SECTION - I
Straight Objective Type

1. $x+y=7$ and $xy=12$

$\Rightarrow (x,y)=(3,4)\text{or}(4,3)$

$\Rightarrow x^2+y^2=3^2+4^2=25$

Hence (b) is the correct option.

2. If $x+\frac{1}{x}=3$

$\Rightarrow x^2+\frac{1}{x^2}+2.x.\frac{1}{x}=9$

$\Rightarrow x^2+\frac{1}{x^2}\frac{1}{x^2}+2=9$

$\Rightarrow x^2+\frac{1}{x^2}=7$

Hence (b) is the correct option.

3. If $a+b+c=9$ and $ab+bc+ca=26$

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

$a^2+b^2+c^2+2(ab+bc+ca)=81$

$a^2+b^2+c^2+2(26)=81$

$\Rightarrow a^2+b^2+c^2=81-52=29$

Hence (c) is the correct option.

4. If $a-b=2$ and ab = 15

Then $a^3-b^3=(a-b)(a^2+b^2+ab)$

$=(a-b)(a-b)^2+3ab)$

$=2(2^2+3\times15)$

$=2(4+45)=2\times49=98$

Hence (c) is the; correct option.

5. If $(x+1)(x+2)(x+3) =$

$x^3 + kx^2 + 11x + 6$

$(x+a)(x+b)(x+c)$

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

$\Rightarrow$ $(x+1)(x+2)(x+3)$

$= x^3 + x^2(1+2+3) + x$

$(1\times2 + 2\times3 + 3\times1) + 1\times2\times3$

$= x^3 + 6x^2 + 11x + 6$

$= x^3 + kx^2 + 11x + 6$

$\Rightarrow$ $k = 6$

Hence (d) is the correct option.

6. Let $f(x) = x^3 - 3x^2 + 2x - 5$

If $f(x)$ is divided by x- a then the remainder is $f(x)$

If $f(x)$ is divided by x - 2 then the remainder is $f(2)$

$f(2) = 2^3 - 3.2^2 + 2.2 - 5$

$= 8 - 12 + 4 - 5$

$= 8 - 8 - 5 = -5$

Hence (b) is the correct option.

7. If $a+b+c=0$ then $a^3+b^3+c^3$

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

$\Rightarrow (a+b)^3 = -c$

$\Rightarrow a^3 + b^3 + 3ab(a+b) = -c^3$

$\Rightarrow a^3 + b^3 + 3ab(-c) = -c^3$

$\Rightarrow a^3 - b^3 - 3abc = -c^3$

$\Rightarrow a^3 + b^3 + c^3 = 3abc$

Hence (b) is the correct option.

8. $$\frac{1.3\times1.3+2.6\times2.7+2.7\times2.7}{(2.7\times2.7)-(1.3\times1.3)}$$

$$=\frac{(1.3)^2+2\times1.3\times1.7+(2.7)^2}{(2.7)^2-(1.3)^2}$$

$$=\frac{(1.3+2.7)^2}{(2.7-1.3)(2.7+1.3)}$$

$$=\frac{2.7+1.3}{2.7-1.3}=\frac{4}{1.4}=\frac{40}{14}=\frac{20}{7}=\frac{10}{3.5}$$

Hence (b) is the correct option.

9. If $(a^2+b^2)^3=(a^3+b^3)^2$ and $ab\neq0$

Then the numerical value of $\frac{a}{b}+\frac{b}{a}$

$$(a^2+b^2)^3=(a^3+b^3)^2$$

$$a^6+b^6+3a^2b^2(a^2+b^2)$$

$$=a^6+b^6+2a^3b^3$$

$$\Rightarrow\frac{a^2b^2\left(a^2+b^2\right)}{a^3b^3}=\frac{2}{3}$$

$$\Rightarrow\frac{a}{b}+\frac{b}{a}=\frac{2}{3}$$

Hence (b) is the correct option.

10. If $x=\frac{\sqrt{3}-1}{\sqrt{3}+1}$ $\quad y=y=\frac{\sqrt{3}+1}{\sqrt{3}-1}$

$$x=\frac{\left(\sqrt{3}-1\right)^2}{2} \qquad y=\frac{\left(\sqrt{3}+1\right)^2}{2}$$

$$=\frac{3+1-2\sqrt{3}}{2} \qquad =\frac{3+1+2\sqrt{3}}{2}$$

$$=2-\sqrt{3} \qquad =2+\sqrt{3}$$

$x^2+y^2=(2-\sqrt{3})^2+(2+\sqrt{3})^2$

$=2(4+3)=14$

$x^2+y^2-xy=14+(2+\sqrt{3})(2-\sqrt{3})$

$=14-1=13$

$x^2+y^2+xy=14+(2+\sqrt{3})(2-\sqrt{3})$

$=14+=15$

then $\dfrac{x^2-xy+y^2}{x^2+xy+y^2}=\dfrac{13}{15}$

Hence (b) is the correct option.

11. If $3^{x-y}=27$ $3^{y+1}=27^x$

$3^{x-y}=3^3$ $3^{y+1}=3^{3x}$

$\Rightarrow$ $x-y=3$ $y+1=3x$

$x-3=y$ $x-3+1=3x$

$\Rightarrow 2x=-2$

$x=-1$

$y=-1-3=-4$

Then $2^{2x-y}=2^{2(-1)+4}$

$=2^{-2+4}=2^2=4$

Hence (b) is the correct option.

12. If $zx+y=7z, yz+x=8z$

$x+y+z=12$

$(x,y,z)=(4,6,2)$

Hence (b) is the correct option.

13. The value of

$$\frac{119^2+119\times111+111^2}{119^3-111^3}$$

$$= \frac{119^2 + 119 \times 111 \times 111^2}{(119-111)\left(119^2 + 119 \times 111 + 111^2\right)}$$

$$= \frac{1}{8}$$

Hence (b) is the correct option.

14. If $a^x = b^y = c^z$ and $\frac{b}{a} = \frac{c}{b}$

$a^x = k \Rightarrow a = K^{\frac{1}{x}}$

$b^y = k \Rightarrow b = K^{\frac{1}{y}}$

$c^z = k \Rightarrow c = K^{\frac{1}{z}}$

$\frac{b}{a} = \frac{c}{b} \Rightarrow b^2 = ac$

$\Rightarrow \left(K^{\frac{1}{y}}\right) = K^{\frac{1}{x}} K^{\frac{1}{y}}$

$\Rightarrow K^{\frac{2}{y}} = K^{\frac{1}{x}+\frac{1}{y}}$

$\frac{2}{y} = \frac{1}{x} + \frac{1}{y}$

$\frac{2}{y} = \frac{z+x}{zx}$

$\Rightarrow \frac{2z}{x+z} = \frac{y}{x}$

Hence (b) is the correct option.

15. Factors of $4x^2 - y^2 + 2x - 2y - 3xy$

$4x^2 - y^2 + 2x - 2y - 3y$

$= (x - y)(4x + y + 2)$

Hence (b) is the correct option.

16. If $x^4+ax^3+bx^2+cx+d=(x^2+px+q)^2$

$x^4+ax^3+bx^2+cx+d$

$=x^4+p^2x^2+q^2+2px^3+2pqx+2pqx^2$

$=x^4+2px^3+(p^2+2q)x^2+2pqx+q^2$

$\Rightarrow a=2p, \quad p^2+2q \quad =b$

$\left(\frac{\alpha}{2}\right)^2+2q=b$

$\Rightarrow 2q=b-\frac{\alpha^2}{4}$

$a=2p, \ 2pq=C$

$\Rightarrow 2q=\frac{C}{P}$

$2q=\frac{C}{\alpha/2}=\frac{2C}{\alpha}$

Hence (b) is the correct option.

17. If $1+3^{x-1}=4^{x-2}$

$1+3^{x-1}=\left(2^2\right)^{x-2}$

$1+3^{x-1}=2^{2x-2}$

$\Rightarrow x=(-4,1)$

Hence (b) is the correct option.

18. If $x=\frac{\sqrt{3}}{2}$

$1+x=1+\frac{\sqrt{3}}{2}=\frac{2+\sqrt{3}}{2}$

$$\sqrt{1+x}=\sqrt{\frac{2+\sqrt{3}}{2}}=\sqrt{\frac{4+2\sqrt{3}}{4}}$$

$$=\sqrt{\frac{\left(\sqrt{B+1}\right)^2}{2^2}}=\frac{\sqrt{3}+1}{2}$$

$$\sqrt{1-x}=\frac{\sqrt{3}-1}{2}$$

$$\Rightarrow\frac{1+x}{1+\sqrt{1+x}}+\frac{1-x}{1-\sqrt{1-x}}$$

$$=\frac{\frac{2+\sqrt{3}}{2}}{1+\frac{\sqrt{3}+1}{2}}+\frac{\frac{2-\sqrt{3}}{2}}{1=\frac{\sqrt{3}-1}{2}}$$

$$=\frac{2+\sqrt{3}}{3+\sqrt{3}}+\frac{2-\sqrt{3}}{3-\sqrt{3}}$$

$$=\frac{6+3\sqrt{3}-2\sqrt{3}-3+6-3\sqrt{3}+2\sqrt{3}-3}{9-3}$$

$$=\frac{6}{6}=1$$

Hence (b) is the correct option.

19. If $2x-3y-x=0, x+3y-14z=0$

The numerical value of $\frac{x^2+3xy}{y^2+z^2}=2$

Hence (b) is the correct option.

20. If a, b, c are three positive integers

$$\frac{a+b}{2}=\sqrt{ab}$$

$$\frac{b+c}{2}=\sqrt{bc}$$

$$\frac{c+a}{2}=\sqrt{ac}$$

$$\left(\frac{a+b}{2}\right)\left(\frac{b+c}{2}\right)\left(\frac{c+a}{2}\right)\geq\sqrt{a^2b^2c^2}$$

$$\frac{(a+b)(b+c)(c+a)}{8}\geq abc$$

$$\frac{(a+b)(b+c)(c+a)}{8}\geq abc$$

Hence (b) is the correct option.

21. If $xy=-42 \Rightarrow xy=7\times-6$

$yz=30 \quad yz=-6\times-5$

$zx=-35 \quad zx=-5\times7$

$\Rightarrow x=+7, y=-6, z=-5$

Hence (b) is the correct option.

22. $a^x=(x+y+z)^y,$

$a^y=(x+y+z)^z$

$a^z=(x+y+z)^x$

$a^x=(x+y+z)^y$

$a=(x+y+z)^{\frac{y}{x}}$

$a^y=(x+y+z)^z \Rightarrow a=(x+y+z)^{\frac{z}{y}}$

$a^z=(x+y+z)^x$

$a=(x+y+z)^{\frac{x}{z}} \Rightarrow a=(x+y+z)^{\frac{x}{2}}$

$\Rightarrow x=y=z=\frac{\alpha}{3}$

Hence (b) is the correct option.

23. If $P=\sqrt{7}-\sqrt{5}q=\sqrt{13}-\sqrt{11}$

$\frac{1}{P}=\frac{\sqrt{7}+\sqrt{5}}{2}\frac{1}{q}=\frac{\sqrt{13}+\sqrt{11}}{2}$

$\frac{1}{q}>\frac{1}{p}$

$\Rightarrow q<p$ or $p>q$

Hence (b) is the correct option.

24. $x-\frac{2}{x-1}=1-\frac{2}{x-1}$

The equation has infinite number of roots

Hence (d) is the correct option.

25. LCM of $2x+2,3x^2-2x,4x^2+2x+8$

$2x+2=2(x+1)$

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

$4x^2+2x+8=$

LCM of $2x+2,3x^2-2x,4x^2+2x+8$

= no root.

Hence (a) is the correct option.

26. $x^2-2mx+m^2-1=0$

$x^2-(m+1)x-(m-1)x+m^2-1=0$

$x(x-m-1)-(m-1)(x-m-1)=0$

$(x-m-1)(x-m+1)=0$

$[x-(m+1)][x-(m-1)]=0$

$m-1\le x\le m+1$

$x^2-2mx+m^2-1=0$ lies between – 2 and 4 then $-1\le m\le 3$

Hence (d) is the correct option.

27. If $x=7+4\sqrt{3}$

$$xy = 1 \Rightarrow y = \frac{1}{x}$$

$$y = \frac{1}{7+4\sqrt{3}} = 7-4\sqrt{3}$$

$$\frac{1}{x^2}+\frac{1}{y^2} = \frac{x^2+y^2}{(xy)^2}$$

$$= \frac{\left(7+4\sqrt{3}\right)^2+\left(7-4\sqrt{3}\right)^2}{\left(7+4\sqrt{3}\right)\left(7-4\sqrt{3}\right)}$$

$$= \frac{2(49+48)}{1}$$

$$= 194$$

Hence (c) is the correct option.

28. If $2x-2 = 52-x$

$\Rightarrow x-c = 0$ or $2-x = 0$

$\Rightarrow x = 2$

Hence (b) is the correct option.

29. (d) is the correct option.

30. $$y = \frac{1-t^2}{1+t^2}$$

$$\frac{y}{1} = \frac{1-t^2}{1+t^2}$$

(Components and dividends)

$$\frac{y+1}{g-1} = \frac{1}{t^2}$$

$$\frac{\sqrt{y+1}}{\sqrt{y-1}} = \frac{1}{t}$$

$\Rightarrow t = \sqrt{\frac{y-1}{y+1}}$

Hence (b) is the correct option.

SECTION - II
Assertion - Reason Questions

31. $(a+2b)^2 = a^2 + 4b^2 + 4ab$

Hence (a) is the correct option.

32. $\sum a^2 b = a^2 b + b^2 a$

Hence (b) is the correct option.

33. $(a+b)^2 + (a-b)^2 = 2(a^2 + b^2)$

$(a+b)^2 - (a-b)^2 = 4ab$

The roots of $5x^2 - 7x - 36 = 0$

are $\frac{9}{5}$ and $-\frac{4}{3}$

Hence (b) is the correct option.

34. $x + y = 7 \quad ; \quad xy = 12$

$\Rightarrow (x+y)^2 = 49$

$\Rightarrow x^2 + y^2 + 2(12) = 49$

$\Rightarrow x^2 + y^2 = 25$

Hence (a) is the correct option.

35. $(x-3)(x-4) = x^2 - 7x + 12$

$(a+b+c)(a^2 + b^2 + c^2 - ab - bc - ca)$

$= a^3 + b^3 + c^3 - 3abc$

Hence (b) is the correct option.

36. $(x+9)(x+3) = x^2+12x+27$

$(x+a)(x+b) = x^2+(a+b)x+ab$

Hence (a) is the correct option.

37. $a+b+c=0 \Rightarrow a^3+b^3+c^3 = 3abc$

$(a-b)^3+(b-c)^3+(c-a)^3 = 3(a-b)(b-c)(c-a)$

Hence (a) is the correct option.

38. $a^3+b^3 = (a+b)(a^2-ab+b^2)$

Hence (a) is the correct option.

39. $x+\frac{1}{x}=3 \Rightarrow x^3+\frac{1}{x^3}=18$

Hence (b) is the correct option.

40. $(a+b)^2+(a-b)^2 = 2(a^2+b^2)$

Hence (b) is the correct option.

SECTION - III

Linked Comprehension Type

Paragraph 41 - 43

41. $2x^2+7x+6 = (2x+3)(x+2)$

Hence (a) is the correct option.

42. $3x^2-11x+6 = (3x-2)(x-3)$

Hence (c) is the correct option.

43. $12x^2-17x+6 = 12x^2-8x-9x+6$

$= 4x(3x-2)-3(3x-2)$

$= (4x-3)(3x-2)$

Hence (a) is the correct option.

Paragraph 44 - 46

44. $a^3 - b^3 + c^3 - 3abc \div (a - b - c)$

$= a^2 + b^2 + c^2 + ab - bc + ca$

Hence (a) is the correct option.

45. $(2x+3)(3x+5) = 6x^2 + 19x + 15$

Hence (a) is the correct option.

46. $(x+2)(x+3)(x+4)$

$= x^3 + x^2(2+3+4) + (2\times3 + 3\times4 + 2\times4) + 24$

$= x^3 + 9x^2 + 26x + 24$

$K + l = 9 + 24 = 33$

Hence (b) is the correct option.

Paragraph 47 - 49

47. $(3x-5)(x^2+3x-1)$

$= 3x^3 - 5x^2 + 9x^2 - 15x + 5 - 3x$

$= 3x^3 + 4x^2 - 18x + 5$

Hence (b) is the correct option.

48. $(2x+3)(3x-5)$

$= 6x^2 + 9x - 10x - 15$

$= 6x^2 - x - 15$

Hence (a) is the correct option.

49. $(A \times B) + C =$

$6x^2 - x - 15 + x^2 + 3x - 1$

$= 7x^2 + 2x - 16$

Hence (c) is the correct option.

Paragraph 50 - 82

50. Let $f(x) = x^3 + 3x^2 - 2x - 5$

$f(-2) = (-2)^3 + 3(-2)^2 - 2(-2) - 5$

$= -8 + 12 - 4 - 5$

$= -5$

Hence (b) is the correct option.

51. Let $f(x) = x^3 - 5x^2 + 11x - 10$

$f(x) = 2^3 - 5(2)^2 + 11(2) - 10$

$= 8 - 20 + 22 - 10 = 0$

Hence (a) is the correct option.

52.

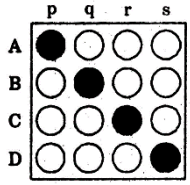
$$x^2 - 2x + 3 \left| \begin{matrix} x^4 - 4x^2 - 13x - 4 \\ x^4 - 2x^3 \end{matrix} \right| x^2 + 2x$$

$$\left| \begin{matrix} 2x^3 - 4x^2 - 13x \\ 2x^3 - 4x^2 - 6x \\ - \quad + \quad + \\ \hline -7x - 4 \end{matrix} \right|$$

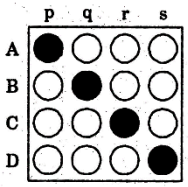
Hence (d) is the correct option.

SECTION - IV
Matrix - Match Type

53.



54.



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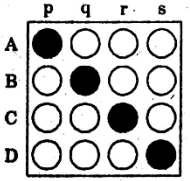

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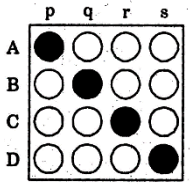

57.