

MAHESH TUTORIALS SCIENCE

00 - 00		Q. Booklet Serial No: 240515	
Test No : 1101	3 Hrs.		Q. Booklet Version :

Hints & Solutions

PART C - MATHS

<p>61. d) None of these $(x - 1)^x = (x - 1)^2$ $x = 2$ $x - 1 = 1 \Rightarrow x = 2$ $x - 1 = -1 \Rightarrow x = 0$ $x - 1 = 0 \Rightarrow x = 1$ Also $x = 0, 1, 2$ all satisfy above equation.</p> <p>62. c) 14 $(2 + \sqrt{3})^2 + \frac{1}{(2 + \sqrt{3})^2} \frac{(2 - \sqrt{3})^2}{(2 - \sqrt{3})^2}$ $= (2 + \sqrt{3})^2 + (2 - \sqrt{3})^2$ $= 4 + 3 + 4\sqrt{3} + 4 + 3 - 4\sqrt{3}$ $= 14$</p> <p>63. a) 144 $a = 2k, b = 3k, c = 5k, d = 7k$ $a + b = 5k = 60 \Rightarrow k = 12$ $c + d = 12k = 144$</p> <p>64. d) ± 28 $a^2 + \frac{1}{a^2} = 786$ $\Rightarrow a^2 + \frac{1}{a^2} - 2 = 784 = 28^2$ $\left(a - \frac{1}{a}\right)^2 = 28^2$ $a - \frac{1}{a} = \pm 28$</p>	<p>65. c) 14 $a + \frac{1}{a} + 2 = \pm 2$ $\Rightarrow a + \frac{1}{a} = 0, -4$ $\Rightarrow a^2 + \frac{1}{a^2} + 2 = 0, 16$ $\Rightarrow a^2 + \frac{1}{a^2} = -2, 14$</p> <p>66. c) 89 $3^{2/3} = a, 3^{-2/3} = \frac{1}{a}$ $\left(a - \frac{1}{a}\right)\left(a^2 + a\frac{1}{a} + \frac{1}{a^2}\right)$ $= a^3 - \frac{1}{a^3}$ $= 9 - \frac{1}{9} = \frac{80}{9}$</p> <p>67. a) 0 $x = \sqrt{x^2 - x - 1}$ $x^2 = x^2 - x - 1$ $\Rightarrow x = -1$ \rightarrow not satisfying the given equation as square root is always positive so no solution.</p> <p>68. d) $(a + b)(a - 1)$ $a^2 + ab - a - b$ $= a(a + b) - 1(a + b)$ $= (a - 1)(a + b)$</p> <p>69. c) $\frac{1}{3}$ or -1 Using TOER $E = \frac{w + x + y + z}{3(w + x + y + z)} = \frac{1}{3}$</p>
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$$\text{if } w + x + y + z \neq 0$$

$$\text{Also if } x + y + z + w = 0$$

$$\Rightarrow x + y + z = -w$$

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

70. **c)** $(ax - ay + bx + by)^2$
 $(ax - ay)^2 + 2(ax - ay)(bx + by) + (bx + by)^2$
 $= (ax - ay + bx + by)^2$

71. **a)** **0**

$$\text{Let } \sqrt{\frac{p}{q}} = a$$

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

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

$$\Rightarrow a = 1 \Rightarrow \frac{p}{q} = 1$$

72. **b)** **9 : 5 : 8**

$$A = 2B = 3C = K$$

$$A = K, B = \frac{K}{2}, C = \frac{K}{3}$$

$$A + B = \frac{3K}{2}, B + C = \frac{5K}{6}, C + A = \frac{4K}{3}$$

$$A + B : B + C : C + A = \frac{3}{2} : \frac{5}{6} : \frac{4}{3}$$

$$= \frac{9}{6} : \frac{5}{6} : \frac{8}{6}$$

$$= 9 : 5 : 8$$

73. **c)** $-3ab(b - a)$

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

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

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

74. **b)** **70**

$$a + b + c = 10, ab + bc + ca = 31$$

$$a^2 + b^2 + c^2 + 2(ab + bc + ca) = 100$$

$$a^2 + b^2 + c^2 = 100 - 62 = 38$$

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

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

$$= 10(38 - 31)$$

$$= 10(7) = 70$$

75. **a)** **4**

$$P(1) = 1 + 1 + 1 = 3$$

$$P(-1) = -1 + 1 - 1 = -1$$

$$P(1) - P(-1) = 4$$

76. **d)** **None of these**

$$\frac{25 \times 5^3}{10} a^4 a^8$$

$$= \frac{625}{2} a^4$$

77. **d)** **None of these**

not a Polynomial so degree not defined.

78. **b)** **-2**

$$-5 - 11 = 8x$$

$$\Rightarrow 8x = -16$$

$$\Rightarrow x = -2$$

79. **c)** $\left(\frac{2}{3}\right)^{12}$

$$x = \left(\frac{2}{3}\right)^{-2} \left(\frac{2}{3}\right)^{-4} = \left(\frac{2}{3}\right)^{-6}$$

$$x^{-2} = \left(\left(\frac{2}{3}\right)^{-6}\right)^{-2} = \left(\frac{2}{3}\right)^{12}$$

80. **b)** $\frac{15}{16}$

using synthetic division

	1	0	0	0	1
$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{4}$	$\frac{1}{8}$	$\frac{1}{16}$	
1	$\frac{1}{2}$	$\frac{1}{4}$	$\frac{1}{8}$	$\frac{1}{16}$	

$$\text{Sum of coefficient} = \frac{1 + \frac{1}{2} + \frac{1}{4} + \frac{1}{8}}{2}$$

$$= \frac{15}{16}$$

81. c) -9

$$P(2) = 2^3 - 5(2)^2 + 2 + 1 \\ = 8 - 20 + 2 + 1 = -9$$

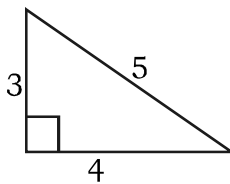
82. c) 20

$$P(3) = 3^3 - 3^2 + 3 - 1 \\ = 27 - 9 + 3 - 1 = 20$$

83. b) -10

$$P(2) = 0 = 8 + 2 + a \\ \Rightarrow a = -10$$

84. d) 6



$$\Delta = \frac{1}{2} \times 3 \times 4 = 6$$

85. b) $A - 2B + 3C = 12$

$$A = 2B = 3C = K \\ A = K, B = K/2, C = K/3$$

$$A + B + C = K + \frac{K}{2} + \frac{K}{3} = \frac{11K}{6} = 22$$

$$\Rightarrow K = 12$$

$$A = 12, B = 6, C = 4$$

$$A + 2B + 3C = 36$$

$$A - 2B + 3C = 12$$

86. b) $R : S : T = 9 : 15 : 10$

$$\frac{R}{2} = \frac{S}{3}, \frac{S}{5} = \frac{T}{3}$$

$$\Rightarrow \frac{R}{10} = \frac{S}{15} = \frac{T}{9}$$

$$\Rightarrow R : S : T = 10 : 15 : 9$$

$$R + S + T = 34K = 34$$

$$\Rightarrow K = 1$$

$$R - S + T = 10 - 15 + 9 = 4$$

$$R - S + T = 10 + 15 - 9 = 16$$

87. c) 6

$$x^3 - 6x^2 + 11x - 6 = (x-1)(x-2)(x-3) \\ \text{So roots are } 1, 2, 3 \\ \text{sum} = 1 + 2 + 3 = 6$$

88. d) $a^2 + b^2 + c^2 \leq ab + bc + ca$

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

$$\Rightarrow \text{Either } a = b = c$$

$$a + b + c = 0$$

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

$$a^2 + b^2 + c^2 \leq ab + bc + ca$$

89. d) 5

$$(x^2)^{100} < (3^3)^{100}$$

$$\Rightarrow x^2 < 27$$

$$x = 1, 2, 3, 4, 5$$

Maximum value of $x = 5$

90. b) 2

$$x^{\sqrt{x}} = \sqrt{x^x}$$

$$x^{2\sqrt{x}} = x^x$$

$$\Rightarrow 2\sqrt{x} = x \Rightarrow x^2 = 4x \Rightarrow x = 0, 4$$

$$x = 1$$

$$x = -1 \text{ (neglected)}$$

$$x = 0 \text{ (neglected)}$$

so $x = 1, 4$ are 2 solutions.