c}$ are non-orthogonal to each other
C. $\vec{a}, \vec{b}, \vec{c}$ are orthogonal in pairs but $|\vec{a}| \neq |\vec{c}|$
D. $\vec{a}, \vec{b}, \vec{c}$ are orthogonal in pair but $|\vec{b}| \neq 1$

53.ABCD is a quadrilateral whose diagonals are AC and BD . Which one of the following is correct?

A. $\overline{BA} + \overline{CD} = \overline{AC} + \overline{DB}$
B. $\overline{BA} + \overline{CD} = \overline{BD} + \overline{CA}$
C. $\overline{BA} + \overline{CD} = \overline{AC} + \overline{BD}$
D. $\overline{BA} + \overline{CD} = \overline{BC} + \overline{AD}$

54.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?

A. $2\overrightarrow{OP}$
B. $4\overrightarrow{OP}$
C. $6\overrightarrow{OP}$
D. $8\overrightarrow{OP}$

55.If $\vec{a}=\hat{i}-\hat{j}+\hat{k}$, $\vec{b}=2\hat{i}+3\hat{j}+2\hat{k}$ and $\vec{c}=\hat{i}+m\hat{j}+n\hat{k}$ are three coplanar vectors and $|\vec{c}|=\sqrt{6}$, then which one of the following is correct?

A. m = 2 and n ± 1
B. m = ±2 and n = -1
C. m = 2 and n = -1
D. m = ±2 and n = 1

56.Under which one of the following conditions are the lines x = ay + b; z = cy + d and x = ey + f; z = gy + h perpendicular?

A. ae + cg – 1 = 0
B. ae + bf – 1 = 0
C. ae + cg + 1 = 0
D. ag + ce + 1 = 0

57.The line passing through the points (1, 2, -1) and (3, -1, 2) meets the yz-plane at which one of the following points?

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

58.The points P(3, 2, 4), Q(4, 5, 2), R(5, 8, 0) and S(2, -1, 6) are

A. vertices of a rhombus which is not a square
B. non-coplanar
C. collinear
D. coplanar but not collinear

59.(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?

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

60.A straight line with direction cosines (0, 1, 0) is

A. parallel to x-axis
B. parallel to y-axis
C. parallel to z-axis
D. equally inclined to all the axes

61.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

A. 5, 2
B. 2, 5
C. 1, 0
D. 0, 0

62.What is the acute angle between the pair of straight lines $\sqrt{2x} + \sqrt{3y} = 1$ and $\sqrt{3x} + \sqrt{2y} = 2$?

A. $\tan^{-1}\left(\frac{1}{2\sqrt{6}}\right)$
B. $\tan^{-1}\left(\frac{1}{\sqrt{2}}\right)$

C. $\tan^{-1}(3)$

D. $\tan^{-1}\left(\frac{1}{\sqrt{3}}\right)$

63.What is the equation of the straight line parallel to 2x + 3y + 1 = 0 and passes through the point (-1, 2)?

A. 2x + 3y – 4 = 0
B. 2x + 3y – 5 = 0
C. x + y – 1 = 0
D. 3x – 2y + 7 = 0

64.What is the equation of the ellipse having foci $(\pm 2, 0)$ and the eccentricity $\frac{1}{4}$?

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. $\frac{x^2}{24}+\frac{y^2}{20}=1$

65.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 $B(2,-4)$?

A. 1 : 3
B. 3 : 4
C. 1 : 2
D. 2 : 3

66.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?

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. $x^2 + y^2 = 5$

67.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?

A. 2 < r < 8
B. r = 2 r = 8
C. r < 2
D. r > 2

68.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?

A. (1, 2)
B. (1, 0)
C. (0, 0)
D. (1, -1)

69.The incentre of the triangle with vertices $A\left(1, \sqrt{3}\right)$, $B(0,0)$ and $C(2,0)$ is

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. $\left(1, \frac{1}{\sqrt{3}}\right)$

70.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

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

71.If $\sec\theta-\operatorname{cosec}\theta=\frac{4}{3}$, then what is $(\sin\theta-\cos\theta)$ equal to?

A. -2 only

B. $\frac{1}{2}$ only

C. Both -2 and $\frac{1}{2}$

D. Neither $\frac{1}{2}$ nor -2

72.Consider the following for triangle ABC:

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?

A. 1 and 3
B. 1 and 2
C. 1 and 4
D. 2 and 3

73.If $\tan(\alpha+\beta)=2$ and $\tan(\alpha-\beta)=1$, then $\tan(2\alpha)$ is equal to

A. -3
B. -2
C. $-\frac{1}{3}$
D. 1

74.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?

A. x = y =z
B. xz = 1
C. x ≠ y and y = z
D. x = yand y ≠ z

75.What is the value of tan 18°?

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. $\frac{\sqrt{10+\sqrt{5}}}{\sqrt{5}-1}$

76.If $\sin\theta == 3\sin(\theta+2\alpha)$, then the value of $\tan(\theta+\alpha)+2\tan\alpha$ is equal to

A. -1
B. 0
C. 1
D. 2

77.The expression $\frac{\sin\alpha+\sin\beta}{\cos\alpha+\cos\beta}$ is equal to

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. $\cos\left(\frac{\alpha+\beta}{2}\right)$

78.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?

A. $\frac{1}{2}$
B. $\frac{1}{4}$
C. $\frac{1}{8}$
D. $\frac{1}{16}$

79.The maximum value of $\sin\left(x+\frac{\pi}{6}\right)+\cos\left(x+\frac{\pi}{6}\right)$ in the interval ss is attained at

A. $\frac{\pi}{12}$
B. $\frac{\pi}{6}$

C. $\frac{\pi}{3}$

D. $\frac{\pi}{2}$

80.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?

A. 120 m
B. 180 m
C. 240 m
D. 360 m

81.What is $\frac{1}{\sin 10^\circ} - \frac{\sqrt{3}}{\cos 10^\circ}$ equal to?

A. 0
B. 1
C. 2
D. 4

82.If $\sin A = \frac{3}{5}$, where $450^\circ < A < 540^\circ$, then $\cos\frac{A}{2}$ is equal to

A. $\frac{1}{\sqrt{10}}$

B. $-\sqrt{\frac{3}{10}}$

C. $\sqrt{\frac{3}{10}}$

D. None of the above

83.If $A = \begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$, then the value of A^4 is

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. $\begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$

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

A. 3 × 1
B. 1 × 1
C. 1 × 3
D. 3 × 3

85.If $A = \begin{bmatrix} \cos\theta & \sin\theta \\ -\sin\theta & \cos\theta \end{bmatrix}$, then what is A^3 equal to?

A. $\begin{bmatrix} \cos 3\theta & \sin 3\theta \\ -\sin 3\theta & \cos 3\theta \end{bmatrix}$

B. $\begin{bmatrix} \cos^3 3\theta & \sin^3 3\theta \\ -\sin^3 3\theta & \cos^3 3\theta \end{bmatrix}$

C. $\begin{bmatrix} \cos 3\theta & -\sin 3\theta \\ \sin 3\theta & \cos 3\theta \end{bmatrix}$

D. $\begin{bmatrix} \cos^3 3\theta & -\sin^3 3\theta \\ \sin^3 3\theta & \cos^3 3\theta \end{bmatrix}$

86.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 1. Let C be the subset of A consisting of all matrices whose determinant is -1. Then which one of the following is correct?

A. C is empty
B. B has as many elements as C
C. $A = B \cup C$
D. B has thrice as many elements as C

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

A. $\frac{x}{y}$ is one of the cube roots of unity
B. x is one of the cube roots of unity
C. y is one of the cube roots of unity
D. $\frac{x}{y}$ is one of the cube roots of -1

88.What is the value of the determinant $\begin{vmatrix} 1 & 1 & 1 \\ 1 & 1+xyz & 1 \\ 1 & 1 & 1+xyz \end{vmatrix}$?

A. 1 + x + y + z
B. 2xyz
C. $x^2y^2z^2$
D. $2x^2y^2z^2$

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

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. $\begin{bmatrix} -4 & -8 \\ 8 & 12 \end{bmatrix}$

90.The equations

$$x + 2y + 3z = 1$$
$$2x + y + 3z = 2$$
$$5x + 5y + 9z = 4$$

A. have the unique solution
B. have infinitely many solutions
C. are inconsistent
D. None of the above

91.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)?

A. Null matrix
B. Identify matrix
C. A
D. -A

92.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

A. a
B. b
C. c
D. 0

93.If B is a non-singular matrix and A is a square matrix, then the value of $\det\left(B^{-1}AB\right)$ is equal to

A. det (B)
B. det (A)
C. det (B^{-1})

D. det (A^{-1})

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

A. ± 1
B. ± 2
C. ± 3
D. ± 5

95.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

A. $\frac{n-5}{6}$
B. $\frac{n-4}{5}$
C. $\frac{5}{n-4}$
D. $\frac{5}{n-5}$

96.If S = {x : x^2 + 1 = 0, x is real}, then S is

A. {-1}
B. {0}
C. {1}
D. an empty set

97.In the binary equation $(1p101)_2+(10q1)_2=(100r00)_2$ where p, q and r are binary digits, what are the possible values of p, q and r respectively?

A. 0, 1, 0
B. 1, 1, 0
C. 0, 0, 1
D. 1, 0, 1

98.Consider the following in respect of sets A and B:

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?

A. 1, 2 and 3
B. 2, 3 and 4
C. 1, 3 and 4
D. 1, 2 and 4

99.The sum of the first n terms of the series $\frac{1}{2}+\frac{3}{4}+\frac{7}{8}+\frac{15}{16}+\ldots$ is equal to

A. $2^n - n - 1$
B. $1 - 2^{-n}$
C. $2^{-n} + n - 1$
D. $2^n - 1$

100.The sum of all the two-digit odd numbers is

A. 2475
B. 2530
C. 4905
D. 5049

101.The fifth term of an (AP) of n terms, whose sum is $n^2 - 2n$, is

A. 5
B. 7
C. 8
D. 15

102.The number of different words (eight-letter words) ending and beginning with a consonant which can be made out of the letters of the word 'EQUATION' is

A. 5200
B. 4320
C. 3000
D. 2160

103.The value
of [C(8,1)+C(8,2)+C(8,3)+C(8,4)+.....+C(8,7)+C(8,8)] is

A. 254
B. 255
C. 256
D. 257

104.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

A. AP
B. GP
C. HP
D. None of the above

105.The sum of the roots of the equation $x^2 + bx + c = 0$ (where b and care non-zero) is equal to the sum of the reciprocals of their squares.
Then $\frac{1}{c}, b, \frac{c}{b}$ are in

A. AP
B. GP
C. HP

D. None of the above

106.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

A. $\frac{c-1}{b}$
B. $\frac{1-c}{b}$
C. $\frac{b}{1-c}$
D. $\frac{b}{1-c}$

107.The number of roots of the equation $z^2 = 2\bar{z}$ is

A. 2
B. 3
C. 4
D. zero

108.If $|z+4| \leq 3$, then the maximum value of $|z+1|$ is

A. 0
B. 4
C. 6
D. 10

109.If the graph of a quadratic polynomial lies entirely above x-axis, then which one of the following is correct?

A. Both the roots are real
B. One root is real and the other is complex
C. Both the roots are complex
D. Cannot say

110.The modulus are principal argument of the complex number $\frac{1+2i}{1-(1-i)^2}$ are respectively

A. 1, 0
B. 1, 1
C. 2, 0
D. 2, 1

111.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

A. mn
B. m + n
C. 2(m + n)
D. -(m + n)

112.If 1, w, w^2 are the cube roots of unity, then $(1+\omega)(1+\omega^2)(1+\omega^3)(1+\omega+\omega^2)$ is equal to

A. -2
B. -1
C. 0
D. 2

113.What is the sum of the series 0.3 + 0.33 + 0.333 + … n terms?

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

114.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?

A. 1233
B. 1322
C. 1323
D. 1332

115.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

A. 1
B. -1
C. i
D. -i

116.If the roots of 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?

A. $p^2m=l^2q$
B. $m^2p=l^2q$
C. $m^2p=q^2l$
D. $m^2p^2=l^2q$

117.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

A. $(-3, -2] \cup [2, 3)$

B. $(-3, 3)$

C. $[-3, -2] \cup [2, 3]$

D. None of the above

118.The value of $i^{2n} + i^{2n+1} + i^{2n+2} + i^{2n+3}$, where $i = \sqrt{-1}$, is

A. 0
B. 1
C. i
D. -i

119.Let $A = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$. Then the number of subsets of A containing two or three element is

A. 45
B. 120
C. 165
D. 330

120.Let S be the set of 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?

A. The relation is an equivalent relation
B. The relation is not reflexive but it is symmetric and transitive
C. The relation is not symmetric but it is reflexive and transitive
D. The relation is not transitive but it is reflexive and symmetric