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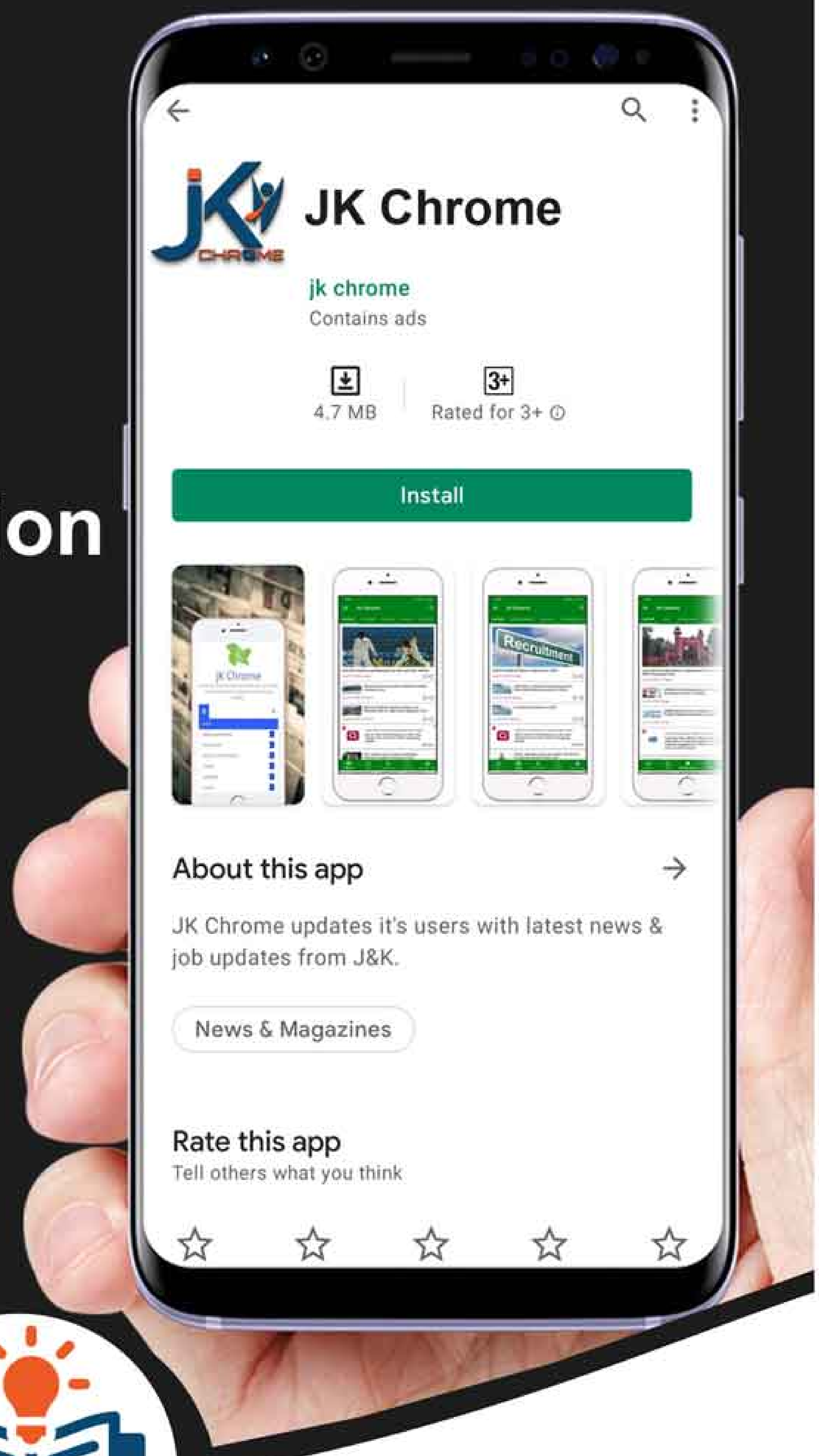

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CHAPTER

3 Algebra

1. If $\left(\frac{3}{5}\right)^3\left(\frac{3}{5}\right)^{-6}=\left(\frac{3}{5}\right)^{2x-1}$, then x is equal to

(SSC CGL 1st Sit. 2010)

(a) –2 (b) 2 (c) –1 (d) 1

2. If a and b are two odd positive integers, by which of the following integers is $(a^4 - b^4)$ always divisible ?

(SSC CGL 1st Sit. 2010)

(a) 3 (b) 6 (c) 8 (d) 12

3. If a = 11 and b = 9, then the value of $\left(\frac{a^2+b^2+ab}{a^3-b^3}\right)$ is

(SSC CGL 1st Sit. 2010)

(a) $\frac{1}{2}$ (b) 2 (c) $\frac{1}{20}$ (d) 20

4. If a and b be positive integers such that $a^2 - b^2 = 19$, then the value of a is **(SSC CGL 2010)**

(a) 19 (b) 20 (c) 9 (d) 10

5. Two natural numbers are in the ratio 3 : 5 and their product is 2160. The smaller of the numbers is

(SSC CGL 1st Sit. 2010)

(a) 36 (b) 24 (c) 18 (d) 12

6. $\frac{\sqrt{3+x}+\sqrt{3-x}}{\sqrt{3+x}-\sqrt{3-x}}=2$ then x is equal to

(SSC CGL 1st Sit. 2010)

(a) $\frac{5}{12}$ (b) $\frac{12}{5}$ (c) $\frac{5}{7}$ (d) $\frac{7}{5}$

7. In an examination, a student scores 4 marks for every correct answer and loses 1 mark for every wrong answer. A student attempted all the 200 questions and scored, in all 200 marks. The number of questions, he answered correctly was

(SSC CGL 2nd Sit. 2010)

(a) 82 (b) 80 (c) 68 (d) 60

8. It $2p+\frac{1}{p}=4$ the value of $p^3+\frac{1}{8p^3}$ is

(SSC CGL 2nd Sit. 2010)

(a) 4 (b) 5 (c) 8 (d) 15

9. If p and q represent digits, what is the possible maximum value of q in the statement 5p9 + 327 + 2q8 = 1114?

(SSC CGL 2nd Sit. 2010)

(a) 9 (b) 8 (c) 7 (d) 6

10. In an examination a student scores 4 marks for every correct answer and loses 1 mark for every wrong answer. If he attempts all 75 questions and secures 125 marks, the number of questions he attempts correctly is

(SSC CGL 1st Sit. 2011)

(a) 35 (b) 40 (c) 42 (d) 46

11. If $1.5x = 0.04y$, then the value of $\frac{y^2-x^2}{y^2+2xy+x^2}$ is

(SSC CGL 2nd Sit. 2011)

(a) $\frac{730}{77}$ (b) $\frac{73}{77}$ (c) $\frac{73}{770}$ (d) $\frac{74}{77}$

12. If $\sqrt{0.03\times0.3\,a}=0.3\times0.3\times\sqrt{b}$ value of $\frac{\vec{a}}{b}$ is

(SSC CGL 2nd Sit. 2011)

(a) 0.009 (b) 0.09 (c) 0.09 (d) 0.08

13. If $\sqrt{1+\frac{x}{9}}=\frac{13}{3}$, then the value of x is

(SSC CGL 2nd Sit. 2011)

(a) $\frac{1439}{9}$ (b) 160 (c) $\frac{1443}{9}$ (d) 169

14. The sum of two numbers is 24 and their product is 143. The sum of their squares is

(SSC CGL 2nd Sit. 2011)

(a) 296 (b) 295 (c) 290 (d) 228

15. If $x = (0.08)^2$, $y = \frac{1}{(0.08)^2}$ and $z = (1 - 0.08)^2 - 1$, then out of the following the true relation is **(SSC CGL 1st Sit. 2012)**

(a) $y < x$ and $x = z$ (b) $x < y$ and $x = z$

(c) $y < z < x$ (d) $z < x < y$

16. In xy–plane, P and Q are two points having co–ordinates (2, 0) and (5, 4) respectively. Then the numerical value of the area of the circle with radius PQ is

(SSC CGL 1st Sit. 2012)

(a) 16π (b) 32π (c) 14π (d) 25π

17. If $x^4+\frac{1}{x^4}=23$, then the value of $\left(x-\frac{1}{x}\right)^2$ will be

(SSC CGL 1st Sit. 2012)

(a) 7 (b) –7 (c) –3 (d) 3

18. If $x+\frac{1}{x}=3$, the value of $x^5+\frac{1}{x^5}$ is **(SSC CGL 1st Sit. 2012)**

(a) 123 (b) 126 (c) 113 (d) 129

19. If $a+b+1=0$, then the value of $(a^3+b^3+1-3ab)$ is **(SSC CGL 1st Sit. 2012)**

(a) 3 (b) 0 (c) –1 (d) 1

20. In the xy–coordinate system, if (a, b) and (a + 3, b + k) are two points on the line defined by the equation $x = 3y - 7$, then k = ? **(SSC CGL 1st Sit. 2012)**

(a) $\frac{7}{3}$ (b) 1 (c) 9 (d) 3

21. If $(a - b) = 3$, $(b - c) = 5$ and $(c - a) = 1$, then the value of $\frac{a^3+b^3+c^3-3abc}{a+b+c}$ is **(SSC CGL 1st Sit. 2012)**

(a) 17.5 (b) 20.5 (c) 10.5 (d) 15.5

22. If $(5x^2-3y^2) : xy = 11 : 2$, then the postive value of x/y is: **(SSC CGL 2nd Sit. 2012)**

(a) 7/2 (b) 5/2 (c) 3/2 (d) 5/3

23. If $a=\frac{\sqrt{3}-\sqrt{2}}{\sqrt{3}+\sqrt{2}}$, $b=\frac{\sqrt{3}+\sqrt{2}}{\sqrt{3}-\sqrt{2}}$, then the value of $\frac{a^2}{b}+\frac{b^2}{a}$ is: **(SSC CGL 2nd Sit. 2012)**

(a) 900 (b) 970 (c) 1030 (d) 930

24. If $ax + by = 6$, $bx - ay = 2$ and $x^2 + y^2 = 4$, then the value of $(a^2 + b^2)$ would be: **(SSC CGL 2nd Sit. 2012)**

(a) 10 (b) 2 (c) 4 (d) 5

25. If $a+\frac{1}{a}=1$, then the value of a^3 is: **(SSC CGL 2nd Sit. 2012)**

(a) –2 (b) 2 (c) –1 (d) 4

26. If $x=2+\sqrt{3}$, then the value of $\sqrt{x}+\frac{1}{\sqrt{x}}$ is: **(SSC CGL 2nd Sit. 2012)**

(a) $\sqrt{3}$ (b) $\sqrt{6}$ (c) $2\sqrt{6}$ (d) 6

27. If $a^3 - b^3 = 56$ and $a - b = 2$, then the value of $(a^2 + b^2)$ is: **(SSC CGL 2nd Sit. 2012)**

(a) –10 (b) –12 (c) 20 (d) 18

28. Area of the trapezium formed by x-axis; y-axis and the lines $3x + 4y = 12$ and $6x + 8y = 60$ is: **(SSC CGL 2nd Sit. 2012)**

(a) 37.5 sq. unit (b) 31.5 sq. unit

(c) 48 sq. unit (d) 36.5 sq. unit

29. Area of the triangle formed by the graph of the line $2x - 3y + 6 = 0$ along with the coordinate axes is: **(SSC CGL 2nd Sit. 2012)**

(a) 1/2 sq. units (b) 3/2 sq. units

(c) 3 sq. units (d) 6 sq. units

30. If $a+\frac{1}{a+2}=0$, then the value of $(a+2)^3+\frac{1}{(a+2)^3}$ is: **(SSC CGL 2nd Sit. 2012)**

(a) 2 (b) 6 (c) 4 (d) 3

31. If $a^2+\frac{1}{a^2}=98\,(a>0)$, then the value of $a^3+\frac{1}{a^3}$ will be **(SSC CGL 1st Sit. 2012)**

(a) 535 (b) 1030 (c) 790 (d) 970

32. If $x = 1 + \sqrt{2}+\sqrt{3}$, then the value of $(2x^4-8x^3-5x^2+26x-28)$ is **(SSC CGL 1st Sit. 2012)**

(a) $6\sqrt{6}$ (b) 0 (c) $3\sqrt{6}$ (d) $2\sqrt{6}$

33. If the distance between two points (0,–5) and (x,0) is 13 unit, then x = **(SSC CGL 1st Sit. 2012)**

(a) 10 (b) ±10 (c) 12 (d) ±12

34. If $4x = 18y$, then the value of $\left(\frac{x}{y}-1\right)$ is **(SSC CGL 1st Sit. 2012)**

(a) $\frac{1}{3}$ (b) $\frac{7}{2}$ (c) $\frac{2}{3}$ (d) $\frac{3}{2}$

35. If $x+\frac{1}{x}=15$, t hen the value of $\frac{x^4+\frac{1}{x^2}}{x^2-3x+1}$ is **(SSC CGL 1st Sit. 2012)**

(a) 70 (b) 50 (c) 110 (d) 55

36. If $x = 2+\sqrt{3}$, $y = 2-\sqrt{3}$, then the value of $\frac{x^2+y^2}{x^3+y^3}$ is **(SSC CGL 1st Sit. 2012)**

(a) $\frac{7}{38}$ (b) $\frac{7}{40}$ (c) $\frac{7}{19}$ (d) $\frac{7}{26}$

37. If $a^2+b^2+c^2=2(a-b-c)-3$ then the value of $2a-3b+4c$ is **(SSC CGL 1st Sit. 2012)**

(a) 3 (b) 1 (c) 2 (d) 4

38. If $2x-\frac{1}{2x}=6$, then the value of $x^2+\frac{1}{16x^2}$ is **(SSC CGL 1st Sit. 2012)**

(a) $\frac{19}{2}$ (b) $\frac{17}{2}$ (c) $\frac{18}{3}$ (d) $\frac{15}{2}$

39. If $5a+\frac{1}{3a}=5$, the value of $9a^2+\frac{1}{25a^2}$ is **(SSC CGL 1st Sit. 2012)**

(a) $\frac{34}{5}$ (b) $\frac{39}{5}$ (c) $\frac{42}{5}$ (d) $\frac{52}{5}$

40. The area of the triangle formed by the lines $5x+7y=35$, $4x+3y=12$ and x-axis is **(SSC CGL 1st Sit. 2012)**

(a) $\frac{160}{13}$ sq. unit (b) $\frac{150}{13}$ sq. unit

(c) $\frac{140}{13}$ sq. unit (d) 10 sq. unit

41. If $x=\frac{4ab}{a+b}$, then the value of

$\frac{x+2a}{x-2a}+\frac{x+2b}{x-2b}$ is **(SSC CGL 2nd Sit. 2012)**

(a) a (b) b

(c) 0 (d) 2

42. If $x=997, y=998, z=999$, then the value of $x^2+y^2+z^2-xy-yz-zx$ will be **(SSC CGL 2nd Sit. 2012)**

(a) 3 (b) 9

(c) 16 (d) 4

43. The area (in sq. unit) of the triangle formed by the three graphs of the equations $x=4$, $y=3$, and $3x+4y=12$, is **(SSC CGL 2nd Sit. 2012)**

(a) 12 (b) 10 (c) 6 (d) 8

44. If $a+b+c=8$, then the value of $(a-4)^3+(b-3)^3+(c-1)^3-3(a-4)(b-3)(c-1)$ is **(SSC CGL 2nd Sit. 2012)**

(a) 2 (b) 4 (c) 1 (d) 0

45. If $x=\sqrt{a}+\frac{1}{\sqrt{a}}$, $y=\sqrt{a}-\frac{1}{\sqrt{a}}$, then the value of $x^4+y^4-2x^2y^2$ is **(SSC CGL 2nd Sit. 2012)**

(a) 16 (b) 20 (c) 10 (d) 5

46. If $5a+\frac{1}{3a}=5$, then the value of $9a^2+\frac{1}{25a^2}$ is

(SSC CGL 2nd Sit. 2012)

(a) $\frac{51}{5}$ (b) $\frac{29}{5}$ (c) $\frac{52}{5}$ (d) $\frac{39}{5}$

47. If $x=3+2\sqrt{2}$, then the value of $\sqrt{x}-\frac{1}{\sqrt{x}}$ is

(SSC CGL 2nd Sit. 2012)

(a) $\pm 2\sqrt{2}$ (b) ± 2 (c) $\pm\sqrt{2}$ (d) $\pm\frac{1}{2}$

48. If $a+b+c=0$, the value of

$\left(\frac{a^2}{bc}+\frac{b^2}{ca}+\frac{c^2}{ab}\right)$ is **(SSC CGL 2nd Sit. 2012)**

(a) 2 (b) 3 (c) 4 (d) 5

49. If a, b, c are real and $a^3+b^3+c^3=3abc$ and $a+b+c\neq 0$, then the relation between a, b, c will be

(SSC CGL 2nd Sit. 2012)

(a) $a+b=c$ (b) $a+c=b$

(c) $a=b=c$ (d) $b+c=a$

50. If $\frac{5x-3}{x}+\frac{5y-3}{y}+\frac{5z-3}{z}=0$, then the value of $\frac{1}{x}+\frac{1}{y}+\frac{1}{z}$ is

(SSC Sub. Ins. 2012)

(a) 15 (b) 3 (c) 5 (d) 10

51. Minimum value of $x^2+\frac{1}{x^2+1}-3$ is **(SSC Sub. Ins. 2012)**

(a) -3 (b) -2 (c) 0 (d) -1

52. If $a+b=5$, $a^2+b^2=13$, the value of $a-b$ (where $a>b$) is

(SSC Sub. Ins. 2012)

(a) 2 (b) -1 (c) 1 (d) -2

53. If $(3x-y):(x+5y)=5:7$, then the value of $(x+y):(x-y)$ is

(SSC Sub. Ins. 2012)

(a) $3:1$ (b) $1:3$

(c) $2:3$ (d) $3:2$

54. The line passing through the points $(-2, 8)$ and $(5, 7)$

(SSC Sub. Ins. 2012)

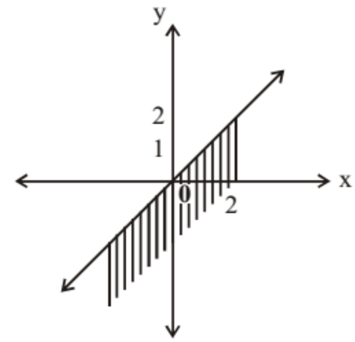
(a) does not cut any axes

(b) cuts x-axis only

(c) cuts y-axis only

(d) cuts both the axes

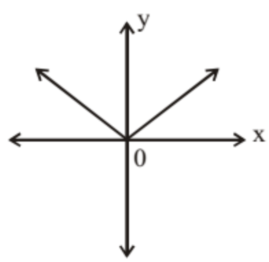
55. The shaded region represents **(SSC Sub. Ins. 2012)**



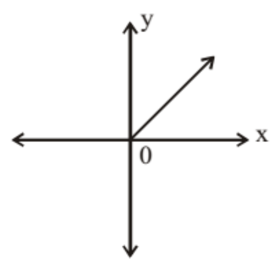
(a) $y\leq x$ (b) $y\geq -x$

(c) $y\geq x$ (d) $y\leq -x$

56. The graph of $y=x+|x|$ is given by **(SSC Sub. Ins. 2012)**



(1)



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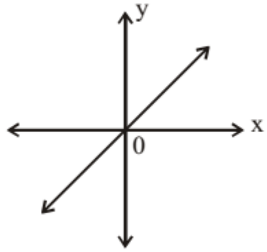

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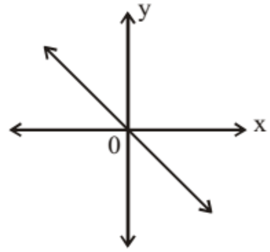
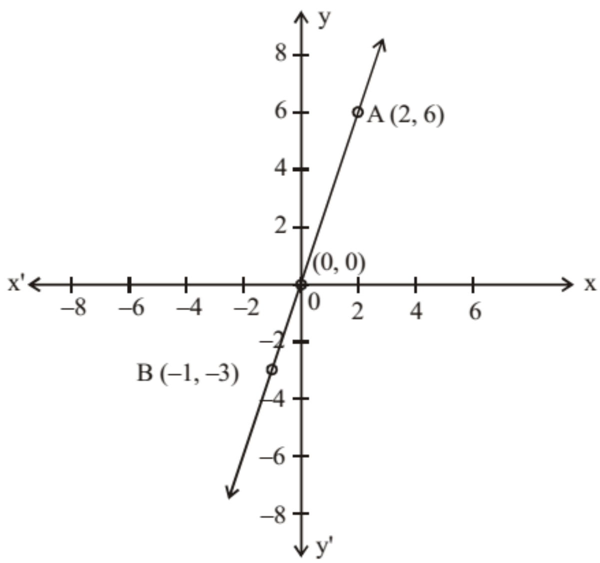


(4)

(a) 1 (b) 2 (c) 3 (d) 4

57. The equation of this graph is **(SSC Sub. Ins. 2012)**



(a) $y=-x$ (b) $y=-3x$ (c) $y=x$ (d) $y=3x$

58. If $\frac{x}{b+c}=\frac{y}{c+a}=\frac{z}{a+b}$, then : **(SSC CHSL 2012)**

(a) $\frac{x-y}{b-a}=\frac{y-z}{c-b}=\frac{z-x}{a-c}$ (b) $\frac{x}{a}=\frac{y}{b}=\frac{z}{c}$

(c) $\frac{x-y}{c}=\frac{y-z}{b}=\frac{z-x}{a}$ (d) none of the above is true

59. If $\frac{3x+5}{5x-2}=\frac{2}{3}$, then the value of x is : **(SSC CHSL 2012)**

(a) 11 (b) 19 (c) 23 (d) 7

60. If the difference of two numbers is 3 and the difference of their squares is 39; then the larger number is : **(SSC CHSL 2012)**

(a) 9 (b) 12 (c) 13 (d) 8

61. If $x=\sqrt{3}+\sqrt{2}$, then the value of $x^3-\frac{1}{x^3}$ is : **(SSC CHSL 2012)**

(a) $14\sqrt{2}$ (b) $14\sqrt{3}$ (c) $22\sqrt{2}$ (d) $10\sqrt{2}$

62. If $a^2+b^2+c^2=2(a-b-c)-3$, then the value of $2a-3b+4c$ is **(SSC CHSL 2013)**

(a) 1 (b) 7 (c) 2 (d) 3

63. Let $a=\sqrt{6}-\sqrt{5}, b=\sqrt{5}-2, c=2-\sqrt{3}$. Then point out the correct alternative among the four alternatives given below. **(SSC CHSL 2013)**

(a) $a<b<c$ (b) $b<a<c$

(c) $a<c<b$ (d) $b<c<a$;

64. If $a=\frac{b^2}{b-a}$ then the value of a^3+b^3 is **(SSC CHSL 2013)**

(a) 2 (b) 6 ab (c) 0 (d) 1

65. If $xy+yz+zx=0$, then

$\left(\frac{1}{x^2-yz}+\frac{1}{y^2-zx}+\frac{1}{z^2-xy}\right)(x,y,z\neq 0)$ is equal to **(SSC CHSL 2013)**

(a) 0 (b) 3

(c) 1 (d) $x+y+z$

66. If $x=a-b, y=b-c, z=c-a$, then the numerical value of the algebraic expression $x^3+y^3+z^3-3xyz$ will be **(SSC Sub. Ins. 2013)**

(a) $a+b+c$ (b) 0

(c) $4(a+b+c)$ (d) $3abc$

67. The linear equation such that each point on its graph has an ordinate four times its abscissa is: **(SSC Sub. Ins. 2013)**

(a) $y+4x=0$ (b) $y=4x$

(c) $x=4y$ (d) $x+4y=0$

68. One of the factors of the expression $4\sqrt{3}x^2+5x-2\sqrt{3}$ is: **(SSC Sub. Ins. 2013)**

(a) $4x+\sqrt{3}$ (b) $4x+3$ (c) $4x-3$ (d) $4x-\sqrt{3}$

69. If the square of the sum of two numbers is equal to 4 times of their product. then the ratio of these numbers is : **(SSC Sub. Ins. 2013)**

(a) 2 : 1 (b) 1 : 3 (c) 1 : 1 (d) 1 : 2

70. If $a^2+b^2=5ab$, then the value of $\left(\frac{a^2}{b^2}+\frac{b^2}{a^2}\right)$ is : **(SSC Sub. Ins. 2013)**

(a) 32 (b) 16 (c) 23 (d) –23

71. Divide 50 into two parts so that the sum of their reciprocals is 1/12. **(SSC CHSL 2013)**

(a) 28, 22 (b) 35, 15

(c) 20, 30 (d) 24, 36

72. In a two-digit number, the digit at the unit's place is 1 less than twice the digit at the ten's place. If the digits at unit's and ten's place are interchanged, the difference between the new and the original number is less than the original number by 20. The original number is **(SSC CHSL 2013)**

(a) 47 (b) 59

(c) 23 (d) 35

73. The equation $\cos^2\theta = \frac{(x+y)^2}{4xy}$ is only possible when

(SSC CHSL 2013)

(a) $x < y$ (b) $x = -y$
(c) $x > y$ (d) $x = y$

74. If a + b + c = 9 (where a, b, c are real numbers), then the minimum value of **(SSC CHSL 2013)**
$a^2 + b^2 + c^2$ is
(a) 81 (b) 100 (c) 9 (d) 27

75. A man buys 3 cows and 18 goats in ` 47,200. Instead if he would have bought 8 cows and 3 goats, he had to pay ` 53,000 mroe. Cost of one cow is : **(SSC CGL 1st Sit. 2013)**
(a) ` 10,000 (b) ` 11,000 (c) ` 12,000 (d) ` 13,000

76. If $p - 2q = 4$, then the value of $p^3 - 8q^3 - 24pq - 64$ is : **(SSC CGL 1st Sit. 2013)**
(a) –1 (b) 2 (c) 0 (d) 3

77. If $\frac{x}{x^2-2x+1} = \frac{1}{3}$, then the value of $x^3 + \frac{1}{x^3}$ is:

(SSC CGL 1st Sit. 2013)
(a) 27 (b) 81 (c) 110 (d) 125

78. If $a^2 + b^2 + c^2 + 3 = (2(a - b - c)$, then the value of $2a - b + c$ is : **(SSC CGL 1st Sit. 2013)**
(a) 2 (b) 3 (c) 4 (d) 0

79. If $\frac{x}{a} = \frac{1}{a} - \frac{1}{x}$, then the value of $x - x^2$ is :

(SSC CGL 1st Sit. 2013)

(a) a (b) – a (c) $\frac{1}{a}$ (d) $-\frac{1}{a}$

80. If $\left(n^r - tn + \frac{1}{4}\right)$ be a perfect square, then the values of t are:

(SSC CGL 1st Sit. 2013)
(a) ±1 (b) ±2 (c) 1, 2 (d) 2, 3

81. If $\left(x + \frac{1}{x}\right) = 4$, then the value of $x^4 + \frac{1}{x^4}$ is :

(SSC CGL 1st Sit. 2013)
(a) 124 (b) 64 (c) 194 (d) 81

82. Equation of the straight line parallel to x-axis and also 3 units below x-axis is : **(SSC CGL 1st Sit. 2013)**
(a) $x = 3$ (b) $x = -3$
(c) $y = 3$ (d) $y = -3$

83. If $(x + 7954 \times 7956)$ be a square number, then the value of 'x' is **(SSC CGL 2nd Sit. 2013)**
(a) 1 (b) 16
(c) 9 (d) 4

84. If the number p is 5 more than q and the sum of the squares of p and q is 55, then the product of p and q is **(SSC CGL 2nd Sit. 2013)**
(a) 10 (b) – 10 (c) 15 (d) – 15

85. If $a + \frac{1}{a-2} = 4$, then the value of

$(a-2)^2 + \left(\frac{1}{a-2}\right)^2$ is **(SSC CGL 2nd Sit. 2013)**

(a) 0 (b) 2 (c) – 2 (d) 4

86. If a + b + c = 2s, then

$\frac{(s-a)^2 + (s-b)^2 + (s-c)^2 + s^2}{a^2 + b^2 + c^2}$ is equal to

(SSC CGL 2nd Sit. 2013)
(a) $a^2 + b^2 + c^2$ (b) 0
(c) 1 (d) 2

87. If $xy(x + y) = 1$ then, the value of

$\frac{1}{x^3y^3} - x^3 - y^3$ is **(SSC CGL 2nd Sit. 2013)**

(a) 3 (b) – 3 (c) 1 (d) – 1

88. If $a^3 - b^3 - c^3 = 0$ then the value of $a^9 - b^9 - c^9 - 3a^3b^3c^3$ is **(SSC CGL 2nd Sit. 2013)**
(a) 1 (b) 2 (c) 0 (d) – 1

89. The minimum value of $(x - 2)(x - 9)$ is **(SSC CGL 2nd Sit. 2013)**

(a) $-\frac{11}{4}$ (b) $\frac{49}{4}$ (c) 0 (d) $-\frac{49}{4}$

90. If x + y + z = 6 and $x^2 + y^2 + z^2 = 20$ then the value of $x^3 + y^3 + z^3 - 3xyz$ is **(SSC CGL 2nd Sit. 2013)**
(a) 64 (b) 70 (c) 72 (d) 76

91. The third proportional to

$\left(\frac{x}{y} + \frac{y}{x}\right)$ and $\sqrt{x^2 + y^2}$ is **(SSC CGL 2nd Sit. 2013)**

(a) xy (b) $\sqrt{xy}$ (c) $\sqrt[3]{xy}$ (d) $\sqrt[4]{xy}$

92. If $x^2 - 3x + 1 = 0$, then the value of $x^2 + x + \frac{1}{x} + \frac{1}{x^2}$ is

(SSC CGL 1st Sit. 2013)
(a) 6 (b) 8 (c) 10 (d) 2

93. If $\frac{4x-3}{x} + \frac{4y-3}{y} + \frac{4z-3}{z} = 0$, then the value of $\frac{1}{x} + \frac{1}{y} + \frac{1}{z}$ is **(SSC CGL 1st Sit. 2013)**
(a) 4 (b) 6 (c) 9 (d) 3

94. If $a^2 + b^2 + 4c^2 = 2(a + b - 2c) - 3$ and a, b, c are real, then the value of $(a^2 + b^2 + c^2)$ is **(SSC CGL 1st Sit. 2013)**

(a) 2 (b) $2\frac{1}{4}$ (c) 3 (d) $3\frac{1}{4}$

95. An equation of the form $ax + by + c = 0$ where $a \neq 0$, $b \neq 0$, $c = 0$ represents a straight line which passes through **(SSC CGL1st Sit. 2013)**
(a) (0,0) (b) (3, 2)
(c) (2,4) (d) None of these

96. The expression $x^4 - 2x^2 + k$ will be a perfect square when the value of k is **(SSC CGL1st Sit. 2013)**

(a) 1 (b) 2 (c) $\frac{1}{2}$ (d) $\frac{1}{4}$

97. If $3x - \frac{1}{4y} = 6$, then the value of $4x - \frac{1}{3y}$ is

(SSC CGL 1st Sit. 2013)

(a) 2 (b) 4 (c) 6 (d) 8

98. If $a + b + c = 0$, find the value of $\frac{a+b}{c} - \frac{2b}{c+a} + \frac{b+c}{a}$.

(SSC CGL 1st Sit. 2013)

(a) 0 (b) 1 (c) – 1 (d) 2

99. If $x + \frac{4}{x} = 4$, find the value of $x^3 + \frac{4}{x^3}$.

(SSC CGL 1st Sit. 2013)

(a) 8 (b) $8\frac{1}{2}$ (c) 16 (d) $16\frac{1}{2}$

100. If $x = 3 + 2\sqrt{2}$, then the value of $\left(\sqrt{x} - \frac{1}{\sqrt{x}}\right)$ is

(SSC CGL1st Sit. 2013)

(a) 1 (b) 2 (c) $2\sqrt{2}$ (d) $3\sqrt{3}$

101. If 'a' be a positive number, then the least value of $a + \frac{1}{a}$ is

(SSC CGL 1st Sit. 2013)

(a) 1 (b) 0 (c) 2 (d) $\frac{1}{2}$

102. If $a = 0$, $b \neq 0$, $c \neq 0$, then the equation $ax + by + c = 0$ represents a line parallel to **(SSC CGL1st Sit. 2013)**

(a) $x + y = 0$ (b) x-axis

(c) y-axis (d) none of these

103. The sum of the ages of Puneet and his father is 45 years and the product of their ages is 126. What is the age of Puneet ?

(SSC CGL1st Sit. 2013)

(a) 3 years (b) 5 years

(c) 10 years (d) 45 years

104. The total cost of 8 buckets and 5 mugs is ` 92 and the total cost of 5 buckets and 8 mugs is ` 77. Find the cost of 2 mugs and 3 buckets. **(SSC CGL 1st Sit. 2013)**

(a) ` 35 (b) ` 70

(c) ` 30 (d) ` 38

105. If $\frac{a}{1-a} + \frac{b}{1-b} + \frac{c}{1-c} = 1$, then the value of

$\frac{1}{1-a} + \frac{1}{1-b} + \frac{1}{1-c}$ is **(SSC CGL 1st Sit. 2013)**

(a) 1 (b) 3

(c) 4 (d) 0

106. If $(x-3)^2 + (y-5)^2 + (z-4)^2 = 0$, then the value of

$\frac{x^2}{9} + \frac{y^2}{25} + \frac{z^2}{16}$ is **(SSC CGL 1st Sit. 2013)**

(a) 12 (b) 9 (c) 3 (d) 1

107. If $\frac{4x}{3} + 2P = 12$ for what value of P, $x = 6$?

(SSC CGL 1st Sit. 2013)

(a) 6 (b) 14 (c) 2 (d) 1

108. If $x\left(3 - \frac{2}{x}\right) = \frac{3}{x}$, then the value of $x^2 + \frac{1}{x^2}$ is

(SSC CGL 1st Sit. 2013)

(a) $2\frac{1}{9}$ (b) $2\frac{4}{9}$ (c) $3\frac{1}{9}$ (d) $3\frac{4}{9}$

109. What number must be added to the expression $16a^2 - 12a$ to make it a perfect square ? **(SSC CGL 1st Sit. 2013)**

(a) $\frac{9}{4}$ (b) $\frac{13}{2}$ (c) $\frac{11}{2}$ (d) 16

110. The straight line $2x + 3y = 12$ passes through :

(SSC CGL 1st Sit. 2013)

(a) lst, 2nd and 3rd quadrant

(b) lst, 2nd and 4th quadrant

(c) 2nd, 3rd and 4th quadrant

(d) lst, 3rd and 4th quadrant

111. If $a^2 + b^2 + c^2 = 2a - 2b - 2$, then the value of $3a - 2b + c$ is

(SSC CGL 2014)

(a) 0 (b) 3 (c) 5 (d) 2

112. If $a + b + c = 3$, $a^2 + b^2 + c^2 = 6$ and $\frac{1}{a} + \frac{1}{b} + \frac{1}{c} = 1$, where a, b, c are all non-zero, then 'abc' is equal to

(SSC CGL 2014)

(a) $\frac{2}{3}$ (b) $\frac{3}{2}$ (c) $\frac{1}{2}$ (d) $\frac{1}{3}$

113. If $a^2 - 4a - 1 = 0$, a ¹ 0, then the value of $a^2 + 3a + \frac{1}{a^2} - \frac{3}{a}$ is

(SSC CGL 2014)

(a) 24 (b) 26 (c) 28 (d) 30

114. The total area (in sq. unit) of the triangles formed by the graph of $4x + 5y = 40$, x-axis, y-axis and $x = 5$ and $y = 4$ is

(SSC CGL 2014)

(a) 10 (b) 20 (c) 30 (d) 40

115. For what value of k, the system of equations $kx + 2y = 2$ and $3x + y = 1$ will be coincident?

(SSC CGL 2014)

(a) 2 (b) 3 (c) 5 (d) 6

116. If $x = 2 + \sqrt{3}$, then $x^2 + \frac{1}{x^2}$ is equal to **(SSC CGL 2014)**

(a) 10 (b) 12 (c) –12 (d) 14

117. If a = 4.965, b = 2.343 and c = 2.622, then the value of $a^3 - b^3 - c^3 - 3abc$ is **(SSC CGL 2014)**

(a) –2 (b) –1 (c) 0 (d) 9.93^2

118. If $x + y + z = 0$, then the value of $\frac{x^2 + y^2 + z^2}{x^2 - yz}$ is **(SSC CGL 2014)**

(a) –1 (b) 0 (c) 1 (d) 2

119. If x : y::2 : 3 and 2 : x :: 4 : 8 the value of y is **(SSC Sub. Ins. 2014)**

(a) 6 (b) 8 (c) 4 (d) 12

120. If $a = \sqrt{6} + \sqrt{5}$ $b = \sqrt{6} - \sqrt{5}$ then $2a^2 - 5ab + 2b^2 =$ **(SSC Sub. Ins. 2014)**

(a) 38 (b) 39 (c) 40 (d) 41

121. If $p = \frac{5}{18}$ then $27p^3 - \frac{1}{216} - \frac{9}{2}p^2 + \frac{1}{4}p$ is equal to **(SSC Sub. Ins. 2014)**

(a) $\frac{4}{27}$ (b) $\frac{5}{27}$ (c) $\frac{8}{27}$ (d) $\frac{10}{27}$

122. If $x + \frac{1}{x} = 2$, then $x^{2013} + \frac{1}{x^{2014}} = ?$ **(SSC Sub. Ins. 2014)**

(a) 0 (b) 1 (c) –1 (d) 2

123. If a = 331, b = 336 and c = – 667, then the value of $a^3 + b^3 + c^3 - 3abc$ is **(SSC Sub. Ins. 2014)**

(a) 1 (b) 6 (c) 3 (d) 0

124. If $x + \frac{1}{x} = 3$, then the value of $\frac{3x^2 - 4x + 3}{x^2 - x + 1}$ is **(SSC CHSL 2014)**

(a) $\frac{4}{3}$ (b) $\frac{3}{2}$ (c) $\frac{5}{2}$ (d) $\frac{5}{3}$

125. If $x = p + \frac{1}{p}$ and $y = p - \frac{1}{p}$, then value of $x^4 - 2x^2y^2 + y^4$ is **(SSC CHSL 2014)**

(a) 24 (b) 4 (c) 16 (d) 8

126. If $x = 3 + 2\sqrt{2}$, then $\frac{x^6 + x^4 + x^2 + 1}{x^3}$ is equal to **(SSC CHSL 2014)**

(a) 216 (b) 192 (c) 198 (d) 204

127. If $\frac{x}{xa + yb + zc} = \frac{y}{ya + zb + xc} = \frac{z}{xa + xb + yc}$ and $x + y + z \neq 0$, then each ratio is **(SSC CHSL 2014)**

(a) $\frac{1}{a - b - c}$ (b) $\frac{1}{a + b - c}$ (c) $\frac{1}{a - b + c}$ (d) $\frac{1}{a + b + c}$

128. The mean of x and $\frac{1}{x}$ is M. Then the mean of x^2 and $\frac{1}{x^2}$ is. **(SSC Sub. Ins. 2015)**

(a) M^2 (b) M^2-2
(c) $4M^2-2$ (d) $2M^2-1$

129. If $3^{2x-y} = 3^{x+y} = \sqrt{27}$, then the value of 3^{x-y} will be : **(SSC Sub. Ins. 2015)**

(a) $\frac{1}{\sqrt{3}}$ (b) $\frac{1}{\sqrt{27}}$ (c) $\sqrt{3}$ (d) 3

130. If $999x + 888y = 1332$
$888x + 999y = 555$
then the value of x+y is: **(SSC Sub. Ins. 2015)**

(a) 888 (b) 1 (c) 999 (d) 555

131. The term that should be added to $(4x^2 + 8x)$ so that resulting expression be a perfect square is: **(SSC Sub. Ins. 2015)**

(a) 4 (b) 1 (c) 2x (d) 2

132. If $x + \frac{1}{x} = 2$, then the value of $x^7 + \frac{1}{x^5}$ is: **(SSC Sub. Ins. 2015)**

(a) 2^5 (b) 2^{12} (c) 2 (d) 2^7

133. If p = –0.12, q = –0.01 & r = –0.015, then the correct relationship among the three is : **(SSC CHSL 2015)**

(a) $q > p > r$ (b) $p > q > r$
(c) $p > r > q$ (d) $p < r < q$

134. If $a = \frac{\sqrt{3} - \sqrt{2}}{\sqrt{3} + \sqrt{2}}$ and $b = \frac{\sqrt{3} + \sqrt{2}}{\sqrt{3} - \sqrt{2}}$, then the value of $\frac{a^2}{b} + \frac{b^2}{a}$ is : **(SSC CHSL 2015)**

(a) 970 (b) 930 (c) 1030 (d) 1025

135. If for non–zero x, $x^2 - 4x - 1 = 0$ the value of $x^2 - \frac{1}{x^2}$ is : **(SSC CHSL 2015)**

(a) 10 (b) 4 (c) 12 (d) 18

136. A number of boys raised ` 12,544 for a famine fund, each boy has given as many rupees as there were boys. The number of boys was: **(SSC CHSL 2015)**

(a) 122 (b) 132 (c) 112 (d) 102

137. Two positive whole numbers are such that the sum of the first and twice the second number is 8 and their difference is 2. The numbers are : **(SSC CHSL 2015)**

(a) 7, 5 (b) 6, 4
(c) 3, 5 (d) 4, 2

138. If $(2a - 1)^2 + (4b - 3)^2 + (4c + 5)^2 = 0$ then the value of $\frac{a^3 + b^3 + c^3 - 3abc}{a^2 + b^2 + c^2}$ is: **(SSC CHSL 2015)**

(a) $1\frac{3}{8}$ (b) $3\frac{3}{8}$ (c) $2\frac{3}{8}$ (d) 0

139. If $a+\frac{1}{b}=1$ and $b+\frac{1}{c}=1$ then $c+\frac{1}{a}$ is equal to **(SSC CHSL 2015)**
(a) 0 (b) 1 (c) 2 (d) $\frac{1}{2}$

140. The length of the portion of the straight line $3x + 4y = 12$ intercepted between the axes is **(SSC CGL 1st Sit. 2015)**
(a) 3 (b) 4 (c) 7 (d) 5

141. If $m = -4, n = -2$, then the value of $m^3 - 3m^2 + 3m + 3n + 3n^2 + n^3$ is **(SSC CGL 1st Sit. 2015)**
(a) 124 (b) –124 (c) 126 (d) –126

142. $2x - ky + 7 = 0$ and $6x - 12y + 15 = 0$ has no solution for **(SSC CGL 1st Sit. 2015)**
(a) $k = -4$ (b) $k = 4$ (c) $k = 1$ (d) $k = -1$

143. If $\frac{m-a^2}{b^2+c^2}+\frac{m-b^2}{c^2+a^2}+\frac{m-c^2}{a^2+b^2}=3$, then the value of m is **(SSC CGL 1st Sit. 2015)**
(a) $a^2 + b^2$ (b) $a^2 + b^2 + c^2$
(c) $a^2 - b^2 - c^2$ (d) $a^2 + b^2 - c^2$

144. If $x = 332, y = 333, z = 335$, then the value of $x^3 + y^3 + z^3 - 3xyz$ is **(SSC CGL 1st Sit. 2015)**
(a) 7000 (b) 8000 (c) 9000 (d) 10000

145. If $2+x\sqrt{3}=\frac{1}{2+\sqrt{3}}$, then the simplest value of x is **(SSC CGL 1st Sit. 2015)**
(a) 1 (b) –2 (c) 2 (d) –1

146. The area of the triangle formed by the graphs of the equations $x = 0, 2x + 3y = 6$ and $x + y = 3$ is **(SSC CGL 1st Sit. 2015)**
(a) 3 sq. unit (b) $1\frac{1}{2}$ sq. unit
(c) 1 sq. unit (d) $4\frac{1}{2}$ sq. unit

147. Among the equations
$x + 2y + 9 = 0; 5x - 4 = 0; 2y - 13 = 0; 2x - 3y = 0$, the equation of the straight line passing through origin is : **(SSC CGL 1st Sit. 2015)**
(a) $2x - 3y = 0$ (b) $5x - 4 = 0$
(c) $x + 2y + 9 = 0$ (d) $2y - 13 = 0$

148. The HCF of $x^8 - 1$ and $x^4 + 2x^3 - 2x - 1$ is: **(SSC CGL 1st Sit. 2015)**
(a) $x^2 + 1$ (b) $x + 1$ (c) $x^2 - 1$ (d) $x - 1$

149. If $x=\frac{x^{24}+1}{x^{12}}=7$ then the value of $\frac{x^{72}+1}{x^{36}}$ **(SSC CGL 1st Sit. 2015)**
(a) 432 (b) 433 (c) 343 (d) 322

150. If $5x + 9y = 5$ and $125x^3 + 729y^3 = 120$ then the value of the product of x and y is **(SSC CGL 1st Sit. 2015)**
(a) 135 (b) $\frac{1}{135}$ (c) $\frac{1}{9}$ (d) 45

151. If $p = 99$ then the value of $p(p^2 + 3p + 3)$ **(SSC CGL 1st Sit. 2015)**
(a) 999999 (b) 988899 (c) 989898 (d) 998889

152. If $x = 2$ then the value of $x^3 + 27x^2 + 243x + 631$ **(SSC CGL 1st Sit. 2015)**
(a) 1233 (b) 1231 (c) 1321 (d) 1211

153. If $C+\frac{1}{C}=3$, then the value of $(C-3)^7+\frac{1}{C^7}$ is **(SSC CGL 1st Sit. 2016)**
(a) 2 (b) 0 (c) 3 (d) 1

154. If $2x+\frac{1}{4x}=1$, then the value of $x^2+\frac{1}{64x^2}$ is **(SSC CGL 1st Sit. 2016)**
(a) 0 (b) 1 (c) 1/4 (d) 2

155. If $\sqrt{x}-\sqrt{y}=1$, $\sqrt{x}+\sqrt{y}=17$ then $\sqrt{xy}=?$ **(SSC CGL 1st Sit. 2016)**
(a) $\sqrt{72}$ (b) 72 (c) 32 (d) 24

156. If $x=\sqrt{3}+\frac{1}{\sqrt{3}}$, then the value of $\left(x-\frac{\sqrt{126}}{\sqrt{42}}\right)\left(x-\frac{1}{x-\frac{2\sqrt{3}}{3}}\right)$ is **(SSC CGL 1st Sit. 2016)**
(a) $5\frac{\sqrt{3}}{6}$ (b) $\frac{2\sqrt{3}}{3}$ (c) 5/6 (d) 2/3

157. If $a^3 - b^3 = 56$ and $a - b = 2$ then what is the value of $a^2 + b^2$? **(SSC CGL 1st Sit. 2016)**
(a) 12 (b) 20 (c) 28 (d) 32

158. If $x^2 - 3x + 1 = 0$, $(x \neq 0)$, then the value of $x+\frac{1}{x}$ is **(SSC CGL 1st Sit. 2016)**
(a) 1 (b) 0 (c) 3 (d) 2

159. The length of the base of an isosceles triangle is $2x - 2y + 4z$, and its perimeter is $4x - 2y + 6z$. Then the length of each of the equal sides is **(SSC CGL 1st Sit. 2016)**
(a) $x + y$ (b) $x + y + z$
(c) $2(x + y)$ (d) $x + z$

160. If $\frac{2+a}{a}+\frac{2+b}{b}+\frac{2+c}{c}=4$, then the value of $\frac{ab+bc+ca}{abc}$ is **(SSC CGL 1st Sit. 2016)**
(a) 2 (b) 1
(c) 0 (d) $\frac{1}{2}$

161. If $x + y + z = 1$, $\frac{1}{x}+\frac{1}{y}+\frac{1}{z}=1$ and $xyz = -1$, then $x^3 + y^3 + z^3$ is equal to **(SSC CGL 1st Sit. 2016)**
(a) –1 (b) 1 (c) –2 (d) 2

162. If $(x-2)(x-p) = x^2 - ax + b$, then the value of $(a-p)$ is **(SSC CGL 1st Sit. 2016)**

(a) 0 (b) 1 (c) 2 (d) 3

163. When $2x + \frac{2}{x} = 3$, then value of $x^3 + \frac{1}{x^3} + 2$ is **(SSC CGL 1st Sit. 2016)**

(a) 2/7 (b) 7/8 (c) 7/2 (d) 8/7

164. If $x = \sqrt{a} + \frac{1}{\sqrt{a}}$, $y = \sqrt{a} - \frac{1}{\sqrt{a}}$, $(a > 0)$, then the value of $x^4 + y^4 - 2x^2y^2$ is **(SSC CGL 1st Sit. 2016)**

(a) 16 (b) 20 (c) 10 (d) 5

165. If $x = \sqrt[3]{x^2+11} - 2$, then the value of $x^3 + 5x^2 + 12x$ is **(SSC CGL 1st Sit. 2016)**

(a) 0 (b) 3 (c) 7 (d) 11

166. If $4x + \frac{1}{x} = 5$, $x \neq 0$, then the value of $\frac{5x}{4x^2 + 10x + 1}$ is **(SSC CGL 1st Sit. 2016)**

(a) 1/2 (b) 1/3 (c) 2/3 (d) 3

167. If $C + \frac{1}{C} = \sqrt{3}$, then the value of $C^3 + \frac{1}{C^3}$ is equal to **(SSC CGL 1st Sit. 2016)**

(a) 0 (b) $3\sqrt{3}$ (c) $1/\sqrt{3}$ (d) $6\sqrt{3}$

168. If $x = 222$, $y = 223$, $z = 225$ then the value of $x^3 + y^3 + z^3 - 3xyz$ is **(SSC CGL 1st Sit. 2016)**

(a) 4590 (b) 4690 (c) 4950 (d) 4960

169. If $x = 3^{1/3} - 3^{-1/3}$ then $3x^3 + 9x$ is equal to **(SSC CGL 1st Sit. 2016)**

(a) 5 (b) 6 (c) 7 (d) 8

170. If, $x + 1 = \sqrt{y} + 3, y > 0$, then the value of

$\frac{1}{2}\left(\frac{x^3 - 6x^2 - 12x - 8}{\sqrt{y}} - y\right)$ is **(SSC Sub. Inspector 2016)**

(a) -1 (b) 1 (c) 0 (d) $\frac{1}{2}$

171. If p, q, r are all real numbers, then $(p-q)^3 + (q-r)^3 + (r-p)^3$ is equal to **(SSC Sub. Inspector 2016)**

(a) 0 (b) $3(p-q)(q-r)(r-p)$

(c) $(p-q)(q-r)(r-p)$ (d) 1

172. If $\frac{a}{b} = \frac{c}{d} = \frac{e}{f}$, then each of them is equal to **(SSC Sub. Inspector 2016)**

(a) $\frac{a+3c-5e}{b+3d-5f}$ (b) $\frac{a-c-e}{b+d-5f}$

(c) $\frac{a-3c-5e}{b-d-f}$ (d) $\frac{3a-3c-5e}{b-3d-f}$

173. If $3^{x+y} = 81$ and $81^{x+y} = 3$, then the value of $\frac{x}{y}$ is **(SSC Sub. Inspector 2016)**

(a) $\frac{15}{34}$ (b) $\frac{15}{17}$ (c) $\frac{17}{15}$ (d) $\frac{17}{30}$

174. If $x = 1 + \sqrt{2} + \sqrt{3}$ and $y = 1 + \sqrt{2} - \sqrt{3}$, then the value of $\frac{x^2 + 4xy - y^2}{x - y}$ is **(SSC Sub. Inspector 2016)**

(a) 1 (b) $2\sqrt{2}$

(c) 6 (d) $2(1+\sqrt{2})$

175. If $x + \frac{1}{x} = 3$ where $x \neq 0$, then the value of $\frac{x^4 - 3x^3 - 5x^2 - 3x - 1}{x^4 - 1}$ is **(SSC Sub. Inspector 2016)**

(a) 5 (b) 7 (c) 2 (d) 3

176. If $x = \frac{2+\sqrt{3}}{2-\sqrt{3}}$, then what is the value of $x + \frac{1}{x}$? **(SSC CGL 2017)**

(a) 14 (b) $8\sqrt{3}$ (c) 0 (d) 18

177. If $x = 2 + \sqrt{3}$, then what is the value of $\sqrt{2x} + \frac{1}{\sqrt{2x}}$? **(SSC CGL 2017)**

(a) $2\sqrt{3}$ (b) $3\sqrt{3}$

(c) $(3\sqrt{3}+1)/2$ (d) $2\sqrt{3}+1$

178. If $x + \frac{1}{x} = 4$, then what is the value of $x^6 + \frac{1}{x^6}$? **(SSC CGL 2017)**

(a) 52 (b) 256

(c) 1026 (d) 2702

179. If $y = \frac{2-x-x}{1+1+x}$, then what is the value of $\frac{1}{y+1} + \frac{2y+1}{y^2-1}$? **(SSC CGL 2017)**

(a) $\frac{(1+x)(2-x)}{2x-1}$ (b) $\frac{(1-x)(2+x)}{x-1}$

(c) $\frac{(1+x)(2-x)}{1-2x}$ (d) $\frac{(1+x)(1-2x)}{2-x}$

180. If $x + (1/x) = 2$, then what is the value of $x^{64} + x^{121}$? **(SSC CGL 2017)**

(a) 0 (b) 1 (c) 2 (d) -2

181. If $x = 6 + 2\sqrt{6}$, then what is the value of $\sqrt{x-1} + \frac{1}{\sqrt{x-1}}$? **(SSC CGL 2017)**

(a) $2\sqrt{3}$ (b) $3\sqrt{2}$ (c) $2\sqrt{2}$ (d) $3\sqrt{3}$

182. If a + b + c = 27, then what is the value of $(a-7)^3+(b-9)^3+(c-11)^3-3(a-7)(b-9)(c-11)$?
(SSC CGL 2017)

(a) 0 (b) 9 (c) 27 (d) 81

183. If $x=\frac{2\sqrt{15}}{\sqrt{3}+\sqrt{5}}$, then what is the value of $\frac{x+\sqrt{5}}{x-\sqrt{5}}+\frac{x+\sqrt{3}}{x-\sqrt{3}}$?
(SSC CGL 2017)

(a) $\sqrt{5}$ (b) $\sqrt{3}$ (c) $\sqrt{15}$ (d) 2

184. If (x – 2) and (x + 3) are the factors of the equation $x^2+k_1x+k_2=0$, then what are the values of k_1 and k_2?
(SSC CGL 2017)

(a) $k_1=6, k_2=-1$ (b) $k_1=1, k_2=-6$
(c) $K_1=1, k_2=6$ (d) $k_1=-6, k_2=1$

185. If (x – y) = 7, then what is the value of $(x-15)^3-(y-8)^3$?
(SSC CGL 2017)

(a) 0 (b) 343 (c) 392 (d) 2863

186. If $x-y-\sqrt{18}=-1$ and $x+y-3\sqrt{2}=1$, then what is the value of $12xy(x^2-y^2)$? **(SSC CGL 2017)**

(a) 0 (b) 1 (c) $512\sqrt{2}$ (d) $612\sqrt{2}$

187. If p/q = r/s = t/u = $\sqrt{5}$, then what is the value of $[(3p^2+4r^2+5t^2)/(3q^2+4s^2+5u^2)]$? **(SSC CGL 2017)**

(a) 1/5 (b) 5 (c) 25 (d) 60

188. What is the value of $\frac{1+x}{1-x^4}\div\frac{x^2}{1+x^2}\times x(1-x)$?
(SSC CGL 2017)

(a) 1/x (b) x^2-1 (c) x+1 (d) x

189. If $x+\frac{1}{x}=17$, then what is the value of $\frac{x^4+\frac{1}{x^2}}{x^2-3x+1}$?
(SSC CGL 2017)

(a) 2431/7 (b) 3375/7
(c) 3375 / 14 (d) 3985 / 9

190. What is the value of x in the equation

$\sqrt{\frac{1+x}{x}}-\sqrt{\frac{x}{1+x}}=\frac{1}{\sqrt{6}}$? **(SSC CGL 2017)**

(a) –2 (b) 3
(c) 2 (d) none of these

191. If $2\left[x^2+\frac{1}{x^2}\right]-2\left[x-\frac{1}{x}\right]-8=0$, then what two values of $x-\frac{1}{x}$? **(SSC CGL 2017)**

(a) – 1 or 2 (b) 1 or – 2 (c) – 1 or – 2 (d) 1 or 2

192. If 3x – 8(2 – x) = –19, then the value of x is
(SSC CHSL 2017)

(a) –3/11 (b) –33/11 (c) –3/5 (d) –33/5

193. If x – y = 6 and xy = 40, then find x^2+y^2?
(SSC CHSL 2017)

(a) 116 (b) 80 (c) 89 (d) 146

194. The line passing through (–2, 5) and (6, b) is perpendicular to the line 20x + 5y = 3. Find b? **(SSC CHSL 2017)**

(a) –7 (b) 4 (c) 7 (d) –4

195. If 'a' and 'b' are positive integers such that $a^2-b^2=19$, then the value of 'a' is : **(SSC MTS 2017)**

(a) 20 (b) 19 (c) 10 (d) 9

196. If $(p^2+q^2)/(r^2+s^2)=(pq)/(rs)$, then what is the value of (p – q) (p + q) in terms of r and s? **(SSC Sub. Ins. 2017)**

(a) (r + s) / (r – s) (b) (r – s) / (r + s)
(c) (r + s)/ (rs) (d) (rs) / (r – s)

197. If the expression (px^3-8x^2-qx+1) is completely divisible by the expression $(3x^2-4x+1)$, then what will be the value of p and q respectively? **(SSC Sub. Ins. 2017)**

(a) (21/4,15/8) (b) (6, 1)
(c) (33/4, 5/4) (d) (1, 6)

198. If a = 2017, b = 2016 and c = 2015, then what is the value of $a^2+b^2+c^2-ab-bc-ca$? **(SSC Sub. Ins. 2017)**

(a) –2 (b) 0 (c) 3 (c) 4

199. If $x^2-3x+1=0$, then what is the value of $x^3+\frac{1}{x^3}$?
(SSC Sub. Ins. 2017)

(a) 3 (b) 7 (c) 11 (d) 18

200. If $\frac{6x-1}{x}+\frac{7y-1}{y}+\frac{8z-1}{z}=0$, then what is the value of $\frac{1}{x}+\frac{1}{y}+\frac{1}{z}$? **(SSC Sub. Ins. 2017)**

(a) 1 (b) 3 (c) 0 (d) 21

201. If $x-\frac{1}{x}=6$, then $x^3-\frac{1}{x^3}$ is equal to:
(SSC Sub. Ins. 2018)

(a) 234 (b) 198 (c) 176 (d) 216

202. If $a^3+b^3=5824$ and $a+b=28$, then $(a-b)^2+ab$ is equal to:
(SSC Sub. Ins. 2018)

(a) 208 (b) 180 (c) 236 (d) 152

203. If $(2x+3)^3+(x-8)^3+(x+13)^3=(2x+3)(3x-24)(x+13)$, then what is the value of x? **(SSC Sub. Ins. 2018)**

(a) –2 (b) –2.5
(c) –1 (d) –1.5

204. If $a^2+b^2=169$, $ab=60$, $(a>b)$, then (a^2-b^2) is equal to :
(SSC CHSL 2018)

(a) 149 (b) 129 (c) 119 (d) 139

205. If $x+\frac{1}{x}=3$, then $x^3+\frac{1}{x^3}$ is equal to: **(SSC CGL 2018)**

(a) 27 (b) 36 (c) 24 (d) 18

206. If $a+b+c=13$ and $ab+bc+ca=54$, then $a^3+b^3+c^3-3abc$ is equal to: **(SSC CGL 2018)**

(a) 793 (b) 273 (c) 91 (d) 182

207. If $a:b=3:2$, then $(5a+2b):(3a+4b)$ is equal to: **(SSC CGL 2018)**

(a) 16:15 (b) 8:7 (c) 19:17 (d) 17:14

208. If $\sqrt{x}-\frac{1}{\sqrt{x}}=4$, then $x^2+\frac{1}{x^2}$ is equal to: **(SSC CGL 2018)**

(a) 192 (b) 326 (c) 322 (d) 256

209. If $\sqrt{x}+\frac{1}{\sqrt{x}}=\sqrt{6}$, then $x^2+\frac{1}{x^2}$ is equal to: **(SSC CGL 2018)**

(a) 18 (b) 14 (c) 16 (d) 12

210. If $a+b+c=10$ and $ab+bc+ca=32$ then $a^3+b^3+c^3-3abc$ is equal to: **(SSC CGL 2018)**

(a) 50 (b) 40 (c) 60 (d) 70

211. If $a-b=5$ and $ab=6$, then (a^3-b^3) is equal to: **(SSC CGL 2018)**

(a) 225 (b) 155 (c) 90 (d) 215

212. If $(5a-3b):(4a-2b)=2:3$, then $a:b$ is equal to: **(SSC CGL 2018)**

(a) 3:4 (b) 2:3 (c) 5:8 (d) 5:7

213. If $x^{2a}=y^{2b}=z^{2c}\neq 0$ and $x^2=yz$, then the value of $\frac{ab+bc+ca}{bc}$ is : **(SSC CGL 2019-20)**

(a) $3ac$ (b) 3 (c) $3ab$ (d) $3bc$

214. Out of 6 numbers, the sum of the first 5 numbers is 7 times the 6th number. If their average is 136, then the 6th number is : **(SSC CGL 2019-20)**

(a) 102 (b) 84 (c) 96 (d) 116

215. If x, y, z are three integers such that $x+y=8, y+z=13$ and $z+x=17$, then the value of $\frac{x^2}{yz}$ is : **(SSC CGL 2019-20)**

(a) $\frac{7}{5}$ (b) 1 (c) 0 (d) $\frac{18}{11}$

216. If $a-b=4$ and $a^3-b^3=88$, then find the value of a^2-b^2. **(SSC CHSL 2019-20)**

(a) $7\sqrt{6}$ (b) $9\sqrt{6}$ (c) $6\sqrt{6}$ (d) $8\sqrt{6}$

217. If $x+y+z=10, x^3+y^3+z^3=75$ and $xyz=15$, then find the value of $x^2+y^2+z^2-xy-yz-zx$ **(SSC CHSL 2019-20)**

(a) 3 (b) 5 (c) 6 (d) 4

218. Find the value of $2.1+2.25\div[63-\{75\times 8+(13-2.5\times 5)\}]$. **(SSC CHSL 2019-20)**

(a) 3.0 (b) 2.9 (c) 3.1 (d) 2.8

219. If $a+b=11$ and $ab=15$, then a^2+b^2 is equal to: **(SSC CHSL 2019-20)**

(a) 91 (b) 92 (c) 93 (d) 90

220. If $x-\frac{1}{x}=1$, then what is the value of $x^8+\frac{1}{x^8}$? **(SSC CGL 2020-21)**

(a) 119 (b) −1 (c) 3 (d) 47

221. If $x^4+\frac{1}{x^4}=727, x>1$, then what is the value of $\left(x-\frac{1}{x}\right)$? **(SSC CGL 2020-21)**

(a) 6 (b) 5 (c) −5 (d) −6

222. If $2x^2-8x-1=0$, then what is the value of $8x^3-\frac{1}{x^3}$? **(SSC CGL 2020-21)**

(a) 560 (b) 524 (c) 464 (d) 540

223. If $x+\frac{1}{x}=\sqrt{13}$, then one of the values of $x^3-\frac{1}{x^3}$ is: **(SSC CHSL 2020-21)**

(a) $4\sqrt{11}$ (b) $4\sqrt{13}$ (c) 32 (d) 36

224. If $x^2+\left(4-\sqrt{3}\right)x-1=0$, then what is the value of $x^2+\frac{1}{x^2}$? **(SSC CHSL 2020-21)**

(a) $21-8\sqrt{3}$ (b) $17-8\sqrt{3}$

(c) $9-8\sqrt{3}$ (d) $21-12\sqrt{3}$

225. If $x^2+\frac{1}{x^2}=83, x>0$, then the value of $x^3-\frac{1}{x^3}$ is: **(SSC CHSL 2020-21)**

(a) 576 (b) 756 (c) 746 (d) 675

226. If $x:y:z=1:2:3$, what is the value of $\left(\frac{x^2+2y^2+z^2}{3x^2-2y^2+4z^2}\right)$? **(SSC MTS 2020-21)**

(a) $\frac{16}{31}$ (b) $\frac{15}{31}$ (c) $\frac{19}{31}$ (d) $\frac{18}{31}$

227. If $a^2+b^2+c^2+216=12(a+b-2c)$, then $\sqrt{ab-bc+ca}$ is: **(SSC Sub-Inspector 2020-21)**

(a) 8 (b) 3 (c) 6 (d) 4

228. If $x^4+x^{-4}=194, x>0$, then the value of $x+\frac{1}{x}$ is: **(SSC Sub-Inspector 2020-21)**

(a) 14 (b) 6 (c) 4 (d) 8

229. If $\left(5\sqrt{5}x^3-3\sqrt{3}y^3\right)\div\left(\sqrt{5}x-\sqrt{3}y\right)=(Ax^2+By^2+Cxy)$, then the value of $\left(3A+B-\sqrt{15}C\right)$ is : **(SSC Sub-Inspector 2020-21)**

(a) 8 (b) 5 (c) 3 (d) 12

1. (c) $\left(\frac{3}{5}\right)^3\left(\frac{3}{5}\right)^{-6}=\left(\frac{3}{5}\right)^{2x-1}$

$\Rightarrow\left(\frac{3}{5}\right)^3\left(\frac{3}{5}\right)^{-3}\left(\frac{3}{5}\right)^{-3}=\left(\frac{3}{5}\right)^{2x-1}$

$\Rightarrow\left(\frac{3}{5}\right)^0\left(\frac{3}{5}\right)^{-3}=\left(\frac{3}{5}\right)^{2x-1}$

$\Rightarrow 2x-1=-3$

$\Rightarrow 2x=-3+1=-2$

$\Rightarrow x=-1$

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

$\therefore$ Required number $=(3+1)(3-1)=8$

3. (a) $\frac{a^2+b^2+ab}{a^3-b^3}$

$=\frac{a^2+b^2+ab}{(a-b)(a^2+b^2+ab)}=\frac{1}{a-b}=\frac{1}{11-9}=\frac{1}{2}$

4. (d) $a^2-b^2=19$

$\Rightarrow 10^2-9^2=19$

$\Rightarrow a=10$

5. (a) Let the numbers be 3x and 5x.

$\therefore 3x\times 5x=2160$

$\Rightarrow x^2=\frac{2160}{3\times 5}=144=12\times 12$

$\Rightarrow x=12$

$\therefore$ Smaller number $=3x=3\times 12=36$

6. (b) Tricky apporoach

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

By componendo and dividendo,

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

Squaring both sides,

$\frac{3+x}{3-x}=9$

$\Rightarrow 3+x=27-9x$

$\Rightarrow 9x+x=27-3=24$

$\Rightarrow x=\frac{24}{10}=\frac{12}{5}$

7. (b) If the number of correct answers be x, then

$x\times 4-1.(200-x)=200$

$\Rightarrow 4x-200+x=200$

$\Rightarrow 5x=400$

$\Rightarrow x=\frac{400}{5}=80$

8. (b) $2p+\frac{1}{p}=4$

$\Rightarrow p+\frac{1}{2p}=2$

$\therefore\left(p+\frac{1}{2p}\right)^3=2^3$

$2^3=p^3+\frac{1}{8p^3}+3.p.\frac{1}{2p}\left(p+\frac{1}{2p}\right)$

$\Rightarrow 8=p^3+\frac{1}{8p^3}+\frac{3}{2}\times 2$

$\Rightarrow p^3+\frac{1}{8p^3}=8-3=5$

9. (c)

```
 5 P 9
 3 2 7
 2 q 8
-------
1 1 1 4
```

If p = 0, then q's maximum value = 7

10. (b) Let the number of correct answers be x.

$\therefore x+4-(75-x)\times 1=125$

$\Rightarrow 4x-75+x=125$

$\Rightarrow 5x=125+75=200$

$\therefore x=\frac{200}{5}=40$

11. (b) $1.5x=0.04y=\frac{x}{y}=\frac{0.04}{1.5}=\frac{4}{150}=\frac{2}{75}$

$\Rightarrow\frac{y}{x}=\frac{75}{2}$

Now, $\frac{y^2-x^2}{y^2+2xy+x^2}$

$=\frac{(y-x)(y+x)}{(y+x)^2}=\frac{y-x}{y+x}=\frac{\frac{y}{x}-1}{\frac{y}{x}+1}=\frac{\frac{75}{2}-1}{\frac{75}{2}+1}=\frac{73}{77}$

12. (b) $\sqrt{0.03\times 0.3\times a}=0.3\times 0.3\sqrt{b}$

On squaring,

$0.03\times 0.3\times a=0.09\times 0.09\times b$

$\Rightarrow\frac{a}{b}=\frac{0.09\times 0.09}{0.03\times 0.3}=0.9$

13. (b) $\sqrt{1+\frac{x}{9}}=\frac{13}{3}$

Squaring on both sides,

$1+\frac{x}{9}=\frac{169}{9}$

$\Rightarrow \frac{x}{9}=\frac{169}{9}-1=\frac{160}{9}\Rightarrow x=160$

14. (c) Let the two numbers be x and y.

$\therefore x+y=24$

and, $xy=143$

$\therefore x^2+y^2=(x+y)^2-2xy$

$=(24)^2-2\times 143=576-286=290$

15. (d) $x=(0.08)^2$

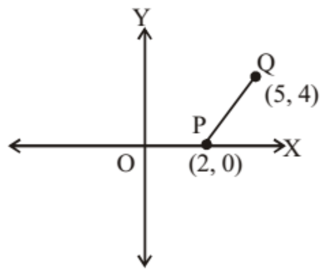
$y=\frac{1}{(0.08)^2}=\frac{10000}{64}=156.25$

$Z=(1-0.08)^2-1$

$=1+(0.08)^2-2\times 0.08-1=(0.08)^2-2\times 0.08$

Clearly, $z<x<y$

16. (d)



$PQ=\sqrt{(5-2)^2+(4-0)^2}$

$=\sqrt{9+16}=5$

$\therefore$ Area of circle $=\pi r^2$

$=25\pi$ sq. units

17. (d) $x^4+\frac{1}{x^4}=23$

$\Rightarrow\left(x^2+\frac{1}{x^2}\right)^2-2=23$

$\Rightarrow\left(x^2+\frac{1}{x^2}\right)^2=23+2=25$

$\therefore x^2+\frac{1}{x^2}=5$

$\therefore\left(x-\frac{1}{x}\right)^2=x^2+\frac{1}{x^2}-2=5-2=3$

18. (a) $x+\frac{1}{x}=3$

On squaring,

$\left(x+\frac{1}{x}\right)^2=9$

$\Rightarrow x^2+\frac{1}{x^2}=9-2=7$

Again, $\left(x+\frac{1}{x}\right)^3=27$

$\Rightarrow x^3+\frac{1}{x^3}+3\left(x+\frac{1}{x}\right)=27$

$\Rightarrow x^3+\frac{1}{x^3}=27-3\times 3=18$

$\therefore\left(x^2+\frac{1}{x^2}\right)\left(x^3+\frac{1}{x^3}\right)$

$=7\times 18$

$\Rightarrow x^5+\frac{1}{x^5}+\left(x+\frac{1}{x}\right)=126$

$\Rightarrow x^5+\frac{1}{x^5}=126-3=123$

19. (b) If $a+b+c=0$

then $a^3+b^3+c^3-3abc=0$

Now,

$a+b+1=0$

$\therefore a^3+b^3+1-3ab=0$

20. (b) Points (a, b) and [(a + 3), (b + k)] will satisfy the equation $x-3y+7=0$.

$\therefore a-3b+7=0$ ......(i)

and $a+3-3(b+k)+7=0$

$\Rightarrow a+3-3b-3k+7=0$

$\Rightarrow a-3b+7+3-3k=0$

$\Rightarrow 3-3k=0\Rightarrow 3k=3$

$\Rightarrow k=\frac{3}{3}=1\quad[\because a-3b+7=0]$

21. (a) $\frac{a^3+b^3+c^3-3abc}{a+b+c}$

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

$=\frac{1}{2}(a+b+c)\left[(a-b)^2+(b-c)^2+(c-a)^2\right]$

$\therefore\frac{a^3+b^3+c^3-3abc}{a+b+c}$

$=\frac{1}{2}\left[(a-b)^2+(b-c)^2+(c-a)^2\right]$

$=\frac{1}{2}(9+25+1)=\frac{35}{2}=17.5$

22. (c) $\frac{5x^2-3y^2}{xy}=\frac{11}{2}$

$10x^2-6y^2=11xy$

$10x^2-11xy-6y^2=0$

$10x^2-15xy+4xy-6y^2=0$

$5x(2x-3y)+2y(2x-3y)=0$

$(5x+2y)(2x-3y)$

$5x\neq 2y,\ 2x=3y$

$\frac{x}{y}=\frac{3}{2}$

23. (b) $a = \frac{\sqrt{3}-\sqrt{2}}{\sqrt{3}+\sqrt{2}} = \frac{\sqrt{3}-\sqrt{2}}{\sqrt{3}+\sqrt{2}} \times \frac{\sqrt{3}-\sqrt{2}}{\sqrt{3}-\sqrt{2}}$

$= \frac{(\sqrt{3}-\sqrt{2})^2}{3-2} = 3+2-2\sqrt{6} = 5-2\sqrt{6}$

$\therefore b = \frac{\sqrt{3}+\sqrt{2}}{\sqrt{3}-\sqrt{2}} = 5+2\sqrt{6}$

$\Rightarrow a+b=10;$

$ab = (5-2\sqrt{6})(5+2\sqrt{6}) = 25-24 = 1$

$\therefore \frac{a^2}{b}+\frac{b^2}{a} = \frac{a^3+b^3}{ab}$

$= \frac{(a+b)^3-3ab(a+b)}{ab}$

$= 10^3 - 3\times 10 = 1000-30 = 970$

24. (a) $ax+by=6$ ...(i)

$bx-ay=2$ ...(ii)

On squaring and adding,

$a^2x^2+b^2y^2+2abxy+b^2x^2+a^2y^2-2abxy$

$=36+4$

$\Rightarrow x^2(a^2+b^2)+y^2(a^2+b^2)=40$

$\Rightarrow (a^2+b^2)(x^2+y^2)=40$

$\Rightarrow (a^2+b^2)\times 4=40$

$\Rightarrow a^2+b^2=10$

25. (c) $a+\frac{1}{a}=1$

$a^2+1=a$

$a^2-a+1=0$

Multiplying both side by (a + 1)

$(a+1)(a^2-a+1)=0$

a^3+1

$a^3=-1$

26. (b) $x=2+\sqrt{3}$

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

$=\frac{2-\sqrt{3}}{4-3}=2-\sqrt{3}$

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

$\therefore \sqrt{x}+\frac{1}{\sqrt{x}}=\sqrt{6}$

27. (c) $(a-b)^3=a^3-b^3-3ab(a-b)$

$\Rightarrow 8=56-3ab(2)$

$\Rightarrow 6ab=56-8=48$

$\Rightarrow 2ab=16$ ...(i)

$\therefore a^2+b^2=(a-b)^2+2ab$

$=4+16=20$

28. (b) For $3x+4y=12$,

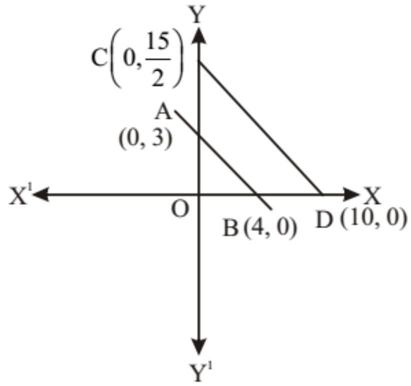
By putting $x=0, y=3$

By putting, $y=0, x=4$

For $6x+8y=60$,

By putting $x=0,\ y=\frac{15}{2}$

By putting $y=0, x=10$



$\therefore$ Area of Δ OCD

$=\frac{1}{2}\times OD\times OC=\frac{1}{2}\times 10\times\frac{15}{2}=\frac{75}{2}$

$\therefore$ Area of Δ OAB $=\frac{1}{2}\times OB\times OA=\frac{1}{2}\times 4\times 3=6$

$\therefore$ Area of trapezium $=\frac{75}{2}-6$

$=\frac{75-12}{2}=\frac{63}{2}=31.5$ sq. units

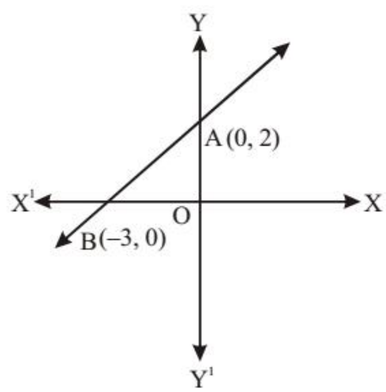
29. (c) Putting $x=0$ in

$2x-3y+6=0$

$\Rightarrow y=2$

Putting $y=0$ in $2x+3y+6=0$

$\Rightarrow x=-3$



Area of Δ OAB

$=\frac{1}{2}\times OB\times OA=\frac{1}{2}\times 3\times 2=3$ sq. units.

30. (a) $a+\frac{1}{a+2}=0$

$\Rightarrow a+2+\frac{1}{a+2}=2$

On cubing,

$\left[(a+2)+\frac{1}{a+2}\right]^3=8$

$\Rightarrow (a+2)^3+\frac{1}{(a+2)^3}+3(a+2)$

$\times\frac{1}{(a+2)}\left(a+2+\frac{1}{a+2}\right)=8$

$\Rightarrow (a+2)^3+\frac{1}{(a+2)^3}+3\times 2=8$

$\Rightarrow (a+2)^3+\frac{1}{(a+2)^3}=8-6=2$

31. (d) $a^2+\frac{1}{a^2}=98$

$\Rightarrow \left(a+\frac{1}{a}\right)^2-2=98$

$\Rightarrow \left(a+\frac{1}{a}\right)^2=100$

$\Rightarrow a+\frac{1}{a}=10$

On cubing both sides, $\left(a+\frac{1}{a}\right)^3=1000$

$\Rightarrow a^3+\frac{1}{a^3}+3\left(a+\frac{1}{a}\right)=1000$

$\Rightarrow a^3+\frac{1}{a^3}=1000-30=970$

32. (a) $x-1=\sqrt{2}+\sqrt{3}$

On squaring,

$x^2-2x+1=2+3+2\sqrt{6}$

$\Rightarrow x^2-2x-4=2\sqrt{6}$

On squaring again,

$x^4+4x^2+16-4x^3-8x^2+16x=24$

$\Rightarrow x^4-4x^3-4x^2+16x-8=0$

$\Rightarrow 2x^4-8x^3-8x^2+32x-16=0$

$\Rightarrow 2x^4-8x^3-5x^2+26x-28-3x^2$

$+6x+12=0$

$\Rightarrow 2x^4-8x^3-5x^2+26x-28$

$=3x^2-6x-12$

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

$=3\times 2\sqrt{6}=6\sqrt{6}$

33. (c) $\sqrt{(x-0)^2+(0+5)^2}=13$

$\Rightarrow x^2+25=169$

$\Rightarrow x^2=169-25=144$

$\therefore x=\sqrt{144}=12$

34. (b) $4x=18y$

$\Rightarrow \frac{x}{y}=\frac{18}{4}=\frac{9}{2}$

$\therefore \left(\frac{18}{4}-1\right)=\frac{9}{2}-1=\frac{7}{2}$

35. (d) $x+\frac{1}{x}=5$

$\Rightarrow x^2-5x+1=0$

$\Rightarrow x^2-3x+1=2x$

$\therefore \frac{x^4+\frac{1}{x^2}}{x^2-3x+1}=\frac{1}{2}\left(\frac{x^4+\frac{1}{x^2}}{x}\right)=\frac{1}{2}\left(x^3+\frac{1}{x^3}\right)$

$=\frac{1}{2}\left[\left(x+\frac{1}{x}\right)^3-3\left(x+\frac{1}{x}\right)\right]=\frac{1}{2}(125-3\times 5)$

$=\frac{1}{2}\times 110=55$

36. (d) $x=2+\sqrt{3}, y=2-\sqrt{3}$

$x+y=4; xy=4-3=1$

$\therefore \frac{x^2+y^2}{x^3+y^3}=\frac{(x+y)^2-2xy}{(x+y)^3-3xy(x+y)}$

$=\frac{16-2}{64-3\times 4}=\frac{14}{52}=\frac{7}{26}$

37. (b) $a^2+b^2+c^2=2(a-b-c)-3$

$\Rightarrow a^2+b^2+c^2-2a+2b+2c+3=0$

$\Rightarrow a^2-2a+1+b^2+2b+1+c^2+2c+1=0$

$\Rightarrow (a-1)^2+(b+1)^2+(c+1)^2=0$

[If $x^2+y^2+z^2=0 \Rightarrow x=0; y=0; z=0$]

$\therefore a-1=0 \Rightarrow a=1$

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

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

$\therefore 2a-3b+4c=2+3-4=1$

38. (a) $2x-\frac{1}{2x}=6$

$\Rightarrow x-\frac{1}{4x}=3$ [on dividing by 2]

$\Rightarrow x^2+\frac{1}{16x^2}-2\times x\times\frac{1}{4x}=9$

[On Squaring]

$\Rightarrow x^2+\frac{1}{16x^2}=9+\frac{1}{2}=\frac{19}{2}$

39. (b) $5a+\frac{1}{3a}=5$

On multiplying by $\frac{3}{5}$,

$3a+\frac{1}{5a}=5\times\frac{3}{5}=3$

On squaring,

$9a^2+\frac{1}{25a^2}+2\times 3a\times\frac{1}{5a}=9$

$\Rightarrow 9a^2+\frac{1}{25a^2}$

$=9-\frac{6}{5}=\frac{45-6}{5}=\frac{39}{5}$

40. (a) $5x+7y=35$ ...(i)
$4x+3y=12$ ...(ii)
By equation (i) × 4 – (ii) × 5

$$\begin{array}{rcrcr} 20x & + & 28y & = & 140 \\ 20x & + & 15y & = & 60 \\ - & & - & & - \\ \hline & & 13y & = & 80 \end{array}$$

$\Rightarrow y=\frac{80}{13}$ = Height of triangle

Point of intersection on x-axis of equation
$5x+7y=35$
$\Rightarrow 5x+7\times 0=35$
$\Rightarrow 5x=35$
$\Rightarrow x=7$
$\therefore (7,0)$
Similarly, point of intersection of
$4x+3y=12=(3,0)$
$\therefore$ Base $=7-3=4$

$\therefore$ Area $=\frac{1}{2}\times 4\times\frac{80}{13}=\frac{160}{13}$ sq. unit

41. (d) $\frac{x+2a}{x-2a}+\frac{x+2b}{x-2b}$

Applying compodendo and Dividendo

$\Rightarrow \frac{x+2a+x-2a}{x+2a-x+2a}+\frac{x+2b+x-2b}{x+2b-x+2b}$

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

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

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

$=\frac{2}{2}(x^2+y^2+z^2-xy-yz-zx)$

$=\frac{1}{2}(2x^2+2y^2+2z^2-2xy-2yz-2zx)$

$=\frac{1}{2}(x^2+y^2-2xy+y^2+z^2-2yz+x^2+z^2-2zx)$

$=\frac{1}{2}[(x-y)^2+(y-z)^2+(z-x)^2]$

$=\frac{1}{2}[(997-998)^2+(998-999)^2+(999-997)^2]$

$=\frac{1}{2}[1^2+1^2+2^2]=\frac{1}{2}\times 6=3$

43. (c) $x=4$ ...(1)
$y=3$ ...(2)
$3x+4y=12$ ...(3)
Putting $x=0$ in 3rd equation we get $y=3$
Putting $y=0$ in 3rd equation we get $x=4$
The triangle will be formed by joining the points (3, 0) and (0, 4).
So, base = 3 and altitude = 4

Area $=\frac{1}{2}\times b\times h\Rightarrow\frac{1}{2}\times 3\times 4=6$

44. (d) We have $x^3+y^3+z^3-3xyz=(x+y+z)(x^2+y^2+z^2-xy-yz-zx)$
Here $x=a-4, y=b-3, z=c-1$
So, given expression is $(x+y+z)(x^2+y^2+z^2-xy-yz-zx)$
$=(a-4+b-3+c-1)(x^2+y^2+z^2-xy-yz-zx)$
$=(a+b+c-8)(x^2+y^2+z^2-xy-yz-zx)$
$=(8-8)(x^2+y^2+z^2-xy-yz-zx)$
$=0$

45. (a) $x^4+y^4-2x^2y^2$
$\Rightarrow (x^2-y^2)^2\Rightarrow[(x+y)(x-y)]^2$

$\Rightarrow\left[\left(\sqrt{a}+\frac{1}{\sqrt{a}}+\sqrt{a}-\frac{1}{\sqrt{a}}\right)\left(\sqrt{a}+\frac{1}{\sqrt{a}}-\sqrt{a}+\frac{1}{\sqrt{a}}\right)\right]^2$

$\Rightarrow\left(2\sqrt{a}\times\frac{2}{\sqrt{a}}\right)^2\Rightarrow 16$

46. (d) $5a+\frac{1}{3a}=5$

Multiply by $\frac{3}{5}$ on both sides

$\frac{3}{5}\left(5a+\frac{1}{3a}\right)=5\times\frac{3}{5}$

$3a+\frac{1}{5a}=3$

Squaring on both sides

$9a^2+\frac{1}{25a^2}+2\times 3a\times\frac{1}{5a}=9$

$\Rightarrow 9a^2+\frac{1}{25a^2}=9-\frac{6}{5}=\frac{39}{5}$

47. (b) $x = 3 + 2\sqrt{2}$

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

$\frac{1}{x} = \frac{3-2\sqrt{2}}{9-8} = 3-2\sqrt{2}$

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

$\left(\sqrt{x} - \frac{1}{\sqrt{x}}\right)^2 = 3+2\sqrt{2}+3-2\sqrt{2}-2 = 4$

$\left(\sqrt{x} - \frac{1}{\sqrt{x}}\right) = \sqrt{4} = \pm 2$

48. (b) If $a+b+c=0$
then $a^3+b^3+c^3 = 3abc$
Dividing both sides by abc

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

$\frac{a^2}{bc} + \frac{b^2}{ac} + \frac{c^2}{ab} = 3$

49. (c)

50. (c) $\frac{5x-3}{x} + \frac{5y-3}{y} + \frac{5z-3}{z} = 0$

$\frac{5x}{x} - \frac{3}{x} + \frac{5y}{y} - \frac{3}{y} + \frac{5z}{z} - \frac{3}{z} = 0$

$5 - \frac{3}{x} + 5 - \frac{3}{y} + 5 - \frac{3}{z} = 0$

$-3\left[\frac{1}{x} + \frac{1}{y} + \frac{1}{z}\right] + 15 = 0$

$\left[\frac{1}{x} + \frac{1}{y} + \frac{1}{z}\right] = \frac{-15}{-3}$

$\frac{1}{x} + \frac{1}{y} + \frac{1}{z} = \frac{-15}{-3} = 5$

51. (b) $x^2 + \frac{1}{x^2+1} - 3$

is minimum when $x = 0$

$0 + \frac{1}{0+1} - 3 = -2$

52. (c) $a + b = 5$
Squaring on both sides
$(a+b)^2 = (5)^2$
$a^2 + b^2 + 2ab = 25$
$13 + 2ab = 25$
$2ab = 25 - 13 = 12$ ...(1)

Again, $a^2 + b^2 = 13$
Subtracting (– 2ab) from both sides
$a^2 + b^2 - 2ab = 13 - 2ab$
$(a-b)^2 = 13 - 12$ from equation (1)
$(a-b)^2 = 1$
TRICK $\Rightarrow a = 3$
$b = 2$ $(a > b)$
$a - b = 1$

53. (a) $\frac{3x-y}{x+5y} = \frac{5}{7} \Rightarrow 21x - 7y = 5x + 25y$

$\Rightarrow 16x = 32y$

$\Rightarrow x = 2y$ or $\frac{x}{y} = \frac{2}{1}$ ...(1)

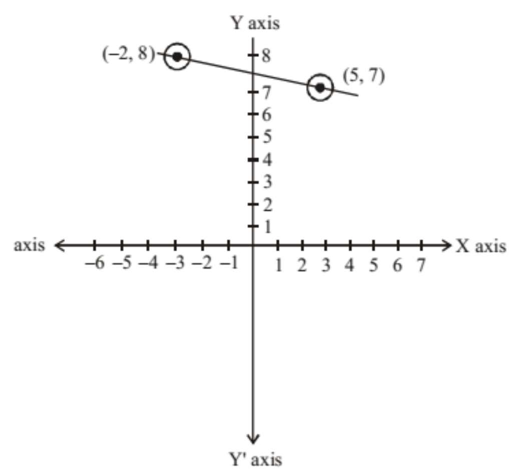
Now, to calculate value of $\frac{x+y}{x-y}$, Divide numerator & denominator by y.

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

Putting value of $\frac{x}{y}$ from equation (1)

$\frac{\frac{2}{1}+1}{\frac{2}{1}-1} = \frac{3}{1}$ or 3:1

54. (c)



As indicated in the graph, the line passing through the points cuts Y-axis only.

55. (a) **56. (b)** **57. (d)**

58. (a) $\frac{x}{b+c}=\frac{y}{c+a}=\frac{z}{a+b}=k(\text{say})$

So, $x=k(b+c)$

$\Rightarrow x-y=k(b+c)-k(c+a)$

$=k(b-a)$

$y=k(c+a)$

$\Rightarrow y-z=k(c+a)-k(a+b)=k(c-b)$

$z=k(a+b)=z-x=k(a+b)-k(b+c)=k(a-c)$

So,check option (a)

$$\frac{x-y}{b-a}=\frac{y-z}{c-b}=\frac{z-x}{a-c}$$

$$\frac{k(b-a)}{b-a}=\frac{k(c-b)}{c-b}=\frac{k(a-c)}{a-c}$$

$k=k=k$

option (a) is true.

59. (b) $\frac{3x+5}{5x-2}=\frac{2}{3}$

$\Rightarrow 9x+15=10x-4$

$\Rightarrow 15+4=10x-9x$

$\Rightarrow x=19$

60. (d) Let the numbers are x, y.

$x-y=3$ ...(1)

$x^2-y^2=39$

$\Rightarrow (x-y)(x+y)=39$

$\Rightarrow x+y=13$ ...(2)

Adding eqn (1) and (2)

$x+y+x-y=16$

$\Rightarrow x=8$

$\therefore y=5$

Hence, 8 is the larger number.

61. (c) $x=\sqrt{3}+\sqrt{2}$

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

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

$=(a+b)^3-(a-b)^3$ [Let $\sqrt{3}=a$ and $\sqrt{2}=b$]

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

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

$=2b^3+6a^2b=2\left(\sqrt{2}\right)^3+6\left(\sqrt{3}\right)^2\left(\sqrt{2}\right)$

$=4\sqrt{2}+18\sqrt{2}=22\sqrt{2}$

62. (a) $a^2+b^2+c^2=2(a-b-c)-3$

$\Rightarrow a^2+b^2+c^2-2(a-b-c)+3=0$

$\Rightarrow a^2+b^2+c^2-2a+2b+2c+3=0$

$\Rightarrow (a^2+1-2a)+(b^2+1+2b)+(c^2+1+2c)=0$

$\Rightarrow (a-1)^2+(b+1)^2+(c+1)^2=0$

This is possible when $(a-1)^2=0,(b+1)^2=0$ and $(c+1)^2=0.$

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

Thus, $2a-3b+4c=2(1)-3(-1)+4(-1)$

$=2+3-4=1.$

63. (a) $\sqrt{6}=2.44, \sqrt{5}=2.23, \sqrt{3}=1.73$

$a=\sqrt{6}-\sqrt{5}=0.21$

$b=\sqrt{5}-2=0.23$

$c=2-\sqrt{3}=0.27$

64. (c) Given $a=\frac{b^2}{b-a}$ or $ab-a^2=b^2$ or $\boxed{ab=b^2+a^2}$

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

$\therefore (a+b)(ab-ab)\Rightarrow 0$ (using given)

65. (d) $xy+yz+zn=0$

$$\frac{1}{x^2-yz}+\frac{1}{y^2-xz}+\frac{1}{z^2-xy}$$

$$=\frac{1}{x^2+xy+zn}+\frac{1}{y^2+xy+yz}+\frac{1}{z^2+yz+xz}$$

$$=\frac{1}{x(x+y+z)}+\frac{1}{y(x+y+z)}+\frac{1}{z(x+y+z)}$$

$$=\frac{yz+xz+xy}{xyz(x+y+z)}=\frac{0}{xyz(x+y+z)}=0$$

66. (b) $x+y+z=a-b+b-c+c-a=0$

$\therefore x^3+y^3+z^3-3xyz=0$

67. (b) $y=4x,$

When, $x=1, y=4$

68. (d) $4\sqrt{3}\,x^2+5x-2\sqrt{3}$

$=4\sqrt{3}\,x^2+8x-3x-2\sqrt{3}$

$=4x(\sqrt{3}x+2)-\sqrt{3}(\sqrt{3x}+2)$

$=\left(4x-\sqrt{3}\right)\left(\sqrt{3x}+2\right)$

69. (c) Let the number be x and y.

According to question,

$(x+y)^2=4xy$

$\Rightarrow x^2+y^2+2xy-4xy=0$

$\Rightarrow (x-y)^2=0$

$\Rightarrow x=y$

70. (c) $a^2+b^2=5ab$

$\Rightarrow \frac{a^2+b^2}{ab}=5 \Rightarrow \frac{a}{b}+\frac{b}{a}=5$

On squaring both sides.

$\therefore \left(\frac{a}{b}+\frac{b}{a}\right)^2=25$

$\Rightarrow \frac{a^2}{b^2}+\frac{b^2}{a^2}+2=25$

$\Rightarrow \frac{a^2}{b^2}+\frac{b^2}{a^2}=25-2=23$

71. (c) $\frac{1}{x}+\frac{1}{50-x}=\frac{1}{12}$

$x^2-50x+600=0$

$x^2-30x-20x+600=0$

$x(x-30)-20(x-30)=0$

$x=30, 20$

72. (a) Since two digit number $=10x+y$

According to question $\rightarrow y=2x-1$ ..(i)

When digits are interchanged then new number

$=10y+x$

then original number – [new number – original number] $=20$

$\rightarrow 10x+y-[10y+x-(10x+y)]=20$

$\rightarrow 10x+y-10y-x+10x+y=20$

$19x-8y=20$

$19x-8(2x-1)=20$ (Using eq. (i))

$19x-16x+8=20$

$3x=12 \rightarrow$ $x=4$

From (i) $y=2\times 4-1=y=7$

$\therefore$ original number $=10x+y=10\times 4+7=47$

73. (d) $\cos^2\theta=\frac{(x+y)^2}{4\times y}$

$1-\cos^2\theta=1-\frac{(x+y)^2}{4\times y}=-\frac{(x-y)^2}{4\times y}$

$\sin^2\theta$ cannot be – ve

Both $\sin^2\theta$ and $\cos^2\theta$ will be +ve when $x=y$

74. (d) $a^2+b^2+c^2=(a+b+c)^2-2(ab+bc+ca)$

$=9^2-2(ab+bc+ca)$

$a^2+b^2+c^2$ will be minimum if $ab+bc+ca$ is maximum.

$ab+bc+ca$ is maximum when $a=3, b=3$, and $c=3$.

$[\because a+b+c=9]$

$\therefore$ minimum value of $a^2+b^2+c^2$

$=81-2(3\times 3+3\times 3+3\times 3)$

$=81-54=27$

75. (c) C.P of 1 cow = ` x

C.P of a goat = ` y

$3x+8y=47200$ ...(i)

$\Rightarrow 8x+3y=100200$ ...(ii)

By equation (i) × 3 – (ii) × 8, $9x+24y-64x-24y$

$=141600-801600$

$\Rightarrow 55x=660000$

$x=\frac{660000}{55}=$ ` 12000

76. (c) $p-21=4$

cubing both sides,

$(p-2q)^3=64$

$\Rightarrow p^3-8q^3+3p.\,4q^2-3p^2.\,2q=64$

$\Rightarrow p^3-8q^3+12pq^2-6p^2q=64$

$\Rightarrow p^3-8q^3-6pq\,(p-2q)=64$

$\Rightarrow p^3-8q^3-6pq\times 4=64$

$\Rightarrow p^3-8q^3-24pq-64=0$

77. (c) $\frac{x}{x^2-2x+1}=\frac{1}{3}$

$\Rightarrow \frac{x^2-2x+1}{x}=3 \Rightarrow x-2+\frac{1}{x}=3 \Rightarrow x+\frac{1}{x}=5$

On cubing both sides

$x^3+\frac{1}{x^3}+3\left(x+\frac{1}{x}\right)=125$

$\Rightarrow x^3+\frac{1}{x^3}=125-3\times 5=110$

78. (a) $a^2+b^2+c^2+3$

$=2a-2b-2c$

$\Rightarrow a^2-2a+1+b^2+2b+1+c^2*+2c+1=0$

$\Rightarrow (a-1)^2+(b+1)^2+(c+1)^2=0$

$\therefore a-1=0 \Rightarrow a=1$

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

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

$\therefore 2a-b+c=2+1-1=2$

79. (a) $\frac{x}{a}=\frac{1}{a}-\frac{1}{x} \Rightarrow \frac{x}{a}=\frac{x-a}{ax}$

$\Rightarrow x^2=x-a \Rightarrow x-x^2=a$

80. (a) For $n^r-tn+\frac{1}{4}$ to be a perfect square,

$r=2$ and $t=\pm 1$

Look :

$n^2-n+\frac{1}{4}=n^2-2.n.\,\frac{1}{2}+\frac{1}{4}=\left(n-\frac{1}{2}\right)^2$

$n^2+n+\frac{1}{4}=n^2+2.n.\frac{1}{2}+\frac{1}{4}=\left(n+\frac{1}{2}\right)^2$

81. (c) $\left(x+\frac{1}{x}\right)=4$

On squaring both sides

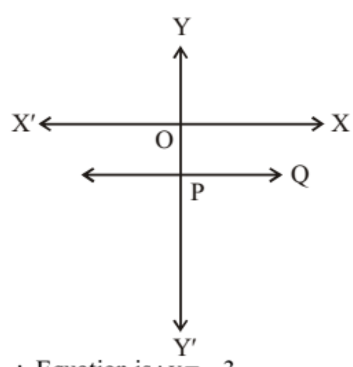
$x^2+\frac{1}{x^2}+2=16$

$\Rightarrow x^2+\frac{1}{x^2}=14$

On squaring again

$x^4+\frac{1}{x^4}+2=196 \Rightarrow x^4+\frac{1}{x^4}=194$

82. (d)



$\therefore$ Equation is : $y=-3$

83. (a) $x + 7954 \times 7956$

$x + 7954(7954 + 2)$

$x + 7954^2 + 2 \times 7954 \times 1$

Putting $x = 1$

$(x + 7954)^2$ or $(1 + 7954)^2$

84. (c) $p = q + 5$

$\Rightarrow p - q = 5$

$p^2 + q^2 = 55$

$\therefore (p - q)^2 + 2pq = 55$

$\Rightarrow 25 + 2pq = 55$

$\Rightarrow 2pq = 30$

$\Rightarrow pq = 15$

85. (b) $a + \frac{1}{a-2} = 4$

$\Rightarrow (a-2) + \frac{1}{(a-2)} = 4 - 2 = 2$

On squaring,

$\Rightarrow (a-2)^2 + \frac{1}{(a-2)^2} + 2 = 4$

$\Rightarrow (a-2)^2 + \frac{1}{(a-2)^2} = 2$

86. (c) Expression

$= \frac{(s-a)^2 + (s-b)^2 + (s-c)^2 + s^2}{a^2 + b^2 + c^2}$

$= \frac{s^2 - 2sa + a^2 + s^2 + b^2 - 2sb + s^2 - 2sc + c^2 + s^2}{a^2 + b^2 + c^2}$

$= \frac{4s^2 + a^2 + b^2 + c^2 - 2s(a+b+c)}{a^2 + b^2 + c^2}$

$= \frac{4s^2 + a^2 + b^2 + c^2 - 4s^2}{a^2 + b^2 + c^2} = 1$

87. (a) $xy(x + y) = 1$

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

Cubing both sides,

$x^3 + y^3 + 3xy(x + y) = \frac{1}{x^3y^3}$

$\Rightarrow x^3 + y^3 + 3 \times 1 = \frac{1}{x^3y^3}$

$\Rightarrow \frac{1}{x^3y^3} - x^3 + y^3 = 3$

88. (c) If $a + b + c = 0$, then

$a^3 + b^3 + c^3 - 3abc = 0$

89. (d) Expression $= (x-2)(x-9)$

$= x^2 - 11x + 18 = ax^2 + bx + c$

Minimum value $= \frac{4ac - b^2}{4a} = \frac{4 \times 1 \times 18 - 121}{4} = \frac{-49}{4}$

> **Alternate Method:**
> In this type of questions take $(x - a)(x - b) = 0$
> and value of $x = \frac{a+b}{2}$ for minimum value and $x = a + b$ for maximum value of equation.
> Required value $= \left(\frac{9+2}{2} - 2\right)\left(\frac{9+2}{2} - 7\right) = \frac{7}{2} \times \frac{-7}{2}$
> $= \frac{-49}{4}$

90. (c) $x + y + z = 6$

On squaring,

$x^2 + y^2 + z^2 + 2xy + 2zy + 2zx = 36$

$\Rightarrow 20 + 2(xy + yz + zx) = 36$

$\Rightarrow xy + yz + zx = 8$

$\therefore x^3 + y^3 + z^3 - 3xyz$

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

$= 6(20 - 8) = 72$

91. (a) Third proportional of a and b

a : b : c

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

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

> **Alternate Method:**
> First Proportional × Third Proportional = (Mid Proportional)^2
> $\therefore$ Third Proportional $= \frac{(\text{Mid proportional})^2}{\text{First proportional}}$
> Required value
> $= \frac{\left(\sqrt{x^2 + y^2}\right)^2}{\frac{x}{y} + \frac{y}{x}} = x^2 + y^2 \times \frac{xy}{x^2 + y^2} = xy$

92. (c) $x^2 - 3x + 1 = 0$

$\Rightarrow x^2 + 1 = 3x$

Dividing both sides by x,

$\Rightarrow x + \frac{1}{x} = 3$

$\therefore x^2 + x + \frac{1}{x} + \frac{1}{x^2}$

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

$= 9 - 2 + 3 = 10$

93. (a) $\frac{4x-3}{x}+\frac{4y-3}{y}+\frac{4z-3}{z}=0$

$\Rightarrow \frac{4x}{x}-\frac{3}{x}+\frac{4y}{y}-\frac{3}{y}+\frac{4z}{z}-\frac{3}{z}=0$

$\Rightarrow \frac{3}{x}+\frac{3}{y}+\frac{3}{z}=4+4+4=12$

$\Rightarrow \frac{1}{x}+\frac{1}{y}+\frac{1}{z}=\frac{12}{3}=4$

94. (b) $a^2+b^2+4c^2=2a+2b-4c-3$
$\Rightarrow a^2+b^2+4c^2-2a-2b+4c+3=0$
$\Rightarrow a^2-2a+1+b^2-2b+1+4c^2+4c+1=0$
$\Rightarrow (a-1)^2+(b-1)^2+(2c+1)^2=0$
$\therefore a-1=0 \Rightarrow a=1;$
$b-1=0 \Rightarrow b=1;$

$2c+1=0 \Rightarrow c=-\frac{1}{2}$

$\therefore a^2+b^2+c^2=1+1+\frac{1}{4}$

$=2\frac{1}{4}$

95. (a) $ax+by+c=0$
When $c=0$,
$ax+by=0$

$by=-ax \Rightarrow y=-\frac{a}{b}x$

When $x=0$, $y=0$ i,e. this line passes through the origin (0, 0).

96. (a) x^4-2x^2+k
$(x^2)^2-2x^2+k \Rightarrow (x^2)^2-2.1.\,x^2+k$
For above expression to make a perfect square, the k value is equal to 1.

97. (d) $3x-\frac{1}{4y}=6$

$12xy-1=24y$
Now,

$4x-\frac{1}{3y}=\frac{12xy-1}{3y}=\frac{24y}{3y}=8$

98. (a) $a+b+c=0$
i.e. $a=-(b+c);\ b=-(c+a);\ c=-(a+b)$

Now, $\frac{a+b}{c}-\frac{2b}{c+a}+\frac{b+c}{a}$

$\Rightarrow \frac{a+b}{-(a+b)}-\frac{2[-(c+a)]}{c+a}+\frac{b+c}{-(b+c)}$

$\Rightarrow -1+2-1=0$

99. (b) $x+\frac{4}{x}=4$

$x^2+4=4x \Rightarrow x^2-4x+4=0 \Rightarrow (x-2)^2=0$
$x=2$

$x^3+\frac{4}{x^3}=(2)^3+\frac{4}{(2)^3}$

$\Rightarrow 8+\frac{4}{8} \Rightarrow 8+\frac{1}{2} \Rightarrow 8\frac{1}{2}$

100. (b) $x=3+2\sqrt{2}$
$x=2+1+2\sqrt{2}$
$x=(\sqrt{2})^2+(1)^2+2.1.\sqrt{2}$
$x=(\sqrt{2}+1)^2$
$\sqrt{x}=(\sqrt{2}+1)$ ...(1)

$\frac{1}{\sqrt{x}}=\frac{1}{\sqrt{2}+1}\times\frac{\sqrt{2}-1}{\sqrt{2}-1}=\frac{\sqrt{2}-1}{2-1}=\sqrt{2}-1$

Now, $\sqrt{x}-\frac{1}{\sqrt{x}}=\sqrt{2}+1-(\sqrt{2}-1)$
$=\sqrt{2}+1-\sqrt{2}+1$
$\therefore \sqrt{x}-\frac{1}{\sqrt{x}}=2$

101. (c) The least value of $a+\frac{1}{a}$ is 2 where $a=1$.

102. (b) It $a=0,\ b\neq 0,\ c\neq 0$, then equation $ax+by+c=0$ represents a line parallel to x-axis.

103. (a) Let Puneet's age $=x$ yr.
Let Puneet's father age $=y$ yr.
$x+y=45 \Rightarrow y=(45-x)$
According to question,
$xy=126$
Putting the value of y.
$(x)(45-x)=126$
$45x-x^2=126$
$x^2-45x+126=0$
$x^2-42x-3x+126=0$
$x(x-42)-3(x-42)=0$
$x=3, x=42$
Hence, Puneet's age is 3yr.

104. (a) C.P. of 1 bucket = ` x
C.P. of 1 mug = ` y
$\therefore 8x+5y=92$ ...(i)
$5x+8y=77$ ...(ii)
By equation (i) × 5 – equation (ii) × 8,
$40x+25y-40x-64y=460-616$
$\Rightarrow -39y=-156$
$\Rightarrow y=4$
From equation (i),
$8x+20=92$
$\Rightarrow 8x=92-20=72$
$\Rightarrow x=9$
$\therefore$ C.P. of 2 mugs and 3 buckets
$=2\times 4+3\times 9$
$=8+27=$ ` 35

105. (c) $\frac{a}{1-a}+\frac{b}{1-b}+\frac{c}{1-c}=1$

$\Rightarrow \frac{a}{1-a}+1+\frac{b}{1-b}+1+\frac{c}{1-c}+1=4$

$\Rightarrow \frac{a+1-a}{1-a}+\frac{b+1-b}{1-b}+\frac{c+1-c}{1-c}=4$

$\Rightarrow \frac{1}{1-a}+\frac{1}{1-b}+\frac{1}{1-c}=4$

106. (c) $(x-3)^2+(y-5)^2+(z-4^2)=0$

$\Rightarrow x-3=0 \Rightarrow x=3$

$y-5=0 \Rightarrow y=5$

$z-4=0 \Rightarrow z=4$

$\therefore \frac{x^2}{9}+\frac{y^2}{25}+\frac{z^2}{16}$

$=\frac{9}{9}+\frac{25}{25}+\frac{16}{16}=1+1+1=3$

107. (c) When $x=6$.

$\frac{4\times 6}{3}+2P=12$

$\Rightarrow 8+2P=12$

$\Rightarrow 2P=12-8=4 \Rightarrow P=2$

108. (b) $3x-2=\frac{3}{x} \Rightarrow 3x-\frac{3}{x}=2$

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

On squaring both sides

$\left(x-\frac{1}{x}\right)^2=\frac{4}{9}$

$\Rightarrow x^2+\frac{1}{x^2}-2=\frac{4}{9}$

$\therefore x^2+\frac{1}{x^2}=\frac{4}{9}+2=\frac{22}{9}=2\frac{4}{9}$

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

$\therefore 16a^2-12a$

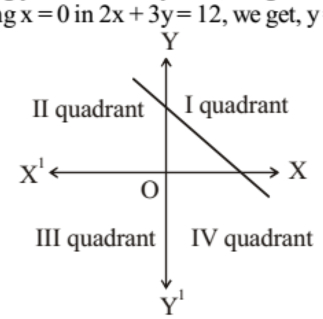
$=(4a)^2-2\times 4a\times\frac{3}{2}$

Hence, on adding $\left(\frac{3}{2}\right)^2=\frac{9}{4}$

Expression will be a perfect square.

110. (b) Putting $y=0$ in $2x+3y=12$, we get $x=6$

Putting $x=0$ in $2x+3y=12$, we get, $y=4$



111. (c) $a^2+b^2+c^2=2a-2b-2$

$(a^2-2a+1)+(b^2+2b+1)+c^2=0$

$(a-1)^2+(b+1)^2+c^2=0$

This equation is possible if

$a-1=0, b+1=0$ and $c=0$

$a=1, b=-1, c=0$

$3a-2b+c=3\times 1-2\times(-1)+0=3+2=5$

112. (b) $a+b+c=3$

Squaring both sides

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

$6+2(ab+bc+ca)=9$

$ab+bc+ca=\frac{3}{2}$ ...(1)

given $\frac{1}{a}+\frac{1}{b}+\frac{1}{c}=1$

$\Rightarrow ab+bc+ac=abc=\frac{3}{2}$ [from (1)]

113. (d) $a^2-4a-1=0$

$a^2-4a=1$

$a(a-4)=1$

$a-4=\frac{1}{a}$

$a-\frac{1}{a}=4$ ...(1)

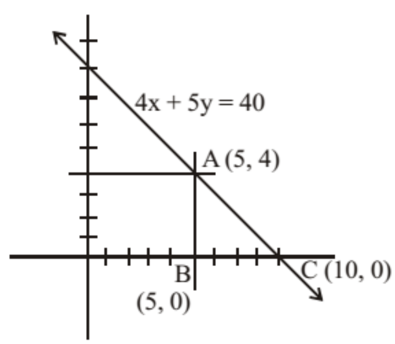
We have $a^2+3a+\frac{1}{a^2}-\frac{3}{a}$

$\left(a^2+\frac{1}{a^2}\right)+3\left(a-\frac{1}{a}\right)$

$\left(a-\frac{1}{a}\right)^2+3\left(a-\frac{1}{a}\right)+2$

$4^2+3\times 4+2=30$

114. (a)



Area of $\Delta ABC=\frac{1}{2}\times$ base $\times$ height

$=\frac{1}{2}\times(10-5)\times 4=\frac{1}{2}\times 5\times 4$

Area = 10 sq unit.

115. (d) $kx+2y=2$ ...(1)

$3x+y=1$ ...(2)

divide eqn (1) by (2)

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

for system of equation to be coincident

$$\frac{k}{2}=3$$

$k=6$

116. (d) $x=2+\sqrt{3}$

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

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

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

$=16-2=14$

117. (c) $a=4.965\approx 5, b=2.343\approx 2$

$c=2.622$

$a-b=c$

taking cube both sides

$a^3-b^3-3a^2b+3ab^2=c^3$

$a^3-b^3-c^3-3ab(a-b)=0$

$a^3-b^3-c^3-3abc=0$

118. (d) $x+y+z=0$

$y+z=-x$

Squaring both sides

$y^2+z^2+2yz=x^2$

$\Rightarrow y^2+z^2=x^2-2yz$ ...(1)

$$\frac{x^2+y^2+z^2}{x^2-yz}=\frac{x^2-2yz+x^2}{x^2-yz}=\frac{2(x^2-yz)}{x^2-yz}=2$$

119. (a) $\frac{x}{y}=\frac{2}{3};\ \frac{2}{x}=\frac{4}{8}$

$x=4$

$$y=\frac{3}{2}x=\frac{3}{2}\times 4=6$$

120. (b) $2a^2-5ab+2b^2$

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

$2(a-b)^2-ab$

$$2\left[\sqrt{6}+\sqrt{5}-\sqrt{6}+\sqrt{5}\right]^2-\left(\sqrt{6}+\sqrt{5}\right)\left(\sqrt{6}-\sqrt{5}\right)$$

$2\times 4\times 5-1=39$

121. (c) $27p^3-\frac{1}{216}-\frac{9}{2}p^2+\frac{1}{4}p$

$$=(3p)^3-\left(\frac{1}{6}\right)^3-3.(3p)^2.\frac{1}{6}+3.3p.\left(\frac{1}{6}\right)^2$$

$$=\left(3p-\frac{1}{6}\right)^3$$

$$=\left(3\times\frac{5}{18}-\frac{1}{6}\right)^3=\left(\frac{2}{3}\right)^3=\frac{8}{27}$$

122. (d) $x+\frac{1}{x}=2\Rightarrow\frac{x^2+1}{x}=2$

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

$$x^{2013}+\frac{1}{x^{2014}}=1+1=2$$

123. (d) Here, $a+b+c=0$

$\therefore a^3+b^3+c^3-3abc=0$

124. (c) $$\frac{3x^2-4x+3}{x^2-x+1}=\frac{\frac{3x^2}{x}-\frac{4x}{x}+\frac{3}{x}}{\frac{x^2}{x}-\frac{x}{x}+\frac{1}{x}}$$

$$\frac{3\left(x+\frac{1}{x}\right)-4}{\left(x+\frac{1}{x}\right)-1}=\frac{3\times 3-4}{3-1}=\frac{5}{2}$$

125. (c) $x^4-2x^2y^2+y^4=(x^2-y^2)^2=[(x+y)(x-y)]^2$

$$=\left(2p\times\frac{2}{p}\right)^2=16$$

126. (d) We have, $x=3+2\sqrt{2}$

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

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

$$\frac{x^6+x^4+x^2+1}{x^3}=x^3+x+\frac{1}{x}+\frac{1}{x^3}$$

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

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

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

$=6[6^2-3]+6=198+6=204$

127. (d) Given,

$$\frac{x}{(xa+yb+zc)}=\frac{y}{(ya+zb+xc)}=\frac{z}{(za+xb+yc)}$$

We know that property of ratio,

$$\frac{a}{b}=\frac{c}{d}=\frac{e}{f}=(a+c+e)/(b+d+f)$$

So,

$$\frac{x}{(xa+yb+zc)}=\frac{y}{(ya+zb+xc)}=\frac{z}{(za+xb+yc)}$$

$=(x+y+z)/(xa+xb+xc+ya+yb+yc+za+zb+zc)$

$\Rightarrow$ $x/(xa+yb+zc)=y/(ya+zb+xc)=z/(za+xb+yc)$

$=x/(xa+yb+zc)=y(ya+zb+xc)=z/(za+xb+yc)$

$=(x+y+z)/\{x(a+b+c)+y(a+b+c)+z(a+b+c)\}$

$\Rightarrow$ $x(xa+yb+zc)=y(ya+zb+xc)=z(za+xb+yc)$

$=(x+y+z)/\{(a+b+c)(x+y+z)\}$

$\Rightarrow$ $x/(xa+yb+zc)=y/(ya+zb+xc)=z/(za+xb+yc)$

$$=\frac{1}{a+b+c}$$

128. (d) Mean of x and $\frac{1}{x}=M$

$$\Rightarrow\frac{1}{2}\left(x+\frac{1}{x}\right)=M$$

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

Mean of x^2 and $\frac{1}{x^2}=\frac{1}{2}\left(x^2+\frac{1}{x^2}\right)=\frac{x^4+1}{2x^2}$

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

$$=\frac{(2xM)^2-2x^2}{2x^2}$$

$$=\frac{4x^2M^2}{2x^2}-1$$

$=2M^2-1$

129. (c) $3^{2x-y}=3^{x+y}=\sqrt{27}=3^{\frac{3}{2}}$

$\Rightarrow 2x-y=\frac{3}{2}\quad x+y=\frac{3}{2}$

$4x-2y=3$ ...(i)

$2x+2y=3$ ...(ii)

Solving equation (i) and (ii)

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

$\Rightarrow 3^{1-\frac{1}{2}}=3^{\frac{1}{2}}=\sqrt{3}$

130. (b) $999x+888y=1332$

$111(9x+8y)=1332$

$$9x+8y=\frac{1332}{111}=12$$

$9x+8y=12$ ...(i)

$888x+999y=555$

$8x+9y=5$ ...(ii)

Solving (i) and (ii)

$x=4\quad y=-3$

$x+y=4-3=1$

131. (a) $4x^2+8x=(2x)^2+2(2x)(2)+(2)^2$

$=(2x+2)^2$ $\quad\therefore x^2+y^2+2xy=(x+y)^2$

So, 4 should be added to make if perfect square.

132. (c) $x+\frac{1}{x}=2$

Take cube on both sides

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

$$x^3+\frac{1}{x^3}+3(x)\left(\frac{1}{x}\right)\left(x+\frac{1}{x}\right)=8$$

$$x^3+\frac{1}{x^3}+3(2)=8$$

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

Squaring on both sides

$$x^6+\frac{1}{x^6}+2=4$$

$$x^6+\frac{1}{x^6}=2$$

Now multiplying both sides by x

$$x\left(x^6+\frac{1}{x^6}\right)=2x\Rightarrow x^7+\frac{1}{x^5}=2x$$

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

$x^2+1=2x$

$x^2-2x+1=0$

$x^2-x-x+1=0$

$x(x-1)-1(x-1)$

$(x-1)^2=0$

$x=1$

So $x^7+\frac{1}{x^5}=2(1)=2$

133. (d) $p=-0.12;\ q=-0.01;\ r=-0.015$

So, $p<r;\ p<q$

$=p<r<q$

134. (a) $a=\frac{\sqrt{3}-\sqrt{2}}{\sqrt{3}+\sqrt{2}}\times\frac{\sqrt{3}-\sqrt{2}}{\sqrt{3}-\sqrt{2}}$

$$=\frac{\left(\sqrt{3}-\sqrt{2}\right)^2}{3-2}=\frac{3+2-2\sqrt{6}}{1}=5-2\sqrt{6}.$$

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

$$= \frac{(\sqrt{3}+\sqrt{2})^2}{3-2} = 5+2\sqrt{6}$$

So, $\frac{a^2}{b}+\frac{b^2}{a} = \frac{(5-2\sqrt{6})^2}{5+2\sqrt{6}} + \frac{(5+2\sqrt{6})^2}{5-2\sqrt{6}}$

$$= \frac{(5-2\sqrt{6})^3+(5+2\sqrt{6})^3}{(5)^2-(2\sqrt{6})^2}$$

$$= \frac{(5)^3-(2\sqrt{6})^3-3(5)(2\sqrt{6})(5-2\sqrt{6})+(5)^3 +(2\sqrt{6})^3+3(5)(2\sqrt{6})(5+2\sqrt{6})}{25-24}$$

$$= \frac{125-48\sqrt{6}-150\sqrt{6}+60(6)+125+48\sqrt{6}+150\sqrt{6}+60(6)}{1}$$

$= 125+125+360+360$
$= 250+720$
$= 970$

135. (d) $x^2-4x-1=0$ can be written as $x^2-4x+4-1=4$

So $(x-2)^2-1=4$

$x-2 = \sqrt{4+1}$

$x = \sqrt{5}+2$

So, $x^2+\frac{1}{x^2} = (2+\sqrt{5})^2 + \frac{1}{(2+\sqrt{5})^2}$

$= 4+5+4\sqrt{5}+\frac{1}{4+5+4\sqrt{5}}$

$= 9+4\sqrt{5}+\frac{1}{9+4\sqrt{5}}$

$= \frac{(9+4\sqrt{5})^2+1}{9+4\sqrt{5}}$

$= \frac{81+16(5)+72\sqrt{5}+1}{9+4\sqrt{5}}$

$= \frac{162+72\sqrt{5}}{9+4\sqrt{5}}$

$= \frac{162+72\sqrt{5}}{9+4\sqrt{5}} \times \frac{9-4\sqrt{5}}{9-4\sqrt{5}}$

$= \frac{(162+72\sqrt{5})(9-4\sqrt{5})}{1}$

$= (162)(9)-(162)(4)(\sqrt{5})+72(9)\sqrt{5}-72(4)(5)$

$= 1458-648\sqrt{5}+648\sqrt{5}-1440$

$= 1458-1440 = 18.$

136. (c) Contribution of each boy = Number of boys
Total contribution raised = ` 12544

So, number of boys = $\sqrt{12544} = 112$

137. (d) Let the two numbers are x and y

So, $x+2y=8$ ...(i)

$x-y=2$ ...(ii)

Solving both equations

$x=4;\ y=2$

So, numbers are 4, 2

138. (d) $(2a-1)^2+(4b-3)^2+(4c+5)^2=0$

$= 2a-1=0;\quad 4b-3=0;\quad 4c+5=0$

$a=\frac{1}{2};\quad b=\frac{3}{4};\quad c=\frac{-5}{4}$

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

But $a+b+c=0$

So, $a^3+b^3+c^3-3abc=0$

So, $\frac{a^3+b^3+c^3-3abc}{a^3+b^3+c^3}=0$

139. (b) $a+\frac{1}{b}=1$ and $b+\frac{1}{c}=1$

$b=1-\frac{1}{c}$

So, $a+\frac{1}{1-\frac{1}{c}}=1$

$\Rightarrow a+\frac{c}{c-1}=1$

$\Rightarrow a=1-\frac{c}{c-1}$

$\Rightarrow a=\frac{c-1-c}{c-1}=-\frac{1}{c-1}$

So, $c+\frac{1}{a} = c+\left(-\frac{1}{1/c-1}\right)$

$= c-(c-1)$

$= c-c+1$

$= 1$

140. (d) Intercept can represent in the form of $\frac{x}{a}+\frac{y}{b}=1$

To get x and y intercept, we have

$3x+4y=12$

$\frac{x}{4}+\frac{y}{3}=1$

So, triplets of 3, 4 and 5.

Hence, 5 is the length of portion of straight line.

141. (d) $m^3-3m^2+3m+3n+3n^2+n^3$

$\Rightarrow (-4)^3-3(-4)^2+3(-4)+3(-2)+3(-2)^2+(-2)^3$

$\Rightarrow -64-48-12-6+12-8$

$\Rightarrow -126$

142. (b) For no solution, a = b

$$\frac{2}{6}=\frac{-k}{-12}$$

$$k=\frac{-12\times 2}{-6}=4$$

143. (b) $$\frac{m-a^2}{b^2+c^2}+\frac{m-b^2}{c^2+a^2}+\frac{m-c^2}{a^2+b^2}=3$$

$$\frac{m-a^2}{b^2+c^2}-1+\frac{m-b^2}{c^2+a^2}-1+\frac{m-c^2}{a^2+b^2}-1=0$$

$$\frac{m-a^2-b^2-c^2}{b^2+c^2}+\frac{m-a^2-b^2-c^2}{c^2+a^2}+\frac{m-c^2-a^2-b^2}{a^2+b^2}=0$$

$$(m-a^2-b^2-c^2)\left[\frac{1}{b^2+c^2}+\frac{1}{c^2+a^2}+\frac{1}{a^2+b^2}\right]=0$$

$$m-a^2-b^2-c^2=0$$

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

144. (a) Using the formula,

$$x^3+y^3+z^3-3xyz=\frac{1}{2}\times(x+y+z)\left[(x-y)^2+(y-z)^2+(z-x)^2\right]$$

$$\Rightarrow \frac{1}{2}\times(332+333+335)\times\left[(332-333)^2+(333-335)^2+(335-332)^2\right]$$

$$\Rightarrow \frac{1}{2}\times 1000\times\left[(-1)^2+(-2)^2+(-3)^2\right]$$

$$\Rightarrow \frac{1}{2}\times 1000\times[1+4+9]$$

$$\Rightarrow \frac{1}{2}\times 1000\times 14=7000$$

145. (d) $$2+x\sqrt{3}=\frac{1}{2+\sqrt{3}}$$

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

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

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

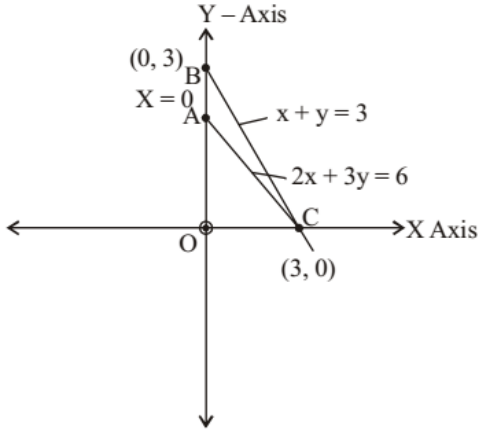
$$x\left(2\sqrt{3}+3\right)=-\left(3+2\sqrt{3}\right)$$

$$x=-1$$

146. (b) $x=0$ ...(1)

$2x+3y=6$ ...(2)

$x+y=3$ ...(3)



$2x+3y=6$ ...(ii)

$x=0, y=2$

$x=3, y=0$

From eqn. (iii) $x+y=3$

$x=0, y=3$

$x=3, y=0$

Area made by these three lines

= Area of triangle OBC – Area of OAC

$$=\frac{1}{2}\times 3\times 3-\frac{1}{2}\times 2\times 3$$

$$=\frac{9}{2}-3=\frac{3}{2}=1\frac{1}{2}\text{sq.}$$

147. (a) $2x-3y=0$ is passing through origion because its satisfy $x=0$ and $y=0$.

148. (c) Given fraction

$$x^8-1=(x^4+1)(x^2+1)(x-1)(x+1)$$

$$x^4+2x^3-2x-1=(x-1)(x+1)^3$$

HCF of Given fractor

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

149. (d) Given that

$$\frac{x^{24}+1}{x^{12}}=7$$

$$\Rightarrow x^{12}+\frac{1}{x^{12}}=7$$

On cubing both sides we get

$$\Rightarrow x^{36}+\frac{1}{x^{36}}+3.x^{12}\frac{1}{x^{12}}\left(x^{12}+\frac{1}{x^{12}}\right)=343$$

$$\Rightarrow x^{36}+\frac{1}{x^{36}}+3\times 7=343$$

$$\Rightarrow \frac{x^{72}+1}{x^{36}}=343-21=322$$

150. (b) $5x+9y=5$ ...(i)

$125x^3+729y^3=120$ ...(ii)

Now cube both sides of equation (i), we get

$\Rightarrow (5x+9y)^3=(5)^3$

$\Rightarrow 125x^3+729y^3+135xy(5x+9y)=125$

$\Rightarrow 125x^3+729y^3+135xy\times 5=125$

Now, put the value of equation (i)

$120+135xy\times 5=125$

$\Rightarrow 135\times 5xy=125-120$

$\Rightarrow 135\times 5xy=5$

$xy=\frac{5}{135\times 5}=\frac{1}{135}$

151. (a) Given $p=99$

then $p(p^2+3p+3)$

$=p((p+1)^2+p+2)$

$=99((99+1)^2+101)$

$=99\times(10000+101)$

$=999999$

152. (a) Given $x=2$

then $x^3+27x^2+243x+631$

$=8+108+486+631=1233$

153. (b) $C+\frac{1}{C}=3$

$C-3+\frac{1}{C}=0$

$C-3=-\frac{1}{C}$

$(C-3)^7=-\left(\frac{1}{C}\right)^7$

$(C-3)^7+\left(\frac{1}{C}\right)^7=0$

154. (a) $2x+\frac{1}{4x}=1$ dividing Eq. by 2

$x+\frac{1}{8x}=\frac{1}{2}$ Squaring on both sides

$x^2+\frac{1}{64x^2}+2x\frac{1}{8x}=\frac{1}{4}$

155. (b) $\sqrt{x}-\sqrt{y}=1$

$\sqrt{x}+\sqrt{y}=17$

By adding both equations

$2\sqrt{x}=18$, $\sqrt{x}=9$

$9-\sqrt{y}=1$

$9-1=\sqrt{y}$

$8=\sqrt{y}$

$\sqrt{x}\cdot\sqrt{y}=8\times 9=72$

156. (c) $x=\sqrt{3}+\frac{1}{\sqrt{3}}$

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

Now

$\Rightarrow\left(x-\frac{\sqrt{126}}{\sqrt{42}}\right)\left(x-\frac{1}{x-\frac{2\sqrt{3}}{3}}\right)$

$\Rightarrow\left(\frac{4}{\sqrt{3}}-\frac{\sqrt{3}\sqrt{42}}{\sqrt{42}}\right)\left(\frac{4}{\sqrt{3}}-\frac{1}{\frac{4}{\sqrt{3}}-\frac{2}{\sqrt{3}}}\right)$

$\Rightarrow\left(\frac{4}{\sqrt{3}}-\sqrt{3}\right)\left(\frac{4}{\sqrt{3}}-\frac{\sqrt{3}}{2}\right)$

$\Rightarrow\left(\frac{4-3}{\sqrt{3}}\right)\left(\frac{8-3}{2\sqrt{3}}\right)$

$\Rightarrow\frac{1}{\sqrt{3}}\times\frac{5}{2\sqrt{3}}=\frac{5}{6}$

157. (b) $(a-b)=2$, $a^3-b^3=56$

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

$8=56-3ab(2)$

$-48=-6ab$

$\therefore\ ab=8$

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

$4=a^2+b^2-16$

$20=a^2+b^2$

158 (c) $x^2-3x+1=0$

Dividing Equation by x

$x-3+\frac{1}{x}=0$

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

159. (d) Base side of isosceles $\Delta=2x-2y+4z$

Perimeter $=4x-2y+6z$

Remaining two sides are $=\frac{P-B}{2}$

$=\frac{4x-2y+6z-2x+2y-4z}{2}$

160. (d) $\frac{2+a}{a}+\frac{2+b}{b}+\frac{2+c}{c}=4$

$\frac{2}{a}+1+\frac{2}{b}+1+\frac{2}{c}+1=4\Rightarrow\frac{2}{a}+\frac{2}{b}+\frac{2}{c}=4-3$

$\frac{2}{a}+\frac{2}{b}+\frac{2}{c}=1$

$2\left[\frac{1}{a}+\frac{1}{b}+\frac{1}{c}\right]=1$

$\frac{ab+bc+ac}{abc}=\frac{1}{2}$

161. (b) $x+y+z=1,\ \frac{1}{x}+\frac{1}{y}+\frac{1}{z}=1,\ xyz=-1$

$\frac{xy+yz+zx}{-1}=1$

$xy+yz+zx=-1$

$(x+y+z)^2=1$

$x^2+y^2+z^2+2xy+2yz+2zx=1$

$x^2+y^2+z^2+2(-1)=1$

$x^2+y^2+z^2=3$

$x^3+y^3+z^3-3xyz$

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

$x^3+y^3+z^3-3(-1)=(1)\ [(3-(-1)]$

$x^3+y^3+z^3+3=4$

$= \quad 4-3=1$

162. (c) $(x-2)(x-p)=x^2-ax+b$

$x^2+(-2-p)x+(-P)(-2)=x^2-ax+b$

$-(2+p)=-a \qquad \because (\alpha+\beta)=\frac{-b}{a}$

$2=a-p$

163. (b) $2x+\frac{2}{x}=3$

Dividing eq by 2

$x+\frac{1}{x}=\frac{3}{2}$ Cubing both sides

$\left(x+\frac{1}{x}\right)^3=\frac{27}{8}$

$x^3+\frac{1}{x^3}+3\left(x+\frac{1}{x}\right)=\frac{27}{8}$

$x^3+\frac{1}{x^3}=\frac{27}{8}-3\left(\frac{3}{2}\right)$

$x^3+\frac{1}{x^3}+2=\frac{27}{8}-\frac{9}{2}+2$

$=\frac{27-36+16}{8}=\frac{7}{8}$

164. (a) $x=\sqrt{a}+\frac{1}{\sqrt{a}}\ ;\ y=\sqrt{a}-\frac{1}{\sqrt{a}}$

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

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

$x^2=a+\frac{1}{a}+2$

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

$(x^2-y^2)^2=\left[a+\frac{1}{a}+2-a-\frac{1}{a}+2\right]^2=(4)^2=16$

165. (b) $x=\sqrt[3]{x^2+11}-2$

$(x+2)=\sqrt[3]{x^2+11}$ (Cubing both sides)

$(x+2)^3=x^2+11$

$x^3+8+6x^2+12x=x^2+11$

$x^3+5x^2+12x=3$

166. (b) $4x+\frac{1}{x}=5$

$\Rightarrow 4x^2+1=5x$

$\frac{5x}{4x^2+10x+1}=\frac{5x}{10x+5x}\Rightarrow\frac{5x}{15x}=\frac{1}{3}$

167. (a) $C+\frac{1}{C}=\sqrt{3}$

Cubing both Sides

$C^3+\frac{1}{C^3}+3(\sqrt{3})=3\sqrt{3}$

$C^3+\frac{1}{C^3}=0$

168. (b) $x^3+y^3+z^3-3xyz=\frac{1}{2}(x+y+z)$

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

$=\frac{1}{2}(222+223+225)$

$[(222-223)^2+(223-225)^2+(225-222)^2]$

$\Rightarrow \frac{1}{2}[670][1+4+9]=335\,[14]=4690$

169. (d) $x=3^{1/3}-3^{-1/3}$

Cubing on both sides

$x^3=3-\frac{1}{3}-3(3)^{\frac{1}{3}}-\frac{1}{3}\left[3^{1/3}-3^{-1/3}\right]$

$x^3=3-\frac{1}{3}-3(x)$

$x^3+3x=\frac{9-1}{3}$

$3x^3+9x=8$

170. (b)

171. (c) If $a+b+c=0$ then $a^3+b^3+c^3=3abc$

let, $a=(p-q),\ b=(q-r),\ c\text{ - }(r-p)$

than, $a+b+c=p-q+q-r+r-p=0$

$\therefore\ (p-q)^3+(q-r)^2+(r-p)^3$

$=3(p-q)(q-r)(r-p)=0$

172. (a)

173. (c) $3^{x+y}=81\Rightarrow(3)^4$

$x+y=4$ ...(i)

$81^{x-y}=3$

$x-y=\frac{1}{4}$ ...(ii)

Solving equ.(i) & (ii)

$2x=\frac{17}{4}\Rightarrow x=\frac{17}{8}$

$\therefore\ y=\frac{15}{8}$

$\frac{x}{y}=\frac{17}{15}$

174. (c)

175. (d)

176. (a) Here,

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

$$\Rightarrow \frac{\left(2+\sqrt{3}\right)^2}{(2)^2-\left(\sqrt{3}\right)^2}=\frac{4+3+2.2.\sqrt{3}}{4-3}$$

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

$$\because\ x=7+4\sqrt{3}\quad \therefore\ \frac{1}{x}=7-4\sqrt{3}$$

$$\therefore\ x+\frac{1}{x}=7+4\sqrt{3}+7-4\sqrt{3}=14$$

177. (c) $\sqrt{2x}+\frac{1}{\sqrt{2x}}$

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

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

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

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

178. (d) $x+\frac{1}{x}=4$

then,

$$x^6+\frac{1}{x^6}=?$$

Let $x+\frac{1}{x}=a$

$$\because\quad x^6+\frac{1}{x^6}=\left(a^3-3a\right)^2-2$$

$\Rightarrow ((4)^3-3\times 4)^2-2$

$\Rightarrow (64-12)^2-2=(2704-2)=2702$

179. (c)

180. (c) According to question,

$$x+\frac{1}{x}=2,\quad \frac{x^2+1}{x}=2$$

$\Rightarrow x^2+1=2x$

$\Rightarrow x^2-2x+1=(x-1)^2$

$\therefore\ x-1=0 \qquad \therefore\quad x=1$

$\therefore\ x^{64}+x^{121}=1+1=2.$

181. (a) $x=6+2\sqrt{6}$

Subtraction by 1 in both side.

$x-1=6+2\sqrt{6}-1$

$x-1=5+2\sqrt{6} \quad\Rightarrow\ 3+2\sqrt{6}$

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

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

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

Now,

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

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

182. (a) According to question,

$a+b+c=27$

$(a-7)+(b-9)+(c-11)=27-7-9-11$

$(a-7)+(b-9)+(c-11)=0$

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

then

$a^3+b^3+c^3-3abc=0$

$\therefore$ Required answer $=0.$

183. (d)

184. (b) $\because$ If $x-2=0$

$\therefore\ x=2$

then,

$x^2+k_1x+k_2=0$

$(2)^2+k_1\times 2+k_2=0$

$2k_1+k_2=-4$ ...(i)

If $x+3=0$

$\therefore\ x=-3$

then,

$x^2+k_1x+k_2=0$

$(-3)^2+k_1x-3+k_2=0$

$\therefore\ 3k_1-k_2=9$ ...(ii)

From equation (i) and (ii),

we get $k_1=1$ and $k_2=-6$

185. (a) Here,

$(x-y)=7$

then,

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

$(x-15)^3-(y-8)^3=?$

$\Rightarrow\ (x-15-y+8)[(x-15)^2+(x-15)(y-8)+(y-8)^2]$

$\Rightarrow\ (x-y-7)[(x-15)^2+(x-15)(y-8)+(y-8)^2]$

$\Rightarrow\ (7-7)[(x-15)^2+(x-15)(y-8)+(y-8)^2]$

$\Rightarrow\ 0\times[(x-15)^2+(x-15)(y-8)+(y-8)^2]$

$\Rightarrow\ 0$

186. (d) According to question,

$$x - y - \sqrt{18} = -1 \quad ...(i)$$

$$x + y - 3\sqrt{2} = 1 \quad ...(ii)$$

From equation (i) and (ii),
We get,

$$x = 3\sqrt{2} \text{ and } y = 1$$

then,
$12xy(x^2 - y^2)$

$$\Rightarrow 12 \times 3\sqrt{2} \times 1\left[(3\sqrt{2})^2 - (1)^2\right]$$

$$\Rightarrow 36\sqrt{2} \times 17 = 612\sqrt{2}$$

187. (b) Here,

$$\frac{p}{q} = \frac{r}{s} = \frac{t}{u} = \frac{\sqrt{5}}{1}$$

then,

$$\frac{(3p^2 + 4r^2 + 5t^2)}{(3q^2 + 4s^2 + 5u^2)} = \frac{3 \times (\sqrt{5})^2 + 4 \times (\sqrt{5})^2 + 5 \times (\sqrt{5})^2}{3 \times (1)^2 + 4 \times (1)^2 + 5 \times (1)^2}$$

$$\Rightarrow \frac{3 \times 5 + 4 \times 5 + 5 \times 5}{3 \times 1 + 4 \times 1 + 5 \times 1} = \frac{15 + 20 + 25}{3 + 4 + 5} = \frac{60}{12} = 5$$

188. (a) $\frac{1+x}{1-x^4} \div \frac{x^2}{1+x^2} \times x(1-x)$

$$\Rightarrow \frac{1+x}{1-x^4} \times \frac{1+x^2}{x^2} \times x(1-x)$$

$$\Rightarrow \frac{(1+x)}{(1)^2 - (x^2)^2} \times \frac{1+x^2}{x^2} \times x(1-x)$$

$$\Rightarrow \frac{(1+x)}{(1+x^2)(1-x^2)} \times \frac{(1+x^2)}{x^2} \times x(1-x)$$

$$\Rightarrow \frac{(1+x)(1-x)}{(1-x^2) \times x}$$

$$\Rightarrow \frac{(1+x)(1-x)}{(1-x)(1+x) \times x} = \frac{1}{x}$$

189. (a) Here,

$$x + \frac{1}{x} = 17$$

$$\Rightarrow \frac{x^2 + 1}{x} = 17 \Rightarrow x^2 + 1 = 17x$$

$$\Rightarrow x^2 - 17x + 1 = 0$$
$$\Rightarrow x^2 - 3x + 1 = 14x$$

$$\therefore \frac{x^4 + \frac{1}{x^2}}{x^2 - 3x + 1} = \frac{1}{14}\left(\frac{x^4 + \frac{1}{x^2}}{x}\right) = \frac{1}{14}\left(x^3 + \frac{1}{x^3}\right)$$

$$\Rightarrow \frac{1}{14}\left[\left(x + \frac{1}{x}\right)^3 - 3\left(x + \frac{1}{x}\right)\right]$$

$$= \frac{1}{14}(4913 - 3 \times 17)$$

$$\Rightarrow \frac{1}{14} \times 4862 = \frac{2431}{7}$$

190. (c) $\sqrt{\frac{1+x}{x}} - \sqrt{\frac{x}{1+x}} = \frac{1}{\sqrt{6}}$

By squaring both sides

$$\left(\sqrt{\frac{1+x}{x}} - \sqrt{\frac{x}{1+x}}\right)^2 = \left(\frac{1}{\sqrt{6}}\right)^2$$

$$\Rightarrow \frac{1+x}{x} + \frac{x}{1+x} - 2.\sqrt{\frac{1+x}{x}}.\sqrt{\frac{x}{1+x}} = \frac{1}{6}$$

$$\Rightarrow \frac{(1+x)^2 + x^2}{x(1+x)} = \frac{13}{6}$$

$$\Rightarrow \frac{1 + x^2 + 2x + x^2}{x + x^2} = \frac{13}{6}$$

$$\frac{2x^2 + 2x + 1}{x^2 + x} = \frac{13}{6}$$

$\Rightarrow 13x^2 + 13x = 12x^2 + 12x + 6$
$\Rightarrow x^2 + 3x - 2x - 6 = 0$
$\Rightarrow x(x+3) - 2(x+3) = 0$
$\Rightarrow (x-2)(x+3) = 0$
$\Rightarrow x - 2 = 0 \quad \therefore x = 2$
$\Rightarrow x + 3 = 0 \quad \therefore x = -3$

191. (a)

192. (a) $3x - 8(2-x) = -19$
$3x - 16 + 8x = -19$
$11x = -3$

$$\therefore x = \frac{-3}{11}$$

193. (a) Here,
$x - y = 6, xy = 40, x^2 + y^2 = ?$
$(x-y)^2 = (6)^2$
$x^2 + y^2 - 2.x.y = 36$
$\therefore \quad x^2 + y^2 = 36 + 2xy$
$\Rightarrow \quad 36 + 2 \times 40$
$= 116$

194. (c) Here,

$20x + 5y = 3$

$\Rightarrow \quad 5y = -20x + 3$

$\therefore \quad y = -4x + \frac{3}{5}$

Slope of $20x + 5y = 3 \Rightarrow -4$

We know, product of slopes = –1 for perpendicular lines

Hence, the slope of the line which passes through

$(-2, 5)$ and $(6, b) = \frac{b-5}{6-(-2)}$

Now, $\frac{b-5}{6+2} = \frac{1}{4}$

$\Rightarrow \quad b - 5 = 2$

$\therefore \quad b = 5 + 2 = 7$

195. (c) According to question,

$a^2 - b^2 = 19$

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

Since 19 is prime, one of $(a + b)(a - b)$ is 19

Therefore,

$(10)^2 - (9)^2 = 19$

$\therefore \quad a = 10$

196. (b)

197. (c) Let $p(x) = px^3 - 8x^2 - qx + 1$

Since, $(3x^2 - 4x + 1)$ is factor of $p(x)$, so $p(a) = 0$

$\because \quad 3x^2 - 4x + 1 = 0$

$3x^2 - 3x - x + 1 = 0$

$3x(x - 1) - 1(x - 1) = 0$

$(3x - 1)(x - 1) = 0$

$\therefore \quad x = \frac{1}{3}, 1$

$\therefore \quad p(x) = \frac{1}{3}, 1$

i.e.,

$p\left(\frac{1}{3}\right) = px^3 - 8x^2 - qx + 1$

$\Rightarrow \quad p\left(\frac{1}{3}\right)^3 - 8\left(\frac{1}{3}\right)^2 - q \times \frac{1}{3} + 1$

$\Rightarrow \quad \frac{p}{27} - \frac{8}{9} - \frac{q}{3} + 1$

$\Rightarrow \quad p - 24 - 9q + 27$

$\Rightarrow \quad p - 9q = -3 \qquad$ ...(i)

$p(1) = px^3 - 8x^2 - qx + 1$

$\Rightarrow \quad p(1)^3 - 8(1)^2 - q \times 1 + 1$

$\Rightarrow \quad p - 8 - q + 1$

$\Rightarrow \quad p - q = 7 \qquad$ ....(ii)

From Eq. (i) and (ii),

$p = \frac{33}{4}, \; q = \frac{5}{4}$

198. (c) Here, $a = 2017, \; b = 2016,$ and $c = 2015$

$\therefore \quad a^2 + b^2 + c^2 - ab - bc - ca$

$\Rightarrow \quad (2017)^2 + (2016)^2 + (2015)^2 - 2017 \times 2016 - 2016 \times 2015 - 2015 \times 2017 = 3$

199. (d) If $x^2 - 3x + 1 = 0$ then $x^3 + \frac{1}{x^3} = ?$

Dividing equation by x

$x - 3 + \frac{1}{x} = 0$

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

$\therefore \quad x^3 + \frac{1}{x^3} = \left(x + \frac{1}{x}\right)^3 - 3\left(x + \frac{1}{x}\right)$

$= (3)^3 - 3 \times 3$

$= 27 - 9 = 18$

200. (d) Here,

$\frac{6x-1}{x} + \frac{7y-1}{y} + \frac{8z-1}{z} = 0$

Then,

$\frac{1}{x} + \frac{1}{y} + \frac{1}{z} = ?$

Now,

$\Rightarrow \quad \frac{6x}{x} - \frac{1}{x} + \frac{7y}{y} - \frac{1}{y} + \frac{8z}{z} - \frac{1}{z} = 0$

$\Rightarrow \quad 6 - \frac{1}{x} + 7 - \frac{1}{y} + 8 - \frac{1}{z}$

$\Rightarrow \quad 21 - \left(\frac{1}{x} + \frac{1}{y} + \frac{1}{z}\right) = 0$

$\therefore \quad \frac{1}{x} + \frac{1}{y} + \frac{1}{z} = 21$

201. (a) $x - \frac{1}{x} = 6,$

$\left(x - \frac{1}{x}\right)^2 = x^2 + \frac{1}{x^2} - 2 = 36.$

$x^2 + \frac{1}{x^2} = 38$

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

$= 6(38 + 1) = 6 \times 39 = 234.$

202. (a) $a^3 + b^3 = 5824$

$(a + b)(a^2 + b^2 - ab) = 5824$

$28(a^2 + b^2 - ab) = 5824$

$(a^2 + b^2 - ab) = \frac{5824}{28} = 208$

Now, $(a - b)^2 + ab = a^2 + b^2 - 2ab + ab$

$= a^2 + b^2 - ab = 208$

203. (a) $(2x+3)^3+(x-8)^3+(x+13)^3=(2x+3)(3x-24)(x+13)$

$(2x+3)^3+(x-8)^3+(x+13)^3=3(2x+3)(x-8)(x+13)$

We know that if $a^3+b^3+c^3=3abc$

then, $a+b+c=0$

$(2x+3)+(x-8)+(x+13)=0$

$4x+8=0$

$x=\frac{-8}{4}$

$\therefore x=-2$

204. (c) From question,

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

$= 169+2\times 60$

$(a+b)^2 = 289 \Rightarrow (a+b)=17$ ...(i)

and

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

$= 169-120=49$

$(a-b) = \sqrt{49}=7$ ...(ii)

from (i) and (ii), we get

$(a+b)(a-b)=17\times 7$

$a^2-b^2=119$

205. (d) $x+\frac{1}{x}=3 \Rightarrow \left(x+\frac{1}{x}\right)^2=x^2+\frac{1}{x^2}+2$

$\Rightarrow x^2+\frac{1}{x^2}=3^2-2=7$

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

$=3(7-1)=3\times 6=18$

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

$(13)^2=a^2+b^2+c^2+2(54)$

$a^2+b^2+c^2=169-108=61$

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

$=13(61-54)=13\times 7=91$

207. (c) $\frac{(5a+2b)}{(3a+4b)}=\frac{5\left(\frac{a}{b}\right)+2}{3\left(\frac{a}{b}\right)+4}=\frac{5\left(\frac{3}{2}\right)+2}{3\left(\frac{3}{2}\right)+4}$

$=\frac{15+4}{9+8}=\frac{19}{17}$

208. (c) Given that: $\sqrt{x}-\frac{1}{\sqrt{x}}=4$

Squaring both sides, we get

$x+\frac{1}{x}=16+2 \Rightarrow x+\frac{1}{x}=18$

Again, squaring both sides, we get

$x^2+\frac{1}{x^2}+2=324 \Rightarrow x^2+\frac{1}{x^2}=322.$

209. (b) On squaring both sides, we get

$\left(\sqrt{x}+\frac{1}{\sqrt{x}}\right)^2=\left(\sqrt{6}\right)^2 \Rightarrow x+\frac{1}{x}+2=6$

$x+\frac{1}{x}=4$

Again, squaring on both sides,

$\left(x+\frac{1}{x}\right)^2=4^2$

$x^2+\frac{1}{x^2}+2=16 \Rightarrow x^2+\frac{1}{x^2}=14$

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

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

$=(10)^2-2(32)=100-64$

$a^2+b^2+c^2=36$

Now, $a^3+b^3+c^3-3abc$

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

$=10(36-32)=40$

211. (d) $(a-b)^2=a^2+b^2-2ab \Rightarrow (5)^2=a^2+b^2-2\times 6$

$\therefore a^2+b^2=25+12=37$

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

$=5(37+6)=215$

212. (d) $\frac{5a-3b}{4a-2b}=\frac{2}{3}$

$\frac{5\left(\frac{a}{b}\right)-3}{4\left(\frac{a}{b}\right)-2}=\frac{2}{3}$

$3\left\{5\left(\frac{a}{b}\right)-3\right\}=2\left\{4\frac{a}{b}\right\}-2$

$15\left(\frac{a}{b}\right)-9=8\left(\frac{a}{b}\right)-4$

$7\left(\frac{a}{b}\right)=9-4=5$

$\frac{a}{b}=\frac{5}{7}$

213. (b) According to question,

$x^{2a}=y^{2b}=z^{2c}\neq 0 \quad x^2=yz$

$\therefore \quad \frac{ab+bc+ca}{bc}=?$

When $x = y = z = 1$ and $a = b = c = 1$

Putting the value of x, y, z and a, b, c on the above condition we get,

$1^2 \times 1 = 1^2 \times 1 = 1^2 \times 1 \Rightarrow 1 = 1 = 1$ (satisfied)

$1^2 = 1 \times 1 \Rightarrow 1 = 1$ (satisfied)

Now, we have to calculate the value of

$$\frac{ab+bc+ca}{bc} = \frac{1\times1+1\times1+1\times1}{1\times1}$$

$$\Rightarrow \frac{1+1+1}{1} = 3$$

214. (a) Let 6^{th} number $= x$

$\therefore$ Sum of first 5 numbers $= 7x$

Now, $x + 7x = 136 \times 6$

$8x = 136 \times 6$

$$\therefore \quad x = \frac{136\times 6}{8} = 102$$

$\therefore$ 6th number $= 102$.

215. (d) Given, $x + y = 8$ ...(i)

$y + z = 13$ ...(ii)

$z + x = 17$ ...(iii)

then $\frac{x^2}{yz} = ?$

By subtracting Eqn. 1 and Eqn. 2 and Eqn. 4 adding with Eqn. 3

$(x + y = 8) - (y + z = 13) = x - z = -5$ ...(iv)

$(x - z = -5) + (z + x = 17) = (2x = 12)$

$$\therefore \quad 2x = 12 \quad \therefore \quad x = \frac{12}{2} = 6$$

Now putting the value of x we get $y = 2$, and $z = 11$.

$$\therefore \quad \frac{x^2}{yz} = \frac{(6)^2}{2\times 11} = \frac{36}{22} = \frac{18}{11}$$

216. (d) We have,

$a - b = 4$ ...(i)

$a^3 - b^3 = 88$

From formula,

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

$$\Rightarrow 88 = 4(a^2 + ab + b^2)$$

$$\therefore (a^2 + ab + b^2) = \frac{88}{4} = 22 \quad \text{...(ii)}$$

Again, $a^2 - 2ab + b^2 = (a-b)^2 = (4)^2 = 16$ ...(iii)

From (i) – (ii), we have

$3ab = 22 - 16 = 6 \Rightarrow ab = 2$

Putting in equation (i),

$$a^2 + 2 + b^2 = 22 \Rightarrow a^2 + b^2 = 20$$

Then, $(a+b)^2 = a^2 + 2ab + b^2 = 20 + 2 \times 2 = 24$

$$\Rightarrow a + b = 2\sqrt{6} \quad \text{...(iv)}$$

From (i) and (iv),

$$(a^2 - b^2) = (a+b)\times(a-b) = (2\sqrt{6})\times(4) = 8\sqrt{6}.$$

217. (a) $x + y + z = 10$

$x^3 + y^3 + z^3 = 75$

$xyz = 15$

From formula,

$$x^3 + y^3 + z^3 - 3xyz$$

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

$$\Rightarrow 75 - 3\times 15 = 10\cdot(x^2 + y^2 + z^2 - xy - yz - zx)$$

$$\Rightarrow 30 = 10\cdot(x^2 + y^2 + z^2 - xy - yz - zx)$$

$$\therefore (x^2 + y^2 + z^2 - xy - yz - zx) = 3.$$

218. (a) $2.1 + 2.25 \div [63 - \{7.5 \times 8 + (13 - 2.5 \times 5)\}]$

$= 2.1 + 2.25 \div [63 - \{60 + 0.5\}] = 2.1 + 2.25 \div 2.5$

$$= 2.1 + 2.25 \times \frac{1}{2.5} = 2.1 + 0.9 = 3.$$

219. (a) $(a + b) = 11, ab = 15$

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

$$= (11)^2 - 2\times 15 = 121 - 30 = 91.$$

220. (d) $x - \frac{1}{x} = 1$

Squaring on both side

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

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

$$\Rightarrow \quad x^2 + \frac{1}{x^2} = 3$$

Again squaing on both sides,

$$x^4 + \frac{1}{x^4} = 9 - 2$$

$$\Rightarrow \quad x^4 + \frac{1}{x^4} = 7$$

Again squaring on both sides,

$$x^8 + \frac{1}{x^8} = 49 - 2$$

$$\Rightarrow \quad x^8 + \frac{1}{x^8} = 47$$

221. (b) $x^4 + \frac{1}{x^4} = 727$

Adding 2 on both sides,

$$x^4 + \frac{1}{x^4} + 2 = 727 + 2$$

$$\Rightarrow \quad \left(x^2 + \frac{1}{x^2}\right)^2 = 729$$

$$\Rightarrow \quad x^2 + \frac{1}{x^2} = 27$$

Subtracting 2 on both sides,

$$x^2+\frac{1}{x^2}-2=27-2$$

$$\Rightarrow \left(x-\frac{1}{x}\right)^2=25$$

$$\Rightarrow \left(x-\frac{1}{x}\right)=5$$

222. (a) $2x^2-8x-1=0$

Dividing by x,

$$2x-8-\frac{1}{x}=0$$

$$\Rightarrow 2x-\frac{1}{x}=8$$

Cubing on both sides,

$$\left(2x-\frac{1}{x}\right)^3=8^3$$

$$\Rightarrow 8x^3-\frac{1}{x^3}-3\times 2x\times\frac{1}{x}\left(2x-\frac{1}{x}\right)=512$$

$$\Rightarrow 8x^3-\frac{1}{x^3}-6(8)=512$$

$$\Rightarrow 8x^3-\frac{1}{x^3}=512+48$$

$$\Rightarrow 8x^3-\frac{1}{x^3}=560$$

223. (d) $x+\frac{1}{x}=\sqrt{13}$

So, $x-\frac{1}{x}=\sqrt{(\sqrt{13})^2-4}=\sqrt{13-4}=\sqrt{9}=3$

Hence, $x^3-\frac{1}{x^3}=(3)^3+3\times(3)=27+9=36$

224. (a) $x^2+(4-\sqrt{3})x-1=0$

$$\Rightarrow x^2+(4-\sqrt{3})x=1$$

Divided by x both sides,

$$\Rightarrow x+(4-\sqrt{3})=\frac{1}{x}$$

$$\Rightarrow x-\frac{1}{x}=\sqrt{3}-4$$

Hence, $x^2+\frac{1}{x^2}=(\sqrt{3}-4)^2+2=(3+16-8\sqrt{3})+2$

$=19-8\sqrt{3}+2=(21-8\sqrt{3})$

225. (b) $x^2+\frac{1}{x^2}=83$

Subtracting '2' on both sides,

$$x^2+\frac{1}{x^2}-2=83-2$$

$$\Rightarrow \left(x-\frac{1}{x}\right)^2=81$$

Taking square root on both sides,

$$x-\frac{1}{x}=9$$

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

$=9\,(83+1)$ $\quad=9\times 84=756$

226. (d) $x:y:z=1:2:3$

$$\frac{x^2+2y^2+z^2}{3x^2-2y^2+4z^2}=\frac{1+2\times 2^2+3^2}{3-2\times 2^2+4\times 3^2}$$

$$\Rightarrow \frac{1+8+9}{3-8+36}=\frac{18}{31}$$

227. (c) $a^2+b^2+c^2+216=2\,(6a+6b-12)$

Coefficient of $a=6$

Coefficient of $b=6$

Coefficient of $c=-12$

$\Rightarrow \sqrt{6\times 6+6\times 12-12\times 6}$

$\Rightarrow 6$

228. (c) $x^4+\frac{1}{x^4}=194$

$$x^4+\frac{1}{x^4}+2\cdot x^4\cdot\frac{1}{x^4}=194+2\cdot x^4\cdot\frac{1}{x^4}$$

$$\left(x^2+\frac{1}{x^2}\right)^2=196$$

$$x^2+\frac{1}{x^2}=14$$

$$=x^2+\frac{1}{x^2}+2\cdot x^2\cdot\frac{1}{x^2}=14+2\cdot x^2\cdot\frac{1}{x^2}$$

$$=\left(x+\frac{1}{x}\right)^2=16=x+\frac{1}{x}=4$$

229. (c) $a^3-b^3=(a-b)\,(a^2+b^2+ab)$

$$\Rightarrow \frac{(\sqrt{5}x-\sqrt{3}y)(5x^2+3y^2+\sqrt{15}xy)}{(\sqrt{5}x-\sqrt{3}y)}$$

$=\text{A}x^2+\text{B}y^2+\text{C}xy$

Compare both sides

A = 5, B = 3, C = $\sqrt{15}$

$\Rightarrow$ 3A + B – $\sqrt{15}$ C

$=3\times 5+3-\sqrt{15}\times\sqrt{15}=3$

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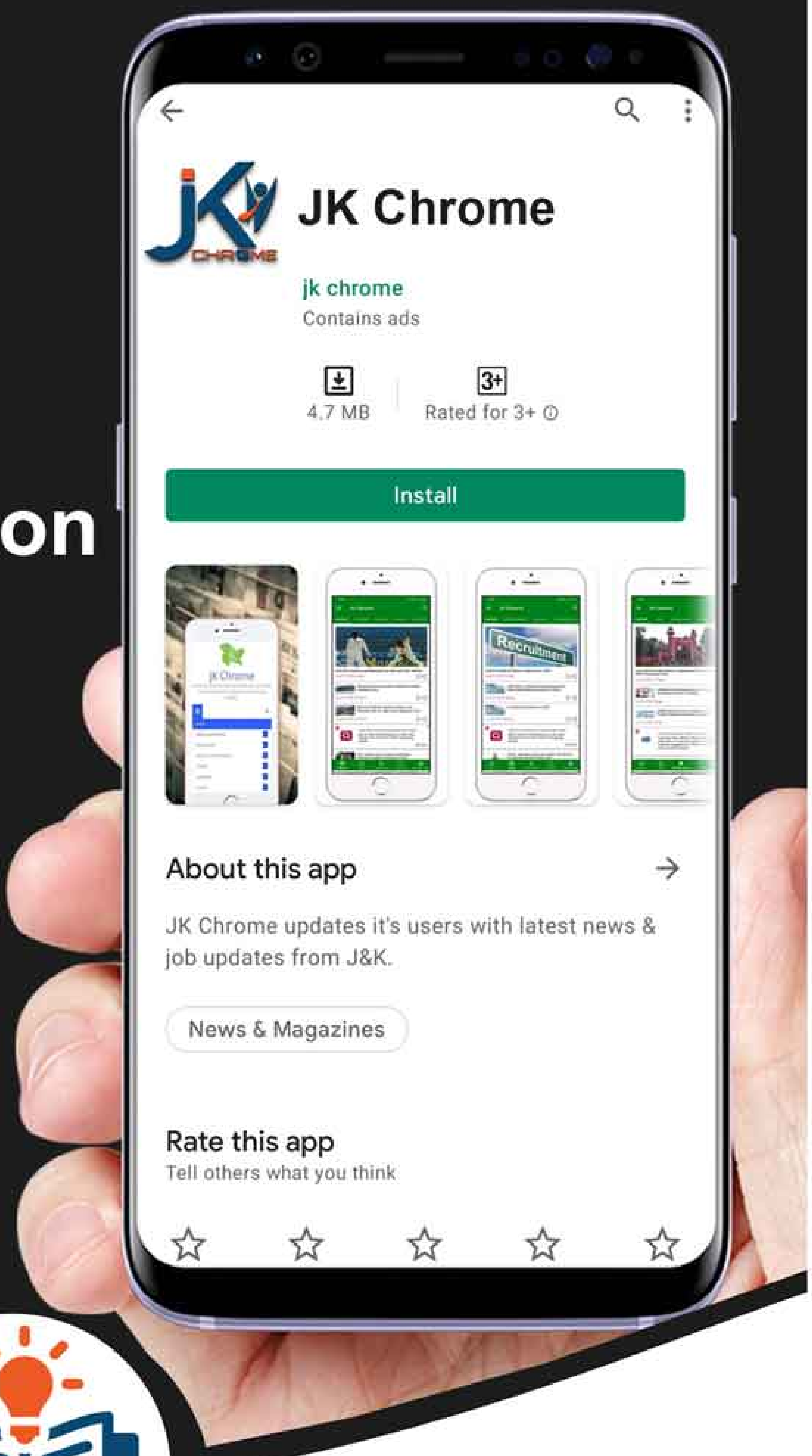

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