

CH 2 SIMPLIFICATION

ANSWERS AND EXPLANATIONS

EXERCISE 1

$$1. \quad (e) \quad ? = \frac{11 \times 55}{5} + 9$$

$$= 121 + 9 = 130$$

$$2. \quad (a) \quad ? = 85333 - 11638 - 60994$$

$$? = 85333 - 72632$$

$$\therefore ? = 12701$$

$$3. \quad (c) \quad ? = 8^4 - 8^2$$

$$= 8^2 (8^2 - 1) = 64 (64 - 1)$$

$$= 64 \times 63 = 4032$$

$$4. \quad (c) \quad ? = 6.3 \times 12.8 \times 9.9 - 69.996$$

$$= 798.336 - 69.996 = 728.34$$

$$5. \quad (d) \quad ? = 8 + \left(\frac{18 \times 368}{16} \right)$$

$$= 8 + 414 = 422$$

$$6. \quad (a) \quad 24848 = 107604$$

$$\Rightarrow ? = 107604 + 24848 = 132452$$

$$7. \quad (b) \quad ? = 894.65 + 100.99 - 388.24$$

$$995.64 - 388.24 = 607.4$$

$$8. \quad (d) \quad (?)^2 + (26)^2 = 1181 + 1520$$

$$\Rightarrow ?^2 + 676 = 2701$$

$$\Rightarrow ?^2 = 2701 - 676 = 2025$$

$$\Rightarrow ? = \sqrt{2025} = 45$$

$$9. \quad (e) \quad \frac{59475}{\sqrt{?}} = 195 \times 5$$

$$\Rightarrow \sqrt{?} = \frac{59475}{195 \times 5} = 61$$

$$\Rightarrow 61 \times 61 = 3721$$

$$10. \quad (b) \quad \sqrt{?} + 29 = \sqrt{2704}$$

$$\Rightarrow \sqrt{?} + 29 = 52$$

$$\Rightarrow \sqrt{?} = 52 - 29 = 23$$

$$\therefore ? = 23 \times 23 = 529$$

$$11. \quad (c) \quad (7)^{1/4} \times (343)^{0.25} = (7)^{1/4} \times (7^3)^{1/4} = (7^4)^{1/4} = 7$$

$$12. \quad (a) \quad 57.63 - 37.26 = 39.27 - ?$$

$$\Rightarrow 20.37 = 39.27 - ?$$

$$\Rightarrow ? = 39.27 - 20.37 = 18.9$$

$$13. \quad (e) \quad \sqrt{?} = \sqrt{1089} + \sqrt{289}$$

$$= 33 + 17 = 50$$

$$? = (50)^2 = 2500$$

$$14. \quad (c) \quad ? = 12.8 \times 2.5 + 8.6$$

$$= 32 + 8.6 = 40.6$$

$$15. \quad (b) \quad ?^2 = (14^2 - 13^2) \div 3$$

$$= (14 + 13)(14 - 13) \div 3$$

$$= 27 \times \frac{1}{3} = 9$$

$$\therefore ? = \sqrt{9} = 3$$

$$16. \quad (e) \quad (19)^? = \frac{(19)^{12} \times (19)^8}{(19)^4}$$

$$\text{or } (19)^? = \frac{(19)^{20}}{(19)^4}$$

$$\text{or } (19)^? = (19)^{20-4} = (19)^{16}$$

$$\text{or } ? = 16$$

$$17. \quad (b) \quad ? = \frac{70.56}{11.2} = 6.3$$

$$18. \quad (a) \quad ? = 986.23 + 7.952 + 8176.158 = 9170.340$$



$$19. (c) ? = \sqrt{1296} \div \sqrt{36}$$

$$= 36 \div 6 = 6$$

$$20. (c) 112 \div 7 \div 4 = 8 \times ?$$

$$\Rightarrow 8 \times ? = \frac{112}{7 \times 4}$$

$$\Rightarrow ? = \frac{4}{8} = \frac{1}{2} = 0.5$$

$$21. (a) ? = 3750 \times \frac{4}{8} \times \frac{2}{3} \times \frac{1}{2} = 625$$

$$22. (e) ? = \frac{24+4}{135-9} = \frac{28}{126} = \frac{2}{9}$$

$$23. (b) ? = (87324 - 79576) \times 1.5$$

$$= 7748 \times 1.5 = 11622$$

$$24. (a) ? = 350 \times 4 \times 50 = 70000$$

$$25. (e) ? = 11.88 \times \frac{250}{18} = 165$$

$$26. (e) ? = \frac{1}{2} \times \frac{3}{4} \div \left(\frac{9}{2} \times \frac{5}{8} \right)$$

$$= \frac{1}{2} \times \frac{3}{4} \div \frac{45}{16}$$

$$= \frac{1}{2} \times \frac{3}{4} \times \frac{16}{45} = \frac{2}{15}$$

$$27. (d) ? = \frac{18+17 \times 3-1}{8-15 \div 3-1}$$

$$= \frac{18+51-1}{8-5-1} = \frac{68}{2} = 34$$

$$28. (a) ? = \frac{3}{2} + \frac{5}{3} \div \left(\frac{6}{7} - \frac{5}{6} \right)$$

$$= \frac{3}{2} + \frac{5}{3} \div \left(\frac{36-35}{42} \right)$$

$$= \frac{3}{2} + \frac{5}{3} \div \frac{1}{42} = \frac{3}{2} + \frac{5}{3} \times 42$$

$$= \frac{3}{2} + 70 = \frac{3+140}{2} = \frac{143}{2}$$

$$= 71.5$$

$$29. (e) \sqrt{?} - 63 = 9^2$$

$$\Rightarrow \sqrt{?} = 81 + 63 = 144$$

$$\Rightarrow ? = (144)^2 = 20736$$

$$30. (e) 916.28 - 72.4 = 728.2 + ?$$

$$\Rightarrow 843.88 = 728.2 + ?$$

$$\Rightarrow ? = 843.88 - 728.2 = 115.68$$

$$31. (c) ? = 7776 \times \frac{1}{18} \times 3 = 1296$$

$$32. (e) ? = 8994 - 4178 - 2094$$

$$= 8994 - 6272 = 2722$$

$$33. (c) ? = 315 \times 114 - 1565$$

$$= 35910 - 1565 = 34345$$

$$34. (d) ? = 1256 \div (32 \times 0.25)$$

$$= 1256 \div 8 = 157$$

$$35. (a) ? = 69.2 \times 18.4 \times 4.5 = 5729.76$$

$$36. (e) ? = 3.2 \times 6.8 \times 9.5 = 206.72$$

$$37. (c) ? = 15^3 \times 9^3 - (1555)^2$$

$$= 3375 \times 729 - 2418025 = 42350$$

$$38. (a) ? = 8\frac{2}{5} + 10\frac{2}{25}$$

$$= \frac{42}{5} + \frac{252}{25}$$

$$= \frac{42}{5} \times \frac{25}{252} = \frac{5}{6}$$

$$39. (c) ? = 992 \times \frac{5}{6} \times \frac{3}{4} \times \frac{3}{5} = 372$$

$$40. (d) \sqrt{?} + 17 = \sqrt{961}$$

$$\text{or } \sqrt{?} + 17 = 31$$

$$\text{or } \sqrt{?} = 31 - 17$$

$$\text{or } \sqrt{?} = 14$$

$$\text{or } ? = 14 \times 14 = 196$$

$$41. (a) ? = \frac{123}{6 \times 0.8} = 25.625$$



$$42. (b) ? = [(4)^3 \times (5)^4] \div (4)^5$$

$$= \frac{4^3 \times 5^4}{4^5} = \frac{5^4}{4^2}$$

$$= \frac{5 \times 5 \times 5 \times 5}{4 \times 4} = 39.0625$$

$$43. (c) ? = \frac{1.6 \times 3.2}{0.08} = 64$$

$$44. (b) ? = \frac{7857 + 3596 + 4123}{96}$$

$$= \frac{15576}{96} = 162.25$$

$$45. (d) \frac{(84)^2}{\sqrt{?}} = 168$$

$$\sqrt{?} = \frac{84 \times 84}{168} = 42$$

$$\Rightarrow ? = (42)^2 = 1764$$

$$46. (e) ? = \sqrt[3]{50623} = \sqrt[3]{(37)^3} = 37$$

$$47. (a) ? = \frac{93336}{17891 + 16239 - 26352} = \frac{93336}{7778} = 12$$

$$48. (a) ? = \frac{1}{4} \times 6624 \times \frac{1}{6} \times 12 = 3312$$

$$49. (e) ? = \frac{18 \times 15 - 50}{(40 \times 80) \div 160} = \frac{220}{20} = 11$$

$$50. (e) \sqrt{?} = \frac{2296}{\sqrt{1681}} = \frac{2296}{41} = 56$$

$$? = (56)^2 = 3136$$

$$51. (a) ? = 93 \times 45 \div 25$$

$$= \frac{93 \times 45}{25} = 167.4$$

$$52. (d) ? = \frac{0.2944}{0.08 \times 1.6} = 2.3$$

$$53. (a) ? = 6 \times 66 \times 666 = 263736$$

$$54. (c) ? = \frac{36}{7} \times \frac{49}{6} \times \frac{8}{63}$$

$$= \frac{16}{3} = 5\frac{1}{3}$$

$$55. (e) \frac{(7)^3}{\sqrt{?}} = 14 - 7 = 7$$

$$\Rightarrow \sqrt{?} = \frac{7^2}{7} = 49$$

$$\Rightarrow ? = 49^2 = 2401$$

$$56. (e) ? = \frac{1035}{\sqrt[3]{12167}} = \frac{1035}{23} = 45$$

$$57. (b) ? = 1256 \times 3892 = 4888352$$

$$58. (b) ? = 0.08 \times 0.5 + 0.9$$

$$= 0.04 + 0.9 = 0.94$$

$$59. (d) ? \times 12 = 7847 - \frac{8195}{745}$$

$$\Rightarrow ? \times 12 = 7847 - 11 = 7836$$

$$\Rightarrow ? = 653$$

$$60. (a) 666 \div (2.4 \times ?) = 185$$

$$\text{or } \frac{666}{2.4 \times ?} = 185$$

$$\text{or } ? = \frac{666}{2.4 \times 185} = 1.5$$

$$61. (d) \frac{3}{8} \times \frac{4}{7} \times ? = 5376$$

$$\text{or } ? \times \frac{3}{14} = 5376$$

$$\text{or } ? = \frac{5376 \times 14}{3} = 25088$$

$$62. (e) [9^3 \times (?^2)] \div 21 = 1701$$

$$\text{or } \frac{9^3 \times (?^2)}{21} = 1701$$



$$\text{or } ?^2 = \frac{1701 \times 21}{9 \times 9 \times 9} = 49$$

$$\therefore ? = \sqrt{49} = 7$$

$$63. \text{ (c) } ? = 897214 - (336 + 46521 + 1249 + 632176) \\ = 897214 - 680282 = 216932$$

$$64. \text{ (a) } \sqrt{11881} \times \sqrt{?} = 10137$$

$$\text{or } 109 \times \sqrt{?} = 10137$$

$$\text{or } \sqrt{?} = \frac{10137}{109} = 93$$

$$\text{or } ? = 93 \times 93 = 8649$$

$$65. \text{ (e) } 3.5 \times 2.4 \times ? = 42$$

$$\text{or } ? = \frac{42}{3.5 \times 2.4} = 5$$

$$66. \text{ (d) } ? = \sqrt[3]{804357}$$

$$= \sqrt[3]{93 \times 93 \times 93}$$

[from given options]

$$= 93$$

$$67. \text{ (c) } \sqrt{?} \div 16 \times 24 = 186$$

$$\text{or } ? = \frac{\sqrt{?}}{16} \times 24 = 186$$

$$\text{or } \sqrt{?} = \frac{186 \times 16}{24} = 124$$

$$\therefore ? = 124 \times 124 = 15376$$

$$68. \text{ (e) } \frac{?^2}{(0.04)^2} \times 5.6 = 117740$$

$$\text{or } (?)^2 = \frac{117740 \times 0.04 \times 0.04}{5.6} = 33.64$$

$$\text{or } ? = \sqrt{33.64} = 5.8$$

$$69. \text{ (b) } 9418 - ? + 1436 + 2156 = 5658$$

$$\text{or } 13010 - ? = 5658$$

$$\text{or } ? = 13010 - 5658 = 7352$$

$$70. \text{ (c) } 9865 + ? + 3174 + 2257 = 19425$$

$$\text{or } ? + 15296 = 19425$$

$$\text{or } ? = 19425 - 15296 = 4129$$

$$71. \text{ (b) } \frac{9}{?} \times 33824 = 63$$

$$\text{or } ? = \frac{9 \times 33824}{63} = 4832$$

$$72. \text{ (b) } (99)^2 - (?)^2 + (38)^2 = 8436$$

$$\text{or } 9801 - (?)^2 + 1444 = 8436$$

$$\text{or } 11245 - (?)^2 = 8436$$

$$\text{or } (?)^2 = 11245 - 8436 = 2809$$

$$\text{or } ? = \sqrt{2809} = 53$$

$$73. \text{ (d) } ? = 12.36 \times 18.15 + 21.52$$

$$= 224.334 + 21.52$$

$$= 245.854$$

$$74. \text{ (a) } (98764 + 89881 + 99763 + 66342) \div$$

$$(1186 + ? + 1040 + 1870) = 55$$

$$\text{or } 354750 \div (? + 4096) = 55$$

$$\text{or } \frac{354750}{? + 4096} = 55$$

$$\text{or } ? + 4096 = \frac{354750}{55}$$

$$\text{or } ? = 4096 = 6450$$

$$\text{or } ? = 6450 - 4096 = 2354$$

$$75. \text{ (a) } ? = (64)^2 \div \sqrt[3]{32 \times 32 \times 32}$$

$$\text{or } ? = \frac{64 \times 64}{32} = 128$$

$$76. \text{ (e) } ? = \frac{21 \times 14 - 34}{12.4 + 5.6 - 15.5}$$

$$= \frac{294 - 34}{18 - 15.5} = \frac{260}{2.5} = 104$$

$$77. \text{ (c) } 0.09 \times 6.8 \times ? = 2.142$$



$$\text{or } ? = \frac{2.142}{0.09 \times 6.8} = 3.5$$

$$78. \text{ (d) } ? = 11 + \frac{1}{7} + 2 + \frac{5}{8}$$

$$= (11+2) + \left(\frac{1}{7} + \frac{5}{8}\right) = 13 + \left(\frac{8+35}{56}\right)$$

$$= 13 + \frac{43}{56} = 13\frac{43}{56}$$

$$79. \text{ (d) } ? = 7275.84 + 124.518 - 889.4$$

$$= 7400.358 - 889.4 = 6510.958$$

$$80. \text{ (a) } ? = \frac{(12+4)(12-4)}{(9+3)(9-3)} = \frac{16 \times 8}{12 \times 6} = \frac{16}{9} = 1\frac{7}{9}$$

$$81. \text{ (b) } ? = \frac{18800}{470} \div 20 = 40 \div 20 = 2$$

$$82. \text{ (d) } \sqrt{?} + 136 = 320 \times \frac{5}{8}$$

$$\text{or } \sqrt{?} + 136 = 200$$

$$\text{or } \sqrt{?} = 200 - 136 = 64$$

$$\text{or } ? = 64 \times 64 = 4096$$

$$83. \text{ (b) } 946.68$$

$$84. \text{ (c) } ? = \frac{0.000016}{0.04} = 0.0004$$

$$85. \text{ (d) } ? = 4^7 \div (4^2)^4 \times 4 = 4^8 \div 4^8 = 1$$

$$86. \text{ (c) } [(135)^2 \div 15 \times 32] \div ? = 45 \times 24$$

$$\text{or } \left[\frac{135 \times 135 \times 32}{15}\right] \div ? = 45 \times 24$$

$$\text{or } 38880 \div ? = 45 \times 24$$

$$\text{or } ? = \frac{388880}{45 \times 24} = 36$$

$$87. \text{ (d) } (96)^2 + (63)^2 = (?)^2 - (111)^2 - 8350$$

$$\text{or } 9216 + 3969 = (?)^2 - 12321 - 8350$$

$$\text{or } 13185 = ?^2 - 20671$$

$$\text{or } ?^2 = 33856$$

$$\text{or } ? = \sqrt{33856} = 184$$

$$88. \text{ (c) } 4368 - 2158 - 596 - ? = 3421 + 1262$$

$$\text{or } 6526 - 596 - ? = 4683$$

$$\text{or } ? = 5930 - ? = 4683$$

$$\text{or } ? = 5930 - 4683 = 1247$$

$$89. \text{ (a) } 2172 \div ? = 1832 - 956 - 514$$

$$\text{or } = \frac{2172}{?} = 362$$

$$\text{or } ? = \frac{2172}{362} = 6$$

$$90. \text{ (b) } ? = 666.06 + 66.60 + 0.66 + 6.06 + 6 + 60$$

$$= 805.38$$

$$91. \text{ (a) } 205 \times ? \times 13 = 33625 + 25005$$

$$\text{or } 205 \times ? \times 13 = 58630$$

$$\text{or } ? = \frac{58630}{205 \times 13} = 22$$

$$92. \text{ (d) } ? = (10)^{24} \times (10)^{-21}$$

$$= (10)^{24-21} = 10^3 = 1000$$

$$93. \text{ (b) } ? = 78 \div 5 \div 0.5$$

$$= \frac{78}{5 \times 0.5} = 31.2$$

$$94. \text{ (e) } ? = 12.22 + 22.21 + 221.12$$

$$= 255.55$$

$$95. \text{ (c) } ? = 12^4 \times 12^{13} = 12^{4+13} = 12^{17}$$

$$96. \text{ (a) } ? = 464 \div (16 \times 2.32)$$

$$= \frac{464}{16 \times 2.32} = 12.5$$

$$97. \text{ (e) } 4800.4444$$

$$98. \text{ (d) } \frac{361.6}{6.4} = 56.5$$



$$99. (d) \sqrt{?} = 31 - 17 = 14 = \sqrt{196}$$

$$100. (c) ? = 832.456 - (539.982 + 123.321) \\ = 832.456 - 663.303 = 169.153$$

$$101. (a) 236.69 + 356.74 = 393.39 + ? \\ \text{or } 593.43 = 393.39 + ? \\ \text{or } ? = 593.43 - 393.39 = 200.04$$

$$102. (a) ? = \frac{35 \times 15 \times 10}{25 \times 2} = 105$$

$$103. (e) ? = \frac{558 \times 45}{18 \times 4.5} = 310$$

$$104. (b) 559 + 965 = ? \times 16 \\ \text{or } 1524 = ? \times 16 \\ \text{or } \Rightarrow ? = \frac{1524}{16} = 95.25$$

$$105. (b) ? = 7 + \frac{3}{4} + 5 + \frac{1}{4} + 8 + \frac{1}{2} \\ = (7 + 5 + 8) + \left(\frac{3}{4} + \frac{1}{4} + \frac{1}{2} \right) \\ = 20 + \left(\frac{3+1+2}{4} \right) \\ = 20 + \frac{3}{2} = 20 + 1 + \frac{1}{2} = 21\frac{1}{2}$$

$$106. (a) ? = 9.1 \times 7.5 \times 6.2 \\ = 423.15$$

$$107. (a) 49 + \sqrt{?} = 87 \\ \text{or } = 87 - 49 = 38 \\ \text{or } ? = (38)^2 = 1444$$

$$108. (e) \sqrt{?} = 17 + 22 = 39 \\ \Rightarrow ? = 39 \times 39 \\ = 1521$$

$$109. (e) ? = 628.306 + 6.1325 \times 44.0268 \\ ? \approx 628 + 6 \times 44 \\ \approx 628 + 264 = 892 = 900$$

$$110. (b) ? = 1896 \div 29 + 445$$

$$= \frac{1896}{29} + 445 \\ = 65.4 + 445 = 510.4 \\ \approx 510$$

$$111. (a) ? = (9795 + 7621 + 938) \div (541 + 831 + 496) \\ = 18354 \div 1868 \approx 9.8 \approx 9$$

$$112. (c) 814296 \times 36 = ? \times 96324 \\ \text{or } ? = \frac{814296 \times 36}{96324} \approx 304$$

$$113. (d)$$

$$114. (e) 95^{3.7} \div 95^{0.9989} = 95^? \\ \text{or } 95^{(3.7 - 0.9989)} = 95^? \\ \text{or } 95^{2.7011} = 95^? \\ \text{or } ? = 2.7011 \approx 2.7$$

$$115. (b) \sqrt{10000 + 1891.992} \text{ of } \frac{3.001}{4.987} \\ = 100 + 1892 \times \frac{3}{5} = 100 + 1135.2$$

$$= 1235.2 = 1230$$

$$116. (c) 0.0004 \div 0.0001 \times 36.000009 \\ = 4 \div 1 \times 36 \\ = 144 \approx 145$$

$$117. (c) 3739 + 164 \times 27 \\ = 3739 + 4428 = 8167 \approx 8200$$

$$118. (c)$$

$$119. (b) ? = \sqrt{3781} \times 5.36 \\ \approx 61.5 \times 5.36 \approx 329.64 \approx 330$$

$$120. (e) ? = \frac{5321}{305} \times (19)^2 = 6297.97 \approx 6300 \text{ (approx)}$$

$$121. (d) ? = 4123 \div (2.3)^2 - 446 \\ = \frac{4123}{2.3 \times 2.3} - 446 \\ \approx 779 - 446 = 333 \text{ (approx)}$$



$$122.(d) \quad 894 \div 28 \times \sqrt{589} = ?$$

$$\text{or } ? = \frac{894}{28} \times 24.3 \approx 775.86$$

$$\approx 775$$

$$123.(b) \quad ? = 4275 \div 496 \times 21^2$$

$$= \frac{4275 \times (21)^2}{496} \approx \frac{4275 \times 441}{495} \approx 3800$$

$$124.(e) \quad ? = 5470 \div 378 \times 19^2$$

$$= \frac{5470}{378} \times 361$$

$$= 5223.996$$

$$= 5224 \text{ (approx)}$$

$$125.(c) \quad ? = \frac{5989}{48} \times 11 = 124.8 \times 11 = 1372$$

$$126.(c) \quad ? = \sqrt{876} \times 20.6 + 165.34$$

$$\approx 29 \times 21 + 165$$

$$= 609 + 165 = 774 \approx 775$$

EXERCISE 2

$$1. (c) \text{ Let } \sqrt{28-10\sqrt{3}} = \sqrt{x} - \sqrt{y}$$

$$\Rightarrow 28-10\sqrt{3} = x+y-2\sqrt{xy}$$

$$\Rightarrow x+y=28, xy=75$$

Therefore,

$$(x-y)^2 = (x+y)^2 - 4xy = 784 - 300 = 484$$

$$\Rightarrow x-y=22 \text{ or } x=25, y=3$$

$$\text{Thus, } \sqrt{28-10\sqrt{3}} = \sqrt{25} - \sqrt{3}$$

$$\text{Again, let } \sqrt{7+4\sqrt{3}} = \sqrt{p} + \sqrt{q}$$

$$\Rightarrow 7+4\sqrt{3} = p+q+2\sqrt{pq}$$

$$\Rightarrow p+q=7, pq=12$$

$$\Rightarrow p-q=1 \text{ or } p=4, q=3$$

$$\text{Thus, } \sqrt{7+4\sqrt{3}} = \sqrt{4} + \sqrt{3}$$

$$\text{Now, } (28-10\sqrt{3})^{\frac{1}{2}} - (7+4\sqrt{3})^{-\frac{1}{2}}$$

$$= \sqrt{25} - \sqrt{3} - \frac{1}{\sqrt{4} + \sqrt{3}} = \sqrt{25} - \sqrt{3} - \frac{\sqrt{4} - \sqrt{3}}{1}$$

$$= \sqrt{25} - \sqrt{4} = 5 - 2 = 3$$

$$2. (a) \quad \frac{(2.3)^2 - 0.04}{2.1 \times 1.25} = \frac{(2.3)^2 - (0.2)^2}{2.1 \times 1.25}$$

$$= \frac{(2.3-0.2)(2.3+0.2)}{2.1 \times 1.25} = \frac{2.1 \times 2.5}{2.1 \times 1.25} = \frac{2.50}{1.25} = 2$$

$$3. (a) \quad 1.236 \times 10^{15} - 5.23 \times 10^{14}$$

$$= 10^{14}(12.36 - 5.23) = 7.13 \times 10^{14}$$

$$4. (b) \text{ Given exp.}$$

$$= \frac{1}{\left(1 + \frac{x^b}{x^a} + \frac{x^c}{x^a}\right)} + \frac{1}{\left(1 + \frac{x^a}{x^b} + \frac{x^c}{x^b}\right)} + \frac{1}{\left(1 + \frac{x^b}{x^c} + \frac{x^a}{x^c}\right)}$$

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

$$= \frac{(x^a + x^b + x^c)}{(x^a + x^b + x^c)} = 1$$

$$5. (b) \text{ Given exp.} = \sqrt{\frac{(0.03)^2 + (0.21)^2 + (0.065)^2}{\left(\frac{0.03}{10}\right)^2 + \left(\frac{0.21}{10}\right)^2 + \left(\frac{0.065}{10}\right)^2}}$$

$$= \sqrt{\frac{100[(0.03)^2 + (0.21)^2 + (0.065)^2]}{(0.03)^2 + (0.21)^2 + (0.065)^2}}$$

$$= \sqrt{100} = 10.$$



6. (a) We rationalise the denominator of each

$$\frac{1}{3-\sqrt{8}} = \frac{1}{3-\sqrt{8}} \times \frac{3+\sqrt{8}}{3+\sqrt{8}} = \frac{3+\sqrt{8}}{9-8} = 3+\sqrt{8}$$

$$\frac{1}{\sqrt{8}-\sqrt{7}} = \frac{1}{\sqrt{8}-\sqrt{7}} \times \frac{\sqrt{8}+\sqrt{7}}{\sqrt{8}+\sqrt{7}} = \frac{\sqrt{8}+\sqrt{7}}{8-7} = \sqrt{8}+\sqrt{7}$$

$$\frac{1}{\sqrt{7}-\sqrt{6}} = \frac{1}{\sqrt{7}-\sqrt{6}} \times \frac{\sqrt{7}+\sqrt{6}}{\sqrt{7}+\sqrt{6}} = \frac{\sqrt{7}+\sqrt{6}}{7-6} = \sqrt{7}+\sqrt{6}$$

$$\frac{1}{\sqrt{6}-\sqrt{5}} = \sqrt{6}+\sqrt{5} \text{ and } \frac{1}{\sqrt{5}-2} = \sqrt{5}+2$$

T h u s

$$\frac{1}{3-\sqrt{8}} - \frac{1}{\sqrt{8}-\sqrt{7}} + \frac{1}{\sqrt{7}-\sqrt{6}} - \frac{1}{\sqrt{6}-\sqrt{5}} + \frac{1}{\sqrt{5}-2}$$

$$= 3+\sqrt{8} - \sqrt{8} - \sqrt{7} + \sqrt{7} + \sqrt{6} - \sqrt{6} - \sqrt{5} + \sqrt{5} + 2$$

$$= 5$$

7. (d) $9821 - [48 + \{12 \times 177\}]$
 $= 9821 - [48 + 2124] = 9821 - 2172 = 7649.$

8. (b) $\frac{1}{\sqrt{1}+\sqrt{2}} + \frac{1}{\sqrt{2}+\sqrt{3}} + \dots + \frac{1}{\sqrt{120}+\sqrt{121}}$
 $= \frac{(\sqrt{2}-\sqrt{1})}{(\sqrt{2}^2-\sqrt{1}^2)} + \frac{(\sqrt{3}-\sqrt{2})}{(\sqrt{3}^2-\sqrt{2}^2)} + \frac{(\sqrt{4}-\sqrt{3})}{(\sqrt{4}^2-\sqrt{3}^2)}$

$$\dots + \frac{(\sqrt{121}-\sqrt{120})}{(\sqrt{121}^2-\sqrt{120}^2)}$$

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

$$\dots + (\sqrt{120}-\sqrt{119}) + (\sqrt{121}-\sqrt{120})$$

$$= -\sqrt{1} + \sqrt{121} = 11 - 1 = 10$$

9. (c) $\left(\frac{1}{64}\right)^0 + (64)^{-1/2} - (-32)^{4/5}$

$$= 1 + \frac{1}{8} - 16 = \frac{-119}{8} = -14\frac{7}{8}$$

10. (c) $\frac{17}{3} \times \frac{19}{6} + \frac{7}{3}$

$$= \frac{(20-3)(20-1)}{3} + \frac{7}{3}$$

$$= \left(\frac{20}{3}-1\right)\left(\frac{20}{6}-\frac{1}{6}\right) + \frac{7}{3}$$

$$= \frac{400}{18} - \frac{20}{18} - \frac{20}{6} + \frac{1}{6} + \frac{7}{3}$$

$$= \frac{400-20-60+3+42}{18} = \frac{365}{18} = 20\frac{5}{18}$$

11. (a) Let $\frac{128+16x-7x^2}{7^2-8x+6+x^2} = 1.$

$$\text{Then, } 8x - 7 \times 2 = 49 - 48 + x^2$$

$$\Rightarrow 8x - 14 = 1 + x^2$$

$$\Rightarrow x^2 - 8x + 15 = 0$$

$$\Rightarrow (x-3)(x-5) = 0$$

$$\Rightarrow x = 3 \text{ or } x = 5.$$

12. (b) $\frac{(a+b)^2 - (a-b)^2}{ab} = \frac{4ab}{ab} = 4$ (where $a = 469$, $b = 174$)

13. (d) $\left(\frac{-1}{216}\right)^{\frac{2}{3}} = \left(\frac{-1}{6^3}\right)^{\frac{2}{3}} = \left(-\frac{1}{6}\right)^{-2} = (-6)^2 = 36$

14. (b) $\sqrt[3]{\sqrt{0.000064}} = \sqrt[3]{0.008} = \left((0.2^3)\right)^{1/3} = 0.2$

15. (a) $\frac{1}{2} \div \frac{1}{2} \times \frac{1}{2} = \frac{1}{2} \times 2 \times \frac{1}{2} = \frac{1}{2} \times \frac{4}{3} = \frac{2}{3}$
 $\frac{1}{2} + \frac{1}{2} \times \frac{1}{2} = \frac{3}{4}$

16. (d) Given exp. $= \left(\frac{3}{5} \times \frac{4}{7} \times \frac{5}{9} \times \frac{21}{24} \times 504\right) = 84.$



$$\begin{aligned}
 17. (a) \quad & \frac{(243)^{0.13} \times (243)^{0.07}}{7^{0.25} \times (49)^{0.075} \times (343)^{0.2}} \\
 &= \frac{(243)^{(0.13+0.07)}}{7^{0.25} \times (7^2)^{0.075} \times (7^3)^{0.2}} \\
 &= \frac{(243)^{(0.2)}}{7^{0.25} \times (7)^{(2 \times 0.075)} \times (7)^{(3 \times 0.2)}} \\
 &= \frac{(3^5)^{0.2}}{7^{0.25} \times 7^{0.15} \times 7^{0.6}} \\
 &= \frac{(3)^{(5 \times 0.2)}}{7^{(0.25+0.15+0.6)}} = \frac{3^1}{7^1} = \frac{3}{7}
 \end{aligned}$$

$$\begin{aligned}
 18. (d) \quad & \text{Let } (17)^{3.5} \times (17)^x = 17^8. \\
 & \text{Then, } (17)^{3.5+x} = 17^8. \\
 \therefore & 3.5 + x = 8 \Rightarrow x = (8 - 3.5) \Rightarrow x = 4.5
 \end{aligned}$$

$$19. (a) \quad \text{Let the the number be } = x$$

According to the question,

$$x^2 - 26^2 = 549$$

$$\text{or, } x^2 - 676 = 549$$

$$\text{or, } x^2 = 549 + 676 = 1225$$

$$\text{or, } x = \sqrt{1225} = 35$$

$$20. (b) \quad \text{Let the number be } x.$$

$$\therefore x^2 + 61^2 = 5242$$

$$\Rightarrow x^2 = 5242 - 3721$$

$$= 1521$$

$$\therefore x = 39$$

$$21. (c) \quad \text{Let the number be } x.$$

Then,

$$x^2 - (74)^2 = 5340$$

$$\Rightarrow x^2 = 5340 + 5476$$

$$= 10816$$

$$\Rightarrow x = \sqrt{10816} = 104$$

$$22. (d) \quad \text{Let the number be } = x$$

According to the question,

$$x^2 - (74)^2 = 3740$$

$$\text{or } x^2 = 3740 + 5476 = 9216$$

$$\therefore x = \sqrt{9216} = 96$$

$$23. (b) \quad \text{Let the number be } x$$

$$\therefore x^2 - (46)^2 = 485$$

$$\Rightarrow x^2 = 485 + (46)^2 = 2601$$

$$\therefore x = \sqrt{2601} = 51$$

$$24. (e) \quad \text{Let the number be } = x$$

According to the question,

$$x^2 + 57^2 = 8010$$

$$\text{or, } x^2 + 3249 = 8010$$

$$\text{or, } x^2 = 8010 - 3249 = 4761$$

$$\text{or, } x = \sqrt{4761} = 69$$

$$25. (a) \quad \text{Let the required number be } x$$

$$\therefore x^2 - (9)^3 = 567$$

$$x^2 = 567 + 729 = 1296$$

$$\therefore x = \sqrt{1296} = \sqrt{(36)^2} = 36$$

$$26. (e) \quad \text{Let the number be } x.$$

According to the question,

$$x^2 - 78^2 = 6460$$

$$\text{or, } x^2 = 6460 + 6084$$

$$\text{or, } x^2 = 12544$$

$$27. (d) \quad \therefore \sqrt{4400} \approx 66.33$$

$$\therefore \text{Required number} = 67^2 - 4400$$

$$= 4489 - 4400$$

$$= 89$$

$$\text{or, } x = \sqrt{12544} = 112$$

$$28. (a) \quad \text{Let the larger and smaller numbers be } x \text{ and } y \text{ respectively.}$$

$$\text{Then, } x - y = 3 \quad \dots(i)$$

$$\text{and, } x^2 - y^2 = 63$$

$$\Rightarrow (x + y)(x - y) = 63$$



$$\Rightarrow (x + y) = \frac{63}{3} = 21$$

... (ii)

From equation (i) and (ii), $x = 12$

$$29. (d) \quad 1248 \times \frac{5}{6} - 1150 \times \frac{4}{5}$$

$$= 1040 - 920 = 120$$

$$30. (c) \quad 2x + 3y = 78 \quad \dots (i)$$

$$3x + 2y = 72 \quad \dots (ii)$$

From equations (i) and (ii),

$$x = 12, y = 18$$

$$\therefore x + y = 12 + 18 = 30$$

$$31. (c) \quad x + y = 18$$

$$\Rightarrow (x + y)^2 = 18^2 = 324$$

$$\Rightarrow x^2 + y^2 + 2xy = 324$$

$$\Rightarrow x^2 + y^2 = 324 - 2xy$$

$$\Rightarrow x^2 + y^2 = 324 - 2(72)$$

$$\Rightarrow x^2 + y^2 = 324 - 144 = 180$$

$$32. (b) \quad \begin{array}{r} 90 \\ 9 \overline{) 8115} \\ \underline{81} \\ 180 \\ \underline{180} \\ 0 \end{array}$$

$$\therefore \text{required number} = 91 \times 91 - 8115 = 166$$

$$33. (e) \quad \begin{array}{r} 66 \\ 6 \overline{) 4321} \\ \underline{6} \\ 6 \\ \underline{6} \\ 126 \\ \underline{126} \\ -35 \end{array}$$

$$\therefore = (66)^2 - 4321$$

$$= 4356 - 4321 = 35$$

$$34. (d) \quad 69 \times 69 = 4761$$

$$68 \times 68 = 4624$$

Clearly, $4624 < 4700 < 4761$ \therefore Hence, 61 should be added to make

$$= 4761 - 4700 = 61$$

$$35. (c) \quad \therefore \sqrt{3986} = 63.13$$

$$\therefore \text{Here, } 63^2 = (64)^2 - 3986$$

$$= 4096 - 3986 = 110$$

$$36. (b) \quad 3x + 5y = 44 \quad \dots (i)$$

$$10x - 2y = 16 \quad \dots (ii)$$

By equation (i) $\times 2$ + equation (ii) $\times 5$ we have

$$6x + 10y + 50x - 10y = 88 + 80$$

$$\text{or, } 56x = 168$$

$$\therefore x = \frac{168}{56} = 3$$

$$37. (a) \quad \text{Given, } x + y = 20 \text{ and } xy = 84$$

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

$$= (20)^2 - 2 \times 84$$

$$= 400 - 168 = 232$$

$$38. (e) \quad \text{Other parts are equal to 300.}$$

$$39. (e) \quad \text{The other parts are equal to 105.10.}$$

$$40. (b) \quad \text{Other parts are equal to}$$

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

$$41. (d) \quad \text{Check all options one by one.}$$

$$(a) \quad \frac{75 \times 8}{6} = 100$$

$$(b) \quad \frac{98}{2.5} + (15.2 \times 4) = 100$$

$$(c) \quad (15 \times 8) - (5 \times 4) = 100$$

$$(d) \quad (76 \times 1.5) - (5.5 \times 2.6) = 99.7$$

$$(e) \quad (48 \times 1.2) + \frac{127.2}{3} = 100$$

$$42. (c) \quad \text{All others are equal to 100. But option (c) gives a value equal to 98.}$$

$$43. (d) \quad \text{Others equal 5650.}$$

$$44. (b) \quad \text{Except it, others are equal to 550.}$$

$$45. (b) \quad \text{The other parts are equal to 1000.}$$



46. (c) Others equal 80 whereas (c) equals 80.8.

47. (b) Others are equal to 144 whereas (b) equals 1440.

48. (c) (c) = 605.5 whereas the other parts are equal to 600.5

49. (c) The other parts are equal to 200.

50. (e) Others are equal to 301.82.

EXERCISE 3

$$1. (b) \frac{3}{2} \sqrt[4]{\frac{32}{243}} = \frac{3}{2} \times \left(\frac{32}{243}\right)^{\frac{1}{4}} = \left(\frac{2}{3}\right)^{-1} \left\{\left(\frac{2}{3}\right)^5\right\}^{\frac{1}{4}}$$

$$= \left(\frac{2}{3}\right)^{\frac{1}{4}} = \sqrt[4]{\frac{2}{3}}$$

2. (b) We have, $9^x \times 3^x = 9$

or $(3)^{2x} \times (3)^x = 9$

or $(3)^{3x} = (3^2)$

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

3. (b) $x^{abc} = x^a x^b x^c \Rightarrow x^{abc} = x^{a+b+c} \Rightarrow abc = a+b+c$
 This happens for positive integer value of a, b, c, only when a, b, c take value of 1, 2 & 3.

Hence, $a^2 + b^2 + c^2 = 1^2 + 2^2 + 3^2 = 1 + 4 + 9 = 14$.

4. (c) $729 = 9^3 = 3^6$, Now $4X - 2 = 6 \Rightarrow X = 2$.

5. (a) $2^{x+4} - 2^{x+2} = 3$

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

$\Rightarrow 2^{x+2} = 2^0$

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

6. (d) $4 \times 5 = 20^{z/x} \times 20^{z/y} = 20^{z/x + z/y} = 20$

i.e. $1 = z/x + z/y$

i.e. $z = xy/(x + y)$

7. (c) $\frac{1}{1+a^{(n-m)}} + \frac{1}{1+a^{(m-n)}} = \frac{1}{\left(1+\frac{a^n}{a^m}\right)} + \frac{1}{\left(1+\frac{a^m}{a^n}\right)}$

$$= \frac{a^m}{(a^m + a^n)} + \frac{a^n}{(a^m + a^n)}$$

$$= \frac{(a^m + a^n)}{(a^m + a^n)} = 1$$

8. (d)

$$\frac{\frac{7}{3} + 1\frac{1}{2} \text{ of } \frac{5}{3}}{2 + 1\frac{2}{3}} = \frac{\frac{7}{3} + \frac{3}{2} \text{ of } \frac{5}{3}}{2 + \frac{5}{3}} = \frac{\frac{7}{3} + \frac{5}{2}}{\frac{11}{3}} = \frac{29}{6} \times \frac{3}{11} = \frac{29}{22}$$

\therefore Required answer

$$\frac{29}{22} \times \frac{1}{4} = \frac{58-11}{44} = \frac{47}{44} = 1\frac{3}{44}$$

9. (a)

$$\begin{array}{r} 1 \overline{)15376} \text{ (124)} \\ \underline{1} \\ 22 \\ \underline{44} \\ 244 \\ \underline{976} \\ 976 \\ \hline \times \end{array}$$

\therefore Number of rows = 124.

10. (d) $(216)^{3/5} \times (2500)^{2/5} \times (300)^{1/5}$

$$= (3^3 \times 2^3)^{3/5} \times (5^4 \times 2^2)^{2/5} \times (5^2 \times 2^2 \times 3)^{1/5}$$

=

$$3^{\left(\frac{3 \times 3}{5}\right)} \times 2^{\left(\frac{3 \times 3}{5}\right)} \times 5^{\left(\frac{4 \times 2}{5}\right)} \times 2^{\left(\frac{2 \times 2}{5}\right)} \times 5^{\left(\frac{2 \times 1}{5}\right)} \times 2^{\left(\frac{2 \times 1}{5}\right)} \times 3^{\frac{1}{5}}$$

$$= 3^{\frac{9}{5}} \times 2^{\frac{9}{5}} \times 5^{\frac{8}{5}} \times 2^{\frac{4}{5}} \times 5^{\frac{2}{5}} \times 2^{\frac{2}{5}} \times 3^{\frac{1}{5}}$$

$$= 3^{\left(\frac{9}{5} + \frac{1}{5}\right)} \times 2^{\left(\frac{9}{5} + \frac{4}{5} + \frac{2}{5}\right)} \times 5^{\left(\frac{8}{5} + \frac{2}{5}\right)} = 3^2 \times 2^3 \times 5^2$$

Hence, the number of prime factors = $(2 + 3 + 2) = 7$



$$11. (c) \sqrt[4]{(28+16\sqrt{3})} = \sqrt{\sqrt{(28+16\sqrt{3})}}$$

$$= \sqrt{\sqrt{(28+2\sqrt{192})}} = \sqrt{\sqrt{(\sqrt{16}+\sqrt{12})^2}}$$

$$= \sqrt{\sqrt{16}+\sqrt{12}} = \sqrt{(4+2\sqrt{3})}$$

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

$$12. (a) a^y = 19683$$

$$\Rightarrow 3^9 = 27^3 = (19683)^1 = 19683$$

As y is a multiple of a, $a = 3$, $y = 9$

$$b^x = 1024$$

$$\Rightarrow 2^{10} = 4^5 = 32^2 = (1024)^1 = 1024$$

As b is a factor of x, $b = 2$, $x = 10$

Now, $x^a + y^b$

$$\Rightarrow 10^3 + 9^2 = 1000 + 81 = 1081.$$

$$13. (a) \text{ Given, } a + n = 12 \Rightarrow n = 12 - a$$

\therefore Given expression becomes

$$a^{\frac{10-a}{2}} \cdot 3^{a+2} \cdot 2 \cdot 2^{\frac{12-a}{2}} \cdot \left(\frac{a}{2}\right)^{-5+\frac{a}{2}} = 2^{12-a} \cdot 3^{12-a}$$

By comparing, power of 3, we get

$$a + 2 = 12 - a \Rightarrow a = 5 \text{ and } n = 7$$

$$\therefore \text{ Required answer} = (a^2 + n^2) - (n^2 - a^2)$$

$$= (49 + 25) - (49 - 25) = 50$$

$$14. (a) mx^m = nx^n$$

$$\therefore x^m = \frac{nx^n}{m}$$

$$\therefore \text{ Given } \left(\frac{1}{\frac{nx^n}{m} + x^n} + \frac{1}{\frac{nx^n}{m} - x^n} \right)$$

$$= \left(\frac{m}{x^n(n+m)} + \frac{m}{x^n(n-m)} \right)$$

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

15. (c) At each stage, displayed entry can be through of as a pair of x. Each reciprocation reverses sign of exponent of x. Each squaring doubles the exponent.

Thus each pair of squaring : reciprocal multiples the exp. by -2 .

$$\therefore \text{ Final exponent} = (-2)^n \Rightarrow y = x^{(-2)^n}$$

16. (a) Let the power of the terms be x and y.

$$6^x - 11^y = 95$$

Put $x = 3$, $y = 2$ (By trial and error)

$$6^3 - 11^2 = 95$$

Hence satisfied.

$$\text{Score of team A} = 63 = 216$$

