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Answers Key:

3 Marks

1. $(a)\ \sqrt{3}, -\sqrt{3}$
   $(b)\ \sqrt{3}, -\sqrt{3}$
   $(c)\ \sqrt{3}, -\sqrt{3}$
2. $2\sqrt{3} - 4\sqrt{2} + 4 + \sqrt{6}$
3. $\sqrt{3}$
4. $\frac{2\sqrt{3}+\sqrt{30}-3\sqrt{2}}{4}$
5. $\frac{2+\sqrt{3}}{2-\sqrt{3}} = \frac{2+\sqrt{3}}{2-\sqrt{3}} \times \frac{2+\sqrt{3}}{2+\sqrt{3}}$
   $= \frac{(2+\sqrt{3})^2}{(2)^2-(\sqrt{3})^2} \left[\because (a+b)(a-b) = a^2 - b^2\right]$
   $= \frac{(2+\sqrt{3})^2}{4-3}$
   $= (2+\sqrt{3})^2 = 4 + 3 + 4\sqrt{3} \ \left[\because\ (a+b)^2 = a^2 + b^2 + 2ab\right]$
   $= 7 + 4\sqrt{3}$
   $But \quad \frac{2+\sqrt{3}}{2-\sqrt{3}} = a + b\sqrt{3}$
   $\because\ a + b\sqrt{3} = 7 + 4\sqrt{3}$
   On comparing coefficient of a and b from both sides, we gieta=7, b=4
   $\therefore\ a^2 + b^2 = (7)^2 + (4)^2 = 49 + 16 = 65$
6. 2
7. $\frac{30}{5\sqrt{3}-3\sqrt{5}} \times \frac{5\sqrt{3}+3\sqrt{5}}{5\sqrt{3}+3\sqrt{5}} = \frac{30\left(5\sqrt{3}+3\sqrt{5}\right)}{\left(5\sqrt{3}\right)^2-\left(3\sqrt{5}\right)^2}$
   $= \frac{30\left(5\sqrt{3}+3\sqrt{5}\right)}{30}$
   $= 5\sqrt{3} + 3\sqrt{5}$
8. $\left(\sqrt{3}+1\right)\left(1-\sqrt{12}\right) + \frac{9}{\left(\sqrt{3}+\sqrt{12}\right)}$
   $= \left(\sqrt{3} - 6 + 1 - \sqrt{12}\right) + \frac{9}{\left(\sqrt{12}+\sqrt{3}\right)} \times \frac{\left(\sqrt{12}-\sqrt{3}\right)}{\left(\sqrt{12}-\sqrt{3}\right)}$
   $= \left(\sqrt{3} - 6 + 1 - \sqrt{12}\right) + \frac{9\left(\sqrt{12}-\sqrt{3}\right)}{12-3}$
   $= \sqrt{3} - 5 - \sqrt{12} + \sqrt{12} - \sqrt{3}$
   = -5
9. $x = \frac{1}{3-2\sqrt{2}} \times \frac{3+2\sqrt{2}}{3+2\sqrt{2}}$
   $= \frac{3+2\sqrt{2}}{9-8} = 3 + 2\sqrt{2}$
   and $y = \frac{1}{3+2\sqrt{2}} \times \frac{3-2\sqrt{2}}{3-2\sqrt{2}}$
   $= \frac{3-2\sqrt{2}}{9-8} = 3 - 2\sqrt{2}$
   x + y + xy = 3 + 2√2 + 3 - 2√2 + (3 + 2√2)(3 - 2√2)
   = 6 + 9 - 8
   = 7
10. We have $(3\sqrt{3} + 7\sqrt{2}) + (\sqrt{3} - 5\sqrt{2})$
    $= 3\sqrt{3} + 7\sqrt{2} + \sqrt{3} - 5\sqrt{2}$
    $= (3\sqrt{3} + \sqrt{3}) + (7\sqrt{2} - 5\sqrt{2})$
    $= \sqrt{3}(3+1) + \sqrt{2}(7-2)$
    $= \sqrt{3}(4) + \sqrt{2}(5) = (4\sqrt{3} + 5\sqrt{2})$

2 Marks

11. 103/90
12. 23^{-17}
13. 254
14. 15
15. $-8\sqrt{5}$
16. $a = \frac{8}{3}, b = 0$
17. $\frac{27}{225}$
18. -4
19. 3
20. $\frac{3}{5}$
21. $[\mu]^{a^2-b^2} = \mu$
22. $\frac{2^{x-1}}{2^{-2}} - \frac{2^{-x}}{2^{x+1}} = 0$
    $\Rightarrow\ 2^{x-1-x+2} - 2^{-x-x-1} = 0$
    $\Rightarrow\ 2^1 - -2^{-2x-1} = 0$
    $\Rightarrow\ 2^{-2x-1} = 2^1$
    $\Rightarrow -2x - 1 = 1 \Rightarrow\ x = -1$

23. $8\sqrt{3} - 2\sqrt{3} + 4\sqrt{3} = \sqrt{3}(8 - 2 + 4)$
$= 10\sqrt{3}$

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

25. $[5[8^{\frac{1}{3}} + 27^{\frac{1}{3}}]^3]^{\frac{1}{4}} = [5(2+3)^3]^{\frac{1}{4}}$
$= (5^4)^{\frac{1}{4}} = 5$

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