CLASS X - KEY

1.	D	16.	C	31.	A	46.	C	61.	A,B,C
2.	Attempt mark (Printing mistake)	17.	A	32.	B	47.	D	62.	A,C
		18.	A	33.	B	48.	A	63.	A,C
		19.	B	34.	D	49.	D	64.	C,D
3.	B	20.	C	35.	E	50.	B	65.	C,D
4.	D								
5.	C	21.	B	36.	D	51.	A	66.	2.5
		22.	A	37.	C	52.	B	67.	11
6.	B	23.	D	38.	D	53.	B	68.	136
7.	B	24.	C	39.	A	54.	C	69.	1980
8.	C	25.	C	40.	C	55.	A	70.	10.48 A.M
9.	A								
10.	C	26.	A	41.	B	56.	A,D	71.	12
		27.	C	42.	B	57.	A,B,C,D	72.	78
11.	C	28.	B	43.	A	58.	A,B,C,D	73.	200 mts (or) 0.2 Km
12.	C	29.	C	44.	C	59.	A,B,C,D	74.	0.7 (or) 70%
13.	C	30.	D	45.	B	60.	B,C	75.	6

CLASS - X

SOLUTIONS

01. **D**

$$x^3 - ax^2 + bx - c = (x-a)(x-b)(x-c)$$

$$= x^3 - x^2(a+b+c) + x(ab+bc+ca) + abc$$

Comparing the coefficients on both sides

$a+b+c = a \Rightarrow b+c=0$

$ab+bc+ca = b \Rightarrow a(b+c)+bc = b \Rightarrow c = 1$

$abc = c \Rightarrow ab = 1$

But $b+c = 0 \Rightarrow b = -c = -1$

$ab = 1, \therefore a = \frac{1}{b} = -1$

$a = -1, b = -1, c = 1$

$p(3) = (3)^3 - (-1)(3)^2 + (-1)(3) - 1 = 27 + 9 - 3 - 1 = 36 - 4 = 32$

02. **attempt mark (Printing mistake)**

Let x and y be two positive numbers

$$a=\frac{x+y}{2};\quad b=xr;\quad c=xr^2$$

$$\frac{b^3+c^3}{abc}=\frac{\left[x\left(\frac{y}{x}\right)^{1/3}\right]^3+\left[x\left(\frac{y}{x}\right)^{2/3}\right]^3}{\left(\frac{x+y}{2}\right)\left(x\left(\frac{y}{x}\right)^{1/3}\right)\left(x.\left(\frac{y}{x}\right)^{2/3}\right)}=\frac{x^3.\frac{y}{x}+x^3.\frac{y^2}{x^2}}{\frac{(x+y)}{2}\left(x^2.\left(\frac{y}{x}\right)\right)}$$

$$=\frac{2x^3\left[\frac{xy+y^2}{x^2}\right]}{(x+y)(xy)}=\frac{2xy(x+y)}{(xy)(x+y)}=2$$

03. **B**

9 + x + x = 15

2x = 6

x = 3

04. **D** All

05. **C**

3x – 4y + 8 = 0, $AC^2 = BC^2$

$O^2 + p^2 = 16+(p-2)^2$

$p^2 - 4p + 4 + 16 = p^2$

4p = 20 ; p = 5

$\therefore$ C = (4, 5)

Equation of BC $y-2=\left(\frac{5-2}{4-0}\right)(x-0)$

$4y - 8 = 3x \Rightarrow 3x - 4y + 8 = 0$

06. **B**

Total Number of terms 18 $\text{Cos}^2\ 90^o = 0$

Remaining terms = 17

$$\left(\cos^2 5+\cos^2 85\right)+\left(\cos^2 10+\cos^2 80\right)+\ ...\ \left(\cos^2 40+\cos^2 50\right)+\cos^2 45+0$$

$$8(1)+\frac{1}{2}0=\frac{17}{2}$$

07. **B**

$$\left(1^2+2^2+...+20^2\right)-\left(1^2+2^2+...+10^2\right)$$

$$\frac{n(n+1)(2n+1)}{6}$$

$$\frac{20(21)(41)}{6}-\frac{10(11)(21)}{6}=2870-385=2485$$

08. **C**

$$A^2 = A.A = \begin{bmatrix} 1^o & 0 \\ 0 & i \end{bmatrix}\begin{bmatrix} i & 0 \\ 0 & i \end{bmatrix}=\begin{bmatrix} i^2 & 0 \\ 0 & i^2 \end{bmatrix}=\begin{bmatrix} -1 & 0 \\ 0 & -1 \end{bmatrix}$$

$$A^4 = A^2 . A^2 = \begin{bmatrix} -1 & 0 \\ 0 & -1 \end{bmatrix}\begin{bmatrix} -1 & 0 \\ 0 & -1 \end{bmatrix}=\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}=I$$

$$\left(A^4\right)^n = I^n = I$$

09. **A**

$${}^{14}C_4 + {}^{14}C_3 + {}^{15}C_3 + {}^{16}C_3 + {}^{17}C_3$$

$${}^{n}C_r + {}^{n}C_{r-1} = {}^{(n+1)}C_r$$

$${}^{15}C_4 + {}^{15}C_3 + {}^{16}C_3 + {}^{17}C_3 = {}^{16}C_4 + {}^{16}C_3 + {}^{17}C_3$$

$${}^{17}C_4 + {}^{17}C_3 = {}^{18}C_4$$

10. **C**

$$\frac{\text{Cot}A+\text{Tan}B}{\text{Cot}B+\text{Tan}A}=\frac{\frac{\text{Cos}A}{\text{Sin}A}+\frac{\text{Sin}B}{\text{Cos}B}}{\frac{\text{Cos}B}{\text{Sin}B}+\frac{\text{Sin}A}{\text{Cos}A}}=\frac{\frac{\text{Cos}A\text{Cos}B+\text{Sin}A\text{Sin}B}{\text{Sin}A\,\text{Cos}B}}{\frac{\text{Cos}A\,\text{Cos}B+\text{Sin}A\,\text{Sin}B}{\text{Sin}B\,\text{Cos}A}}$$

$$\frac{\text{Sin}B\,\text{Cos}A}{\text{Sin}A\,\text{Cos}B}=\text{Cot}A\ \text{Tan}B$$

11. **C**

$$\underset{n\to a}{\text{Lt}}\frac{\frac{n^2(n+1)^2}{4}}{n^4}\Rightarrow \underset{n\to a}{\text{Lt}}\frac{(n+1)^2}{4n^2}\Rightarrow \frac{1}{4}\left[\underset{n\to a}{\text{Lt}}\left(\frac{n^2+2n+1}{n^2}\right)\right]$$

$$\Rightarrow \frac{1}{4}\left[\underset{\frac{1}{n}\to 0}{\text{Lt}}\left(1+\frac{2}{n}+\frac{1}{n^2}\right)\right]=\frac{1}{4}$$

12. **C**

$$\frac{x^2}{a^2}+\frac{y^2}{b^2}-\frac{z^2}{c^2}=\text{Sec}^2\cos^2 B+\text{Sec}^2 A\text{Sin}^2 B-\text{Tan}^2 A$$

$$= \text{Sec}^2 A\left(\text{Cos}^2 B+\text{Sec}^2 B\right)-\text{Tan}^2 A$$

$$= \text{Sec}^2 A-\text{Tan}^2 A = 1$$

13. **C**

$f(xy) = \log xy = \log x + \log y = f(x) + f(y)$

14. **D**

$\alpha = 3 + 4i$, $\beta = 3 - 4i$

$\alpha + \beta = 6$; $\alpha\beta = 9 - (4i)^2 = 9 + 16 = 25$

$x^2 - 6x + 25 = 0$ i.e. $x^2 + px + q = 0$

$\therefore$ p = -6, q = 25

(-6, 25)

15. **A**

$\frac{2ab}{a+b} = 4 \Rightarrow ab = 2(a+b)$

$2A + a^2 = 27 \Rightarrow 2\left(\frac{a+b}{2}\right) + \left(\sqrt{ab}\right)^2 = 27 \Rightarrow a+b+ab=27$

$\frac{ab}{2} + ab = 27 \Rightarrow \frac{3ab}{2} = 27 \Rightarrow ab = 18$

(a+b) + 2(a+b) = 27

a+b = 9

16. **C**

Disjunction Solution contains 'or'

17. **A**

No. of relations = $2^{mn} = 2^{3x4} = 2^{12} = 4096$

No. of functions = $n(B)^{n(A)} = 3^4 = 81$

Required number = 4096 – 81 = 4015

18. **A**

$S_\alpha = \frac{a}{1-r}$, $x = \frac{1}{1-a}$, $y = \frac{1}{1-b}$

$1 - a = \frac{1}{x} \Rightarrow a = 1 - \frac{1}{x} = \frac{x-1}{x}$ Similarly $b = \frac{y-1}{y}$

$1 + ab + \ldots = \frac{1}{1-ab} = \frac{1}{1 - \frac{(x-1)(y-1)}{xy}} = \frac{xy}{xy - xy + x + y - 1}$

$= \frac{xy}{x + y - 1}$

19. **B**

$$\frac{a+b+c}{3}=m \Rightarrow a+b+c=3m$$

$$(a+b+c)^2=9m^2$$

$$a^2+b^2+c^2+2(ab+bc+ca)=9m^2$$

$$a^2+b^2+c^2=9m^2$$

$$\frac{a^2+b^2+c^2}{3}=3m^2$$

20. **C**

$${}^{100}C_0\ x^{100}+{}^{100}C_1 x^{99}a^1+\ ....+{}^{100}C_{100}\ a^{100}\quad \text{(101 terms)}$$

$${}^{100}C_0\ x^{100}-{}^{100}C_1 x^{99}a^1+\ ....+{}^{100}C_{100}\ a^{100}\quad \text{(101 terms)}$$

$$2\,{}^{100}C_0 x^{100}\ +\ 2\,{}^{100}C_2 x^{98}a^2\ ....\ 2\,{}^{100}C_{100}a^{100}\quad \text{(50 terms)}$$

21. **B**

$$2A-4B=\begin{bmatrix}2 & 10\\ 6 & 14\end{bmatrix},\ 2A-3B=\begin{bmatrix}-2 & 5\\ 0 & 7\end{bmatrix}$$

$$(2A-3B)-(2A-4B)=B=\begin{bmatrix}-2-2 & 5-10\\ 0-6 & 7-14\end{bmatrix}\quad=\begin{bmatrix}-4 & -5\\ -6 & -7\end{bmatrix}$$

22. **A**

a, b, c, d are in proportion

$a:b=c:d \Rightarrow ad=bc \Rightarrow ad-bc=0$

23. **D**

A + B + C = 180 $\Rightarrow$ A + B = 180 – C

Tan (A+B) = Tan (180 – C)

$$\frac{TanA+TanB}{1-TanA\,TanB}=-TanC$$

Tan A + Tan B = Tan C + Tan A Tan B Tan C

Tan A + Tan B + Tan C = Tan A Tan B Tan C

24. **C**

$(A\cap B)-C$

25. **C**

(fog)(x) = x^2 $\Rightarrow$ f(g(x)) = x^2 $\Rightarrow$ f(x^2) = x^2

f(2008) = 2008

26. **A**

(fog)(x) = (gof)(x)

$f(2x+3) = g(x^2+4x) \Rightarrow (2x+3)^2 + 4(2x+3) = 2(x^2+4x)+3$

$4x^2 + 12x + 9 + 8x + 12 = 2x^2 + 8x + 3$

$2x^2 + 12x + 18 = 0 \Rightarrow x^2 + 6x + 9 = 0 \Rightarrow (x+3)^2 = 0$

$x = -3$

27. **C** 0

28. **B** Babage

29. **C**

$$\begin{pmatrix} 1 & 1 \\ 0 & 1 \end{pmatrix}\begin{pmatrix} 1 & 3 \\ 0 & 1 \end{pmatrix} \ldots \begin{pmatrix} a & 2k-1 \\ 0 & 1 \end{pmatrix} = \begin{pmatrix} 1 & 3600 \\ 0 & 1 \end{pmatrix}$$

$$\begin{pmatrix} 1 & 1+3+5+\ldots+(2k-1) \\ 0 & 1 \end{pmatrix} = \begin{pmatrix} 1 & 3600 \\ 0 & 1 \end{pmatrix}$$

$1 + 3 + 5 \ldots + (2k-1) = 3600$

$k^2 = 3600 \Rightarrow k = 60$

$n = 2k - 1 \Rightarrow n = 2x60 - 1 = 119$

30. **D**

$$\frac{\sum f_i x_i}{\sum f_i} = \frac{1^2 + 2^2 + 3^2 + \ldots, + n^2}{1 + 2 + 3 + \ldots\ldots + n} = \frac{n(n+1)(2n+1)/6}{n(n+1)/2}$$

$$= \frac{2n+1}{3}$$

31. **A**

A + C = 180 $\Rightarrow$ A = 180 – C $\Rightarrow$ Cos A = Cos (180-C) = - Cos C

Cos A + Cos C = 0

B + D = 180 $\Rightarrow$ B = 180 – D $\Rightarrow$ Cos B + Cot D = 0

Cos A – Cos B + Cos C – Cos D = 0

32. **B**

OD : AO : AD = 1 : $\sqrt{3}$: 2

AD = 10 = 2 Posts

1 Pont = 5

OD = 5 AO = $5\sqrt{3}$

BD = 10 AC = $10\sqrt{3}$

33. **B**

OP = $\sqrt{39^2 + 52^2} = 13\sqrt{3^2 + 4^2} = 65$

PQ = $\sqrt{65^2 - 25^2} = \sqrt{90 \times 40} = 60$

$\Delta POQ = \Delta POR \Rightarrow \frac{1}{2} \times OQ \times PQ = \frac{1}{2} \times OP \times RS$

$$\frac{1}{2}\times 25\times 60=\frac{1}{2}\times 65\times RS \Rightarrow RS=\frac{25\times 60}{65}=\frac{5\times 60}{13}$$

$QR = 2 \times RS = \frac{600}{13}$

34. **D**

$T.C.T = \sqrt{d^2-(R+r)^2} = 7 \quad \Rightarrow d^2 - (6+r)^2 = 49$

$D.C.T = \sqrt{d^2-(R-r)^2} = 11 \quad \Rightarrow d^2 - (6-r)^2 = 121$

$(6-r)^2 - (6+r)^2 = -72$

$36 - 12r + r^2 - 36 - 12r - r^2 = -72$

$-24r = -72 \Rightarrow r = \frac{-72}{-24} = 3$

$\therefore$ Diameter = 6

35. **E**

$\angle A + \angle POQ = 180^o$

$\therefore \angle POQ = 120^o$

Area of sector $\frac{120}{360}\times\pi\times r^2 = \frac{\pi}{3}$

□APOQ = 2 x $\Delta AOP = 2\times\frac{1}{2}\times AP\times OP = \sqrt{3}\times 1=\sqrt{3}$

Shaded region = $\sqrt{3}-\frac{\pi}{3}$

36. **D**

$x^2 = 7+\sqrt{1+x}$

$\Rightarrow x^2 - 7 = \sqrt{1+x} \Rightarrow x^4 - 14x^2 + 49 = 1 + x$

$x^2 - 14x^2 - x = -48$

37. **C** (Trail and Error method)

38. **D**

$$\frac{t_{29}}{t_{19}}=\frac{a+28d}{a+18d}=\frac{a+8d+20d}{a+8d+10d}=\frac{0+20d}{0+10d}=\frac{2}{1}=2:1$$

39. **A**

$Tan\,a\theta = Tan\,b\theta \Rightarrow Tan\,a\theta = Tan(n\pi + b\theta)$

$a\theta = n\pi + b\theta \Rightarrow (a-b)\theta = n\pi$

$\Rightarrow \theta = \frac{n\pi}{a-b}$

$\frac{\pi}{a-b}, \frac{2\pi}{a-b}, \frac{3\pi}{a-b}, \frac{4\pi}{a-b}, \ldots . \rightarrow$ A.P.

40. **C**

Sin (45+30) = Sin 45 Cos 30 + Cos 45 Sin 30

$$\Rightarrow \frac{\sqrt{3}}{2\sqrt{2}} + \frac{1}{\sqrt{2}} \times \frac{1}{2} = \frac{\sqrt{3}+1}{2\sqrt{2}}$$

41. **B**

$$\frac{1+\text{Cos}\theta}{\text{Sin}\theta} = \frac{2\ \text{Cos}^2\ \theta/2}{2\ \text{Sin}\ \theta/2\ \ \text{Cos}\ \theta/2} = \text{Cot}\ \ \theta/2$$ $\text{CosA} = 2\text{Cos}^2\text{A} - 1$

42. **B** 6 2, 3, 5, 7, 11, 13 $\frac{5+7}{2} = 6$

43. **A** Squares

44. **C** Positive Integer $\frac{a^1-b^1}{a-b}, \frac{a^2-b^2}{a-b}, \frac{a^3-b^3}{a-b}$

45. **B** $P \wedge (\sim q)$

46. **C** For all

47. **D** $\sqrt[mn]{a}$

48. **A**

49. **D**

2^{n-1} A

$$A^2 = A \times A = \begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix} \begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix} = \begin{bmatrix} 2 & 2 \\ 2 & 2 \end{bmatrix} = 2\begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix}$$

$$A^3 = A^2 \times A = 2\begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix} \begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix} = 2\begin{bmatrix} 2 & 2 \\ 2 & 2 \end{bmatrix} = 2^2\begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix}$$

$$A^n = 2^{n-1}\begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix}$$

50. **B**

In $\Delta ADP\ \ AP^2 = 9 - \frac{1}{4} = \frac{-35}{4}$

In $\Delta ABP\ \ AP^2 = x^2 - \left(8\frac{1}{2}\right)^2 = x^2 + \frac{289}{4}$

$$x^2 - \frac{289}{4} = \frac{35}{4} \quad \Rightarrow \quad x^2 = \frac{289}{4} + \frac{35}{4} = \frac{324}{4} = 81$$

x = 9

51. **A**

(A) $4\times\frac{9}{2}+6\times\frac{3}{2}\Rightarrow 18+9=27$ (B) $4\times 0+6\times 4=24$

(C) $4\times 4+6\times 0=16$ (D) $4\times\frac{3}{4}+6\times\frac{5}{6}=3+5=8$

52. **B** Skew Symmetric

53. **B**

$\begin{bmatrix}1 & 0\\ 0 & 1\end{bmatrix}$ $x^3+2x+1=0$, $(x+1)^2=0$, x = -1, -1

$\begin{bmatrix}1 & 0\\ 0 & 1\end{bmatrix}\begin{bmatrix}1 & 0\\ 0 & 1\end{bmatrix}=I$

54. **C** Range

55. **A**

$n(A\cup B)=20+30-10=40 \quad \Rightarrow (A\cup B)'=A'\cap B'$

$n(A'\cap B')=n(\mu)-n(A\cup B)=70-40=30$

56. **A, D** $\left(\frac{n}{2}+1\right)\left(\frac{n+2}{2}\right)$

57. **A, B, C, D**

58. **A, B, C, D**

59. **A, B, C, D**

60. **B, C**

$(2x+2)^2=x(3x+3)$ $t_1 = x$, $t_2 = 2x+2$, $t_3 = 3x+3$

$4x^2+4+8x=3x^2+3x$ If x = - 4

$x^2+5x+4=0$ x, (2x+2), (3x+3)

$(x+4)(x+1)=0$ -4, -6, -9

x = -4, x = -1 a = -4, $r=\frac{-6}{-4}=\frac{3}{2}$

$t_4 = ax^3=(-4)\left(\frac{3}{2}\right)^3=\frac{-27}{2}$

61. **A, B, C**

62. **A & C**

f(mn) = f(m+n)

f(2) = f(2x1) = f(2+1) = f(3) = 2008

f(3) = f(3x1) = f(3+1) = f(4) = 2008

$\therefore$ f(2) = f(3) = ... = f(2008) = 2008

63. **A, C**

Even : $1^2 - 2^2 + 3^2 + 4^2 + 5^2 - 6^2 + 7^2$

$\left(1^2 - 2^2\right) + \left(3^2 + 4^2\right) + \left(5^2 - 6^2\right) + \ldots\ldots\ldots$

$(-3) + (-7) + (-11) + (-15) + \ldots\ldots\ldots$

$-\left[3 + 7 + 11 + 15 + \ldots\ldots\ldots\right] \Rightarrow -\left(\frac{n(n+1)}{2}\right)$

Odd : $1^2 - \left(2^2 - 3^2\right) - \left(4^2 - 5^2\right) - \left(6^2 - 7^2\right)$

$\Rightarrow 1 - (-5) - (-9) - (13)$

$\Rightarrow$ 1 + 5 + 9 + 13 +

Sn = $\frac{n(n+1)}{2}$

64. **C, D**

$ax^2 + x + a^2x + a = 0$

$x(ax+1) + a(ax+1) = 0$

$(x+a)(ax+1) = 0$

$x = -a$ or $-1/a$

65. **C, D**

66. **2.5** The pattern is division by - 2

67. **11** The pattern is number divided by 2 minus 1

So, 26 $\div$ 2 – 1 should be 12.

68. **136** All are products of two consecutive numbers i.e.

5 x 6, 7 x 8, 9 x 10, 11 x 12 should be 132

69. **1980** Since this is a leap year, the same calendar repeats every 4 x 7 = 28 years

70. **10.48 A.M. (or) 48 min past 10 A.M.**

Total time : 29 hrs

24 hrs to min faulty time = 24 hrs correct time

$\frac{145}{6}$ faulty time = 24 hrs correct

$\therefore$ 29 hrs of faulty time = 24 x 29 x $\frac{6}{145} = \frac{144}{5}$

$\Rightarrow$ Original time is 28 hrs 48 min

71.	**12**	Let number be 100x; then increase by 10% is 110 x
		Resulting number decreased by 20% is $110x \times \frac{80}{100} = 88x$
		$\therefore$ Total decrease is 12%
72.	**78**	Let boys = 3x and girls = 2x
		Present = 80% of 3x + 75% of 2x
		$= \frac{80}{100} \times 3x + \frac{75}{100} \times 2x = \frac{39x}{10} \times \frac{100}{5x} = 78\%$
73.	**200 m (or) 0.2 km**	Let length of train be xm
		Relation speed = (60 – 45) km/h = $\left(15 \times \frac{5}{18}\right) m/sec = \frac{25}{6} m/sec$
		$\therefore \frac{x}{25/6} = 48 \Rightarrow$ x = 200 m (or) 0.2 km
74.	**0.7 (or) 70%**	Total coins = 50; So chances of selecting
		a one rupee coin is $\frac{15}{50} = 0.3$ or 30% Therefore not selecting is

0.7 (or) 70%

75.	**6**	A : B = 100 : 90 and A : C = 100 : 87
		$\frac{B}{C} = \frac{B}{A} \times \frac{A}{C} = \frac{90}{100} \times \frac{100}{87} = \frac{90}{87}$ or $\frac{30}{29}$
		$\Rightarrow$ When B runs 30m, C runs 29 m
		When B runs 180 m, C runs 29 x 6 = 174 m
		So, B will beat C by 6 m