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TABLE

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OBJECTIVE QUESTIONS ON ALGEBRA ASKED IN VARIOUS EXAMS CONDUCTED BY SSC IN PREVIOUS YEARS'

1. If $x + \frac{1}{2x} = 2$, find the value of $8x^3 + \frac{1}{x^3}$.

(1) 48 (2) 88
(3) 40 (4) 44

2. If $x = 2 - 2^{1/3} + 2^{2/3}$, then the value of $x^3 - 6x^2 + 18x + 18$ is

(1) 22 (2) 33
(3) 40 (4) 45

3. If $x + \frac{1}{x} = 2$ and x is real, then the value of $x^{17} + \frac{1}{x^{19}}$ is

(1) 1 (2) 0
(3) 2 (4) –2

4. If $x^2 + y^2 - 4x - 4y + 8 = 0$, then the value of $x - y$ is

(1) 4 (2) –4
(3) 0 (4) 8

5. If $a^3 - b^3 - c^3 - 3abc = 0$, then

(1) $a = b = c$
(2) $a + b + c = 0$
(3) $a + c = b$ (4) $a = b + c$

6. If $2x + \frac{1}{3x} = 5$, find the value of $\frac{5x}{6x^2 + 20x + 1}$.

(1) $\frac{1}{4}$ (2) $\frac{1}{6}$
(3) $\frac{1}{5}$ (4) $\frac{1}{7}$

7. If for two real constants a and b, the expression $ax^3 + 3x^2 - 8x + b$ is exactly divisible by $(x + 2)$ and $(x - 2)$, then

(1) $a = 2, b = 12$
(2) $a = 12, b = 2$
(3) $a = 2, b = -12$
(4) $a = -2, b = 12$

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

(1) 9 (2) 18
(3) 27 (4) 1

9. If $x^2 + y^2 + 2x + 1 = 0$, then the value of $x^{31} + y^{35}$ is

(1) –1 (2) 0
(3) 1 (4) 2

10. The lines $2x + y = 5$ and $x + 2y = 4$ intersect at the point :

(1) (1,2) (2) (2,1)
(3) $(\frac{5}{2}, 0)$ (4) (0,2)

11. The value of the expression $x^4 - 17x^3 + 17x^2 - 17x + 17$ at $x = 16$ is

(1) 0 (2) 1
(3) 2 (4) 3

12. If $(2^x)(2^y) = 8$ and $(9^x)(3^y) = 81$, then (x, y) is :

(1) (1,2) (2) (2, 1)
(3) (1,1) (4) (2, 2)

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

(1) 1 (2) 2
(3) $2\sqrt{2}$ (4) $3\sqrt{3}$

14. If $a = 23$ and $b = -29$ then the value of $25a^2 + 40ab + 16b^2$ is :

(1) 1 (2) –1
(3) 0 (4) 2

15. If $x + \frac{1}{4x} = \frac{3}{2}$, find the value of $8x^3 + \frac{1}{8x^3}$.

(1) 18 (2) 36
(3) 24 (4) 16

16. If $x = \frac{4ab}{a+b}$ $(a \neq b)$, the value of $\frac{x+2a}{x-2a} + \frac{x+2b}{x-2b}$ is

(1) a (2) b
(3) 2 ab (4) 2

17. If $x = b + c - 2a$, $y = c + a - 2b$, $z = a + b - 2c$, then the value of $x^2 + y^2 - z^2 + 2xy$ is

(1) 0 (2) $a + b + c$
(3) $a - b + c$ (3) $a + b - c$

18. If $(a - 1)^2 + (b + 2)^2 + (c + 1)^2 = 0$, then the value of $2a - 3b + 7c$ is

(1) 12 (2) 3
(3) –11 (4) 1

19. $(y - z)^3 + (z - x)^3 + (x - y)^3$ is equal to

(1) $3(y - z)(z + x)(y - x)$
(2) $(x - y)(y + z)(x - z)$
(3) $3(y - z)(z - x)(x - y)$
(4) $(y - z)(z - x)(x - y)$

20. If the sum of $\frac{a}{b}$ and its reciprocal is 1 and $a \neq 0$, $b \neq 0$, then the value of $a^3 + b^3$ is

(1) 2 (2) –1
(3) 0 (4) 1

21. If $x^2 + y^2 + \frac{1}{x^2} + \frac{1}{y^2} = 4$, then the value of $x^2 + y^2$ is

(1) 2 (2) 4
(3) 8 (4) 16

22. If $x^2 = y + z$, $y^2 = z + x$, $z^2 = x + y$, then the value of $\frac{1}{x+1} + \frac{1}{y+1} + \frac{1}{z+1}$ is

(1) –1 (2) 1
(3) 2 (4) 4

23. If $x + \frac{1}{x} = \sqrt{3}$ then the value of $x^{18} + x^{12} + x^6 + 1$ is

(1) 0 (2) 1
(3) 2 (4) 3

24. If $a^2 + b^2 = 2$ and $c^2 + d^2 = 1$, then the value of $(ad - bc)^2 + (ac + bd)^2$ is

(1) $\frac{4}{9}$ (2) $\frac{1}{2}$
(3) 1 (4) 2

25. If $x^4 + \frac{1}{x^4}$ = 119 and x > l, then the value of $x^3 - \frac{1}{x^3}$ is
(1) 54 (2) 18
(3) 72 (4) 36

26. If $x - y = \frac{x+y}{7} = \frac{xy}{4}$, the numerical value of xy is
(1) $\frac{4}{3}$ (2) $\frac{3}{4}$
(3) $\frac{1}{4}$ (4) $\frac{1}{3}$

27. If $(x + y - z)^2 + (y + z - x)^2 + (z + x - y)^2 = 0$, then the value of $x + y - z$ is
(1) $\sqrt{3}$ (2) $3\sqrt{3}$
(3) 3 (4) 0

28. If $x + y + z = 0$, then $\frac{x^2}{yz} + \frac{y^2}{zx} + \frac{z^2}{xy}$ = ?
(1) $(xyz)^2$ (2) $x^2 + y^2 + z^2$
(3) 9 (4) 3

29. If $x^2 + 2 = 2x$, then the value of $x^4 - x^3 + x^2 + 2$ is
(1) 0 (2) 1
(3) –1 (4) $\sqrt{2}$

30. If $2^x = 3^y = 6^{-z}$ then $\left(\frac{1}{x} + \frac{1}{y} + \frac{1}{z}\right)$ is equal to
(1) 0 (2) 1
(3) $\frac{3}{2}$ (4) $-\frac{1}{2}$

31. If $\frac{1}{x+y} = \frac{1}{x} + \frac{1}{y}$ ($x \neq 0$, $y \neq 0$, $x \neq y$) then, the value of $x^3 - y^3$ is
(1) 0 (2) 1
(3) –1 (4) 2

32. For real a, b, c if $a^2 + b^2 + c^2 = ab + bc + ca$, then value of $\frac{a+c}{b}$ is
(1) 1 (2) 2
(3) 3 (4) 0

33. If $x = a(b - c)$, $y = b(c - a)$ and $z = c(a - b)$, then
$\left(\frac{x}{a}\right)^3 + \left(\frac{y}{b}\right)^3 + \left(\frac{z}{c}\right)^3$ =
(1) $\frac{xyz}{3abc}$ (2) $3\,xyzabc$
(3) $\frac{3xyz}{abc}$ (4) $\frac{xyz}{abc}$

34. If $a + b + c = 0$, then the value of
$\frac{1}{(a+b)(b+c)} + \frac{1}{(a+c)(b+a)} + \frac{1}{(c+a)(c+b)}$ is:
(1) 1 (2) 0
(3) –1 (4) –2

35. If the square root of x is the cube root of y, then the relation between x and y is
(1) $x^3 = y^2$ (2) $x^2 = y^3$
(3) $x = y$ (4) $x^6 = y^5$

36. If $\frac{2p}{p^2 - 2p + 1} = \frac{1}{4}, p \neq 0$, then the value of $p + \frac{1}{p}$ is
(1) 4 (2) 5
(3) 10 (4) 12

37. If x varies inversely as $(y^2 - 1)$ and is equal to 24 when y = 10, then the value of x when y = 5 is
(1) 99 (2) 12
(3) 24 (4) 100

38. If $m + \frac{1}{m-2} = 4$, find the value of $(m - 2)^2 + \frac{1}{(m-2)^2}$.
(1) –2 (2) 0
(3) 2 (4) 4

39. 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
(1) 1 (2) 2
(3) 3 (4) 4

40. If $x + y = a$ and $xy = b^2$, then the value of $x^3 - x^2y - xy^2 + y^3$ in terms of a and b is :
(1) $(a^2 + 4b^2)\,a$ (2) $a^3 - 3b^2$
(3) $a^3 - 4b^2a$ (4) $a^3 + 3b^2$

41. The value of the expression
$\frac{(a-b)^2}{(b-c)(c-a)} + \frac{(b-c)^2}{(a-b)(c-a)} + \frac{(c-a)^2}{(a-b)(b-c)}$ is :
(1) 0 (2) 3
(3) $\frac{1}{3}$ (4) 2

42. If $\frac{2x-y}{x+2y} = \frac{1}{2}$, then value of $\frac{3x-y}{3x+y}$ is :
(1) $\frac{1}{5}$ (2) $\frac{3}{5}$
(3) $\frac{4}{5}$ (4) 1

43. For what value(s) of a is $x + \frac{1}{4}\sqrt{x} + a^2$ a perfect square?
(1) $\pm\frac{1}{18}$ (2) $\pm\frac{1}{8}$
(3) $-\frac{1}{5}$ (4) $\frac{1}{4}$

44. If $x = \frac{\sqrt{3}}{2}$, then $\frac{\sqrt{1+x}}{1+\sqrt{1+x}} + \frac{\sqrt{1-x}}{1-\sqrt{1-x}}$ is equal to
(1) 1 (2) $2/\sqrt{3}$
(3) $2-\sqrt{3}$ (4) 2

45. If $\sqrt{7\sqrt{7\sqrt{7\sqrt{7....}}}} = (343)^{y-1}$, then y is equal to

(1) $\frac{2}{3}$ (2) 1
(3) $\frac{4}{3}$ (4) $\frac{3}{4}$

46. If $x = \frac{\sqrt{5}-2}{\sqrt{5}+2}$, then $x^4 + x^{-4}$ is
(1) a surd
(2) a rational number but not an integer
(3) an integer
(4) an irrational number but not a surd

47. If $x = \frac{2\sqrt{6}}{\sqrt{3}+\sqrt{2}}$, then the value of $\frac{x+\sqrt{2}}{x-\sqrt{2}} + \frac{x+\sqrt{3}}{x-\sqrt{3}}$ is :
(1) $\sqrt{2}$ (2) $\sqrt{3}$
(3) $\sqrt{6}$ (4) 2

48. If $x = 2 + \sqrt{3}$, then the value, of $\sqrt{x} + \frac{1}{\sqrt{x}}$ is:
(1) $\sqrt{3}$ (2) $\sqrt{6}$
(3) $2\sqrt{6}$ (4) 6

49. If $x = \frac{\sqrt{3}}{2}$, then the value of $\sqrt{1+x} + \sqrt{1-x}$ will be
(1) $\frac{1}{\sqrt{3}}$ (2) $2\sqrt{3}$
(3) $\sqrt{3}$ (4) 2

50. If $x = 1 + \sqrt{2} + \sqrt{3}$, then the value of $(2x^4 - 8x^3 - 5x^2 + 26x - 28)$ is
(1) $6\sqrt{6}$ (2) 0
(3) $3\sqrt{6}$ (4) $2\sqrt{6}$

51. If $x + \frac{1}{x} = 5$, then the value of $\frac{x^4 + \frac{1}{x^2}}{x^2 - 3x + 1}$ is
(1) 70 (2) 50
(3) 110 (4) 55

52. If $x = 2 + \sqrt{3}$, $y = 2 - \sqrt{3}$, then the value of $\frac{x^2+y^2}{x^3+y^3}$ is
(1) $\frac{7}{38}$ (2) $\frac{7}{40}$
(3) $\frac{7}{19}$ (4) $\frac{7}{26}$

53. If $x = 27$ and $\sqrt[3]{x} + \sqrt[3]{y} = \sqrt[3]{729}$, then y =
(1) 64 (2) 125
(3) 216 (4) 81

54. If $\frac{3-5x}{x} + \frac{3-5y}{y} + \frac{3-5z}{z} = 0$, the value of $\frac{1}{x} + \frac{1}{y} + \frac{1}{z}$ is
(1) –5 (2) 5
(3) 2 (4) 3

55. If $x^2 - 3x + 1 = 0$ and $x > 1$, then the value of $\left(x - \frac{1}{x}\right)$ is
(1) $\sqrt{5}$ only (2) 1
(3) $-\sqrt{5}$ only (4) $\pm\sqrt{5}$

56. If $a^x = (x + y + z)^y$, $a^y = (x + y + z)^z$ and $a^z = (x + y + z)^x$, then the value of $x + y + z$ (given $a \neq 0$) is
(1) 0 (2) a^3
(3) 1 (4) a

57. If $x = 2 + \sqrt{3}$, the value of $\frac{x^6 + x^4 + x^2 + 1}{x^3}$ is
(1) 65 (2) 56
(3) 69 (4) 67

58. 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
(1) $y < x$ and $x = z$
(2) $x < y$ and $x = z$
(3) $y < z < x$
(4) $z < x < y$

59. If $x^4 + \frac{1}{x^4} = 23$, then the value of $\left(x - \frac{1}{x}\right)^2$ will be
(1) 7 (2) – 7
(3) – 3 (4) 3

60. If $a + b + 1 = 0$, then the value of $(a^3 + b^3 + 1 - 3ab)$ is
(1) 3 (2) 0
(3) – 1 (4) 1

61. For what value of K is the points A (– 2, 3), B (1, 2) and C (K, 0) are collinear.
(1) 5 (2) 6
(3) – 7 (4) 7

62. If the points A (– 2, – 1), B (1, 0), C (x, 3) and D (1, y) are the vertices of a parallelogram. Then the values of x and y will be
(1) (2, 4) (2) (1, 2)
(3) (4, 2) (4) (–4, 2)

63. The point on x-axis which is equidistant from (7, 6) and (–3, 4) will be
(1) (3, 0) (2) (0, 3)
(3) (–3, 0) (4) (1, 2)

64. The angle between the lines whose slopes are $(2-\sqrt{3})$ and $(2+\sqrt{3})$ is
(1) 30° (2) 45°
(3) 60° (4) 150°

65. The equation of a line which makes an angle 150° with x-axis and passing through (3, –5) will be
(1) $x + \sqrt{3}y = 0$
(2) $x + \sqrt{3}y = 3 - 5\sqrt{3}$
(3) $\sqrt{3}x + y = 3 + 5\sqrt{3}$
(4) $\sqrt{3}x - y - 5\sqrt{3} = 0$

66. The slope of a line whose inclination is 135° is
(1) – 1 (2) 1
(3) $-\frac{1}{2}$ (4) $\frac{1}{2}$

67. The inclination of a line whose slope is $\sqrt{3}$ is
(1) 30° (2) 45°
(3) 90° (4) 60°

68. What will be the slope of a line which passes through the points (–1, 2) and (–2, –4)
(1) 5 (2) 6
(3) – 6 (4) 1

69. For what value of x, the line through (4, x) and (2, 5) is perpendicular to the line through (–1, 4) and (0, 6)
(1) 2 (2) 4
(3) – 4 (4) 5

70. For what value of k the lines passing through (1, 2) and (k, 4) is parallel to the line passing through (–1, 4) and (6, 5)
(1) 12 (2) 15
(3) –1 (4) 7

71. What will be the equation of a line parallel to x-axis and at a distance of 7 units above it.
(1) $x - 7 = 0$
(2) $y + 7 = 0$
(3) $y - 7 = 0$
(4) $x + 7 = 0$

72. What will be the inclination of the line $\sqrt{3}x - y - 4 = 0$
(1) 60° (2) 135°
(3) 150° (4) 180°

73. The angle between the lines $\sqrt{3}x + y = 1$ and $x + \sqrt{3}y = 1$ will be
(1) 30° (2) 60°
(3) 45° (4) 120°

74. The length of perpendicular from the point (a, b) to the line $\frac{x}{a}+\frac{y}{b} = 1$ is given by
(1) $\frac{ab}{a^2+b^2}$ (2) $\frac{ab}{\sqrt{a^2+b^2}}$
(3) $\frac{a+b}{\sqrt{a^2+b^2}}$ (4) $\frac{2ab}{\sqrt{a^2+b^2}}$

75. The coordinates of the point which divides the join of P (– 5, 11) and Q (4, – 7) in the ratio 2 : 7 will be
(1) (4, 2) (2) (– 4, – 2)
(3) (– 3, 7) (4) (– 2, 4)

76. The equation of the line which has p = 3 and α = 150° is given by
(1) $\sqrt{3}x + y + 5 = 0$
(2) $\sqrt{3}x - y - 6 = 0$
(3) $\sqrt{3}x - y + 6 = 0$
(4) $\sqrt{3}x = y$

77. If the slope of the line passing through the points (3, 5) and (x, 2) is 3, then the value of x will be
(1) 2 (2) – 1
(3) 3 (4) 4

78. The distance of the point (2, 3) from the line $2x - 4y + 5 = 0$ is
(1) $\frac{2}{\sqrt{20}}$ units
(2) $\frac{3}{\sqrt{20}}$ units
(3) $\frac{4}{\sqrt{15}}$ units
(4) $\frac{5}{\sqrt{20}}$ units

79. The distance between the parallel lines $2x + 3y + 5 = 0$ and $4x + 6y + 9 = 0$ is
(1) $\frac{1}{\sqrt{13}}$ units (2) $\frac{1}{3\sqrt{13}}$ units
(3) $\frac{1}{2\sqrt{15}}$ units
(4) $\frac{1}{2\sqrt{13}}$ units

80. For what value of k the lines $3x + y = 2$, $kx + 2y = 3$ and $2x - y = 3$ may intersect at a point.
(1) 2 (2) – 5
(3) 6 (4) 5

ANSWERS

1. (3)	**2.** (3)	**3.** (3)	**4.** (3)
5. (4)	**6.** (4)	**7.** (3)	**8.** (2)
9. (1)	**10.** (2)	**11.** (2)	**12.** (1)
13. (2)	**14.** (1)	**15.** (1)	**16.** (4)
17. (1)	**18.** (4)	**19.** (3)	**20.** (3)
21. (1)	**22.** (2)	**23.** (1)	**24.** (4)
25. (4)	**26.** (1)	**27.** (4)	**28.** (4)
29. (1)	**30.** (1)	**31.** (1)	**32.** (2)
33. (3)	**34.** (2)	**35.** (1)	**36.** (3)
37. (1)	**38.** (3)	**39.** (4)	**40.** (3)
41. (2)	**42.** (2)	**43.** (2)	**44.** (2)
45. (3)	**46.** (3)	**47.** (4)	**48.** (2)
49. (3)	**50.** (1)	**51.** (4)	**52.** (4)
53. (3)	**54.** (2)	**55.** (4)	**56.** (4)
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61. (4)	**62.** (3)	**63.** (1)	**64.** (3)
65. (2)	**66.** (1)	**67.** (4)	**68.** (2)
69. (2)	**70.** (2)	**71.** (3)	**72.** (1)
73. (1)	**74.** (2)	**75.** (3)	**76.** (3)
77. (1)	**78.** (2)	**79.** (4)	**80.** (4)

EXPLANATIONS

1. (3) $x + \frac{1}{2x} = 2 \Rightarrow 2x + \frac{2}{2x} = 4$

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

On Cubing

$8x^3 + \frac{1}{x^3} + 3.2x.\frac{1}{x}\left(2x + \frac{1}{x}\right) = 64$

$\Rightarrow 8x^3 + \frac{1}{x^3} + 6 \times 4 = 64$

$\Rightarrow 8x^3 + \frac{1}{x^3} = 64 - 24 = 40$

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

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

On Cubing

$x^3 - 3x^2 \times 2 + 3x \times 4 - 8$

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

$- 3.2^{\frac{2}{3}}.2^{\frac{1}{3}}\left(2^{\frac{2}{3}} - 2^{\frac{1}{3}}\right)$

$\Rightarrow x^3 - 6x^2 + 12x - 8$
$= 4 - 2 - 6(x - 2)$
$\Rightarrow x^3 - 6x^2 + 12x - 8$
$= 2 - 6x + 12$
$\Rightarrow x^3 - 6x^2 + 18x + 18$
$= 2 + 12 + 8 + 18 = 40$

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

$\Rightarrow x^2 - 2x + 1 = 0$
$\Rightarrow (x - 1)^2 = 0 \Rightarrow x = 1$

$\therefore x^{17} + \frac{1}{x^{19}} = 1 + 1 = 2$

4. (3) $x^2 + y^2 - 4x - 4y + 8 = 0$
$\Rightarrow x^2 - 4x + 4 + y^2 - 4y + 4 = 0$
$\Rightarrow (x - 2)^2 + (y - 2)^2 = 0$
$\Rightarrow x = 2$ and $y = 2$
$\therefore x - y = 2 - 2 = 0$

5. (4) $a^3 + b^3 + c^3 - 3$ abc $= 0$
if $a + b + c = 0$
$\therefore a^3 - b^3 - c^3 - 3$ abc $= 0$
$\Rightarrow a - b - c = 0$
$\Rightarrow a = b + c$

6. (4) $2x + \frac{1}{3x} = 5$

$\Rightarrow 6x^2 + 1 = 15x$
$\Rightarrow 6x^2 + 20x + 1 = 15x + 20x$
$= 35x$

$\therefore \frac{5x}{6x^2 + 20x + 1} = \frac{5x}{35x} = \frac{1}{7}$

7. (3) $P(x) = ax^3 + 3x^2 - 8x + b$
$\therefore P(-2) = -8a + 12 + 16 + b = 0$
$\Rightarrow -8a + b + 28 = 0$ ……(i)
$\Rightarrow P(2) = 8a + 12 - 16 + b = 2$
$\Rightarrow 8a + b - 4 = 0$ ….(ii)
By equation (i) + (ii)
$2b + 24 = 0$

$\Rightarrow b = -\frac{24}{2} = -12$

From equation (i),
$- 8a - 12 + 28 = 0$
$\Rightarrow -8a = -16$
$\Rightarrow a = 2$

8. (2) $x^2 - 3x + 1 = 0$
$\Rightarrow x^2 + 1 = 3x$

$\Rightarrow x + \frac{1}{x} = 3$

$\therefore x^3 + \frac{1}{x^3}$

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

$= 27 - 3 \times 3 = 18$

9. (1) $x^2 + y^2 + 2x + 1 = 0$
$\Rightarrow x^2 + 2x + 1 + y^2 = 0$
$\Rightarrow (x + 1)^2 + y^2 = 0$
$\Rightarrow x + 1 = 0 \Rightarrow x = -1$
and $y = 0$
$\therefore x^{31} + y^{35} = -1$

10. (2) $2x + y = 5$ ...(i)
$x + 2y = 4$ ...(ii)
By equation (i) × 2 – equation (ii), we have
$4x + 2y = 10$
$x + 2y = 4$
– – –

$3x = 6$
$\Rightarrow x = 2$
From equation (i),
$2 \times 2 + y = 5$
$\Rightarrow y = 5 - 4 = 1$
$\therefore$ Point of intersection = (2, 1)

11. (2) $x^4 - 17x^3 + 17x^2 - 17x + 17$
$= x^4 - 16x^3 + 16x^2 - 16x - x^3 + x^2 - x + 17$
When $x = 16$,
Expression $= 16^4 - 16^4 + 16^3 - 16^2 - 16^3 + 16^2 - 16 + 17 = 1$

12. (1) $2^x.2^y = 8$
$\Rightarrow 2^{x+y} = 2^3$
$\Rightarrow x + y = 3$ ...(i)
$9^x.3^y = 3^4$
$\Rightarrow 3^{2x}.3^y = 3^4$
$\Rightarrow 2x + y = 4$ ...(ii)
By equation (ii) – (i),
$x = 1$
From equation (i),
$1 + y = 3$
$\Rightarrow y = 2$

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

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

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

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

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

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

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

14. (1) $25a^2 + 40ab + 16b^2$
$= (5a + 4b)^2$
$= (5 \times 23 - 29 \times 4)^2$
$= (115 - 116)^2 = 1$

15. (1) $x + \frac{1}{4x} = \frac{3}{2}$

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

Cubing both sides,

$8x^3 + \frac{1}{8x^3} + 3 \times 2x \times \frac{1}{2x}$

$\left(2x + \frac{1}{2x}\right) = 27$

$\Rightarrow 8x^3 + \frac{1}{8x^3} + 3 \times 3 = 27$

$\Rightarrow 8x^3 + \frac{1}{8x^3} = 27 - 9 = 18$

16. (4) $x = \frac{4ab}{a + b}$

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

By componendo and dividendo,

$\frac{x + 2a}{x - 2a} = \frac{2b + a + b}{2b - a - b} = \frac{3b + a}{b - a}$

Again,

$$\frac{x}{2b} = \frac{2a}{a+b}$$

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

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

$$= \frac{3b+a}{b-a} + \frac{3a+b}{a-b}$$

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

$$= \frac{2(b-a)}{b-a} = 2$$

17. (1) $x^2 + y^2 - z^2 + 2xy$
$= x^2 + y^2 + 2xy - z^2$
$= (x+y)^2 - z^2 = (x+y+z)(x+y-z)$
$= (b + c - 2a + c + a - 2b + a + b - 2c)(x + y - z)$
$= 0$

18. (4) $(a-1)^2 + (b+2)^2 + (c+1)^2 = 0$
$\Rightarrow a - 1 = 0 \Rightarrow a = 1;$
$b + 2 = 0 \Rightarrow b = -2$
$c + 1 = 0 \Rightarrow c = -1$
$\therefore 2a - 3b + 7c$
$= 2 - 3(-2) + 7(-1)$
$= 2 + 6 - 7 = 1$

19. (3) If $a + b + c = 0$,
then, $a^3 + b^3 + c^3 = 3abc$
Here, $y - z + z - x + x - y = 0$
$\therefore (y-z)^3 + (z-x)^3 + (x-y)^3$
$= 3(y-z)(z-x)(x-y)$

20. (3) From the question,

$$\frac{a}{b} + \frac{b}{a} = 1$$

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

21. (1) $x^2 + y^2 + \frac{1}{x^2} + \frac{1}{y^2} - 4 = 0$

$$\Rightarrow x^2 + \frac{1}{x^2} - 2 + y^2 + \frac{1}{y^2} - 2 = 0$$

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

$$\Rightarrow x - \frac{1}{x} = 0$$

$\Rightarrow x^2 - 1 = 0 \Rightarrow x = 1$
Similarly,
$y = 1$
$\therefore x^2 + y^2 = 1 + 1 = 2$

22. (2) $x^2 = y + z$
$\Rightarrow x^2 + x = x + y + z$
$\Rightarrow x(x+1) = x + y + z$ ....(i)
Similarly,
$y(y+1) = x + y + z$ ....(ii)
and, $z(z+1) = x + y + z$ ...(iii)

$$\therefore \frac{1}{x+1} + \frac{1}{y+1} + \frac{1}{z+1}$$

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

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

23. (1) $x + \frac{1}{x} = \sqrt{3}$

Cubing both sides,

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

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

$$\Rightarrow x^3 + \frac{1}{x^3} = 0$$

Now, $x^{18} + x^{12} + x^6 + 1$
$= x^{12}(x^6 + 1) + 1(x^6 + 1)$
$= (x^{12} + 1)(x^6 + 1)$

$$= (x^{12} + 1) \cdot x^3\left(x^3 + \frac{1}{x^3}\right) = 0$$

24. (4) $(ad - bc)^2 + (ac + bd)^2$
$= a^2d^2 + b^2c^2 - 2abcd + a^2c^2 + b^2d^2 - 2abcd$
$= a^2d^2 + b^2c^2 + a^2c^2 + b^2d^2$
$= a^2d^2 + b^2d^2 + b^2c^2 + a^2c^2$
$= d^2(a^2 + b^2) + c^2(b^2 + a^2)$
$= (a^2 + b^2)(c^2 + d^2)$
$= 2 \times 1 = 2$

25. (4) $x^4 + \frac{1}{x^4} = 119$

$$\Rightarrow \left(x^2 + \frac{1}{x^2}\right)^2 - 2 = 119$$

$$\Rightarrow \left(x^2 + \frac{1}{x^2}\right)^2 = 121$$

$$\Rightarrow x^2 + \frac{1}{x^2} = 11$$

$$\Rightarrow \left(x - \frac{1}{x}\right)^2 + 2 = 11$$

$$\Rightarrow \left(x - \frac{1}{x}\right)^2 = 9 \Rightarrow x - \frac{1}{x} = 3$$

Cubing both sides,

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

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

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

$$\Rightarrow x^3 - \frac{1}{x^3} = 27 + 9 = 36$$

26. (1) $x - y = \frac{x+y}{7} = \frac{xy}{4} = k$

$\Rightarrow x - y = k$
$x + y = 7k$
$\therefore (x+y)^2 - (x-y)^2$
$= 49k^2 - k^2$
$\Rightarrow 4xy = 48k^2$
$\Rightarrow 16k = 48k^2$

$$\Rightarrow k = \frac{1}{3}$$

$$\therefore xy = 4k = 4 \times \frac{1}{3} = \frac{4}{3}$$

27. (4) $(x + y - z)^2 + (y + z - x)^2 + (z + x - y)^2 = 0$
$\Rightarrow (x + y - z) = 0$

28. (4) $\frac{x^2}{yz} + \frac{y^2}{zx} + \frac{z^2}{xy}$

$$= \frac{x^3 + y^3 + z^3}{xyz} = \frac{3xyz}{xyz} = 3$$

29. (1) $x^2 + 2 = 2x$

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

$x^2-2x+2\,\big)\,x^4 - x^3 + x^2 + 2\,\big(\,x^2 + x + 1$
$\quad x^4 - 2x^3 + 2x^2$
$\quad - \quad + \quad -$
$\quad x^3 - x^2 + 2$
$\quad x^3 - 2x^2 + 2x$
$\quad - \quad + \quad -$
$\quad x^2 - 2x + 2$
$\quad x^2 - 2x + 2$
$\quad \times$

$\therefore x^4 - x^3 + x^2 + 2$

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

30. (1) $2^x = 3^y = 6^{-z} = k$

$\Rightarrow 2 = k^{\frac{1}{x}};\ 3 = k^{\frac{1}{y}};\ 6 = k^{-\frac{1}{z}}$

$\because 2 \times 3 = 6$

$\Rightarrow k^{\frac{1}{x}} \times k^{\frac{1}{y}} = k^{-\frac{1}{z}}$

$\Rightarrow k^{\frac{1}{x}+\frac{1}{y}} = k^{-\frac{1}{z}}$

$\Rightarrow \frac{1}{x} + \frac{1}{y} = -\frac{1}{z} \Rightarrow \frac{1}{x} + \frac{1}{y} + \frac{1}{z} = 0$

31. (1) $\frac{1}{x+y} = \frac{1}{x} + \frac{1}{y} = \frac{y+x}{xy}$

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

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

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

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

$= 0$

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

$\Rightarrow 2a^2 + 2b^2 + 2c^2$

$= 2ab + 2bc + 2ca$

$\Rightarrow a^2 - 2ab + b^2 + b^2 - 2bc + c^2 + c^2 - 2ac + a^2 = 0$

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

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

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

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

$\Rightarrow a = b = c$

$\therefore \frac{a+c}{b} = \frac{a+a}{a} = 2$

33. (3)

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

Again, $b - c + c - a + a - b = 0$

$\therefore \left(\frac{x}{a}\right)^3 + \left(\frac{y}{b}\right)^3 + \left(\frac{z}{c}\right)^3$

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

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

$= \frac{3xyz}{abc}$

34. (2) $\frac{1}{(a+b)(b+c)} + \frac{1}{(a+c)(b+a)} + \frac{1}{(c+a)(c+b)}$

$= \frac{c+a+b+c+a+b}{(a+b)(b+c)(c+a)}$

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

$= 0$ because $a + b + c = 0$

35. (1) $\sqrt{x} = \sqrt[3]{y}$

$\Rightarrow x^{\frac{1}{2}} = y^{\frac{1}{3}}$

$\Rightarrow (x^{\frac{1}{2}})^6 = (y^{\frac{1}{3}})^6$

$\Rightarrow x^3 = y^2$

36. (3) $\frac{2p}{p^2 - 2p + 1} = \frac{1}{4}$

$\Rightarrow \frac{p^2 - 2p + 1}{2p} = 4$

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

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

$\Rightarrow p + \frac{1}{p} = 8 + 2 = 10$

37. (1) $x \propto \frac{1}{y^2 - 1} \Rightarrow x = \frac{k}{y^2 - 1}$

Where k is a constant.

When $y = 10$, $x = 24$, then

$\therefore 24 = \frac{k}{10^2 - 1} \Rightarrow 24 = \frac{k}{99}$

$\Rightarrow k = 24 \times 99$

When $y = 5$, then

$x = \frac{k}{y^2 - 1} = \frac{24 \times 99}{5^2 - 1} = \frac{24 \times 99}{24} = 99$

38. (3) $m + \frac{1}{m-2} = 4$

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

On squaring both sides,

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

$\Rightarrow$

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

39. (4) $\frac{a}{1-a} + \frac{b}{1-b} + \frac{c}{1-c} = 1$

$\Rightarrow \left(\frac{a}{1-a} + 1\right) + \left(\frac{b}{1-b} + 1\right) + \left(\frac{c}{1-c} + 1\right)$

$= 3 + 1 = 4$

$\Rightarrow \frac{a+1-a}{1-a} + \frac{b+1-b}{1-b} + \frac{c+1-c}{1-c} = 4$

$\Rightarrow \frac{1}{1-a} + \frac{1}{1-b} + \frac{1}{1-c} = 4$

40. (3) $x^3 - x^2y - xy^2 + y^3$

$= x^3 + y^3 - x^2y - xy^2$

$= (x + y)^3 - 3xy(x + y) - xy(x + y)$

$= (x + y)^3 - 4xy(x + y) = a^3 - 4b^2a$

41. (2) $\frac{(a-b)^2}{(b-c)(c-a)} + \frac{(b-c)^2}{(a-b)(c-a)} + \frac{(c-a)^2}{(a-b)(b-c)}$

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

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

$$= \frac{3(a-b)(b-c)(c-a)}{(a-b)(b-c)(c-a)} = 3$$

$$\left[\begin{array}{r}\text{If } a+b+c=0,\\ \because a^3+b^3+c^3=3abc\end{array}\right]$$

42. (2) $\frac{2x-y}{x+2y} = \frac{1}{2}$

$\Rightarrow 4x - 2y = x + 2y \Rightarrow 3x = 4y$

$\Rightarrow \frac{x}{y} = \frac{4}{3}$

$$\therefore \quad \frac{3x-y}{3x+y} = \frac{y\left(3\frac{x}{y}-1\right)}{y\left(3\frac{x}{y}+1\right)}$$

$$= \frac{3\times\frac{4}{3}-1}{3\times\frac{4}{3}+1} = \frac{4-1}{4+1} = \frac{3}{5}$$

43. (2) $x+\frac{1}{4}\sqrt{x}+a^2$

$=\left(\sqrt{x}\right)^2+2.\sqrt{x}.\frac{1}{8}+(a)^2$

Clearly $a = \frac{1}{8}$.

Then, expression = $\left(\sqrt{x}+\frac{1}{8}\right)^2$

44. (2) Given $x = \frac{\sqrt{3}}{2}$

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

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

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

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

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

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

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

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

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

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

45. (3) Let $x=\sqrt{7\sqrt{7\sqrt{7\sqrt{7....}}}}$

On squaring both sides,

$x^2 = 7x$

$\Rightarrow x^2 - 7x = 0$

$\Rightarrow x\,(x - 7) = 0 \Rightarrow x = 7$

$\therefore 7 = (7^3)^{y-1} = 7^{3y-3}$

$\Rightarrow 3y - 3 = 1 \Rightarrow 3y = 4$

$\Rightarrow y = \frac{4}{3}$

46. (3) $x = \frac{\sqrt{5}-2}{\sqrt{5}+2}$

$$= \frac{\left(\sqrt{5}-2\right)^2}{\left(\sqrt{5}+2\right)\left(\sqrt{5}-2\right)}$$

$$= \frac{5+4-4\sqrt{5}}{5-4} = 9-4\sqrt{5}$$

$$\therefore \frac{1}{x} = 9+4\sqrt{5}$$

$\therefore x^4 + x^{-4} = x^4 + \frac{1}{x^4}$

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

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

$$= \left[\left(9+4\sqrt{5}+9-4\sqrt{5}\right)^2-2\right]^2-2$$

$= [(18)^2 - 2]^2 - 2$

$= (322)^2 - 2 = 103682$

whole number

Note : It is not required to find the product.

47. (4) $x = \frac{2\sqrt{3}\times\sqrt{2}}{\sqrt{3}+\sqrt{2}}$

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

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

(By componendo and dividendo)

Similarly,

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

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

$\therefore$ Expression

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

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

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

$= \frac{2(\sqrt{3}-\sqrt{2})}{\sqrt{3}-\sqrt{2}} = 2$

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

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

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

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

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

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

49. (3) $x = \frac{\sqrt{3}}{2}$

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

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

$= \sqrt{\frac{(\sqrt{3}+1)^2}{4}} = \frac{\sqrt{3}+1}{2}$

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

$\therefore \sqrt{1+x}+\sqrt{1-x}$

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

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

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

On squaring,

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

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

On squaring again,

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

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

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

$\Rightarrow 2x^4 - 8x^3 - 5x^2 + 26x - 28 - 3x^2 + 6x + 12 = 0$

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

$= 3x^2 - 6x - 12 = 3(x^2 - 2x - 4)$

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

51. (4) $x+\frac{1}{x} = 5$

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

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

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

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

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

$= \frac{1}{2}(125 - 3\times 5)$

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

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

$x + y = 4$; xy

$= 4 - 3 = 1$

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

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

53. (3) $x = 27$

$\therefore \sqrt[3]{x}+\sqrt[3]{y} = \sqrt[3]{729}$

$\Rightarrow \sqrt[3]{27}+\sqrt[3]{y} = 9$

$\Rightarrow 3+\sqrt[3]{y} = 9$

$\Rightarrow \sqrt[3]{y} = 9-3 = 6$

$\therefore y = (6)^3 = 216$

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

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

$\Rightarrow \frac{3}{x}+\frac{3}{y}+\frac{3}{z}-15 = 0$

$\Rightarrow 3\left(\frac{1}{x}+\frac{1}{y}+\frac{1}{z}\right) = 15$

$\Rightarrow \frac{1}{x}+\frac{1}{y}+\frac{1}{z} = 5$

55. (4) $x^2 - 3x + 1 = 0$

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

On dividing by x

$\Rightarrow x+\frac{1}{x} = 3$

$\therefore \left(x-\frac{1}{x}\right)^2 = \left(x+\frac{1}{x}\right)^2 - 4 = 9$

$- 4 = 5$

$\therefore x-\frac{1}{x} = \pm\sqrt{5}$

When, $x-\frac{1}{x} = \sqrt{5}$

and $x+\frac{1}{x} = 3$

On adding

$2x = 3+\sqrt{5}$

$\Rightarrow x = \frac{3+\sqrt{5}}{2}$

It satisfies $x^2 - 3x + 1 = 0$

Again, when $x-\frac{1}{x} = -\sqrt{5}$ and

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

On adding,

$2x = 3-\sqrt{5}$

$\Rightarrow x = \frac{3-\sqrt{5}}{2}$

$\therefore\ x^2 - 3x + 1$

$= \frac{(3-\sqrt{5})^2}{4} - \frac{3(3-\sqrt{5})}{2} + 1$

$= \frac{9+5-6\sqrt{5}}{4} - \frac{9-3\sqrt{5}}{2} + 1$

$= \frac{14-6\sqrt{5}-18+6\sqrt{5}+4}{4} = 0$

56. (4) $a^x = (x + y + z)^y$

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

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

Multiplying corresponding terms,

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

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

$\Rightarrow a = x + y + z$

57. (2) $\because\ x = 2 + \sqrt{3}$

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

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

$= 2 - \sqrt{3}$

$\therefore\ x + \frac{1}{x} = 4$

Expression

$= \frac{x^6 + x^4 + x^2 + 1}{x^3}$

$= \frac{x^4(x^2+1) + (x^2+1)}{x^3}$

$= \frac{(x^4+1)(x^2+1)}{x^3}$

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

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

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

$= (4^2 - 2)(4) = 56$

58. (4) $x = (0.08)^2$,

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

$= 156.25$

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

$= 1 + (0.08)^2 - 2 \times 0 .08 - 1$

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

Clearly, $z < x < y$

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

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

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

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

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

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

$= 5 - 2 = 3$

60. (2) If $a + b + c = 0$ then $a^3 + b^3 + c^3 - 3abc = 0$

61. (4) We know that when three points are collinear, the points lie on same line. In that case the area of triangle enclosed between the points is zero.

Here, area Δ ABC = 0

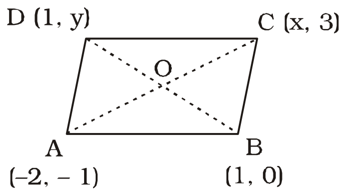
$\Rightarrow \frac{1}{2}\begin{vmatrix} -2 & 3 & 1 \\ 1 & 2 & 1 \\ K & 0 & 1 \end{vmatrix} = 0$

$\Rightarrow -2\ (2 - 0) - 3\ (1 - K) + 1\ (0 - 2K) = 0$

$\Rightarrow -4 - 3 + 3K - 2K = 0$

K = 7

62. (3) Here, ABCD is a parallelogram.



Mid point of AC = Mid point of BD

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

(using mid-point formula)

$-2 + x = 2$

$x = 4$

Now

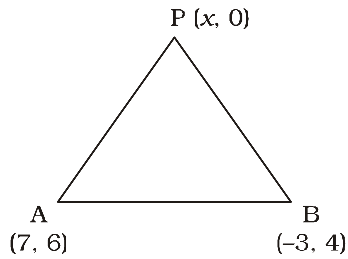
$\frac{-1+3}{2} = \frac{y+0}{2}$

$y = 2$

$\Rightarrow x = 4,\ y = 2$

63. (1) We know that on x-axis, y coordinate is zero.

It is given



PA = PB ...(1)

Using distance formula

PA = $\sqrt{(x-7)^2 + (6-0)^2}$

PB = $\sqrt{(x+3)^2 + (0-4)^2}$

Using equation (1)

$\sqrt{(x-7)^2 + 36} = \sqrt{(x+3)^2 + 16}$

Squaring on both sides, we get

$(x - 7)^2 + 36 = (x + 3)^2 + 16$

$x^2 + 49 - 14x + 36 = x^2 + 9 + 6x + 16$

$\Rightarrow 85 - 25 = 20x$

$\Rightarrow x = \frac{60}{20}$

$\boxed{x = 3}$

The point is (3, 0).

64. (3) Here, $m_1 = \left(2-\sqrt{3}\right)$

$m_2 = \left(2+\sqrt{3}\right)$

Let the angle between, the lines will be θ

$\Rightarrow \tan\theta = \left|\dfrac{m_1 - m_2}{1+m_1.m_2}\right|$

$= \left|\dfrac{2-\sqrt{3}-2-\sqrt{3}}{1+\left(2-\sqrt{3}\right)\left(2+\sqrt{3}\right)}\right|$

$= \left|\dfrac{-2\sqrt{3}}{1+(4-3)}\right| = \dfrac{2\sqrt{3}}{2} = \sqrt{3}$

$\Rightarrow \theta = 60°$

65. (2) Let the equation of line will be

$\dfrac{x-x_1}{\cos\theta} = \dfrac{y-y_1}{\sin\theta}$

Here, θ = 150° and the line passes through (3, – 5)

$\Rightarrow \dfrac{x-3}{\cos 150°} = \dfrac{y+5}{\sin 150°}$

$\dfrac{x-3}{\cos(180°-30°)} = \dfrac{y+5}{\sin(180°-30°)}$

$\dfrac{x-3}{-\cos 30°} = \dfrac{y+5}{\sin 30°}$

$\dfrac{x-3}{\frac{-\sqrt{3}}{2}} = \dfrac{y+5}{\frac{1}{2}}$

$\dfrac{x-3}{-\sqrt{3}} = \dfrac{y+5}{1}$

$x - 3 = -\sqrt{3}y - 5\sqrt{3}$

$\Rightarrow x + \sqrt{3}y = 3 - 5\sqrt{3}$

66. (1) Here, θ = 135°

As we know that

$m = \tan\theta$

$m = \tan 135°$

$m = \tan(90° + 45°)$

$m = -\cot 45°$

$[\because \tan(90° + \theta) = -\cot\theta]$

$\boxed{m = -1}$

67. (4) Here, $m = \sqrt{3}$

and we know that

$m = \tan\theta$

$\tan\theta = \sqrt{3}$

$\tan\theta = \tan 60°$

$\boxed{\theta = 60°}$

68. (2) We know that slope of a line is given by

$m = \dfrac{y_2 - y_1}{x_2 - x_1}$

$= \dfrac{-4-2}{-2-(-1)} = \dfrac{-6}{-1} = 6$

69. (2) The slope (m_1) of a line through (4, x) and (2, 5) is

$m_1 = \dfrac{y_2 - y_1}{x_2 - x_1}$

$m_1 = \dfrac{5-x}{2-4}$

$\boxed{m_1 = -\dfrac{(5-x)}{2}}$

Now, slope (m_2) of a line through (– 1, 4) and (0, 6) is

$m_2 = \dfrac{y_2 - y_1}{x_2 - x_1}$

$m_2 = \dfrac{6-4}{0+1}$

$m_2 = 2$

We know that when two lines are perpendicular then

$m_1.m_2 = -1$

$\dfrac{-(5-x)}{2}.\ 2 = -1$

$-5 + x = -1$

$x = 5 - 1$

$\boxed{x = 4}$

70. (2) Let A (1, 2) and B (k, 4)

Slope of line AB

$= \dfrac{y_2 - y_1}{x_2 - x_1} = \dfrac{4-2}{k-1}$

$m_1 = \dfrac{2}{k-1}$

Let P (–1, 4) and Q (6, 5)

slope of line PQ

$= \dfrac{y_2 - y_1}{x_2 - x_1} = \dfrac{5-4}{6+1} = \dfrac{1}{7}$

We know that when two lines are parallel then $m_1 = m_2$

$\Rightarrow \dfrac{2}{k-1} = \dfrac{1}{7}$

$14 = k - 1$

$\boxed{k = 15}$

71. (3) As the line is parallel to x-axis and 7 units above the origin its equation will be

$y = 7$ or, $\boxed{y - 7 = 0}$

72. (1) Equation of the line is

$\sqrt{3}x - y - 4 = 0$

Slope of line,

$m = -\dfrac{\text{Co-efficient of } x}{\text{Co-efficient of } y}$

$m = \dfrac{-\sqrt{3}}{-1}$

$m = \sqrt{3}$

Also, $m = \tan\theta$

$\Rightarrow \tan\theta = \sqrt{3}$

$\theta = 60°$

73. (1) For the equation $\sqrt{3}x + y = 1$

Its slope

$m_1 = -\dfrac{\text{Co-efficient of } x}{\text{Co-efficient of } y}$

$\boxed{m_1 = -\sqrt{3}}$

For the equation $x + \sqrt{3}y = 1$

Its slope

$m_2 = -\dfrac{\text{Co-efficient of } x}{\text{Co-efficient of } y}$

$= -\dfrac{1}{\sqrt{3}}$

Now, we know that angle between the lines is

$\tan\theta = \left|\dfrac{m_1 - m_2}{1 + m_1 m_2}\right|$

$\tan\theta = \left|\dfrac{-\sqrt{3} + \dfrac{1}{\sqrt{3}}}{1 - \sqrt{3}\left(\dfrac{-1}{\sqrt{3}}\right)}\right|$

$= \left|\dfrac{-2}{\sqrt{3}\times 2}\right| = \dfrac{1}{\sqrt{3}}$

$\tan\theta = \dfrac{1}{\sqrt{3}}$

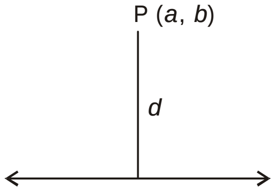
$\Rightarrow \theta = 30°$

74. (2) The equation of the line $\dfrac{x}{a} + \dfrac{y}{b} = 1$ can be written as

$bx + ay = ab$

or, $bx + ay - ab = 0$

Let the distance of the line from point p is d.



$d = \left|\dfrac{b.a + a.b - ab}{\sqrt{b^2 + a^2}}\right|$

$d = \dfrac{ab}{\sqrt{a^2 + b^2}}$ Units

75. (3) Let the coordinates of R will be (x, y)

Using internal section formula

R (x, y)

P 2 : 7 Q

(– 5, 11) (4, –7)

$x = \dfrac{mx_2 + nx_1}{m + n}$

$x = \dfrac{2\times 4 + 7\times -5}{2 + 7}$

$x = \dfrac{8 - 35}{9}$

$x = -3$

$y = \dfrac{my_2 + ny_1}{m + n}$

$y = \dfrac{2\times -7 + 7\times 11}{2 + 7}$

$y = \dfrac{-14 + 77}{9}$

$y = \dfrac{63}{9}$

$y = 7$

∴ The coordinates of R will be (– 3, 7).

76. (3) We know that equation of the line is

$x.\cos\alpha + y\sin\alpha = p$

$\Rightarrow x.\cos 150° + y\sin 150° = 3$

$x\cos(180° - 30°) + y\sin(180° - 30°) = 3$

$-x.\cos 30° + y\sin 30° = 3$

$-\dfrac{\sqrt{3}x}{2} + \dfrac{y}{2} = 3$

$-\sqrt{3}x + y = 6$

$\boxed{\sqrt{3}x - y + 6 = 0}$

77. (1) We know that slope of line is

$m = \dfrac{y_2 - y_1}{x_2 - x_1}$

$3 = \dfrac{2 - 5}{x - 3}$

$3x - 9 = -3$

$3x = 9 - 3$

$3x = 6$

$\boxed{x = 2}$

78. (2) Let the distance be

$d = \left|\dfrac{2.2 - 4.3 + 5}{\sqrt{2^2 + 4^2}}\right|$

$= \left|\dfrac{4 - 12 + 5}{\sqrt{20}}\right|$

$= \dfrac{3}{\sqrt{20}}$ units

79. (4) Let the distance be

$d = \left|\dfrac{4x + 6y + 9}{\sqrt{4^2 + 6^2}}\right|$

$d = \left|\dfrac{2(2x + 3y) + 9}{\sqrt{52}}\right|$

$= \left|\dfrac{2.(-5) + 9}{\sqrt{52}}\right| \quad \because 2x + 3y = -5$

$= \left|\dfrac{1}{\sqrt{52}}\right|$

$= \dfrac{1}{2\sqrt{13}}$ Units

80. (4) As the following lines intersect at a point.

The lines are

$3x + y - 2 = 0$ ...(1)

$kx + 2y - 3 = 0$ and ...(2)

$2x - y - 3 = 0$ ...(3)

Solving equation (1) and (3)

$\dfrac{x}{(-3-2)} = \dfrac{y}{(-4+9)} = \dfrac{-1}{-3-2}$

$\Rightarrow \dfrac{x}{-5} = \dfrac{y}{5} = \dfrac{1}{-5}$

$\Rightarrow x = \dfrac{-5}{-5} = 1$

$y = \dfrac{5}{-5} = -1$

∴ The point of intersection is (1, – 1) put this value in equation (2), we get

$k(1) + 2(-1) - 3 = 0$

$k - 5 = 0$

$\boxed{k = 5}$

OBJECTIVE QUESTIONS ON GEOMETRY ASKED IN VARIOUS EXAMS CONDUCTED BY SSC IN PREVIOUS YEARS'

1. In Δ ABC, O is the centroid and AD, BE, CF are three medians and the area of Δ AOE = 15 cm^2 then area of quadrilateral BDOF is
(1) 20 cm^2 (2) 30 cm^2
(3) 40 cm^2 (4) 25 cm^2

2. The radius of two concentric circles are 9 cm and 15 cm. If the chord of the greater circle be a tangent to the smaller circle, then the length of that chord is
(1) 24 cm (2) 12 cm
(3) 30 cm (4) 18 cm

3. O and C are respectively the orthocentre and circumcentre of an acute-angled triangle PQR. The points P and O are joined and produced to meet the side QR at S. If $\angle$PQS = 60° and $\angle$QCR = 130°, then $\angle$RPS =
(1) 30° (2) 35°
(3) 100° (4) 60°

4. The length of a chord of a circle is equal to the radius of the circle. The angle which this chord subtends in the major segment of the circle is equal to
(1) 30° (2) 45°
(3) 60° (4) 90°

5. In ΔABC, AD is the internal bisector of $\angle$A, meeting the side BC at D. If BD = 5 cm, BC = 7.5 cm, then AB : AC is
(1) 2 : 1 (2) 1 : 2
(3) 4 : 5 (4) 3 : 5

6. Each interior angle of a regular polygon is 144°. The number of sides of the polygon is
(1) 8 (2) 9
(3) 10 (4) 11

7. The ratio of the areas of the circumcircle and the incircle of an equilateral triangle is
(1) 2 : 1 (2) 4 : 1
(3) 8 : 1 (4) 3 : 2

8. ABCD is a square. M is the mid-point of AB and N is the mid-point of BC. DM and AN are joined and they meet at O. Then which of the following is correct ?
(1) OA : OM = 1 : 2
(2) AN = MD
(3) $\angle$ ADM = $\angle$ ANB
(4) $\angle$ AMD = $\angle$ BAN

9. AB = 8 cm and CD = 6 cm are two parallel chords on the same side of the centre of a circle. The distance between them is 1 cm. The radius of the circle is
(1) 5 cm (2) 4 cm
(3) 3 cm (4) 2 cm

10. The circumcentre of a triangle ABC is O. If $\angle$ BAC = 85° and $\angle$ BCA = 75°, then the value of $\angle$ OAC is
(1) 40° (2) 60°
(3) 70° (4) 90°

11. Two chords AB and CD of cricle whose centre is O, meet at the point P and $\angle$ AOC = 50°, $\angle$ BOD = 40°. Then the value of $\angle$ BPD is
(1) 60° (2) 40°
(3) 45° (4) 75°

12. A straight line parallel to the base BC of the triangle ABC intersects AB and AC at the points D and E respectively. If the area of the ΔABE be 36 sq.cm, then the area of the ΔACD is
(1) 18 sq.cm
(2) 36 sq.cm
(3) 18 cm
(4) 36 cm

13. Two equal circles of radius 4 cm intersect each other such that each passes through the centre of the other. The length of the common chord is :
(1) $2\sqrt{3}$ cm (2) $4\sqrt{3}$ cm
(3) $2\sqrt{2}$ cm (4) 8 cm

14. One chord of a circle is known to be 10.1 cm. The radius of this circle must be :
(1) 5 cm
(2) greater than 5 cm
(3) greater than or equal to 5 cm
(4) less than 5 cm

15. In ΔABC, $\angle BAC = 90°$ and $AB = \frac{1}{2}BC$. Then the measure of $\angle$ACB is :
(1) 60° (2) 30°
(3) 45° (4) 15°

16. ABCD is a cyclic parallelogram. The angle $\angle$B is equal to:
(1) 30° (2) 60°
(3) 45° (4) 90°

17. Each interior angle of a regular polygon is three times its exterior angle, then the number of sides of the regular polygon is :
(1) 9 (2) 8
(3) 10 (4) 7

18. The side AB of a parallelogram ABCD is produced to E in such way that BE = AB. DE intersects BC at Q. The point Q divides BC in the ratio
(1) 1 : 2 (2) 1 : 1
(3) 2 : 3 (4) 2 : 1

19. If a chord of a circle of radius 5 cm is a tangent to a circle of radius 3 cm, both the circles being concentric, then the length of the chord is
(1) 10 cm (2) 12.5 cm
(3) 8 cm (4) 7 cm

20. O is the incentre of ΔABC and $\angle$A = 30°, then $\angle$BOC is
(1) 100° (2) 105°
(3) 110° (4) 90°

21. The length of two chords AB and AC of a circle are 8 cm and 6 cm and $\angle$BAC = 90°, then the radius of circle is
(1) 25 cm (2) 20 cm
(3) 4 cm (4) 5 cm

22. The points D and E are taken on the sides AB and AC of ΔABC such that AD = $\frac{1}{3}$ AB, AE = $\frac{1}{3}$ AC. If the length of BC is 15 cm, then the length of DE is :

(1) 10 cm (2) 8 cm
(3) 6 cm (4) 5 cm

23. Each interior angle of a regular polygon is 18° more than eight times an exterior angle. The number of sides of the polygon is

(1) 10 (2) 15
(3) 20 (4) 25

24. If a chord of length 16 cm is at a distance of 15 cm from the centre of the circle, then the length of the chord of the same circle which is at a distance of 8 cm from the centre is equal to

(1) 10 cm (2) 20 cm
(3) 30 cm (4) 40 cm

25. Two medians AD and BE of ΔABC intersect at G at right angles. If AD = 9 cm and BE = 6 cm, then the length of BD, in cm, is

(1) 10 (2) 6
(3) 5 (4) 3

26. The length of the diagonal BD of the parallelogram ABCD is 18 cm. If P and Q are the centroid of the Δ ABC and Δ ADC respectively then the length of the line segment PQ is

(1) 4 cm (2) 6 cm
(3) 9 cm (4) 12 cm

27. Two circles touch each other externally at point A and PQ is a direct common tangent which touches the circles at P and Q respectively. Then $\angle$PAQ =

(1) 45° (2) 90°
(3) 80° (4) 100°

28. The in-radius of an equilateral triangle is of length 3 cm. Then the length of each of its medians is

(1) 12 cm (2) $\frac{9}{2}$ cm
(3) 4 cm (4) 9 cm

29. ABCD is a cyclic trapezium whose sides AD and BC are parallel to each other. If $\angle$ABC = 72°, then the measure of the $\angle$BCD is

(1) 162° (2) 18°
(3) 108° (4) 72°

30. In Δ ABC, PQ is parallel to BC. If AP : PB = 1 : 2 and AQ = 3 cm; AC is equal to

(1) 6 cm (2) 9 cm
(3) 12 cm (4) 8 cm

31. In a quadrilateral *ABCD*, with unequal sides if the diagonals *AC* and *BD* intersect at right angles, then

(1) $AB^2 + BC^2 = CD^2 + DA^2$
(2) $AB^2 + CD^2 = BC^2 + DA^2$
(3) $AB^2 + AD^2 = BC^2 + CD^2$
(4) $AB^2 + BC^2 = 2(CD^2 + DA^2)$

32. The tangents are drawn at the extremities of a diameter *AB* of a circle with centre *P*. If a tangent to the circle at the point *C* intersects the other two tangents at *Q* and *R*, then the measure of the $\angle QPR$ is

(1) 45° (2) 60°
(3) 90° (4) 180°

33. Let *O* be the in-centre of a triangle *ABC* and *D* be a point on the side *BC* of ΔABC, such that $OD \perp BC$. If $\angle BOD$ = 15°, then $\angle ABC$ =

(1) 75° (2) 45°
(3) 150° (4) 90°

34. *AB* is a chord to a circle and *PAT* is the tangent to the circle at *A*. If $\angle BAT$ = 75° and $\angle BAC$ = 45°, *C* being a point on the circle, then $\angle ABC$ is equal to

(1) 40° (2) 45°
(3) 60° (4) 70°

35. *D* is any point on side *AC* of D*ABC*. If *P, Q, X, Y* are the midpoints of *AB*, *BC*, *AD* and *DC* respectively, then the ratio of *PX* and *QY* is

(1) 1 : 2 (2) 1 : 1
(3) 2 : 1 (4) 2 : 3

36. PR is tangent to a circle, with centre O and radius 4 cm, at point Q. If $\angle$POR = 90°, OR = 5 cm and OP = $\frac{20}{3}$ cm , then, in cm, the length of PR is :

(1) 3 (2) $\frac{16}{3}$
(3) $\frac{23}{3}$ (4) $\frac{25}{3}$

37. ABC is an equilateral triangle. P and Q are two points on $\overline{AB}$ and $\overline{AC}$ respectively such that $\overline{PQ} \parallel \overline{BC}$. If $\overline{PQ}$ = 5 cm the area of ΔAPQ is :

(1) $\frac{25}{4}$ sq. cm
(2) $\frac{25}{\sqrt{3}}$ sq. cm
(3) $\frac{25\sqrt{3}}{4}$ sq. cm
(4) $25\sqrt{3}$ sq. cm

38. Measure of each interior angle of a regular polygon can never be :

(1) 150° (2) 105°
(3) 108° (4) 144°

39. In a triangle ABC, incentre is O and $\angle$BOC = 110°, then the measure of $\angle$BAC is :

(1) 20° (2) 40°
(3) 55° (4) 110°

40. If an exterior angle of a cyclic quadrilateral be 50°, then the interior opposite angle is :

(1) 130° (2) 40°
(3) 50° (4) 90°

41. ABCD is a rhombus whose side AB = 4 cm and $\angle$ABC = 120°, then the length of diagonal BD is equal to :

(1) 1 cm (2) 2 cm
(3) 3 cm (4) 4 cm

42. The ortho centre of a right angled triangle lies

(1) outside the triangle
(2) at the right angular vertex
(3) on its hypotenuse
(4) within the triangle

43. Two line segments PQ and RS intersect at X in such a way that XP = XR. If ∠PSX = ∠RQX, then one must have
(1) PR = QS (2) PS = RQ
(3) ∠XSQ = ∠XRP
(4) ar(ΔPXR) = ar(ΔQXS)

44. AD is the median of a triangle ABC and O is the centroid such that AO = 10 cm. The length of OD in cm is
(1) 4 (2) 5
(3) 6 (4) 8

45. The external bisector of ∠B and ∠C of ΔABC (where AB and AC extended to E and F respectively) meet at point P. If ∠BAC = 100°, then the measure of ∠BPC is
(1) 50° (2) 80°
(3) 40° (4) 100°

46. If the sum of the interior angles of a regular polygon be 1080°, the number of sides of the polygon is
(1) 6 (2) 8
(3) 10 (4) 12

47. A parallelogram ABCD has sides AB = 24 cm and AD = 16 cm. The distance between the sides AB and DC is 10 cm. Find the distance between the sides AD and BC.
(1) 16 cm. (2) 18 cm.
(3) 15 cm. (4) 26 cm.

48. ABCD is a rhombus. A straight line through C cuts AD produced at P and AB produced at Q. If DP = $\frac{1}{2}$ AB, then the ratio of the lengths of BQ and AB is
(1) 2 : 1 (2) 1 : 2
(3) 1 : 1 (4) 3 : 1

49. If the circumradius of an equilateral triangle be 10 cm, then the measure of its in-radius is
(1) 5 cm. (2) 10 cm.
(3) 20 cm. (4) 15 cm.

50. If in a Δ ABC, the medians CD and BE intersect each other at 0, then the ratio of the areas of Δ ODE and Δ ABC is
(1) 1 : 6 (2) 6 : 1
(3) 1 : 12 (4) l2 : 1

51. The ratio of the angles ∠A and ∠B of a non-square rhombus ABCD is 4 : 5, then the value of ∠C is :
(1) 50° (2) 45°
(3) 80° (4) 95°

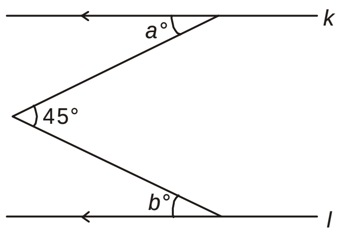
52. A straight line parallel to BC of ΔABC intersects AB and AC at points P and Q respectively. AP = QC, PB= 4 units and AQ = 9 units, then the length of AP is :
(1) 25 units (2) 3 units
(3) 6 units (4) 6.5 units

53. I is the incentre of Δ ABC, ∠ABC = 60° and ∠ACB = 50°. Then ∠ BIC is :
(1) 55° (2) 125°
(3) 70° (4) 65°

54. ABCD is a cyclic trapezium such that AD||BC, if ∠ABC = 70°, then the value of ∠BCD is :
(1) 60° (2) 70°
(3) 40° (4) 80°

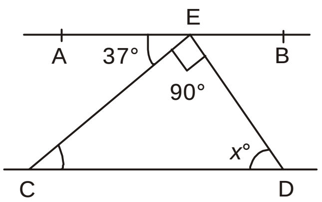
55. The tangents at two points A and B on the circle with centre O intersect at P ; if in quadrilateral PAOB, ∠AOB: ∠APB = 5 : 1, then measure of ∠APB is :
(1) 30° (2) 60°
(3) 45° (4) 15°

56. In the figure below, lines *k* and *l* are parallel. The value of *a*° + *b*° is



(1) 45° (2) 100°
(3) 180° (4) 360°

57. In the figure below, if AB ∥ CD and CE ⊥ ED, then the value of *x* is



(1) 53 (2) 63
(3) 37 (4) 45

58. ΔABC and ΔDEF are similar and their areas be respectively 64 cm^2 and 121 cm^2. If EF = 15.4 cm, BC is:
(1) 12.3 cm (2) 11.2 cm
(3) 12.1 cm (4) 11.0 cm

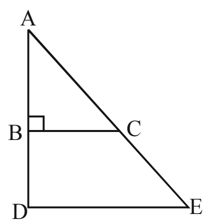
59. If G is the centroid of ΔABC and AG = BC, then ∠BGC is:
(1) 75° (2) 45°
(3) 90° (4) 60°

60. By decreasing 15° of each angle of a triangle, the ratios of their angles are 2:3 : 5, The radian measure of greatest angle is :
(1) $\frac{11\pi}{24}$ (2) $\frac{\pi}{12}$
(3) $\frac{\pi}{24}$ (4) $\frac{5\pi}{24}$

61. If G is the centroid and AD be a median with length 12 cm of ΔABC, then the value of AG is
(1) 4 cm (2) 8 cm
(3) 10 cm (4) 6 cm

62. ABC is a right-angled triangle. AD is perpendicular to the hypotenuse BC. If AC = 2 AB, then the value of BD is
(1) $\frac{BC}{2}$ (2) $\frac{BC}{3}$
(3) $\frac{BC}{4}$ (4) $\frac{BC}{5}$

63. Given that ∠ABC = 90°, BC is parallel to DE. If AB = 12, BD = 6 and BC = 10, then the length of DE is



(1) 16 (2) 15
(3) 12 (4) 14

64. If G be the centroid of ΔABC and the area of ΔGBD is 6 sq. cm, where D is the mid-point

of side BC, then the area of ΔABC is
(1) 18 sq. cm (2) 12 sq. cm
(3) 24 sq. cm (4) 36 sq. cm

65. In any triangle ABC, the base angles at B and C are bisected by BO and CO respectively. Then $\angle$ BOC is
(1) $\frac{\pi}{2}+\frac{A}{2}$ (2) $\pi-\frac{A}{2}$
(3) $\frac{(\pi-A)}{2}$ (4) $\frac{\pi}{2}+A$

66. Two sides of a triangle are of length 4 cm and 10 cm. If the length of the third side is '*a*' cm, then
(1) $a > 5$ (2) $6 \le a \le 12$
(3) $a < 6$ (4) $6 < a < 14$

67. In ΔABC, AD is the median and AD $=\frac{1}{2}$ BC.If $\angle BAD = 30°$, then measure of $\angle ACB$ is
(1) 90° (2) 45°
(3) 30° (4) 60°

68. The three medians AD, BE and CF of ΔABC intersect at point G. If the area of ΔABC is 60 sq.cm. then the area of the quadrilateral BDGF is :
(1) 10 sq.cm (2) 15 sq.cm
(3) 20 sq.cm (4) 30 sq.cm

69. In Δ ABC, $\angle B = 90°$, $\angle C = 45°$ and D is the midpoint of AC. If AC = $4\sqrt{2}$ units, then BD is
(1) $2\sqrt{2}$ units (2) $4\sqrt{2}$ units
(3) $\frac{5}{2}$ units (4) 2 units

70. A straight line parallel to the base BC of the triangle ABC intersects AB and AC at the points D and E respectively. If the area of the ΔABE be 36 sq.cm, then the area of the ΔACD is
(1) 18 sq.cm (2) 36 sq.cm
(3) 18 cm (4) 36 cm

71. In ΔABC, $\angle BAC = 90°$ and AB $=\frac{1}{2}$ BC. Then the measure of $\angle ACB$ is :
(1) 60° (2) 30°
(3) 45° (4) 15°

72. O is the incentre of ΔABC and $\angle A = 30°$, then $\angle BOC$ is
(1) 100° (2) 105°
(3) 110° (4) 90°

73. The points D and E are taken on the sides AB and AC of ΔABC such that AD = $\frac{1}{3}$ AB, AE = $\frac{1}{3}$ AC. If the length of BC is 15 cm, then the length of DE is :
(1) 10 cm (2) 8 cm
(3) 6 cm (4) 5 cm

74. Two medians AD and BE of ΔABC intersect at G at right angles. If AD = 9 cm and BE = 6 cm, then the length of BD, in cm, is
(1) 10 (2) 6
(3) 5 (4) 3

75. The in-radius of an equilateral triangle is of length 3 cm. Then the length of each of its medians is
(1) 12 cm (2) $\frac{9}{2}$ cm
(3) 4 cm (4) 9 cm

76. In Δ ABC, PQ is parallel to BC. If AP : PB = 1 : 2 and AQ = 3 cm; AC is equal to
(1) 6 cm (2) 9 cm
(3) 12 cm (4) 8 cm

77. Let *O* be the in-centre of a triangle *ABC* and *D* be a point on the side *BC* of ΔABC, such that $OD \perp BC$. If $\angle BOD = 15°$, then $\angle ABC$ =
(1) 75° (2) 45°
(3) 150° (4) 90°

78. *D* is any point on side *AC* of D*ABC*. If *P, Q, X, Y* are the midpoints of *AB*, *BC*, *AD* and *DC* respectively, then the ratio of *PX* and *QY* is
(1) 1 : 2 (2) 1 : 1
(3) 2 : 1 (4) 2 : 3

79. ABC is an equilateral triangle. P and Q are two points on $\overline{AB}$ and $\overline{AC}$ respectively such that $\overline{PQ} \parallel \overline{BC}$. If $\overline{PQ}$ = 5 cm the area of ΔAPQ is :
(1) $\frac{25}{4}$ sq. cm
(2) $\frac{25}{\sqrt{3}}$ sq. cm
(3) $\frac{25\sqrt{3}}{4}$ sq. cm
(4) $25\sqrt{3}$ sq. cm

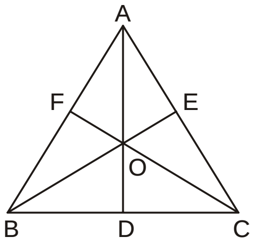
80. The ortho centre of a right angled triangle lies
(1) outside the triangle
(2) at the right angular vertex
(3) on its hypotenuse
(4) within the triangle

ANSWERS

1. (2)	**2.** (1)	**3.** (2)	**4.** (1)
5. (1)	**6.** (3)	**7.** (2)	**8.** (3)
9. (1)	**10.** (3)	**11.** (3)	**12.** (2)
13. (2)	**14.** (2)	**15.** (1)	**16.** (4)
17. (2)	**18.** (2)	**19.** (3)	**20.** (2)
21. (4)	**22.** (4)	**23.** (3)	**24.** (3)
25. (3)	**26.** (2)	**27.** (2)	**28.** (4)
29. (4)	**30.** (2)	**31.** (2)	**32.** (3)
33. (3)	**34.** (3)	**35.** (2)	**36.** (4)
37. (3)	**38.** (2)	**39.** (2)	**40.** (3)
41. (4)	**42.** (2)	**43.** (2)	**44.** (2)
45. (3)	**46.** (2)	**47.** (3)	**48.** (1)
49. (1)	**50.** (3)	**51.** (2)	**52.** (3)
53. (2)	**54.** (2)	**55.** (1)	**56.** (1)
57. (1)	**58.** (2)	**59.** (3)	**60.** (1)
61. (2)	**62.** (2)	**63.** (2)	**64.** (4)
65. (1)	**66.** (4)	**67.** (4)	**68.** (3)
69. (1)	**70.** (2)	**71.** (2)	**72.** (2)
73. (4)	**74.** (3)	**75.** (4)	**76.** (2)
77. (3)	**78.** (2)	**79.** (3)	**80.** (2)

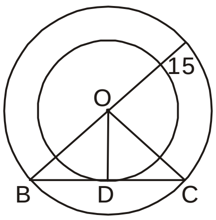
EXPLANATIONS

1. (2)



Area of quadrilateral BDOF
= 2 × 15 = 30 sq.cm.

2. (1)



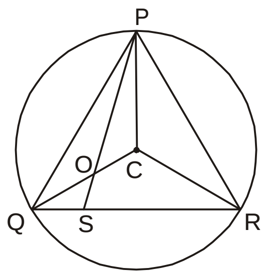
BO = OC = 15 cm.
OD = 9 cm.

$\therefore$ BD = $\sqrt{15^2 - 9^2}$

= $\sqrt{24 \times 6}$ = 12 cm

$\therefore$ BC = 2 × 12 = 24 cm.

3. (2)

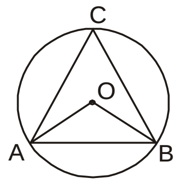


$\angle$PQS = 60°
$\angle$ QCR = 130°

$\therefore$ $\angle$QPR = $\frac{1}{2} \times 130°$ = 65°

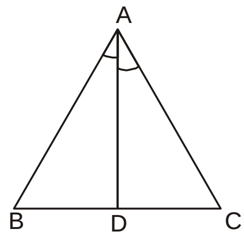
$\Rightarrow$ QPR = 180° – 60° – 65° = 55°
$\therefore$ In Δ QCR
QC = CR
$\therefore$ $\angle$CQR = $\angle$CRQ = 25°
$\therefore$ $\angle$PQC = $\angle$QPC = 35°
$\angle$CPR = 30°
$\therefore$ $\angle$RPS = 35°

4. (1)



AO = OB = AB
$\therefore \angle$ AOB = 60°
$\therefore \angle$ ACB = 30°

5. (1)



AD is the internal bisector of $\angle$A.

$\therefore \quad \frac{AB}{AC} = \frac{BD}{DC}$

$= \frac{5}{7.5 - 2}$

$= \frac{5}{2.5}$ = 2 : 1

6. (3) If the number of sides of the polygon be n, then

$$\left(\frac{2n - 4}{n}\right) \times 90° = 144°$$

$$\Rightarrow \frac{(2n - 4)5}{n} = 8$$

$\Rightarrow 10n - 20 = 8n$
$\Rightarrow 2n = 20 \Rightarrow n = 10$

7. (2) For the equilateral triangle of side a,

In radius = $\frac{a}{2\sqrt{3}}$

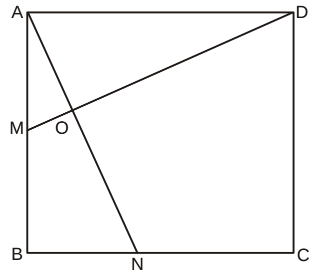
Circum-radius = $\frac{a}{\sqrt{3}}$

$\therefore$ Required ratio

$$= \pi\left(\frac{a}{\sqrt{3}}\right)^2 : \pi\left(\frac{a}{2\sqrt{3}}\right)^2$$

$$= \frac{1}{3} : \frac{1}{12} = 4:1$$

8. (3)



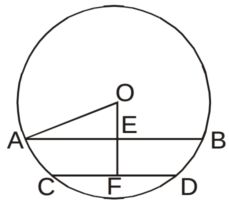
If AB = $2x$, then BN = x

$\therefore$ AN = $\sqrt{4x^2 + x^2} = \sqrt{5}x$

Similarly,

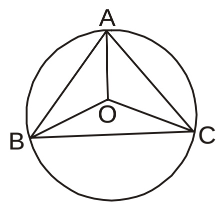
MD = $\sqrt{4x^2 + x^2} = \sqrt{5}x$

9. (1)



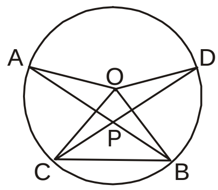
Let OE = x cm
$\therefore$ OF = (x +1) cm
OA = OC = r cm
AE = 4 cm; CF = 3 cm
From ΔOAE,
$OA^2 = AE^2 + OE^2$
$\Rightarrow r^2 = 16 + x^2$
$\Rightarrow x^2 = r^2 - 16$ ......(i)
From ΔOCF,
$(x + 1)^2 = r^2 - 9$ ..... (ii)
By equation (ii) – (i),
$(x + 1)^2 - x^2 = r^2 - 9 - r^2 + 16$
$\Rightarrow 2x + 1 = 7 \Rightarrow x$ = 3cm
$\therefore$ From equation (i),
$9 = r^2 - 16 \Rightarrow r^2 = 25 \Rightarrow r = 5$

10. (3) $\because$ $\angle$BAC = 85°
$\therefore$ $\angle$BOC = 2 × 85° = 170°



$\therefore$ $\angle$OBC = $\angle$OCB = 5°
$\therefore$ $\angle$OCA = $\angle$OAC
= 75° – 5° = 70°

11. (3)



Join CB.

$\angle AOC + \angle BOD$

$= 2\angle ABC + 2\angle BCD$

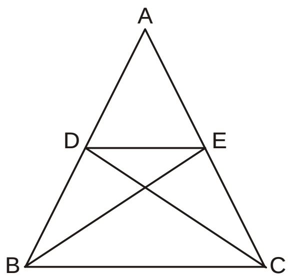
(Exterior angles of triangle)

$= 2\,(\angle ABC + \angle BCD)$

$= 2\angle BPD$

$\therefore\ \angle BPD = \frac{1}{2}(50° + 40°) = 45°$

12. (2)



ΔDBC AND ΔEBC lie on the same base and between same parallel lines.

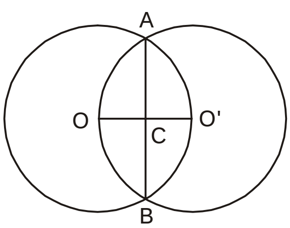
$\therefore\ \Delta DBC = \Delta BEC$

$\Rightarrow \Delta ABC - \Delta DBC$

$= \Delta ABC - \Delta BEC$

$\Rightarrow \Delta ADE = \Delta ABE = 36$ sq.cm

13. (2)



OC = 2cm

OA = 4cm

$\therefore$ AC = $\sqrt{4^2 - 2^2}$

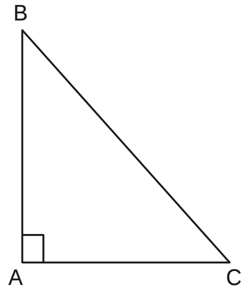
$= \sqrt{16 - 4}$

$= \sqrt{12} = 2\sqrt{3}$

$\therefore$ AB = $4\sqrt{3}$ cm

14. (2) The largest chord of a circle is its diameter.

15. (1)



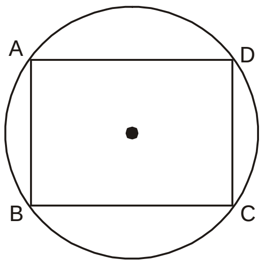
If AB = x; BC = $2x$ units

$\therefore$ AC = $\sqrt{4x^2 - x^2} = \sqrt{3}x$

$\therefore \sin ACB = \frac{AB}{BC} = \frac{1}{2} = \sin 30°$

$\therefore \angle ACB = 30°$

16. (4)



ABCD is a cyclic parallelogram.

$\therefore \angle B + \angle D = 180°$

$\Rightarrow 2\angle B = 180°$

$\Rightarrow \angle B = 90°$

17. (2) If the number of sides of regular polygon be n, then

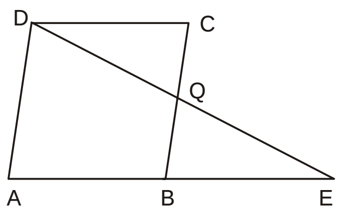
$$\frac{(2n-4)90°}{n} = \frac{360}{n} \times 3$$

$\Rightarrow 2n - 4 = 4 \times 3$

$\Rightarrow 2n = 12 + 4 = 16$

$\therefore n = 8$

18. (2) AD || BC $\Rightarrow$ AD || BQ



Point B is the mid-point of AE.

$\therefore$ Q is the mid-point of DE.

In Δs DQC and BQE,

$\angle DQC = \angle BQE$

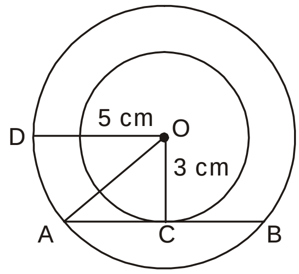
$\angle DCQ = \angle QBE$

$\angle CDQ = \angle QEB$

$\therefore$ Both triangles Δ DQC and Δ BQE are similar.

$\therefore\ \frac{DQ}{QE} = \frac{CQ}{BQ} = 1 : 1$

19. (3)



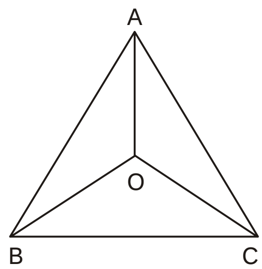
AC = $\sqrt{AO^2 - OC^2}$

$= \sqrt{5^2 - 3^2}$

$= \sqrt{25 - 9} = \sqrt{16} = 4$ cm

$\therefore$ AB = 2 × 4 = 8 cm

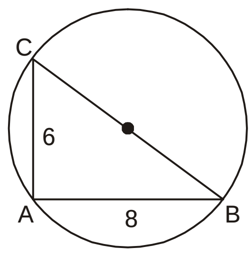
20. (2)



$\angle BOC = 90° + \frac{1}{2}\angle BAC$

$= 90° + 15° = 105°$

21. (4)



$\angle BAC = 90°$

$\therefore$ BC is the diameter of the circle.

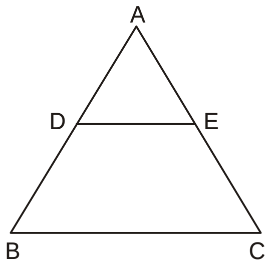
$\therefore$ BC = $\sqrt{AB^2 + AC^2}$

$= \sqrt{8^2 + 6^2} = \sqrt{64 + 36}$

$= \sqrt{100} = 10$ cm

$\therefore$ Radius of the circle = 5 cm

22. (4)



$\frac{AD}{AB} = \frac{AE}{AC} = \frac{1}{3}$

$\therefore \frac{DE}{BC} = \frac{1}{3}$

$\Rightarrow$ DE = $\frac{15}{3}$ = 5 cm

23. (3) If the number of sides of the regular polygon be n, then

$\therefore \left(\frac{2n-4}{n}\right) \times 90$

$= 8 \times \frac{4 \times 90°}{n} + 18$

$\Rightarrow \left(\frac{2n-4}{n}\right) \times 5 = \frac{160}{n} + 1$

$\Rightarrow 10 = n - 20 = 160 + n$

$\Rightarrow 10n - n = 180$

$\Rightarrow 9n = 180$

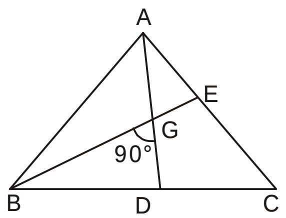
$\Rightarrow n = 20$

24. (3) The chord nearer to the centre is larger.

$\therefore \frac{15}{8} = \frac{x}{16}$

$\Rightarrow x = \frac{15 \times 16}{8} = 30$ cm

25. (3)



AD = 9 cm.

$\Rightarrow$ GD = $\frac{1}{3} \times 9 = 3$ cm

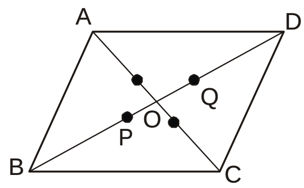
BE = 6 cm

$\Rightarrow$ BG = $\frac{2}{3} \times 6 = 4$ cm

$\therefore$ BD = $\sqrt{3^2 + 4^2} = \sqrt{9 + 16}$

= 5 cm.

26. (2)



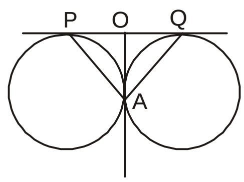
Centroid is the point where medians intersect. Diagonals of parallelogram bisect each other.

OP = $\frac{1}{3} \times 9 = 3$ cm

OQ = $\frac{1}{3} \times 9 = 3$cm

$\therefore$ PQ = 6cm

27. (2)

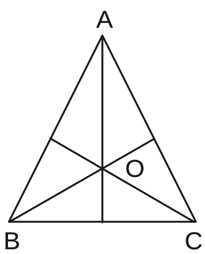


AO is perpendicular to PQ.

OA = OP = OQ.

$\angle$OPA = $\angle$OAP = $\angle$OQA = 45°

28. (4)



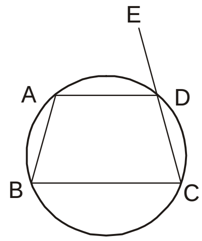
In equilateral triangle centroid, incentre, orthocentre coincide at the same point.

$\therefore \frac{\text{Height}}{3} = \text{in radius}$

$\therefore$ Height = Median = 3 × 3

= 9 cm

29. (4)



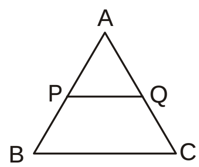
$\angle$ABC + $\angle$CDA = 180°

$\Rightarrow$ $\angle$CDA = 180° – 72° = 108°

AD ∥ BC

$\angle$BCD = $\angle$ADE = $\angle$ABC = 72°

30. (2)

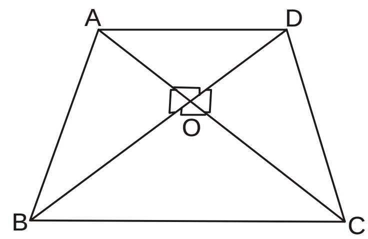


$\frac{AP}{PB} = \frac{AQ}{QC} = \frac{1}{2}$

$\Rightarrow \frac{QC}{AQ} = \frac{2}{1} \Rightarrow \frac{QC + AQ}{AQ} = \frac{3}{1}$

$\Rightarrow$ AC = 3AQ = 9 cm

31. (2)



$OB^2 + OC^2 = BC^2$

$OC^2 + OD^2 = CD^2$

$OD^2 + OA^2 = AD^2$

$OA^2 + OB^2 = AB^2$

$\therefore$ $2 (OB^2 + OA^2 + OD^2 + OC^2)$

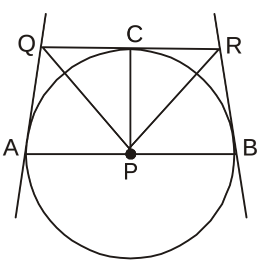
$= AB^2 + BC^2 + CD^2 + DA^2$

$\Rightarrow$ $2(AB^2 + CD^2)$

$= AB^2 + BC^2 + CD^2 + DA^2$

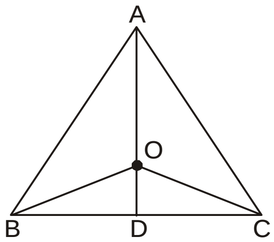
$\Rightarrow$ $AB^2 + CD^2 = BC^2 + DA^2$

32. (3)



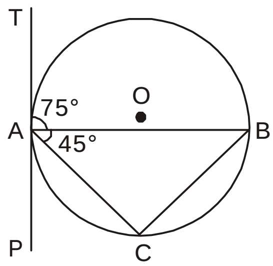
In ΔPCR and ΔRBP,
PC = PB (radii)
RC = RB
PR is common.
$\therefore$ $\Delta PCR \cong \Delta RBP$
$\therefore$ $\angle CPR = \angle RPB$
Similarly, $\angle CPQ = \angle QPA$
$\therefore \angle QPR = 90°$
because $\angle APB = 180°$

33. (3)



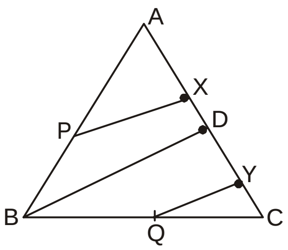
BO is the internal bisector of $\angle B$
$\angle ODB = 90°$; $\angle BOD = 15°$
$\angle OBD = 180° - 90° - 15° = 75°$
$\angle ABC = 2 \times 75° = 150°$

34. (3)



If a line touches a circle and from the point of contact a chord is drawn, the angles which this chord makes with the given line are equal respe. ctively to the angles formed in the corresponding alternate segments.
$\therefore$ $\angle ACB = \angle BAT = 75°$
$\angle ABC = 180° - 45° - 75°$
$= 60°$

35. (2)

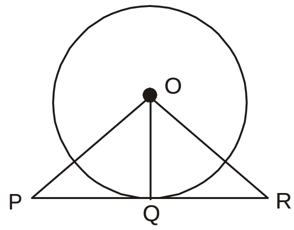


PX ∥ BD and PX = $\frac{1}{2}$ BD

QY ∥ BD and QY = $\frac{1}{2}$ BD

$\therefore$ PX : QY = 1 : 1

36. (4)



$OQ \perp PR$
$\therefore$ From ΔOPQ,

$PQ = \sqrt{OP^2 - OQ^2}$

$= \sqrt{\left(\frac{20}{3}\right)^2 - 4^2}$

$= \sqrt{\frac{400}{9} - 16}$

$= \sqrt{\frac{400 - 144}{9}}$

$= \sqrt{\frac{256}{9}} = \frac{16}{3}$ cm

From ΔOQR,

$QR = \sqrt{OR^2 - OQ^2}$

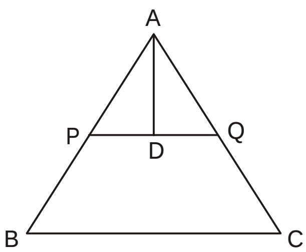
$= \sqrt{5^2 - 4^2} = \sqrt{25 - 16}$

$= \sqrt{9} = 3$ cm

$\therefore$ PR = PQ + QR

$= \frac{16}{3} + 3 = \frac{25}{3}$ cm

37. (3)



PQ „ BC
$\angle APQ = \angle ABC = 60°$

$\angle AQP = \angle ACB = 60°$

$\therefore$Area of $\Delta APQ = \frac{\sqrt{3}}{4} \times (PQ)^2$

$= \frac{\sqrt{3}}{4} \times (5)^2 = \frac{25\sqrt{3}}{4}$ sq.cm.

38. (2) Each interior angle

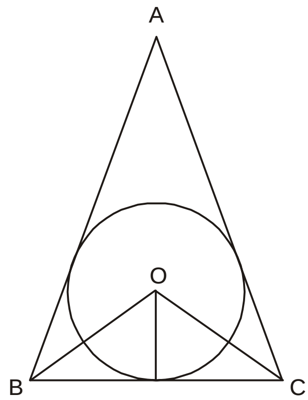
$= \left(\frac{2n - 4}{n}\right) \times 90°$

$\therefore$ $\frac{(2n - 4) \times 90°}{n} = 105°$

$\Rightarrow (12n - 4) \times 6 = 7n$
$\Rightarrow 12n - 24 = 7n$
$\Rightarrow 5n = 24$

$\Rightarrow n = \frac{24}{5}$ which is impossible.

39. (2)

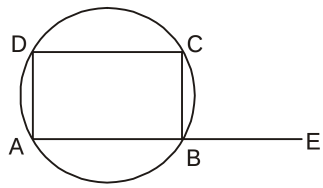


$\angle BOC = 90° + \frac{A}{2}$

$\Rightarrow$ $110 = 90° + \frac{A}{2}$

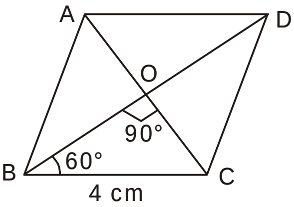
$\Rightarrow$ A = 2 × 20 = 40°

40. (3)



$\angle ABC + \angle ADC = 180°$
$\angle CBE = 50°$
$\therefore \angle ABC = 180° - 50° = 130°$
$\therefore \angle ADC = 180° - 130° = 50°$

41. (4)



From ΔBOC,

$\cos 60° = \dfrac{BO}{4}$

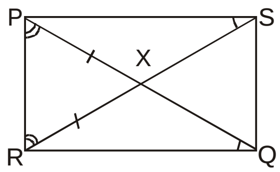
$\Rightarrow BO = \dfrac{1}{2} \times 4$

= 2 cm

$\therefore$ BD = 2 × 2 = 4 cm

42. (2) at the right angular vertex

43. (2)



XP = XR

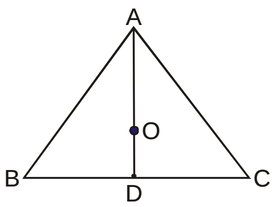
$\therefore$ $\angle$XPR = $\angle$XRP

If $\angle$PSX = $\angle$RQX,

then, PS = RQ

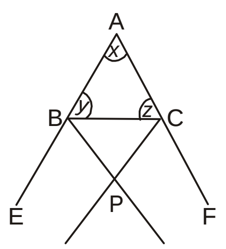
44. (2) D, is the mid-point of side BC.

Point O is the centroid that divides AD in the ratio 2 : 1.



$\therefore$ OD = 5 cm.

45. (3)



In ΔABC,

$\angle A = x$, $\angle B = y$; $\angle C = z$

In ΔPBC,

$\angle$PBC + $\angle$PCB + $\angle$BPC = 180°

$\Rightarrow \dfrac{1}{2}\angle EBC + \dfrac{1}{2}\angle FCB + \angle BPC$

= 180°

$\Rightarrow \angle EBC + \angle FCB + 2\angle BPC$

= 360°

$\Rightarrow (180° - y) + (180° - z) + 2\angle BPC = 360°$

$\Rightarrow 360° - (y + z) + 2\angle BPC = 360°$

$\Rightarrow 2\angle BPC = y + z$

$\Rightarrow 2\angle BPC = 180° - x$

= 180° – $\angle$BAC

$\therefore \angle BPC = 90° - \dfrac{1}{2}\angle BAC$

= 90° – 50° = 40°

46. (2) Sum of the interior angles of a regular polygon of n sides

= $(2n - 4) \times 90°$

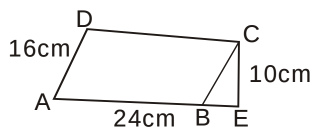
$\therefore (2n - 4) \times 90° = 1080°$

$\Rightarrow 2n - 4 = 1080 \div 90 = 12$

$\therefore 2n = 12 + 4 = 16$

$\Rightarrow n = 8$

47. (3)



Area of the parallelogram

= Base × Height

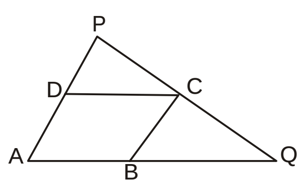
= 24 × 10 = 240 sq.cm.

If the required distance be x cm, then

$240 = 16 \times x$

$\Rightarrow x = \dfrac{240}{16} = 15$ cm.

48. (1)



AB = BC = CD = DA

$DP = \dfrac{1}{2}AB = \dfrac{1}{2}BC = \dfrac{1}{2}CD$

$= \dfrac{1}{2}DA$

In Δs APQ and BCQ,

$\angle P = \angle QCB$; $\angle A = \angle QBC$; $\angle Q = Q$

$\therefore$ Δ APQ and Δ BCQ are similar.

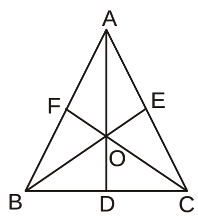
$\therefore \dfrac{AB + BQ}{BQ} = \dfrac{AD + DP}{BC}$

$\Rightarrow \dfrac{AB}{BQ} + 1 = \dfrac{\frac{3}{2}BC}{BC} = \dfrac{3}{2}$

$\Rightarrow \dfrac{AB}{BQ} = \dfrac{3}{2} - 1 = \dfrac{1}{2}$

$\Rightarrow \dfrac{BQ}{AB} = \dfrac{2}{1}$

49. (1)



Let AB = x cm.

$\therefore BD = \dfrac{x}{2}$

$AD = \sqrt{x^2 - \dfrac{x^2}{4}} = \dfrac{\sqrt{3}}{2}x$ cm.

$\therefore OD = \dfrac{1}{3} \times \dfrac{\sqrt{3}}{2}x = \dfrac{x}{2\sqrt{3}}$ cm.

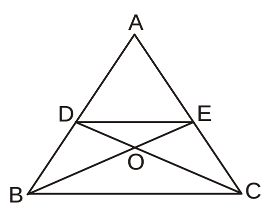
$OB = \sqrt{BD^2 + OD^2}$

$= \sqrt{\dfrac{x^2}{4} + \dfrac{x^2}{12}} = \sqrt{\dfrac{4x^2}{12}} = \dfrac{x}{\sqrt{3}}$ cm.

$\therefore \dfrac{x}{\sqrt{3}} = 10 \Rightarrow x = 10\sqrt{3}$ cm.

$\therefore OD = \dfrac{x}{2\sqrt{3}} = \dfrac{10\sqrt{3}}{2\sqrt{3}} = 5$ cm.

50. (3)



In Δs ODE and BOC,

$\angle BOC = \angle DOE$

$\angle DEO = \angle OBC$; $\angle ODE = \angle OCB$

$\therefore$ Both triangles are similar,

$\therefore \dfrac{\Delta ODE}{\Delta BOC} = \dfrac{DE^2}{BC^2}$

DE $\parallel$ BC and DE = $\dfrac{1}{2}$BC

and area of Δ ABC

= 3 × Area of Δ OBC

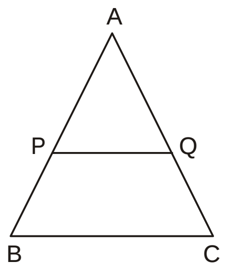
$\therefore \dfrac{\Delta\ ODE}{\Delta\ ABC} = \dfrac{1}{3} \times \dfrac{1}{4} = \dfrac{1}{12}$

51. (2) $4x + 5x = 180°$

$\Rightarrow 9x = 180° \Rightarrow x = 20°$

$\therefore \angle C = 4x = 80°$

52. (3)



PQ || BC

$\therefore \dfrac{AP}{AB} = \dfrac{AQ}{AC}$

$\Rightarrow \dfrac{AB}{AP} = \dfrac{AC}{AQ}$

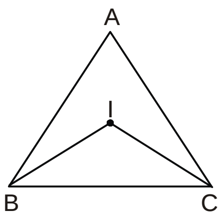
$\Rightarrow \dfrac{AP+PB}{AP} = \dfrac{AQ+QC}{AQ}$

$\Rightarrow \dfrac{PB}{AP} = \dfrac{QC}{AQ} = \dfrac{AP}{AQ}$

$\Rightarrow AP^2 = PB.\ AQ = 4 \times 9 = 36$

$\therefore$ AP = 6 units

53. (2)



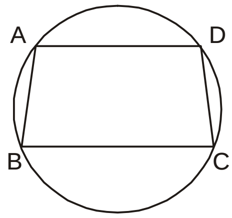
$\angle IBC = \dfrac{1}{2} \angle ABC = 30°$

$\angle ICB = \dfrac{1}{2} \angle ACB = 25°$

$\therefore \angle BIC = 180° - 30° - 25°$

$= 125°$

54. (2)

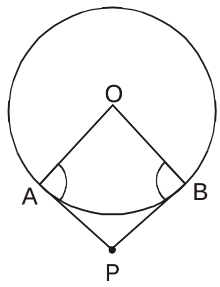


$\angle ABC + \angle CDA = 180°$

$\therefore \angle CDA = 180° - 70° = 110°$

$\therefore \angle BCD = 180° - 110° = 70°$

55. (1)



$\angle OAP = \angle OBP = 90°$

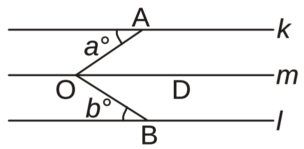
$\angle AOB + \angle APB = 180°$

$\Rightarrow 5\angle APB + \angle APB = 180°$

$\Rightarrow 6 \angle APB = 180°$

$\Rightarrow \angle APB = 30°$

56. (1)



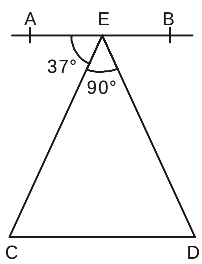
$k \parallel l \parallel m$

$\angle BOA = 45°$

$\Rightarrow \angle AOD = a°$ and $\angle DOB = b°$

$\therefore a° + b° = \angle AOB = 45°$

57. (1)



$\angle AEC + \angle CAD + \angle DEB = 180°$

$\Rightarrow 37° + 90° + \angle DEB = 180°$

$\Rightarrow \angle DEB = 180° - 127° = 53°$

EB || CD

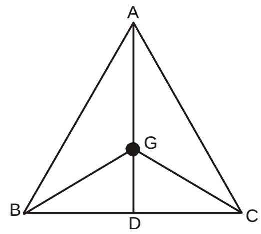
$\therefore \angle BED = \angle EDC = 53°$

58. (2) $\dfrac{\Delta\ ABC}{\Delta\ DEF} = \dfrac{64}{121} = \dfrac{BC^2}{EF^2}$

$\Rightarrow \dfrac{8}{11} = \dfrac{BC}{EF} \Rightarrow \dfrac{8}{11} = \dfrac{BC}{15.4}$

$\Rightarrow BC = \dfrac{8 \times 15.4}{11} = 11.2$ cm

59. (3)



AG = BC

$\angle BGC = 90°$

60. (1) $2x + 3x + 5x = 180° - 45°$

$= 135°$

$\Rightarrow 10x = 135°$

$\Rightarrow x = \dfrac{135}{10} = \dfrac{27}{2}$

$\therefore$ Largest angle

$= 5x + 15° = \left(5 \times \dfrac{27}{2}\right)° + 15°$

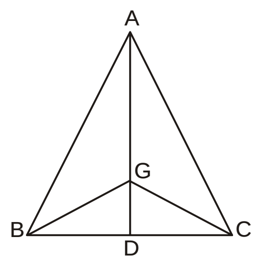
$= \dfrac{135+30}{2} = \dfrac{165°}{2}$

$\because 180° = \pi$ radian

$\therefore \dfrac{165°}{2} = \dfrac{\pi}{180} \times \dfrac{165}{2} = \dfrac{11\pi}{24}$

radian

61. (2)



$AG = \dfrac{2}{3} AD = \dfrac{2}{3} \times 12 = 8$ cm