

ALGEBRA PROBLEMS SOLUTIONS

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Q1. $[(a+b)_2 + (a-b)_2]/[a_2 + b_2] =$

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

Q2. $[(a+b)_2 - (a-b)_2]/ab =$

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

Q3. If $a+b+c=0$ then $(a_3+b_3+c_3)/abc =$

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

Q4. If $5\sqrt{x}+12\sqrt{x}=13\sqrt{x}$ then value of x is,

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

Q5. For any real number x the maximum value of $4-6x-x_2$ is,

A. 7B.11C.13 D. 17

Q6. If $2b+1/b=2$, then value of $8b_3+1/b_3$ is,

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

Q7. If $x(x-3)=-1$ then the value of $x_3(x_3-18)$ will be,

A. 0B.-1C.-2 D. None

Q8. If $1.5x=0.04y$ then the value of $(y_2-x_2)/(y_2+2xy+x_2)$ will be,

A. 71/77B.72/77C.73/77 D. None

Q9. If $x=\sqrt{5}+2$, then the value of $(2x_2-3x-2)/(3x_2-4x-3)$ is,

A. 0.125B.0.425C.0.625 D. None

Q10. If $x=5_{n-1}+5_{-n-1}$ where n is real, the minimum value of x is,

A. 1/5B.2/5C.3/5 D. 4/5

Q11. If $a=\sqrt{7+2\sqrt{12}}$ and $b=\sqrt{7-2\sqrt{12}}$, then value of a_3+b_3 is,

A. 41B.52C.63 D. 74

Q12. If $x_3+y_3=9$ and $x+y=3$ then the value of x_4+y_4 is,

A.17B.18C.19 D. None

Q13. If $x_{1/3}+y_{1/3}-z_{1/3}=0$ then value of $(x+y-z)_3+27xyz$ is,

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

Q14. If $(a-4)_2+(b-9)_2+(c-3)_2=0$, then the value of $\sqrt{(a+b+c)}$ is,

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

Q15. If $x=100.48$, $y=100.70$ and $xz=y_2$, then approximate value of z is

A. 1.9B.2.9C.3.9 D. 4.9

Q16. If $a+b+c=0$ then the value of is,
$$\frac{a^2+b^2+c^2}{a^2-bc}$$

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

Q17. The number of possible values of x in the equation, $\sqrt{(x_2-x+1)+1}/\sqrt{(x_2-x+1)}=2-x_2$ is,

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

Q18. The value of $\sqrt{(x-4)^2} + \sqrt{(x-2)^2}$, where $2 < x < 3$, is,
A.1B.2C.3D.4

Q19. If $4y - 3x = 13$ and $xy = 14$, then $64y^3 - 27x^3$ is,
A.8739B.8749C.8759D.8769

Q20. If $x_2 + 2 = 2x$ then the value of $x_4 - x_3 + x_2 + 2$ will be,
A.0B.1C.2D.4

Q21. If $x = (0.09)_2$, $y = 1(0.09)_2$ and $z = (1-0.09)_2 - 1$, then which of the following relations is true?,
A.z < x < yB.z < y < xC.x < y < zD.None

Q22. If $x+2/x=1$, then $(x_2+x+2)/[x_2(1-x)]$ is,
A.1B.2C.3D.4

Q23. If $a/(1-a) + b/(1-b) + c/(1-c) = 1$, then the value of $1/(1-a) + 1/(1-b) + 1/(1-c)$,
A.1B.2C.3D.4

Q24. If $x = (\sqrt{2}+1)/(\sqrt{2}-1)$ and $xy = 1$ find the value of $(2x_2 + 3xy + 2y_2)/(2x_2 - 3xy + 2y_2)$.
A.73/65B.71/65C.69/65D.67/65

Q25. Find the value of α when the expression $x_2y_2 + \alpha x + 1/y^2$ is a perfect square.
A.1B.2C.3D.4

Q26. The area in square unit of triangle formed by the graphs of $x=4$, $y=3$ and $3x+4y=12$ is,
A.3B.5C.6D.None

Q27. If $(x+1/x)_2 = 3$ then the value of,
 $x_{206} + x_{200} + x_{90} + x_{84} + x_{18} + x_{12} + x_6 + 1$ is,
A.0B.5C.7D. None

Q28. If $n = 7 + 3\sqrt{5}$, then the value of $\sqrt{n} + 1/\sqrt{n}$ is,
A. $(9+\sqrt{5})/2\sqrt{2}$ B. $(7+\sqrt{5})/2\sqrt{2}$ C. $(9+\sqrt{6})/2\sqrt{2}$ D. $(9+\sqrt{5})/2$

Q29. If $p+1/p=5$, then the value of $(p_4+1/p_2)/(p_2-3p+1)$ is,
A.104B.110C.117D.125

Q30. If $\sqrt{2}x - \sqrt{3}y = 0$ and $\sqrt{7}x + \sqrt{2}y = 0$ then the value of $x+y$ is,
A.0B.2C.3D.4

Q31. If $x+1/x=-2$, then the value of $x_{2n+1} + 1/x_{2n+1}$ where n is a positive integer is,
A.1B.-2C.3D.-4

Q32. Find the remainder when $x^5 - 9x^2 + 12x - 14$ is divided by $(x-3)$.
A.180B.182C.184D. None

Q33. If $x_3 + 3/x = 4(a_3 + b_3)$ and $3x + 1/x_3 = 4(a_3 - b_3)$, then $a_2 - b_2$ is,
A.1B.-2C.3D.-4

Q34. If $x=2015$, $y=2014$ and $z=2013$ then the value of $x_2 + y_2 + z_2 - xy - yz - zx$ is,
A.3B.5C.7D.None

Q35. If $x=20$, $y=19$, the value of $(x_2+y_2+xy)/(x_3-y_3)$ is,
A.1B.2C.3D.4

Q36. If $(x+y):(y+z):(z+x)=6:7:8$ and $x+y+z=14$, then value of z is,
A. 3B.6C.9 D. None

Q37. If $a:b=2/9:1/3$, $b:c=2/7:5/14$ and $d:c=7/10:3/5$ find the value of $a:b:c:d$.
A. 16:24:30:35 B.15:24:30:35 C.16:25:30:35D.
16:24:33:35

Q38. If x is real then the minimum value of $4x_2-x-1$ is,
A.-1B.-2C. -4 D. -17/4

Q39. If $p=1+\sqrt{2}+\sqrt{3}$, then $p+1/(p-1)$ is,
A.1+3 $\sqrt{3}$ B.1+2 $\sqrt{3}$ C. $1+\sqrt{3}$ D. None

Q40. If a and b are positive integers such that $a_2-b_2=19$ then $a+b$ is,
A. 3B.6C.10 D. 19

Q41. If $a-b=3$, and $a_3-b_3=117$, then absolute value of $(a+b)/(a-b)$ is,
A. 3/7B.5/4C.7/3 D. None

Q42. If $x=\sqrt[3]{5}+2$, then the value of $x_3-6x_2+12x-13$, is,
A. 0B.1C.2 D. None

Q43. If $p/a+q/b+r/c=1$, and $a/p+b/q+c/r=0$, where p , q , r , a , b and c are non-zero, the value of $p_2/a_2+q_2/b_2+r_2/c_2$ is,
A. 0B.1C.2D.None

Q44. If $x_2-4x+1=0$, then x_3+1/x_3 is,
A. 41B.52 C. 63 D. 74

Q45. If $2x_2-7xy+3y_2=0$, then the value of $x:y$ is,
A. 3:1B.1:2C. 2:3 D. A and B

Q46. If equation $2x_2-7x+12=0$ has two roots α and β , then the value of $\alpha/\beta+\beta/\alpha$ is,
A.1/48B.1/24C.1/12D.None

Q47. If $9\sqrt{x}=\sqrt{12}+\sqrt{147}$ then the value of x is,
A. 1B.2 C. 3 D. 4

Q48. If $p+2p/3+p/2+p/7=9/7$, then the value of p is,
A. 30B.36C.42 D. 48

Q49. When the expression $12x_3-13x_2-5x+7$ is divided by $3x+2$ the remainder is,
A. 0B.1C.2D.None

Q50. If $x+1/x=3$ then the value of x_5+1/x_5 is,
A. 121B.122C. 123 D. 125

Q51. If $p=124$, then the value of $[p(p_2+3p+3)+1]^{1/3}$ is,
A.0B.125C.216D.None

Q52. The expression x_4-2x_2+k will be a perfect square if value of k is,
A.1B.-2C.3D.

22 322 322 3Q53. One of the factors of $(a-b)+(b-c)+(c-a)$ is,

-4

- A. $(b-c)(b-c)$ B. $(a+b)(a-b)$

- C. $(a+b)(a+b)$ D. $(a-b)(a-b)$

Q54. If $6+1/x=x$, then the values of x_4+1/x_4 is,
A. 6000B.1442C.

1222

D. None

Q55. If $x_4+1/x_4=119$ and $x>1$, then positive value of x_3-1/x_3 is,
A. 16B.26C.36

D. 46

Q56. If $x=2.361$, $y=3.263$, and $z=5.624$, then the value of $x_3+y_3-z_3+3xyz$ is,
A. 0B.1C.2D.

None

Q57. If $x_2+1/x_2=66$, then the value of $(x_2-1+2x)/x$ is,
A. 10,-6B.10,6C.12,4

D. None

Q58. If $(x+1/x)_2=3$ then the value of $(x_{72}+x_{66}+x_{54}+x_{36}+x_{24}+x_6+1)$ is,
A. 1B.1/ $\sqrt{3}$ C.- $\sqrt{3}$

D. None

Q59. Find the minimum value of $2x_2-(x-3)(x+5)$, where x is real,
A. 10B.12C.14

D. None

Q60. If $x+y=7$ then the value of x_3+y_3+21xy is,
A. 100B.121C.

343

D. None

Q61. If $3x+1/2x=5$, then the value of $8x_3+1/27x_3$ is,
A. 620/81B.720/27C.

820/27

D. None

Q62. If $2a+1/3a=6$, then find the value of the expression $3a+1/2a$ is,
A. 0B.3C.6

D. 9

Q63. If $p_3+3p_2+3p=7$ then the value of p_2+2p is,
A. $\sqrt{3}$ B.3C.

9

D. None

Q64. If $x_2+y_2-2x+6y+10=0$, then (x_2+y_2) is,
A. 0B.10C.

20

D. None

Q65. If $x=\sqrt{3}/2$ then the value of $[\sqrt{(1+x)}+\sqrt{(1-x)}]/[\sqrt{(1+x)}-\sqrt{(1-x)}]$ will be,
A. $\sqrt{3}$ B.1/ $\sqrt{3}$ C.- $\sqrt{3}$ D.

None

Q66. If $x_3+y_3=9$ and $x+y=3$, then value of $1/x+1/y$ will be,
A. 1/2B.2/3C.3/2

D. 4/3

Q67. If $x_2=2$, then $x+1$ is,

- A.($x-2)/(3-2x$). B.($x-4)/(3-2x$). C.($x-1)/(3-2x$). D.None

Q68. If $x+1/16x=1$, then the value of $64x_3+1/64x_3$ is,

- A. 30B.41C.52

D. None

Q69. If $a_2+b_2+1/a_2+1/b_2=4$ then a_2+b_2 is,

- A. 0B.1

C. 2

D. None

Q70. If $a+b+c=6$, $a_2+b_2+c_2=14$ and $a_3+b_3+c_3=36$, then the value of abc is,

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

6

Q71. If $(x-a)(x-b)=1$ and $(a-b)+5=0$, then $(x-a)_3-1/(x-a)_3$ is

- A. 100B.140C.200

D. 280

Q72. If a, b and c are non-zero and $a+1/b=1$ and $b+1/c=1$, the value of abc is,

- A. 0B.-1C.-2D.None

Q73. If $x_2+y_2+z_2=xy+yz+zx$, then the value of, $(4x+2y-3z)/2x$ is,

- A. 1/10B.2/15C.3/2

D. None

Q74. If $a_4+a_2b_2+b_4=8$ and $a_2+ab+b_2=4$, then the value of ab is,

- A. 0B.1C.2

D. None

Q75. If $a+b+c=2s$, then $[s_2 + (s-a)_2 + (s-b)_2 + (s-c)_2]/(a_2+b_2+c_2)$ is,

- A. 0B.1C.2

D. None

Q76. If $ax_2+bx+c=a(x-p)_2$, then the relation between a, b and c can be expressed as,

- A.b_2=4acB.b_2=acC.a+b=cD.None

Q77. If $a:b=2:3$ and $b:c=4:5$, then the value of $a_2:b_2:bc$ is,

- A. 1B.-2C.3

D. -4

Q78. If $x=5-\sqrt{21}$, then value of $\sqrt{x}/[\sqrt{(32-2x)} - \sqrt{21}]$ is,

- A. $[\sqrt{7}-\sqrt{3}]/\sqrt{2}$ B. $[\sqrt{7}-\sqrt{3}]/\sqrt{3}$ C. $[\sqrt{7}+\sqrt{3}]/\sqrt{2}$

D. None

Q79. The terms a, 1, and b are in AP and the terms 1, a and b are in GP. Find the values of a and b, where $a \neq b$.

- A. -2, 4B.-2, 5C.-3, 5D.None

Q80. The value of $a=b_2/(b-a)$, then the value of a_3+b_3 is,

- A. 0B.1C.2

D. None

Q81. The minimum value of $(a-2)(a-9)(a-2)(a-9)$ is,

- A. 27/4B.-49/4C.81/4

D. None

Q82. If $a=11$ and $b=9$, then the value of, $(a+b)$

- A. $+ab)/(a_3-b_3)$ is,

1B.1/2C.1/3

D. 1/4

Q83. The factors of $(a_2+4b_2+4b-4ab-2a-8)$ are,

- A. $(a-2b-4)(a-2b+2)$ B. $(a+2b-4)(a+2b+2)$

- C. $(a+2b-1)(a-2b+1)$ D. $(a-2b-1)(a-2b+1)$ None

Q84. The value of $a = b_2/(b-a)$, then the value of a_3+b_3 is,
A.0B.1C.2D.None

Q85. If $xy(x+y)=1$, then $1/(x_3y_3)-x_3-y_3$ is,
A.0B.1 C.2 D.3

Q86. If $a+b+c=6$, $a_2+b_2+c_2=14$ and $a_3+b_3+c_3=36$, then the value of abc is,
A.0B.3C.6D. 9

Q87. If $x \neq 0$, $y \neq 0$ and $z \neq 0$, and $1/x_2+1/y_2+1/z_2=1/xy + 1/yz + 1 zx$, then the relation
between x, y and z is,
A. $x=y=z$ B. $x>y>z$ C. $x<y<z$ D.None

Q88. If $a:b=3:2$, then the ratio of, $(2a_2+3b_2):(3a_2-2b_2)$ is,
A.1B.-2C.3 D. -4

Q89. If $xy(x+y)=1$, then $1/(x_3y_3)-x_3-y_3$ is,
A.0B.1C.2 D. 3

Q90. If $a_{1/3}=11$ then a_2-331a is
A.1333100B.1331000 C. 13333310 D. None

Q91. If $a=xy/(x+y)$, $b=xz/(x+z)$ and $c=yz/(y+z)$, where aa, bb and cc are all non-zero numbers,
then the value of x is,
A. $2abc/(ac+bc-ab)$ B. $2abc/(ac-bc-ab)$
C. $2abc/(ac+bc-ab)$ D. $2abc/(ac+bc+ab)$

Q92. If $a_2-4a-1=0$, then $a_2+1/a_2+3a-3/a$ is,
A. 20B.30 C. 50 D. None

Q93. If $x(3-2/x)=3/x$, and $x \neq 0$ then x_2+1/x_2 is,
A. 0B.11/9C. 22/9 D. None

Q94. If $a+1/(a-2)=4$, then $(a-2)_2+1/(a-2)_2$ is,
A. 0B.1C. 2 D. None

Q95. If $a_2+b_2+c_2=2(a-b-c)-3$, then $4a-3b+5c$ is,
A. 1B.2C. 3 D. None

Q96. If $x_2+y_2+z_2=xy+yz+zx$, then the value of $z+xy$ is,
A. 0B.2C.3 D. None

Q97. If $\sqrt{(4x-9)}+\sqrt{(4x+9)}=5+\sqrt{7}$, find the value of x.
A. 1B.2C.3 D. 4

Q98. If $2(x_2+1/x_2)-(x-1/x)-7=0$, then the two values of x are,
A. 2,-1/2B.3,-2C.3,1/3 D. None

Q99. If $x=(\sqrt{2}+1)^{-1/3}$, then the value of $[x_3-1/x_3]$
A. 0B.1C. -2 D. -3

Q100. If $x_{x\sqrt{x}} = (x\sqrt{x})_x$ then xx is equal to,
A.1/4B.4/9C.9/4D.16/9

Q101. If $a+1/b=1$ and $b+1/c=1$, then value of $c+1/a$ is,
A.1B.2C.3

D. 4

Q102. If $a+1/b=1$ and $b+1/c=1$, then value of $c+1/a$ is,
A.1B.2C.3

D. 4

----- ANSWER -----

Q1.B	Q2.D	Q3.C	Q4.D	Q5.C
Q6.A	Q7.B	Q8.C	Q9.C	Q10.B
Q11.B	Q12.A	Q13.A	Q14.D	Q15.B
Q16.C	Q17.B	Q18.B	Q19.B	Q20.A
Q21.A	Q22.A	Q23.D	Q24.B	Q25.B
Q26.C	Q27.A	Q28.A	Q29.B	Q30.A
Q31.B	Q32.C	Q33.A	Q34.A	Q35.A
Q36.B	Q37.A	Q38.D	Q39.B	Q40.D
Q41.C	Q42.A	Q43.B	Q44.B	Q45.A
Q46.B	Q47.C	Q48.C	Q49.B	Q50.C
Q51.B	Q52.A	Q53.B	Q54.B	Q55.C
Q56.A	Q57.A	Q58.A	Q59.C	Q60.D
Q61.C	Q62.D	Q63.B	Q64.B	Q65.A
Q66.C	Q67.C	Q68.C	Q69.C	Q70.D
Q71.B	Q72.B	Q73.C	Q74.B	Q75.B
Q76.A	Q77.B	Q78.A	Q79.A	Q80.A
Q81.B	Q82.B	Q83.A	Q84.A	Q85.D
Q86.C	Q87.A	Q88.B	Q89.D	Q90.B
Q91.C	Q92.B	Q93.C	Q94.C	Q95.A
Q96.B	Q97.D	Q98.A	Q99.C	Q100.C
Q101.A	102.A			

----- SOLUTION -----

Q1.B

Q2.D

Q3.C

Q4.D

Q4 Solution:-

we know:

$$12^2 + 5^2 = 13^2$$

Comparing with

$$5\sqrt{x} + 12\sqrt{x} = 13\sqrt{x} \text{ we get } \sqrt{x} = 2 \Rightarrow x = 4$$

Q5.C

Q5 Solution:-

Given:

$$4 - 6x - x^2$$

$$= 4 + 9 - 6x - x^2$$

$$= 13 - (9 + 6x + x^2)$$

$$= 13 - (3 + x)^2$$

Clearly value of expression will be maximum when $(3 + x)^2$ is minimum, its minimum value is zero so value of expression will be maximum as 13

Q6.A

Q6 Solution:-

$x_3 + y_3$, we get,

Q7.B

Q7 Solution:-

$$x+1/x=3$$

$$\text{Or, } x_2 + 1/x_2 + 2x \cdot 1/x = 9.$$

$$\text{Or, } x_2 + 1/x_2 + 2 = 9.$$

$$\text{Or, } x_2 + 1/x_2 = 9 - 2 = 7.$$

Now we can get the sum of cubed inverses,

$$x_3 + 1/x_3 = (x+1/x)(x_2 - 1 + 1/x_2)$$

$$= 3 \times (7 - 1) = 3 \times 6$$

$$= 18.$$

$$x_6 + 1 = 18x_3$$

$$x_6 - 18x_3 = -1$$

$$\text{Or, } x_3(x_3 - 18) = -1$$

Q8.C

Q8 Solution:-

$$1.5x = 0.04y,$$

$$\text{Or, } 3/2x = 4/100y,$$

$$\text{Or, } x/y = 2/75.$$

Now:

$$(y_2 - x_2)/(y_2 + 2xy + x_2) = [(x+y)(y-x)]/(x+y)^2$$

$$= (y-x)/(x+y) = (1-x/y)/(1+x/y)$$

$$= (1-2/75)/(1+2/75)$$

Q9.C

Q9 Solution:-

Working on the target expression now,

$$\begin{aligned} & (2x^2 - 3x - 2) / (3x^2 - 4x - 3) \\ & = [2x(x-1/x-3/2)] / [3x(x-1/x-4/3)] = [2(4-3/2)] / [3(4-4/3)] \\ & = 5/8 \\ & = 0.625 \end{aligned}$$

Q10.B

Q10 Solution:-

$$x = 5^{n-1} + 5^{-n-1} \geq 2.$$

$$[a+b \geq 2\sqrt{ab}]$$

Q11.B

Q11 Solution:-

$$a_3 + b_3 = (a+b)(a^2 - ab + b^2)$$

$a_2 = 7 + 2\sqrt{12}$ and $b_2 = 7 - 2\sqrt{12}$, and so, $a_2 + b_2 = 14$.

Again, $ab = 7_2 - 4 \times 12 = 1$, and so, $(a^2 - ab + b^2) = 13$.

Now we have to transform $a+b$ and find its value.

$a_2 + b_2 = 14$ and $ab = 1$,

So,

$$2a_2 + 2ab + b_2 = (a+b)^2$$

$$= 14 + 2$$

$$= 16$$

And so, $a_3 + b_3 = (a+b)(a^2 - ab + b^2) = 4(16-3) = 4 \times 13 = 52$.

Q12.A

Q12 Solution:-

$$x_3 + y_3 = (x+y) \times (x^2 - xy + y^2)$$

$$9 = 3 \times [(x+y)_2 - 3xy] = 3 \times (9 - 3xy) = 27 - 9xy$$

Or, $9xy = 27 - 9 = 18$.

Or, $xy = 2$

Now

$$x_4 + y_4 = (x_2)_2 + (y_2)_2$$

$$= (x_2 + y_2)_2 - 2x_2 y_2$$

$$= [(x+y)_2 - 2xy]_2 - 2(xy)_2$$

$$= [3_2 - 2 \cdot 2]_2 - 2(2)_2$$

$$= (9 - 4)_2 - 2 \cdot 4$$

$$= 5_2 - 8$$

$$= 25 - 8$$

$$= 17.$$

Q13.A

Q13 Solution:-

We are given:

$$x_{1/3} + y_{1/3} = z_{1/3}$$

Now cubing both sides we get,

$$x + 3x_{1/3}y_{1/3}(x_{1/3} + y_{1/3}) + y = z$$

$$\text{or, } (x+y-z) = -3x_{1/3}y_{1/3}z_{1/3}$$

Cubing again both sides, $(x+y-z)^3 = -27xyz$.

So answer is 0.

Q14.D

Q14 Solution:-

In our given problem we have,

$$(a-4)=0,$$

Or, $a=4$.

$$(b-9)=0,$$

Or, $b=9$, and

$$(c-3)=0,$$

Or, $c=3$.

So,

$$\sqrt{(a+b+c)}=\sqrt{16}=4.$$

Q15.B

Q15 Solution:-

Putting the value of x and y in the third equation we get,

$$(100.48)z=(100.70)2=101.40 \quad (100.48)z=(100.70)2=101.40.$$

So, $0.48z=1.40$,

Or, $z=1.40/0.48=.35/12=2.9$ (Approx)

Q16.C

Q16 Solution:-

We have

$$b + c = -a$$

Squaring we get $b^2 + c^2 + 2bc = a^2$.

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

$$So \ a^2 + b^2 + c^2 = a^2 + b^2 + c^2 - 2bc = a^2 + a^2 - 2bc = 2a^2 - 2bc = 2(a^2 - bc)$$

$$a^2 + b^2 + c^2 = 2(a^2 - bc)$$

Putting in ,we get=2

$$a^2 - bc \qquad \qquad \qquad (a^2 - bc)$$

Q17.B

Q17 Solution:-

$$p = \sqrt{x_2 - x_1}$$

$$\sqrt{x_2 - x_1} + 1 / \sqrt{x_2 - x_1}$$

$$= (p+1/p),$$

$$= (p_2 + 1)/p.$$

Q18.B

Q18. Solution:-

As given $2 < x < 3$, $x-2$ and $4-x$ is positive.

So,

$$\sqrt{(x-4)^2} + \sqrt{(x-2)^2}$$

$$= x-2+4-x$$

$$= 2.$$

Q19.B

Q19. Solution:-

$$4y - 3x = 13,$$

$$Or, (p-q)^2 = p^2 - 2pq + q^2 = 169,$$

Or, $p^2 + q^2 = 169 + 3pq$, the term $3pq$ added to both sides,

Or, $p_2 + pq + q_2 = 169 + 504 = 673$.

So,

$$\begin{aligned}64y_3 - 27x_3 &= p_3 - q_3 \\&= (p - q)(p_2 + pq + q_2) \\&= 13 \times 673 \\&= 8749.\end{aligned}$$

Q20.A

Q20 Solution:-

Given $x_2 - 2x = -2$.

Given expression:-

$$x_2(x_2 - 2x) + 2x_3 - x_3 + 2x = x_3 - 2x_2 + 2x = x(x_2 - 2x) + 2x = -2x + 2x = 0$$

Q21.A

Q21 Solution:-

By substitution, $p = 0.09$, where $p < 1$ we have the transformed given equations as,

$$x = p_2,$$

$$y = lp_2, \text{ and}$$

$$z = (l-p)_2 - 1 = p_2 - 2p.$$

When comparing x with y we can conclude that,

$y > x$, as $p < 1$ (dividing 1 by a value less than 1 makes y larger than 1, whereas x is less than 1).

Comparing x with z we can conclude that,

$x > z$, as p is positive.

These two conclusions are sufficient to finally form the desired comparative relation between the three variables as,

$$y > x > z,$$

Or, $z < x < y$.

Q22.A

Q22 Solution:-

$$x+2/x=1$$

Or, $x_2 - x + 2 = 0$.

$$\begin{aligned}(x_2 + x + 2)/[x_2(1-x)] &= (x_2 - x + 2 + 2x)/[x_2(1-x)] = (0 + 2x)/[x_2(1-x)] \\&= 2x/[x_2(1-x)] \\&= 2/x(1-x) \\&= 2/(x-x_2) \\&= 2/(x-x_2) - 1 + 1 \\&= (x_2 - x + 2)/(x-x_2) + 1 \\&= 0/(x-x_2) + 1 [\text{As } (x_2 - x + 2) = 0] \\&= 0 + 1 \\&= 1\end{aligned}$$

Q23.D

Q23. Solution:-

Adding 3 to both sides of the first expression we get,

$$3 + a/(1-a) + b/(1-b) + c/(1-c) = 4,$$

$$\text{Or, } [1+a/(1-a)] + [1+b/(1-b)] + [1+c/(1-c)] = 4$$

$$\text{Or, } 1/(1-a) + 1/(1-b) + 1/(1-c) = 4.$$

Q24.B

Q24 Solution:-

$$x+y=(\sqrt{2}+1)/(\sqrt{2}-1) + (\sqrt{2}-1)/(\sqrt{2}+1)$$

$$= [(\sqrt{2}+1)_2 + (\sqrt{2}-1)_2] / (2-1)$$

$$= 2 \cdot (2+1)/1$$

$$= 6$$

Now

$$\begin{aligned}x_2 + y_2 &= (x+y)_2 - 2xy = 6^2 - 2 \cdot 1 = 36 - 2 = 34 \\&= 71/65.\end{aligned}$$

$$(2x_2 + 3xy + 2y_2) / (2x_2 - 3xy + 2y_2) = (2 \cdot 34 + 3) / (2 \cdot 34 - 3) = 71/65$$

Q25.B

Q25 Solution:-

$$a_2 = (xy)_2 \text{ and}$$

$$b_2 = (1/y)_2.$$

For the quadratic equation to be a perfect square then the mid-term must be,

$$2ab = 2 \times xy \times 1/y = x.$$

Thus for the given equation to be a perfect square,

$$\alpha x = 2x,$$

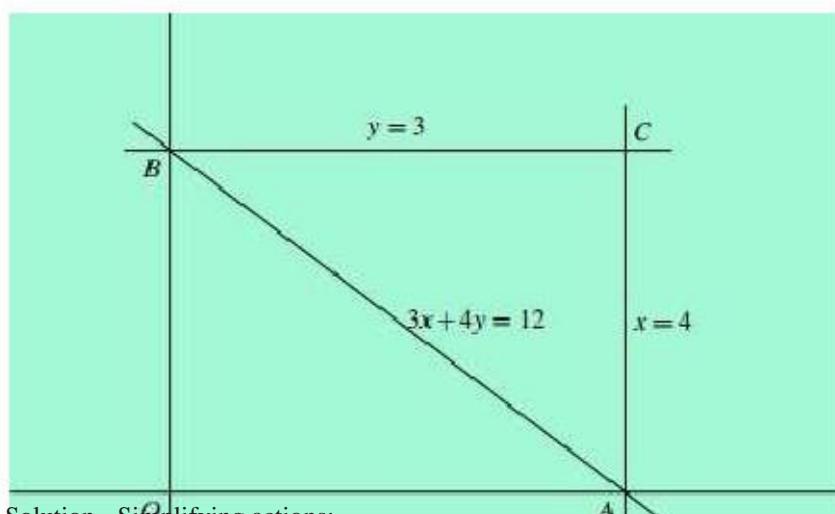
$$\text{Or, } \alpha = 2$$

$$= 3$$

Q26.C

Q26 Solution:-

at $x=0$ and $y=3$ and the x -axis and the first straight line at $x=4$ and $y=0$. The situation is represented in the following figure.



Solution - Simplifying actions:

$$\begin{aligned}\text{Area of the triangle } \Delta ABC &= (1/2)(\text{Area of rectangle OABC}) \\&= (1/2) \cdot (4 \times 3) \\&= 6 \text{ square units}\end{aligned}$$

Q27.A

Q27 Solution:-

$$(x+1/x)=3$$

Or, $x_2+1/x_2=3$,
Or, $x_2+1/x_2-1=0$.

Using our sum of cubes expression concept,

$$x_3+1/x_3=(x+1/x)(x_2-1+1/x_2)$$
$$=0$$

This is a great simplifying resource and let us use it now on the four pairs of terms in the target expression,

$$\begin{aligned} & X_{206}+X_{200}+X_{90}+X_{84}+X_{18}+X_{12}+X_6+1 \\ & =X_{203}(x_3+1/x_3)+X_{87}(x_3+1/x_3)+X_{15}(x_3+1/x_3)+X_3(x_3+1/x_3) \\ & =0. \end{aligned}$$

Q28.A

Q28 Solution:-

$$\begin{aligned} n &= 7+3\sqrt{5} \\ &= (14+6\sqrt{5})/2 \\ &= (1/2)(3+\sqrt{5})_2, \end{aligned}$$

$$\text{Or, } \sqrt{n} = (3+\sqrt{5})/\sqrt{2}. \text{ ----- (i)}$$

Inversing we get:

$$\begin{aligned} 1/\sqrt{n} &= \sqrt{2}/(3+\sqrt{5}) \\ &= \sqrt{2}(3-\sqrt{5})/4, [\text{rationalization multiplying numerator and denominator by } 3-\sqrt{5}] \\ &= (3-\sqrt{5})/2\sqrt{2}. \text{ ----- (ii)} \end{aligned}$$

Adding equation (i) and (ii)

$$\sqrt{n}+1/\sqrt{n} = (9+\sqrt{5})/2\sqrt{2}.$$

Q29.B

Q29 Solution:-

Let us take care of the numerator expression first.

$$p+1/p=5$$

$$\text{Or, } p^2-1+1/p^2=25-3=22.$$

So,

$$\begin{aligned} p^3+1/p^3 &= (p+1/p)(p^2-1+1/p^2) \\ &= 5 \times 22 \\ &= 110. \end{aligned}$$

Thus numerator = 110p.

Expanding the given expression and rearranging we get,

$$p^2-5p+1=0.$$

So denominator is,

$$p^2-3p+1=2p.$$

Finally then the desired value of the target expression is,

$$(p^4+1/p^2)/(p^2-3p+1) = 110p/2p=55.$$

Q30.A

Q30 Solution:-

Given:-

$$\sqrt{2}x-\sqrt{3}y=0$$

$$\text{Or, } \sqrt{(4x/3)}-\sqrt{2}y=0. [\text{Dividing by } \sqrt{3}]$$

Adding this equation with the second equation $\sqrt{7}x+\sqrt{2}y=0$ we get,

$$\sqrt{(4x/3)}+\sqrt{7}x=0,$$

$$\text{Or, } \sqrt{x}(\sqrt{(4/3)}+\sqrt{7})=0.$$

So,

$\sqrt{x=0} \Rightarrow x=0$ and substituting it in any of the two equations we get $y=0$ also.
So $x+y=0+0=0$.

Q31.B

Q31 Solution:-

$$x+1/x = -2$$

Squaring both sides and rearranging,

$$x^2 + 1 = -2x$$

$$x^2 + 1 + 2x =$$

$$\text{Or, } (x+1)^2 = 0,$$

$$\text{Or, } x+1 = 0.$$

$$\text{Or, } x = -1.$$

$$x^{2n+1} + 1/x^{2n+1}$$

$$= (-1)^{2n+1} + 1 / (-1)^{2n+1}$$

$$= -1 - 1$$

$$= -2$$

Q32.C

Q32 Solution:-

Put $x-3=0$ or $x=3$

$$3^5 - 9 \cdot 3^2 + 12 \cdot 3 - 14$$

$$343 - 9 \cdot 9 + 36 - 14 \Rightarrow 184.$$

Q33.A

Q33 Solution:-

First we add the two equations giving,

$$8a_3 = x_3 + 3/x_3 + 3x_3 + 1/x_3$$

$$= x_3 + 3(x_2 \times 1/x_3) + 3(x_3 \times 1/x_2) + 1/x_3$$

$$= (x+1/x)_3$$

$$\text{Or, } (x+1/x) = 2a$$

In the same way, we would get,

$$(x-1/x) = 2b$$

Squaring the two and subtracting we get,

$$4(a_2 - b_2) = 4,$$

$$\text{Or, } a_2 - b_2 = 1.$$

Q34.A

Q34 Solution:-

We reproduce from the remembrance of rich algebraic concepts,

$$(x-y)^2 + (y-z)^2 + (z-x)^2$$

$$= 2(x^2 + y^2 + z^2 - xy - yz - zx).$$

So,

$$(x^2 + y^2 + z^2 - xy - yz - zx) = (1/2)(1+1+4)$$

Q35.A

Q35 Solution:-

$$x_3 - y_3 = (x-y)(x_2 + xy + y_2).$$

$$= (x_2 + y_2 + xy)/(x_3 - y_3)$$

$$= (x_2 + y_2 + xy)/(x-y)(x_2 + xy + y_2)$$

$$= 1/(x-y)$$

So the minimum value of the given expression will be $-17/16$ when $2x=14$.

Q39.B

Q39 Solution:-

$$\begin{aligned} p+1/(p-1) \\ =1+(p-1)+1/(p-1) \\ =1+q+1/q, \text{ where } q=p-1 \\ p=1+\sqrt{2+\sqrt{3}}, \\ \text{Or, } p-1=q=\sqrt{3+\sqrt{2}}. \\ \text{And } 1/q=1/(\sqrt{3+\sqrt{2}}) \\ 1/q=\sqrt{3}-\sqrt{2}. [\text{Rationalizing the surd expression on the }] \\ \text{So the sum of inverses is,} \\ q+1/q=2\sqrt{3}. \\ \text{Finally then the target expression,} \\ p+1/(p-1)=1+q+1/q=1+2\sqrt{3}. \end{aligned}$$

Q40.D

Q40 Solution:-

$$a_2-b_2=(a+b)(a-b)=19$$

As 19 is a prime number and a and b are positive integers, So there is only one possibility that $a-b=1$ and $a+b=19$.

So, $a=10$ and $b=9$.

Q41.C

Q41 Solution:-

$$(a-b)_3=a_3-b_3-3ab(a-b),$$

$$\text{Or, } 9ab=117-27=90,$$

So $ab=10$, and

$$(a+b)_2=(a-b)_2+4ab=49,$$

Q42.A

Q42 Solution:-

$$x=\sqrt[3]{5+2},$$

$$\text{Or, } (x-2)^3=5$$

$$\text{Or, } x^3-6x^2+12x-8=5,$$

$$\text{Or, } x^3-6x^2+12x-13=0.$$

Q43.B

Q43 Solution:-

substituting $x=p/a$, $y=q/b$ and $z=r/c$.

The given expressions are then transformed to,

$$x+y+z=1 \text{ and } 1/x+1/y+1/z=0.$$

$$\text{Given } 1/x+1/y+1/z=0.$$

$$\text{Or, } xy+yz+zx=0, \text{ a simple result.}$$

Now we take up the first expression intending to square it, as the target has the squares,

$$x+y+z=1,$$

$$\text{Or, } (x+y+z)^2=1.$$

$$\text{Or, } x^2+y^2+z^2+2(xy+yz+zx)=1$$

$$\text{Or, } x^2+y^2+z^2=1.$$

Q44.B

Q44 Solution:-

$$x_2 - 4x + 1 = 0$$

$$\text{Or, } x_2 + 1 = 4x$$

$$\text{Or, } x + 1/x = 4$$

We have

$$x_3 + 1/x_3 = (x + 1/x)(x_2 - 1 + 1/x_2) = 4((x + 1/x)_2 - 3) = 4 \times (4^2 - 3) = 4 \times (16 - 3) = 4 \times 13 = 52$$

Q45.A

Q45 Solution:-

Factorising we get

$$2x_2 - 7xy + 3y_2 = (2x - y)(x - 3y) = 0.$$

So Either $2x = y$

$$\text{Or } x = 3y.$$

Either $x:y = 1:2$ and in the second case,

$$\text{Or } x:y = 3:1.$$

Q46.B

Q46 Solution:-

As α and β are the two roots we can write,

$$2x_2 - 7x + 12 = 0,$$

$$\text{Or, } x_2 - 72x + 6$$

$$= (x - \alpha)(x - \beta)$$

$$= x_2 - x(\alpha + \beta) + \alpha\beta$$

$$= 0.$$

Equating coefficients of like powers,

$$\alpha + \beta = 7/2 \text{ and } \alpha\beta = 12/2 = 6.$$

Taking up the target expression now,

$$\alpha/\beta + \beta/\alpha = (\alpha_2 + \beta_2)/\alpha\beta$$

$$= [(\alpha + \beta)^2 - 2\alpha\beta]/\alpha\beta$$

$$= (49/4 - 12)/6$$

$$= 1/24.$$

Q47.C

Q47 Solution:-

$$9\sqrt{x} = \sqrt{12} + \sqrt{147} = 2\sqrt{3} + 7\sqrt{3} = 9\sqrt{3}$$

$$\text{So, } \sqrt{x} = \sqrt{3}$$

$$x = 3$$

Q48.C

Q48 Solution:-

Essentially this problem turns out to be an evaluation of sum of fractions,

$$p + 2p/3 + p/2 + p/7 = 9/7,$$

$$\text{Or, } p(1 + 2/3 + 1/2 + 1/7) = 9/7,$$

$$\text{Or, } p(42 + 28 + 21 + 6)/42 = 9/7,$$

$$\text{Or, } p(97/42) = 9/7,$$

$$\text{Or, } p = 42.$$

Q49.B

Q49 Solution:-

$$12x_3 - 13x_2 - 5x + 7$$

$$\begin{aligned}
 &= 4x_2(3x+2) - 8x_2 - 13x_2 - 5x + 7 \\
 &= 4x_2(3x+2) - 7x(3x+2) + 14x - 5x + 7 \\
 &= 4x_2(3x+2) - 7x(3x+2) + 3(3x+2) - 6 + 7 \\
 &= 4x_2(3x+2) - 7x(3x+2) + 3(3x+2) + 1.
 \end{aligned}$$

Thus remainder will be 1.

Q50.C

Q50 Solution:-

To get the sum of inverse squares,

$$x+1/x=3,$$

$$\text{Or, } x_2+1/x_2=3^2-2=7.$$

Carrying on further to get sum of inverse cubes,

$$x_3+1/x_3=(x+1/x)(x_2-1+1/x_2)$$

$$=3\times(7-1)=18$$

Now

$$(x_2+1/x_2)(x_3+1/x_3)$$

$$=(x_5+1/x_5)+(x+1/x)$$

$$\text{Or, } 7\times 18=(x_5+1/x_5)+3,$$

$$\text{Or, } (x_5+1/x_5)=126-3=123$$

Q51.B

Q51 Solution:-

$$[p(p_2+3p+3)+1]^{1/3}$$

$$=(p_3+3p_2+3p+1)^{1/3}$$

$$=[(p+1)_3]^{1/3}$$

$$=p+1$$

$$=124+1=125.$$

Q52.A

Q52 Solution:-

$$x_4-2x_2+k$$

$$= x_4-2x_2+1 + k - 1$$

$$=(x_2-1)_2+k-1$$

Clearly above expression will be perfect square if $k-1=0$ that is $k=1$.

Q53.B

assume, $p-q=x$, $q-r=y$ and $r-p=z$ transforming the target expression again to,

$x_3+y_3+z_3$, but we have one additional helping expression, $x+y+z=0$.

We know under these conditions,

$x_3+y_3+z_3=3xyz$, that is all three of $x=a_2-b_2$, $y=b_2-c_2$ and $z=c_2-a_2$ are factors of the given expression. Out of the choices we detect only $a_2-b_2a_2-b_2$ in product form.

Q54.B

Q54 Solution:-

$$x-1/x=6,$$

Or, squaring both sides,

$$x_2-2+1/x_2=36$$

$$\text{Or, } x_2+1/x_2=38.$$

Squaring both sides again,

$$x_4+2+1/x_4=38_2=1444,$$
$$\text{Or, } x_4+1/x_4=1444-2=1442.$$

Q55.C

Q55 Solution:-

We have,

$$x_4+1/x_4=119$$

$$\text{Or, } x_4+2+1/x_4=121$$

$$\text{Or, } (x_2+1/x_2)_2=121$$

$$\text{Or, } x_2+1/x_2=11,$$

$$\text{Again, } x_2+1/x_2=11$$

$$\text{Or, } x_2-2+1/x_2=9$$

Or, $(x-1/x)=3$, as $x>1$, $1/x < x$ and $x-1/x$ is positive (it could have been -3).

Now from the target expression we have,

$$x_3-1/x_3=(x-1/x)(x_2+1+1/x_2)$$

$$=3\times(11+1)=36$$

Q56.A

Q56 Solution:-

We have $x+y=z$

$$\text{Or, } x_3+y_3+3xy(x+y)=z_3$$

$$\text{Or, } x_3+y_3-z_3+3xyz=0.$$

Q57.A

Q57 Solution:-

$$x_2+1/x_2=66,$$

$$\text{Or, } x_2-2+1/x_2=64,$$

$$\text{Or, } (x-1/x)_2=82$$

$$\text{Or, } x-1/x=\pm 8$$

$$\text{So, } x-1/x+2=\pm 8+2=10, -6.$$

Q58.A

Q58 Solution:-

$$(x+1/x)_2=3,$$

$$\text{Or, } x_2+2+1/x_2=3$$

$$\text{Or, } x_2+1/x_2=1,$$

$$\text{Or, } x_2+1/x_2-1=0.$$

Now, $x_3+1/x_3=(x+1/x)(x_2-1+1/x_2)=0.$

$$\begin{aligned} &= (x_{72}+x_{66}+x_{54}+x_{36}+\dots+x_{24}+x_6+1) \\ &= x_{69}(x_3+1/x_3)+x_{54}+x_{36}+x_{24}+x_6+1 \\ &= x_{54}+x_{36}+x_{24}+x_6+1. \\ &= x_{54}+x_{36}+x_{24}+x_6+1 \\ &= x_{54}+x_{48}-x_{48}-x_{42}+x_{42}+x_{36}+x_{24}+x_6+1 \\ &= x_{51}(x_3+1/x_3)-x_{45}(x_3+1/x_3)+x_{42}+x_{36}+x_{24}+x_6+1 \\ &= x_{42}+x_{36}+x_{24}+x_6+1. \\ &= x_{24}+x_{18}-x_{18}-x_{12}+x_{12}+x_6+1 \\ &= 1, \text{ as taking common } x_{21}, x_{15} \text{ and } x_3 \text{ will make three pairs of terms combine to 0.} \end{aligned}$$

Q59.C

Q59 Solution:-

$$\begin{aligned}2x_2 - (x-3)(x+5) \\= 2x_2 - (x^2 + 5x - 3x - 15) \\= 2x_2 - x^2 - 2x + 15 \\= x_2 - 2x + 15 \\= (x-1)_2 + 14.\end{aligned}$$

Minimum value of $(x-1)_2$ is 0.

So Minimum value will be $0+14=14$.

Q60.D

Q60 Solution:-

$$\begin{aligned}(x+y)_3 &= x_3 + y_3 + 3xy(x+y) \\&= x_3 + y_3 + 3xy \times 7 \\&= x_3 + y_3 + 21xy,\end{aligned}$$

Or, $7_3 = x_3 + y_3 + 21xy$,

Or, $x_3 + y_3 + 21xy = 343$.

Q61.C

Q61 Solution:-

$$3x + 12x = 5,$$

Multiplying both sides by $2/3$ for making the coefficients between the given and the target expressions conform we have,

$$2x + 1/3x = 10/3.$$

So by the sum of cubes expression,

$$\begin{aligned}(2x)_3 + (1/3x)_3 &= (2x + 1/3x)((2x + 1/3x)^2 - 3 \times 2x \times 1/3x) \\&= 10/3((10/3)_2 - 2) \\&= 10/3(82/9) \\&= 820/27\end{aligned}$$

Q62.D

Q62 Solution:-

$$2a + 1/3a = 6$$

$$\text{Or, } a + 1/6a = 3$$

$$\text{Or, } 3a + 1/2a = 9.$$

[Dividing by 2]

[Multiplying by 3]

Q63.B

Q63 Solution:-

$$p_3 + 3p_2 + 3p = 7,$$

$$\text{Or, } p_3 + 3p_2 + 3p + 1 = 8,$$

$$\text{Or, } (p+1)_3 = 2_3,$$

$$\text{Or, } p+1 = 2,$$

$$\text{Or, } (p+1)_2 = p_2 + 2p + 1 = 4.$$

So finally,

$$p_2 + 2p = 3.$$

Q64.B

Q64 Solution:-

We have

$$x_2 + y_2 - 2x + 6y + 10 = 0,$$

$$\text{Or, } (x_2 - 2x + 1) + (y_2 + 6y + 9) = 0,$$

Or, $(x-1)^2 + (y+3)^2 = 0$,
 $x-1=0$, and $y+3 = 0$,
Or, $x=1$, and $y=-3$,
Or, $x_2+y_2=1+9=10$

Q65.A

Q65 Solution:-

$$\begin{aligned}\sqrt{1+x} &= \sqrt{1+\sqrt{3}}/2 \\ &= (\sqrt{2}+\sqrt{3})/2 \\ &= (\sqrt{4+2\sqrt{3}})/2 \\ &= (\sqrt{3}+1+2\sqrt{3})/2 \\ &= 1/2\sqrt{(\sqrt{3}+1)^2} \\ &= 1/2(\sqrt{3}+1).\end{aligned}$$

Similarly,

$$\sqrt{1-x}=1/2(\sqrt{3}-1).$$

Now, $[\sqrt{1+x}+\sqrt{1-x}]/[\sqrt{1+x}-\sqrt{1-x}]$
 $= [\sqrt{3}+1+\sqrt{3}-1]/[\sqrt{3}+1-\sqrt{3}+1]$, the $1/2$ canceled out.
 $= 2\sqrt{3}/2$
 $= \sqrt{3}$

Q66.C

Q66 Solution:-

We have,

$$1/x+1/y=(x+y)/xy=3/xy. \text{ We need only to get the value of } xy.$$

Now we turn our attention to the given expressions, especially the first one.

$$\begin{aligned}x_3+y_3 &= 9 = (x+y)(x^2-xy+y^2) \\ &= 3(x^2+2xy+y^2-3xy) \\ &= 3((x+y)^2-3xy)\end{aligned}$$

$$\text{Or, } 9-3xy=3,$$

$$\text{Or, } xy=2.$$

$$\text{So, } 1/x+1/y=3/xy=3/2.$$

Q67.C

Q67 Solution:-

Given:

$$x_2=2$$

$$\text{Or, } 2x_2=4$$

$$\text{Or, } 3x-2x_2+3-2x=x-1$$

$$\text{Or, } (x+1)(3-2x)=x-1$$

$$\text{Or, } x+1=(x-1)/(3-2x),$$

Q68.C

Q68 Solution:-

Given,

$$x+1/16x=1,$$

$$\text{Or, } 4x+1/4x=4, [\text{multiplying each terms by } 4]$$

$$\text{Or, } (4x+1/4x)^2=16, [\text{squaring both sides}]$$

$$\text{Or, } (16x^2+1/16x^2)=14.$$

Again,

$$64x^3+1/64x^3$$

$$=(4x+1/4x)(16x^2 \cdot 4x \cdot 1/4x+1/16x^2)$$

$$\begin{aligned}
 &= (4x+1/4x)(16x_2+1/16x_2 - 1) \\
 &= 4x(14 - 1) \\
 &= 4 \times 13 \\
 &= 52
 \end{aligned}$$

Q69.C

Q69 Solution:-

$$\begin{aligned}
 a_2+b_2+1/a_2+1/b_2 &= 4, \\
 \text{Or}, (a_2-2+1/a_2)+(b_2-2+1/b_2) &= 0, \\
 \text{Or}, (a-1/a)_2+(b-1/b)_2. \\
 \text{And so, } a_2 &= 1/a, \text{ or, } a_2 = 1, \text{ and,} \\
 b_2 &= 1/b, \text{ or, } b_2 = 1, \\
 \text{Or}, a_2+b_2 &= 2
 \end{aligned}$$

Q70.D

Q70 Solution:-

We have,

$$\begin{aligned}
 a_3+b_3+c_3 &= a_3+b_3+c_3-3abc+3abc = (a+b+c) \times (a_2+b_2+c_2-ab-bc-ca)+3abc. \\
 \text{Or}, a_3+b_3+c_3 &= (a+b+c) \times (a_2+b_2+c_2-ab-bc-ca)+3abc, \\
 \text{Or}, 36 &= 6(14-ab-bc-ca)+3abc.
 \end{aligned}$$

Given,

$$\begin{aligned}
 (a+b+c)_2 &= 36 \\
 &= a_2+b_2+c_2+2(ab+bc+ca),
 \end{aligned}$$

$$\text{Or}, ab+bc+ca = 11.$$

$$\text{So}, 36 = 6(14-(ab+bc+ca))+3abc,$$

$$\text{Or}, 36 = 6(14-11)+3abc,$$

$$\text{Or}, 3abc = 18,$$

$$\text{Or}, abc = 6.$$

Q71.B

Q71 Solution:-

Clearly,

$$(x-a)-(x-b)=5$$

$$(x-a)(x-b)=1,$$

$$(x-b)=1/(x-a).$$

$$(x-a)-(x-b)=5,$$

$$\text{Or}, (x-a)-1/(x-a)=5,$$

$$p-1/p=5, [\text{Let } p=x-a]$$

Squaring both sides we get,

$$p^2+1/p^2=25+2=27$$

$$p^3-1/p^3=(p-1/p)(p^2+1/p^2+1)$$

$$=5 \times (27+1)=140$$

Q72.B

Q72.Solution:-

We are given:

$$a+1/b=1$$

$$\text{Or}, ab+1=b$$

$$\text{And, } b+1/c=1$$

$$\text{Or}, bc+1=c.$$

$$\text{Or}, bc-c=-1$$

----- (i)

----- (ii)

Or, $abc+c=bc$, [Multiplying eq (i) by c]

Or, $abc=bc-c=-1$ [As we have $bc-c=-1$ from equation Number (ii)]

Q73.C

Q73 Solution:-

Cleraly

$$2(x_2+y_2+z_2)=2(xy+yz+zx), [\text{multiplying given expression by } 2]$$

$$\text{Or}, (x-y)^2 + (y-z)^2 + (z-x)^2 = 0$$

Again the use of Principle of sum of squares.

$$\text{So}, (x-y)=(y-z)=(z-x)=0$$

$$\text{Or}, x=y=z$$

$$\text{So}, (4x+2y-3z)/2x=3x/2x=3/2$$

Q74.B

Q74 Solution:-

$$a_4+a_2b_2+b_4+2ab(a_2+ab+b_2)=8+2\times 4=16,$$

$$\text{Or}, 8+2ab\times 4=16, [\text{a}_4+\text{a}_2\text{b}_2+\text{b}_4=8 \text{ and } \text{a}_2+\text{ab}+\text{b}_2=4]$$

$$\text{Or}, 8ab=8,$$

$$\text{Or}, ab=1.$$

Q75.B

Q75 Solution:-

We have,

$$\begin{aligned}s_2 + (s-a)_2 + (s-b)_2 + (s-c)_2 &= 4s_2 + a_2 + b_2 + c_2 - 2s(a+b+c) \\&= 4s_2 + a_2 + b_2 + c_2 - 2s(a+b+c) \\&= 4s_2 + a_2 + b_2 + c_2 - 2s \cdot 2s [\text{substituting the value of } a+b+c=2s] \\&\quad \cancel{\cancel{\cancel{2s}}} = 4s + a + b + c - 4s \\&= a_2 + b_2 + c_2\end{aligned}$$

So,

$$\begin{aligned}&[s_2 + (s-a)_2 + (s-b)_2 + (s-c)_2]/(a_2 + b_2 + c_2) \\&= (a_2 + b_2 + c_2)/(a_2 + b_2 + c_2) \\&= 1\end{aligned}$$

Q76.A

Q76. Solution:-

$$\text{Let}, ax_2 + bx + c = a(x-p)_2$$

$$= ax_2 - 2pax + ap^2.$$

ax_2 cancels out and equating
coefficients of xx and the constants on
both sides of the equation
we get,

$$b = -2pa, \text{ and } c = ap^2.$$

$$b = -2pa,$$

$$\text{Or}, p = -b/a.$$

Putting this value in the second
equation we get,

$$c = a(-b/a)^2 = b^2/4a.$$

$$\text{Or}, b^2 = 4ac.$$

Q77.B

Q77 Solution:-

we have $a:b=2:3$ which gives, $a_2:b_2=4:9$.

But the second ratio we don't square. Instead we multiply numerator and denominator
by b to get, $b_2:bc=4:5$.

Q83.A

Q84.A

Q84 Solution:-

$$\begin{aligned} a &= b_2/(b-a), \\ \text{Or, } ab - a_2 &= b_2, \\ \text{Or, } a_2 - ab + b_2 &= 0. \end{aligned}$$

As,

$$\begin{aligned} a_3 + b_3 &= (a+b)(a_2 - ab + b_2), \\ &= (a+b).0 \\ &= 0 \end{aligned}$$

Q85.D

Q85 Solution:-

$$x+y = 1/xy$$

$$\text{Or, } (x+y)^3 = 1/x^3y^3$$

$$\text{Or, } x_3 + y_3 + 3xy(x+y) = 1/x^3y^3$$

$$\text{Or, } 1/x^3y^3 - x_3 - y_3 = 3xy(x+y) = 3$$

Q86.C

Q87.A

Q87 Solution:-

Given:

$$1/x_2 + 1/y_2 + 1/z_2 = 1/xy + 1/yz + 1 zx$$

Let $1/x = a$, $1/y = b$ and $1/z = c$.

So we get

$$a_2 + b_2 + c_2 = ab + bc + ca$$

$$\text{Or, } 2(a_2 + b_2 + c_2) = 2(ab + bc + ca)$$

$$\text{Or, } a_2 - 2ab + b_2 - 2bc + c_2 - 2ca + a_2$$

$$\text{Or, } (a-b)_2 + (b-c)_2 + (c-a)_2 = 0$$

$$\text{Or, } a = b = c$$

$$\text{Or, } x = y = z$$

$$= 0$$

Q88.B

Q88 Solution:-

$$a:b = 3:2$$

$$\text{Or, } 2a = 3b,$$

$$\text{Or, } 4a^2 = 9b^2$$

$$2a^2 + 3b^2 = 12(4a^2 + 6b^2)$$

$$= 12(9b^2 + 6b^2)$$

$$= 12 \times 15b^2.$$

$$3a^2 - 2b^2 = 1/4(12a^2 - 8b^2)$$

$$= 14(27b^2 - 8b^2)$$

$$= 14 \times 19b^2.$$

Taking the ratio of the two,

$$2a^2 + 3b^2 : 3a^2 - 2b^2 = 30:19$$

Q89.D

Q89 Solution:-

Q94.C

Q94.Solution:-

We are given:

$$a+1/(a-2)=4$$

$$\text{Or}, (a-2)+1/(a-2)=2$$

And we are to find the value of

$$(a-2)_2+1/(a-2)_2$$

$$\text{Let } a-2 = p$$

SoNow we are to find the value of

$$p_2+1/p_2 \text{ with condition that } p+1/p=2$$

We are given:

$$p+1/p=2$$

$$\text{Or}, (p+1/p)_2=4,$$

$$\text{Or}, p_2+2+1/p_2=4,$$

$$\text{Or}, p_2+1/p_2=2.$$

Q95.A

Q95 Solution:-

We analyze the given expression and gather friendly terms on the LHS,

$$a_2+b_2+c_2=2(a-b-c)-3,$$

$$\text{Or}, (a-1)_2+(b+1)_2+(c+1)_2=0$$

As the sum of squares is 0, each of the squares must be 0.

So, $a=1$, $b=-1$ and $c=-1$.

Thus the target expression is,

$$4a-3b+5c=4+3-5=2.$$

Q96.B

Q96 Solution:-

Given:

$$x_2+y_2+z_2=xy+yz+zx$$

$$\text{Or}, 2x_2+2y_2+2z_2-2xy-2yz-2zx=0$$

$$\text{Or}, (x-y)_2+(y-z)_2+(z-x)_2=0$$

Q97.D

Q97 Solution:-

Raising the given equation to the power of 2,

$$[\sqrt{(4x-9)}+\sqrt{(4x+9)}]_2=[(5+\sqrt{7})_2,$$

$$\text{Or}, 8x+2\sqrt{(16x^2-81)}=32+10\sqrt{7}.$$

Equating the non-square-root terms of LHS and RHS,

$$8x=32,$$

$$\text{Or}, x=4.$$

Q98.A

Q98.Solution:-

Let $(x-1/x)=p$.

Squaring both sides,

$$(x_2+1/x_2-2)=p_2,$$

$$\text{Or}, (x_2+1/x_2)=p_2+2.$$

$$2(x_2+1/x_2)-(x-1/x)-7=0,$$

$$\text{Or}, 2(p_2+2)-p-7=0,$$

Or, $2p^2 - p - 3 = 0$, a very simple quadratic equation.

$$\text{Or}, (2p-3)(p+1)=0.$$

So we get

$$p=3/2,$$

Or, $p=3/2$. By reverse substitution of the original expression value of pp ,

$$x-1/x=3/2,$$

$$\text{Or}, 2x^2 - 3x - 2 = 0,$$

$$\text{Or}, (2x+1)(x-2) = 0,$$

So values of x , as, 2 and $-1/2$.

Q99.C

Q99 Solution:-

Q100.C

Q100 Solution:-

$$\text{Given: } x\sqrt{x} = (x\sqrt{x})_x = (x^{3/2})_x = x^{3x/2}.$$

Now equating powers on both sides, we get,

$$x\sqrt{x} = 3x/2$$

$$\sqrt{x} = 3/2$$

$$\text{or } x = 9/4.$$

Q101.A

Q101 Solution:-

Finding b in terms of a from the first equation,

$$a+1/b=1$$

$$\text{Or}, 1/b = 1-a,$$

$$\text{Or}, b = 1/(1-a).$$

Substituting this value in the second equation,

$$b+1/c=1,$$

$$\text{Or}, 1/(1-a)+1/c=1,$$

$$\text{Or}, 1/c = 1-1/(1-a) = -a/(1-a),$$

$$\text{Or}, c = -1-a/a,$$

$$\text{Or}, c+1/a = 1$$

$$\text{Or, Value of } a+b=7$$

Q102.A

Q102 Solution:-

Finding b in terms of a from the first equation,

$$a+1/b=1$$

$$\text{Or}, 1/b = 1-a,$$

$$\text{Or}, b = 1/(1-a).$$

Substituting this value in the second equation,

$$b+1/c=1,$$

$$\text{Or}, 1/(1-a)+1/c=1,$$

$$\text{Or}, 1/c = 1-1/(1-a) = -a/(1-a),$$

$$\text{Or}, c = -1-a/a,$$

$$\text{Or}, c+1/a = 1$$

$$\text{Or, Value of } a+b=7$$