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IMPORTANT LONG QUESTIONS (FOR 6 MARKS) FOR CLASS XI

1. STATISTICS : Measures of Dispersion

1. Find the mean deviation about the median for the following frequency distribution:

Class	10-20	20-30	30-40	540-50	50-60	60-70	70-80
f	4	6	10	20	10	6	4

Ans – 11.33

2. Find the variance and standard deviation of following frequency distribution:

Class	30-40	40-50	50-60	60-70	70-80	80-90	90-100
f	3	7	12	15	8	3	2

Ans – 14.17

3. For the data given below , state which group is more variable :

Classes	10-20	20-30	30-40	40-50	50-60	60-70	70-80
Group A	9	17	32	23	40	18	1
Group B	18	22	40	18	32	8	2

Ans – Group B

4. The mean and standard deviation of 20 observation are found to be 10 and 2 respectively . On checking it was found that an observation 8 was incorrect . Calculate the correct mean and standard deviation in each of the following cases :

a) If the wrong item is omitted Ans - 10.10 , 1.997

b) If it is replaced by 12 . Ans – 10.2 , 1.9899

5. The mean and variance of 5 observations are 4.4 and 8.24 respectively . If 3 is the observation are 1 , 2 and 6 find the remaining two observations . Ans – 9 , 4 or 4 , 9

6. If $x_1, x_2, x_3 \dots\dots\dots\dots\dots.. x_n$ are n observations if each is increased by a non zero number a then prove that variance remains unchanged if multiply by a then new variance is a^2 times of old variance .

2. Straight lines

7.A line is such that its segment between the straight lines $5x - y + 4 = 0$ and $3x + 4y - 4 = 0$ is bisected at the point (1 , 5) . Obtain its equation. Ans – $107x - 3y - 92 = 0$

8If the lines whose equations are y = $m_1x + c_1$, y = $m_2x + c_2$, *and* y = $m_3x + c_3$ are concurrent then prove that

$$m_1(c_2 - c_3) + m_2(c_3 - c_1) + m_3(c_1 - c_2) = 0$$

9A ray of light is sent along the line $x - 2y - 3 = 0$. Upon reaching the line $3x - 2y - 5 = 0$, the ray is reflected from it . Find the equation of the line containing the reflected ray . Ans – $29x - 2y - 31 = 0$.

10. Find the image of the point (-8, 12) with respect to the line mirror $4x + 7y + 13 = 0$ and foot of perpendicular from point.

Ans – Image (-16,-2) and foot (-12, 5)

11. If p and q be the length of the perpendicular from origin to the lines $x \sec\theta - y \operatorname{cosec}\theta = k$ *and* $x\cos\theta - y\sin\theta = k\cos 2\theta$, respectively show that $4p^2 + q^2 = k^2$.

12. Prove that the product of the lengths of the perpendiculars from the points $\left(\sqrt{a^2 - b^2}\ ,\ 0\right)$ and $\left(-\sqrt{a^2 - b^2}\ , 0\right)$ to the line $\frac{x}{a}\cos\theta + \frac{y}{b}\sin\theta = 1$ is b^2 .

13. If A(1,4) B(2, -3) and C (-1, -2) are the vertices of a ΔABC then find equation of right bisector of side BC . Ans – $3x - y - 4 = 0$

3. Trigonometric functions

14. If $\cos(\alpha-\beta)+\cos(\beta-\gamma)+\cos(\gamma-\alpha)=-\frac{3}{2}$, then prove that $\cos\alpha+\beta+\cos\gamma=$ $\sin\alpha+\sin\beta+\sin\gamma=0$.

15. If α and β are the solution of the equation $a\sec\theta+b\tan\theta=c$ then show that $\tan(\alpha+\beta)=\frac{2bc}{b^2-c^2}$.

16. If $\tan\beta=\frac{n\sin\alpha\cos\alpha}{1-n\sin^2\alpha}$ then prove that

$$\tan(\alpha-\beta)=(1-n)\tan\alpha$$

17. Prove that $\tan 20^\circ\tan 40^\circ\tan 60^\circ=\sqrt{3}$

18. Prove that : $\cos\alpha+\beta+\cos\gamma+\cos(\alpha+\beta+\gamma)$ = $4\cos\frac{\alpha+\beta}{2}\cos\frac{\beta+\gamma}{2}\cos\frac{\gamma+\alpha}{2}$

19. If $\sin\theta=n\sin(\theta+2\alpha)$, Prove that $\tan(\theta+\alpha)=\frac{1+n}{1-n}\tan\alpha$

20. Show that $\frac{\sec 8A-1}{\sec 4A-1}=\frac{\tan 8A}{\tan 2A}$.

21. If $\tan\frac{\theta}{2}=\sqrt{\frac{1-e}{1+e}}\tan\frac{\varphi}{2}$ then prove that $\cos\varphi=\frac{\cos\theta-e}{1-e\cos\theta}$.

22. If α and β be the two different roots of equation $a\sin\theta+b\cos\theta=c$ prove that

 a) $\tan(\alpha+\beta)=\frac{2ab}{a^2-b^2}$ b) $\cos(\alpha+\beta)=\frac{a^2-b^2}{a^2+b^2}$

23. Prove that $\cos 36^\circ\cos 72^\circ\cos 108^\circ\cos 144^\circ=\frac{1}{16}$

24. Prove that $\tan 6^\circ\tan 42^\circ\tan 66^\circ\tan 78^\circ=1$

4. Sequence and series

25. Let the sum of n , 2n ,3n terms of an A.P be S_1,S_2,S_3 respectively show that $S_3=3(S_2-S_1)$

26. The sum of the first p , q,r terms of an A.P are a , b, c respectively show that $\frac{a}{p}(q-r)+\frac{b}{q}(r-p)+\frac{c}{r}(p-q)=0$

27. Let S be the sum , P the product and R the sum of reciprocal of n terms of a G.P Prove that $P^2R^n=s^n$.

28. If a and b are the roots of equation $x^2-3x+p=0$ and c, d are roots of equation $x^2-12x+q=0$ where a, b,c ,d form a G.P then prove that $(q+p):(q-p)=17:15$.

29. If p, q, r are in G.P and the equation $px^2+2qx+r=0$ and $dx^2+2ex+f=0$ have a common root then show that $\frac{d}{p},\frac{e}{q},\frac{f}{r}$ are in A.P

30. Prove that the product of n geometric means between two quantities is equal to the nth power of single geometric mean of those two quantities .

31. The arithmetic mean between two positive numbers a and b , where a $>b$ is twice geometric mean . Prove that a: b = $(2+\sqrt{3}):(2-\sqrt{3})$.

32. Find the sum to n terms of the series

 a) $1^2+(1^2+2^2)+(1^2+2^2+3^2)+$................

 b) $\frac{1^3}{1}+\frac{1^3+2^3}{1+3}+\frac{1^3+2^3+3^3}{1+3+5}+$........

 c) $(3^3-2^3)+(5^3-4^3)+(7^3-6^3)+$.........

 d) $\frac{1}{1.2}+\frac{1}{2.3}+\frac{1}{3.4}+$......... to n terms

 e) $1+3+7+15+$................

 f) $\frac{1.2^2+2.3^2+\cdots...+n(n+1)^2}{1^2.2+2^2.3+\cdots.......+n^2(n+1)}$