TYPE–V

1. The simplified value of

$$\frac{(0.0539 - 0.002) \times 0.4 + 0.56 \times 0.07}{0.04 \times 0.25} = ?$$

(1) 59.96 (2) 0.5996
(3) 5.996 (4) 599.6

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 (Ist Sitting) TF No. 8037731)

SHORT ANSWERS

TYPE-I

1. (1)	**2.** (1)	**3.** (4)	**4.** (3)
5. (1)	**6.** (3)	**7.** (2)	**8.** (4)
9. (2)	**10.** (3)	**11.** (1)	**12.** (4)
13. (4)	**14.** (4)	**15.** (3)	**16.** (1)
17. (2)	**18.** (1)	**19.** (3)	**20.** (3)
21. (1)	**22.** (3)	**23.** (4)	**24.** (3)
25. (*)	**26.** (1)		

TYPE-II

1. (3)	**2.** (1)	**3.** (3)	**4.** (3)
5. (1)	**6.** (2)	**7.** (1)	**8.** (1)
9. (2)	**10.** (4)	**11.** (2)	**12.** (1)
13. (1)	**14.** (3)	**15.** (4)	**16.** (1)
17. (1)	**18.** (1)	**19.** (4)	**20.** (3)
21. (3)	**22.** (3)	**23.** (2)	**24.** (2)
25. (4)	**26.** (2)	**27.** (2)	**28.** (1)
29. (4)	**30.** (4)	**31.** (1)	**32.** (2)
33. (3)	**34.** (3)	**35.** (2)	**36.** (2)
37. (1)	**38.** (3)	**39.** (1)	**40.** (3)
41. (2)	**42.** (4)	**43.** (2)	**44.** (2)
45. (4)	**46.** (2)	**47.** (4)	**48.** (2)
49. (1)	**50.** (3)	**51.** (4)	**52.** (3)
53. (2)	**54.** (1)	**55.** (1)	**56.** (4)
57. (3)	**58.** (4)	**59.** (4)	**60.** (2)
61. (1)	**62.** (2)	**63.** (1)	**64.** (4)
65. (4)	**66.** (4)	**67.** (1)	**68.** (4)
69. (3)	**70.** (1)	**71.** (4)	**72.** (4)
73. (1)	**74.** (2)	**75.** (3)	**76.** (2)
77. (4)	**78.** (3)	**79.** (1)	**80.** (2)
81. (2)	**82.** (1)	**83.** (2)	**84.** (*)
85. (4)	**86.** (1)	**87.** (4)	**88.** (4)

TYPE-III

1. (3)	**2.** (3)	**3.** (1)	**4.** (4)
5. (4)	**6.** (3)	**7.** (2)	**8.** (2)
9. (2)	**10.** (3)	**11.** (4)	**12.** (2)
13. (1)	**14.** (4)	**15.** (4)	**16.** (4)
17. (4)	**18.** (2)	**19.** (2)	**20.** (2)
21. (1)	**22.** (4)	**23.** (2)	**24.** (4)
25. (1)	**26.** (3)	**27.** (3)	**28.** (3)
29. (2)	**30.** (3)	**31.** (1)	**32.** (3)
33. (2)	**34.** (4)	**35.** (2)	**36.** (1)
37. (2)	**38.** (2)	**39.** (2)	**40.** (2)
41. (2)	**42.** (4)	**43.** (3)	**44.** (4)
45. (2)	**46.** (3)	**47.** (3)	**48.** (4)
49. (3)	**50.** (3)	**51.** (3)	**52.** (2)
53. (3)	**54.** (2)	**55.** (1)	**56.** (4)
57. (1)	**58.** (3)	**59.** (3)	**60.** (2)
61. (3)	**62.** (3)	**63.** (2)	**64.** (2)
65. (2)	**66.** (2)	**67.** (1)	**68.** (3)
69. (2)	**70.** (3)	**71.** (4)	**72.** (2)
73. (1)	**74.** (4)	**75.** (4)	**76.** (3)
77. (4)	**78.** (2)	**79.** (1)	**80.** (3)
81. (1)	**82.** (4)	**83.** (3)	**84.** (4)
85. (2)	**86.** (3)	**87.** (3)	**88.** (3)
89. (3)	**90.** (3)	**91.** (1)	**92.** (3)
93. (3)	**94.** (1)	**95.** (4)	**96.** (3)
97. (1)	**98.** (3)	**99.** (2)	**100.** (1)
101. (4)	**102.** (3)	**103.** (3)	**104.** (4)
105. (3)	**106.** (2)	**107.** (4)	**108.** (3)
109. (3)	**110.** (3)	**111.** (4)	**112.** (4)
113. (1)	**114.** (2)	**115.** (4)	**116.** (4)
117. (1)	**118.** (1)	**119.** (3)	**120.** (2)
121. (2)	**122.** (4)	**123.** (2)	**124.** (2)
125. (1)	**126.** (1)	**127.** (4)	**128.** (4)
129. (3)	**130.** (1)	**131.** (3)	**132.** (3)
133. (4)	**134.** (2)	**135.** (4)	**136.** (1)
137. (2)	**138.** (1)	**139.** (2)	**140.** (2)
141. (3)	**142.** (2)	**143.** (3)	**144.** (3)
145. (3)	**146.** (1)	**147.** (4)	**148.** (4)
149. (1)	**150.** (2)	**151.** (4)	**152.** (1)
153. (2)	**154.** (1)	**155.** (3)	**156.** (3)

TYPE-IV

1. (1)	**2.** (2)	**3.** (2)	**4.** (4)
5. (4)	**6.** (2)	**7.** (3)	**8.** (3)
9. (4)	**10.** (2)	**11.** (3)	**12.** (3)
13. (1)	**14.** (2)	**15.** (1)	**16.** (2)
17. (1)	**18.** (2)	**19.** (4)	**20.** (2)
21. (3)	**22.** (2)	**23.** (2)	**24.** (1)
25. (2)	**26.** (2)	**27.** (2)	**28.** (2)
29. (4)	**30.** (4)	**31.** (2)	**32.** (1)
33. (3)	**34.** (1)	**35.** (2)	**36.** (3)
37. (3)	**38.** (4)	**39.** (4)	**40.** (4)
41. (1)	**42.** (2	**43.** (1)	**44.** (2)

TYPE-V

1. (3)			

EXPLANATIONS

TYPE-I

1. (1)

$$? = 1 + \cfrac{1}{1 + \cfrac{2}{2 + \cfrac{3}{1 + \cfrac{4}{5}}}}$$

$$= 1 + \cfrac{1}{1 + \cfrac{2}{2 + \cfrac{3 \times 5}{5 + 4}}} \quad = 1 + \cfrac{1}{1 + \cfrac{2}{2 + \cfrac{5}{3}}}$$

$$= 1 + \cfrac{1}{1 + \cfrac{2 \times 3}{6 + 5}} \quad = 1 + \frac{1 \times 11}{11 + 6}$$

$$= 1 + \frac{11}{17} \quad = 1\frac{11}{17}$$

2. (1) $? = 1 + \cfrac{2}{1 + \cfrac{3 \times 5}{9}} = 1 + \cfrac{2}{1 + \cfrac{5}{3}}$

$$= 1 + \frac{2 \times 3}{8} = \frac{7}{4}$$

3. (4) $\cfrac{1}{3 + \cfrac{1}{2 - \cfrac{1}{\cfrac{7}{9}}}} + \frac{17}{22}$

$$= \frac{1}{3+\frac{1}{2-\frac{9}{7}}} + \frac{17}{22}$$

$$= \frac{1}{3+\frac{1}{\frac{14-9}{7}}} + \frac{17}{22}$$

$$= \frac{1}{3+\frac{1}{\frac{5}{7}}} + \frac{17}{22} = \frac{1}{3+\frac{7}{5}} + \frac{17}{22}$$

$$= \frac{1}{\frac{15+7}{5}} + \frac{17}{22}$$

$$= \frac{5}{22} + \frac{17}{2} = \frac{22}{22} = 1$$

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

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

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

$$= 1 + \frac{1}{\frac{8}{5}} = 1 + \frac{5}{8} = \frac{13}{8}$$

$$\therefore 2x + \frac{7}{4} = 2 \times \frac{13}{8} + \frac{7}{4}$$

$$= \frac{13+7}{4} = \frac{20}{4} = 5$$

5. (1) $\cfrac{19}{43} \div \cfrac{1}{2+\cfrac{1}{3+\cfrac{1}{1+\frac{1}{4}}}}$

$$= \frac{19}{43} \div \frac{1}{2+\frac{1}{3+\frac{4}{5}}}$$

$$= \frac{19}{43} \div \frac{1}{2+\frac{5}{19}} = \frac{19}{43} \div \frac{19}{43}$$

$$= \frac{19}{43} \times \frac{43}{19} = 1$$

6. (3) $\cfrac{5}{3+\cfrac{3}{\frac{3-2}{3}}} = \cfrac{5}{3+\cfrac{3}{\frac{1}{3}}}$

$$\frac{5}{3+3\times 3} = \frac{5}{3+9} = \frac{5}{12}$$

7. (2) $\quad 2 = x + \cfrac{1}{1+\cfrac{1}{3+\frac{1}{4}}}$

$$\Rightarrow 2 = x + \frac{1}{1+\frac{1}{\frac{12+1}{4}}}$$

$$\Rightarrow 2 = x + \frac{1}{1+\frac{4}{13}}$$

$$\Rightarrow 2 = x + \frac{1}{\frac{13+4}{13}}$$

$$\Rightarrow 2 = x + \frac{1}{\frac{17}{13}}$$

$$\Rightarrow 2 = x + \frac{13}{17} \Rightarrow x = 2 - \frac{13}{17}$$

$$= \frac{34-13}{17} = \frac{21}{17}$$

8. (4) $\cfrac{2}{1+\cfrac{1}{\frac{1}{2}}} \times \cfrac{3}{\left(\frac{5}{6}\times\frac{3}{2}\right) \div \frac{5}{4}}$

$$= \frac{2}{1+2} \times \frac{3}{\frac{5}{4} \div \frac{5}{4}}$$

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

9. (2) $1 + \cfrac{4}{2+\cfrac{3}{\frac{10-1}{2}}} - \frac{1}{2} \times 5$

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

$$= 1 + \frac{4}{\frac{8}{3}} - \frac{5}{2} = 1 + \frac{4\times 3}{8} - \frac{5}{2}$$

$$= 1 + \frac{3}{2} - \frac{5}{2} = \frac{2+3-5}{2} = 0$$

10. (3) Suppose that

$$1 + \frac{1}{10+\frac{1}{10}} = \frac{111}{101} = a$$

and, $1 - \cfrac{1}{10+\cfrac{1}{10}} = \frac{91}{101} = b.$

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

= (a – b)

$$= \frac{111}{101} - \frac{91}{101} = \frac{20}{101}$$

11. (1) $\cfrac{\frac{79}{14}}{5+\cfrac{3}{3+\frac{5}{3}}}$

$$= \frac{\frac{79}{14}}{5+\frac{3}{\frac{9+5}{3}}}$$

$$= \frac{\frac{79}{14}}{5+\frac{9}{14}} = \frac{\frac{79}{14}}{\frac{70+9}{14}}$$

$$= \frac{79}{14} \times \frac{14}{79} = 1$$

12. (4) $\cfrac{2}{2+\cfrac{2}{3+\cfrac{2}{\frac{11}{3}}} \times 0.39}$

$$= \frac{2}{2+\frac{2}{3+\frac{6}{11}} \times 0.39}$$

$$= \frac{2}{2+\frac{2}{\frac{33+6}{11}\times 0.39}}$$

$$= \frac{2}{2+\frac{11\times 2}{39}\times 0.39}$$

$$= \frac{2}{2+\frac{11\times 2}{39}\times\frac{39}{100}}$$

$$= \frac{2}{2+\frac{11}{50}} = \frac{2}{\frac{100+11}{50}}$$

$$= \frac{100}{111}$$

13. (4) Expression $= 1 + \frac{1}{1+\frac{1}{2}}$

$$= 1+\frac{1}{\frac{2+1}{2}} = 1+\frac{2}{3} = \frac{3+2}{3} = \frac{5}{3}$$

14. (4) Check through options

$$\frac{1}{3+\frac{1}{1+\frac{1}{2+\frac{1}{4}}}}$$

$$= \frac{1}{3+\frac{1}{1+\frac{1}{\frac{8+1}{4}}}} = \frac{1}{3+\frac{1}{1+\frac{4}{9}}}$$

$$= \frac{1}{3+\frac{1}{\frac{9+4}{9}}} = \frac{1}{3+\frac{9}{13}} = \frac{1}{\frac{39+9}{13}} = \frac{13}{48}$$

15. (3) Expression

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

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

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

$$= 1+\frac{1}{1+\frac{1}{1+\frac{5}{8}}}$$

$$= 1+\frac{1}{1+\frac{1}{\frac{8+5}{8}}}$$

$$= 1+\frac{1}{1+\frac{8}{13}} = 1+\frac{1}{\frac{13+8}{13}}$$

$$= 1+\frac{13}{21} = \frac{21+13}{21} = \frac{34}{21}$$

16. (1) Expression

$$= \frac{\frac{7}{3}-\frac{13}{11}}{3+\frac{1}{3+\frac{1}{\frac{9+1}{3}}}} = \frac{\frac{77-39}{33}}{3+\frac{1}{3+\frac{3}{10}}}$$

$$= \frac{\frac{38}{33}}{3+\frac{1}{\frac{30+3}{10}}} = \frac{\frac{38}{33}}{3+\frac{10}{33}}$$

$$= \frac{\frac{38}{33}}{\frac{99+10}{33}} = \frac{38}{33}\times\frac{33}{109} = \frac{38}{109}$$

17. (2) Expression $= 3+\frac{3}{3+\frac{1}{\frac{9+1}{3}}}$

$$= 3+\frac{3}{3+\frac{3}{10}} = 3+\frac{3}{\frac{30+3}{10}}$$

$$= 3+\frac{30}{33} = 3+\frac{10}{11} = \frac{33+10}{11} = \frac{43}{11}$$

18. (1) Expression $= 1+\frac{1}{1+\frac{1}{5}}$

$$= 1+\frac{1}{\frac{5+1}{5}} = 1+\frac{5}{6} = \frac{6+5}{6} = \frac{11}{6}$$

19. (3) First part $= \frac{\frac{30}{7}-\frac{1}{2}}{\frac{7}{2}+\frac{8}{7}}$

$$= \frac{\frac{60-7}{14}}{\frac{49+16}{14}} = \frac{53}{14}\times\frac{14}{65} = \frac{53}{65}$$

Second part $= \frac{1}{2+\frac{1}{2+\frac{1}{\frac{25-1}{5}}}}$

$$= \frac{1}{2+\frac{1}{2+\frac{5}{24}}} = \frac{1}{2+\frac{1}{\frac{48+5}{24}}}$$

$$= \frac{1}{2+\frac{24}{53}} = \frac{1}{\frac{106+24}{53}}$$

$$= \frac{53}{130}$$

$\therefore$ Expression

$$= \frac{53}{65}\div\frac{53}{130} = \frac{53}{65}\times\frac{130}{53} = 2$$

20. (3)

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

$$= 4-\frac{5}{1+\frac{1}{\frac{27+4}{9}}} = 4-\frac{5}{1+\frac{9}{31}}$$

$$= 4-\frac{5}{\frac{40}{31}} = 4-\frac{5\times 31}{40}$$

$$= 4-\frac{31}{8} = \frac{32-31}{8} = \frac{1}{8}$$

$\because$ Time taken in completing $\frac{1}{8}$ part = 10 minutes

$\therefore$ Time taken in completing $\frac{3}{5}$ part

$= 10 \times 8 \times \frac{3}{5}$

$= 48$ minutes

21. (1) $\dfrac{4\frac{1}{7}-2\frac{1}{4}}{3\frac{1}{2}+1\frac{1}{7}} = \dfrac{\frac{29}{7}-\frac{9}{4}}{\frac{7}{2}+\frac{8}{7}}$

$= \dfrac{\frac{116-63}{28}}{\frac{49+16}{14}} = \dfrac{53}{28} \times \dfrac{14}{65} = \dfrac{53}{130}$

Again,

$\dfrac{1}{2+\frac{1}{2+\frac{1}{\frac{25-1}{5}}}} = \dfrac{1}{2+\frac{1}{2+\frac{5}{24}}}$

$= \dfrac{1}{2+\frac{1}{\frac{48+5}{24}}} = \dfrac{1}{2+\frac{24}{53}}$

$= \dfrac{1}{\frac{106+24}{53}} = \dfrac{53}{130}$

$\therefore$ Expression $= \sqrt{\dfrac{53}{130} \div \dfrac{53}{130}} = 1$

22. (3) $1+\dfrac{1}{1+\frac{2}{\frac{15+4}{5}}}$

$= 1+\dfrac{1}{1+\frac{2\times 5}{19}} = 1+\dfrac{1}{\frac{19+10}{19}}$

$= 1+\dfrac{19}{29} = \dfrac{29+19}{29} = \dfrac{48}{29}$

23. (4) Expression $= 1-\dfrac{a}{1-\frac{1}{1+\frac{a}{1-a}}}$

$= 1-\dfrac{a}{1-\frac{1}{\frac{1-a+a}{1-a}}}$

$= 1-\dfrac{a}{1-\frac{1}{\frac{1}{1-a}}}$

$= 1-\dfrac{a}{1-(1-a)} = 1-\dfrac{a}{1-1+a}$

$= 1 - 1 = 0$

24. (3) First part $= \dfrac{4\frac{1}{7}-2\frac{1}{7}}{3\frac{1}{2}+1\frac{1}{7}}$

$= \dfrac{\frac{29}{7}-\frac{15}{7}}{\frac{7}{2}+\frac{8}{7}} = \dfrac{\frac{14}{7}}{\frac{49+16}{14}}$

$= \dfrac{2}{\frac{65}{14}} = \dfrac{2\times 14}{65} = \dfrac{28}{65}$

Second part $= \dfrac{1}{2+\frac{1}{2+\frac{1}{\frac{25-1}{5}}}}$

$= \dfrac{1}{2+\frac{1}{2+\frac{5}{24}}} = \dfrac{1}{2+\frac{1}{\frac{48+5}{24}}}$

$= \dfrac{1}{2+\frac{24}{53}} = \dfrac{1}{\frac{106+24}{53}} = \dfrac{53}{130}$

$\therefore$ Expression $= \dfrac{28}{65} \div \dfrac{53}{130}$

$= \dfrac{28}{65} \times \dfrac{130}{53} = \dfrac{56}{53}$

25. (*) Let, $a = 1 + \dfrac{1}{10+\frac{1}{10}}$

$= 1 + \dfrac{1}{\frac{100+1}{10}} = 1+\dfrac{10}{101}$

$= \dfrac{101+10}{101} = \dfrac{111}{101}$

Again,

$b = 1-\dfrac{1}{10+\frac{1}{10}} = 1-\dfrac{1}{\frac{100+1}{10}}$

$= 1-\dfrac{10}{101}$

$= \dfrac{101-10}{101} = \dfrac{91}{101}$

$\therefore$ Expression

$= \left(a^2-b^2\right) \div ab$

$= \{(a+b)\ (a-b)\} \div ab$

$= \left(\dfrac{111}{101}+\dfrac{91}{101}\right)\left(\dfrac{111}{101}-\dfrac{91}{101}\right) \div \left(\dfrac{111}{101}\times\dfrac{91}{101}\right)$

$= \dfrac{202}{101} \times \dfrac{20}{101} \times \dfrac{101\times 101}{111\times 91}$

$= \dfrac{4040}{10101}$

26. (1) Expression

$= 4-\dfrac{5}{1+\frac{1}{3+\frac{1}{\frac{8+1}{4}}}}$

$= 4-\dfrac{5}{1+\frac{1}{3+\frac{4}{9}}} = 4-\dfrac{5}{1+\frac{1}{\frac{27+4}{9}}}$

$= 4-\dfrac{5}{1+\frac{9}{31}} = 4-\dfrac{5}{\frac{31+9}{31}}$

$= 4-\dfrac{5\times 31}{40} = \dfrac{160-155}{40}$

$= \dfrac{5}{40} = \dfrac{1}{8}$

TYPE-II

1. (3) $? = \dfrac{9|3-5|-5|4|\div 10}{-3(5)-2\times 4\div 2}$

$= \dfrac{9\times 2-5\times 4\div 10}{-15-8\div 2}$

$= \dfrac{18-2}{-19} = -\dfrac{16}{19}$

2. (1) Using Rule 1,

$? = 5 - [4 - \{3 - (3 - 3 - 6)\}]$

$= 5 - [4 - \{3 - (-6)\}]$

$= 5 - [4 - \{3 + 6\}]$

$= 5 - [4 - 9]$

$= 5 + 5 = 10$

3. (3) $? = \frac{-(-2)^2 + 6 + 6}{18 - 15}$

$= \frac{-4 + 12}{3} = \frac{8}{3}$

4. (3) Using Rule 1,

$$\frac{\frac{5}{3} \times \frac{7}{51} \text{ of } \frac{17}{5} - \frac{1}{3}}{\frac{2}{9} \times \frac{5}{7} \text{ of } \frac{28}{5} - \frac{2}{3}}$$

$$= \frac{\frac{5}{3} \times \frac{7}{15} - \frac{1}{3}}{\frac{2}{9} \times 4 - \frac{2}{3}}$$

$$= \frac{\frac{7}{9} - \frac{1}{3}}{\frac{8}{9} - \frac{2}{3}} = \frac{4}{9} \times \frac{9}{2} = 2$$

5. (1) Using Rule 1,
$? = 1 - [5 - \{2 + (-1)2\}]$
$= 1 - [5 - \{2 - 2\}]$
$= 1 - [5 - 0]$
$= 1 - 5 = -4$

6. (2) Using Rule 1,
$3034 - (1002 \div 20.04)$

$= 3034 - \frac{1002}{20.04}$

$= 3034 - \frac{1002}{2004} \times 100$

$= 3034 - 50 = 2984$

7. (1) Using Rule 1,

$$(100)^{\frac{1}{2}} \times (0.001)^{\frac{1}{3}} - (0.0016)^{\frac{1}{4}} \times 3^0 + \left(\frac{5}{4}\right)^{-1}$$

$= 10 \times 0.1 - 0.2 \times 1 + \frac{4}{5}$

$= 1 - 0.2 + 0.8 = 1.6$

8. (1) Using Rule 1,

$$? = \left(\frac{1}{2} - \frac{1}{4} + \frac{1}{5} - \frac{1}{6}\right) \div \left(\frac{2}{5} - \frac{5}{9} + \frac{3}{5} - \frac{7}{18}\right)$$

$$= \left(\frac{30 - 15 + 12 - 10}{60}\right) \div \left(\frac{36 - 50 + 54 - 35}{90}\right)$$

$$= \left(\frac{17}{60}\right) \div \left(\frac{5}{90}\right) = \frac{17}{60} \times 18$$

$$= \frac{51}{10} = 5\frac{1}{10}$$

9. (2) Using Rule 1,

$$8\frac{1}{2} - \left[3\frac{1}{4} \div \left\{1\frac{1}{4} - \frac{1}{2}\left(1\frac{1}{2} - \frac{1}{3} - \frac{1}{6}\right)\right\}\right]$$

$$= \frac{17}{2} - \left[\frac{13}{4} \div \left\{\frac{5}{4} - \frac{1}{2}\left(\frac{3}{2} - \frac{1}{3} - \frac{1}{6}\right)\right\}\right]$$

$$= \frac{17}{2} - \left[\frac{13}{4} \div \left\{\frac{5}{4} - \frac{1}{2}\left(\frac{9 - 2 - 1}{6}\right)\right\}\right]$$

$$= \frac{17}{2} - \left[\frac{13}{4} \div \left\{\frac{5}{4} - \frac{1}{2} \times \frac{6}{6}\right\}\right]$$

$$= \frac{17}{2} - \left[\frac{13}{4} \div \left\{\frac{5}{4} - \frac{1}{2}\right\}\right]$$

$$= \frac{17}{2} - \left[\frac{13}{4} \div \left\{\frac{5 - 2}{4}\right\}\right]$$

$$= \frac{17}{2} - \left[\frac{13}{4} \div \frac{3}{4}\right]$$

$$= \frac{17}{2} - \left[\frac{13}{4} \times \frac{4}{3}\right] = \frac{17}{2} - \frac{13}{3}$$

$$= \frac{51 - 26}{6} = \frac{25}{6} = 4\frac{1}{6}$$

10. (4) Let the value of * be x.

$$\therefore \frac{50}{x} = \frac{x}{12\frac{1}{2}}$$

$$\Rightarrow \frac{50}{x} = \frac{2x}{25}$$

$\Rightarrow 2x^2 = 50 \times 25$
$\Rightarrow x^2 = 25 \times 25$
$\therefore x = 25$

11. (2) Using Rule 1,
$0.008 \times 0.01 \times 0.072 \div (0.12 \times 0.0004)$
$= 0.008 \times 0.01 \times 0.072 \div (0.000048)$

$$= 0.008 \times 0.01 \times \frac{0.072}{0.000048}$$

$$= \frac{0.00000576}{0.000048} = 0.12$$

12. (1) Using Rule 1,

$$\frac{2}{3} \times \frac{3}{\frac{5}{6} \div \frac{2}{3} \text{ of } 1\frac{1}{4}}$$

$$= \frac{2}{3} \times \frac{3}{\frac{5}{6} \div \frac{2}{3} \text{ of } \frac{5}{4}}$$

$$= \frac{2}{3} \times \frac{3}{\frac{5}{6} \div \frac{10}{12}}$$

$$= \frac{2}{3} \times \frac{3}{\frac{5}{6} \times \frac{12}{10}} = \frac{2}{3} \times \frac{3}{1} = 2$$

13. (1)

$$\frac{1}{9} + \frac{1}{6} + \frac{1}{12} + \frac{1}{20} + \frac{1}{30} + \frac{1}{42} + \frac{1}{56} + \frac{1}{72}$$

$$= \frac{1}{9} + \frac{1}{2 \times 3} + \frac{1}{3 \times 4} + \frac{1}{4 \times 5} + \frac{1}{5 \times 6} + \ldots \frac{1}{8 \times 9}$$

$$= \frac{1}{9} + \frac{1}{2} - \frac{1}{3} + \frac{1}{3} - \frac{1}{4} + \ldots + \frac{1}{8} - \frac{1}{9} = \frac{1}{2}$$

Aliter :
Using Rule 2,

$$\frac{1}{9} + \frac{1}{6} + \frac{1}{12} + \frac{1}{20} + \frac{1}{30} + \frac{1}{42} + \frac{1}{56} + \frac{1}{72}$$

$$= \frac{1}{9} + \frac{1}{2 \times 3} + \frac{1}{3 \times 4} + \frac{1}{4 \times 5} + \frac{1}{5 \times 6} + \frac{1}{6 \times 7} + \frac{1}{7 \times 8} + \frac{1}{8 \times 9}$$

$$= \frac{1}{9} + \left[\frac{1}{2} - \frac{1}{(2 + 7)}\right]$$

$\because$ n = 2 and r = 7

$$= \frac{1}{9} + \frac{1}{2} - \frac{1}{9} = \frac{1}{2}$$

14. (3) Using Rule 1,
Expression
$= 25 - 5 [2 + 3 \{2 - 2(5 - 3) + 5\} - 10] \div 4$
$= 25 - 5 [2 + 3 \{2 - 2 \times 2 + 5\} - 10] \div 4$
$= 25 - 5 [2 + 9 - 10] \div 4$

$$= 25 - 5 \div 4 = 25 - \frac{5}{4}$$

$$= \frac{100 - 5}{4} = \frac{95}{4} = 23.75$$

15. (4) Using Rule 1,
We have

$$\frac{5}{3}\div\frac{2}{7}\times\frac{*}{7}=\frac{5}{4}\times\frac{2}{3}\times 6$$

$$\Rightarrow \frac{5}{3}\times\frac{7}{2}\times\frac{*}{7}=\frac{5\times 2\times 6}{4\times 3}$$

$$\therefore * = \frac{5\times 2\times 6\times 3\times 2\times 7}{5\times 7\times 4\times 3}=6$$

16. (1) Using Rule 1,
Expression

$$= 9-\frac{11}{9}\text{ of }\frac{36}{11}\div\frac{36}{7}\text{of }\frac{7}{9}$$

$$= 9-\frac{11}{9}\times\frac{36}{11}\div\frac{36}{7}\times\frac{7}{9}$$

$$= 9 - 4 \div 4$$

$$= 9-4\times\frac{1}{4}=9-1=8$$

17. (1) Using Rule 1,

$$\frac{5}{\frac{15}{8}\times\frac{4}{3}}\times\frac{\frac{21}{10}}{\frac{7}{2}}of\frac{5}{4}$$

$$=5\times\frac{2}{5}\times\frac{21}{10}\times\frac{2}{7}\times\frac{5}{4}$$

$$=\frac{3}{2}=1\frac{1}{2}$$

18. (1) Using Rule 1,

$$\frac{9}{20}-\left[\frac{1}{5}+\left\{\frac{1}{4}+\left(\frac{5}{6}-\overline{\frac{1}{3}+\frac{1}{2}}\right)\right\}\right]$$

$$=\frac{9}{20}-\left[\frac{1}{5}+\left\{\frac{1}{4}+\left(\frac{5}{6}-\frac{5}{6}\right)\right\}\right]$$

$$=\frac{9}{20}-\left[\frac{1}{5}+\frac{1}{4}\right]=\frac{9}{20}-\frac{9}{20}=0$$

19. (4) $\dfrac{0.8\overline{3}\div 7.5}{2.3\overline{21}-0.0\overline{98}}=\dfrac{\frac{83-8}{90}\div 7.5}{2\frac{321-3}{990}-\frac{98}{990}}$

$$=\frac{\frac{75}{90}\div 7.5}{2\frac{318}{990}-\frac{98}{990}}=\frac{\frac{75}{90}\div 7.5}{2\frac{220}{990}}$$

$$=\frac{7.5}{90\times 7.5}\times\frac{990}{2200}=\frac{1}{20}=0.05$$

20. (3) Let '*' be H

$$\left[\frac{(H)}{21}\times\frac{(H)}{189}\right]=1$$

$$\Rightarrow (H)^2 = 21\times 189$$

$$\Rightarrow H=\sqrt{21\times 189}=63$$

21. (3) $80\times\sqrt{P}=1120$

$$\Rightarrow\sqrt{P}=\frac{1120}{80}=14$$

$$\Rightarrow P=(14)^2=196$$

22. (3) Using Rule 1,

$$\frac{\frac{13}{4}-\frac{5}{6}\times\frac{4}{5}}{\frac{13}{3}\div\frac{1}{5}-\left(\frac{3}{10}+\frac{106}{5}\right)}-\left(\frac{3}{2}\times\frac{5}{3}\right)$$

$$=\frac{\frac{13}{4}-\frac{2}{3}}{\frac{13\times 5}{3}-\left(\frac{3+212}{10}\right)}-\frac{5}{2}$$

$$=\frac{\frac{39-8}{12}}{\frac{65}{3}-\frac{215}{10}}-\frac{5}{2}=\frac{\frac{31}{12}}{\frac{650-645}{30}}-\frac{5}{2}$$

$$=\frac{31}{12}\times\frac{30}{5}-\frac{5}{2}$$

$$=\frac{31}{2}-\frac{5}{2}=\frac{31-5}{2}=\frac{26}{2}=13$$

23. (2) Using Rule 1,

$$\left[\frac{13}{4}\div\left\{\frac{5}{4}-\frac{1}{2}\left(\frac{5}{2}-\frac{3-2}{12}\right)\right\}\right]\div\frac{13}{6}$$

$$=\left[\frac{13}{4}\div\left\{\frac{5}{4}-\frac{1}{2}\left(\frac{5}{2}-\frac{1}{12}\right)\right\}\right]\div\frac{13}{6}$$

$$=\left[\frac{13}{4}\div\left\{\frac{5}{4}-\frac{1}{2}\left(\frac{30-1}{12}\right)\right\}\right]\div\frac{13}{6}$$

$$=\left[\frac{13}{4}\div\left\{\frac{5}{4}-\frac{1}{2}\times\frac{29}{12}\right\}\right]\div\frac{13}{6}$$

$$=\left[\frac{13}{4}\div\left\{\frac{30-29}{24}\right\}\right]\div\frac{13}{6}$$

$$=\left[\frac{13}{4}\div\frac{1}{24}\right]\div\frac{13}{6}$$

$$=\left[\frac{13}{4}\times 24\right]\div\frac{13}{6}$$

$$=13\times 6\times\frac{6}{13}=36$$

24. (2) Using (x) of Basic Formulae
Let 0.1 = a, 0.2 = b and 0.3 = c
Then, we have,

$$\frac{a\times a\times a+b\times b\times b+c\times c\times c-3abc}{a\times a+b\times b+c\times c-ab-bc-ac}$$

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

$$= a + b + c$$

$$= 0.1 + 0.2 + 0.3 = 0.6$$

25. (4) Using Rule 2,

$$\frac{1}{5\times 6}+\frac{1}{6\times 7}+\frac{1}{7\times 8}+\frac{1}{8\times 9}+\frac{1}{9\times 10}+\frac{1}{10\times 11}$$

$$=\frac{1}{5}-\frac{1}{6}+\frac{1}{6}-\frac{1}{7}+\frac{1}{7}-\frac{1}{8}+\frac{1}{8}-\frac{1}{9}+\frac{1}{9}-\frac{1}{10}+\frac{1}{10}-\frac{1}{11}$$

$$=\frac{1}{5}-\frac{1}{11}=\frac{11-5}{55}=\frac{6}{55}$$

26. (2) Using Rule 1,

I. $=\dfrac{3}{4}\times\dfrac{6}{5}=\dfrac{9}{10}$

II. $=3\div\left[\dfrac{4}{5}\times\dfrac{1}{6}\right]=3\div\dfrac{2}{15}=\dfrac{45}{2}$

III. $=\left[3\div\dfrac{4}{5}\right]\div 6=\dfrac{15}{4}\div 6=\dfrac{5}{8}$

IV. $=3\div 4\times\dfrac{5}{6}=3\div\dfrac{10}{3}=\dfrac{9}{10}$

Obviously, (I) and (IV) are equal

27. (2) Using Rule 1,

$$= 1\div\left[1+1\div\left\{1+1\div(1+1\div 2)\right\}\right]$$

$$=1\div\left[1+1\div\left\{1+1\div\left(1+\frac{1}{2}\right)\right\}\right]$$

$$=1\div\left[1+1\div\left\{1+1\div\frac{3}{2}\right\}\right]$$

$$=1\div\left[1+1\div\left\{1+\frac{2}{3}\right\}\right]=1\div\left[1+1\div\frac{5}{3}\right]$$

$$=1\div\left[1+\frac{3}{5}\right]=1\div\frac{8}{5}=\frac{5}{8}$$

28. (1) Using Rule 1,
The given expression

$$=\frac{\frac{1}{3}\times 3\times\frac{1}{3}}{\frac{1}{3}\div\left(\frac{1}{3}\times\frac{1}{3}\right)}-\frac{1}{9}$$

$$=\frac{\frac{1}{3}}{\frac{1}{3}\div\frac{1}{9}}-\frac{1}{9}=\frac{\frac{1}{3}}{\frac{1}{3}\times 9}-\frac{1}{9}$$

$$=\frac{1}{3}-\frac{1}{9}=\frac{1}{9}-\frac{1}{9}=0$$

29. (4) Using Rule 1,
The given expression

$$= \frac{\frac{11}{4}}{\frac{11}{6}} \div \frac{7}{8}\left(\frac{4+3}{12}\right) + \frac{5}{7} \div \frac{3}{4} \text{ of } \frac{3}{7}$$

$$= \left(\frac{11}{4} \times \frac{6}{11}\right) \div \frac{7}{8} \times \frac{7}{12} + \frac{5}{7} \div \left(\frac{3}{4} \times \frac{3}{7}\right)$$

$$= \frac{3}{2} \div \frac{7}{8} \times \frac{7}{12} + \frac{5}{7} \div \frac{9}{28}$$

$$= \frac{3}{2} \times \frac{8}{7} \times \frac{7}{12} + \frac{5}{7} \times \frac{28}{9}$$

$$= 1 + \frac{20}{9} = \frac{9+20}{9} = \frac{29}{9} = 3\frac{2}{9}$$

30. (4) $3.\overline{36} - 2.\overline{05} + 1.\overline{33}$

$$= 3\frac{36}{99} - 2\frac{05}{99} + 1\frac{33}{99}$$

$$= 3 + \frac{36}{99} - 2 - \frac{5}{99} + 1 + \frac{33}{99}$$

$$= (3 - 2 + 1) + \left(\frac{36}{99} - \frac{5}{99} + \frac{33}{99}\right)$$

$$= 2 + \left(\frac{36 - 5 + 33}{99}\right)$$

$$= 2 + \frac{64}{99} = 2\frac{64}{99} = 2.\overline{64}$$

31. (1) Using (x) of Basic Formulae
Let 0.9 = x, 0.2 = y and 0.3 = z
Then, the given expression

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

$$= \frac{x^3 + y^3 + z^3 - 3xyz}{x^2 + y^2 + z^2 - xy - yz - zx}$$

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

$= x + y + z$
$= 0.9 + 0.2 + 0.3 = 1.4$

32. (2) Using Rule 1,

$$\left(\frac{1}{9}\right)^2 \left\{1 - 9\left(\frac{16-1}{90}\right)^2\right\}$$

$$= \frac{1}{81}\left\{1 - \frac{9 \times 15 \times 15}{90 \times 90}\right\}$$

$$= \frac{1}{81} \times \left\{1 - \frac{1}{4}\right\}$$

$$= \frac{1}{81} \times \frac{3}{4} = \frac{1}{108}$$

33. (3) Using Rule 1,

$$\frac{\frac{3}{2}}{\frac{1}{2}} \div \frac{4}{7}\left(\frac{4+3}{10}\right) \text{ of } \frac{\frac{3+2}{6}}{\frac{3-2}{6}}$$

$$= 3 \div \frac{4}{7}\left(\frac{7}{10}\right) \text{ of } \left(\frac{5}{6} \times 6\right)$$

$$= 3 \div \left(\frac{4}{7} \times \frac{7}{10} \times 5\right) = 3 \div 2 = \frac{3}{2}$$

34. (3) Using Rule 1,
$[0.9 - \{2.3 - 3.2 - (7.1 - 8.9)\}]$
$= [0.9 - \{2.3 - 3.2 + 1.8\}]$
$= [0.9 - 0.9] = 0$

35. (2) Using (x) of Basic Formulae
Let, 32 = a
79 = b, –111 = c
When (a + b + c) = 0
then $a^3 + b^3 + c^3 - 3abc = 0$
Here, a+ b+c = 32+79–111 = 0
$\therefore (32)^3 + (79)^3 - (111)^3 + 3 \times 32 \times 79 \times 111 = 0$

36. (2) Using Rule 1,

$$\left(\frac{5}{2} + \frac{3}{2}\right)\left(\frac{25}{4} - \frac{15}{4} + \frac{9}{4}\right)$$

$$= 4 \times \frac{19}{4} = 19$$

37. (1) Expression $= \frac{(0.04 + 0.01)}{(0.01 + 0.02)}$

$$= \frac{0.05}{0.03} = \frac{5}{3}$$

38. (3) Using Rule 1,
Expression

$$= \frac{1}{2} + \left\{\frac{19}{4} - \left(\frac{19}{6} - \frac{7}{3}\right)\right\}$$

$$= \frac{1}{2} + \left\{\frac{19}{4} - \left(\frac{19-14}{6}\right)\right\}$$

$$= \frac{1}{2} + \left\{\frac{19}{4} - \frac{5}{6}\right\}$$

$$= \frac{1}{2} + \frac{19}{4} - \frac{5}{6}$$

$$= \frac{6 + 57 - 10}{12} = \frac{53}{12} = 4\frac{5}{12}$$

39. (1) Expression = 0.125 + 0.015625 + 0.001953125 + 0.00024414 + 0.000030517
$= 0.1428 \approx 0.143$

40. (3) Using Rule 1,
Expression
$= 8.7 - [7.6 - \{6.5 - (5.4 - \overline{4.3 - 2})\}]$
$= 8.7 - [7.6 - \{6.5 - (5.4 - 2.3)\}]$
$= 8.7 - [7.6 - \{6.5 - 3.1\}]$
$= 8.7 - [7.6 - 3.4]$
$= 8.7 - 4.2 = 4.5$

41. (2) Using (x) of Basic Formulae
If $a + b + c = 0$, then
$a^3 + b^3 + c^3 = 3abc$
Here, 0.111 + 0.222 + (–0.333) = 0
$\therefore (0.111)^3 + (0.222)^3 + (-0.333)^3$
$= -3 \times 0.111 \times 0.222 \times 0.333$
$= -(0.333)^2 \times 0.222$
$\therefore$ Expression
$= [-(0.333)^2 \times 0.222 + (0.333)^2 \times 0.222]^3 = 0$

42. (4) Using Rule 1,
Expression

$$= \frac{\frac{5}{4} \div \frac{3}{2}}{\left(\frac{2 + 30 - 27}{30}\right)}$$

$$= \frac{\frac{5}{4} \times \frac{2}{3}}{\frac{5}{30}} = \frac{5}{6} \times \frac{30}{5} = 5$$

43. (2) Using Rule 1,
Expression

$$= \frac{-30 - 40 + 48 - 20 + 12 + 45}{\frac{30 + 40 - 80 + 20 - 12 - 48}{60}}$$

$$= \frac{105 - 90}{90 - 140} = -\frac{15}{50} = -\frac{3}{10}$$

44. (2) Expression

$$= 0.\overline{63} + 0.\overline{37} + 0.\overline{80}$$

$$= \frac{63}{99} + \frac{37}{99} + \frac{80}{99}$$

$$= \frac{63 + 37 + 80}{99} = \frac{180}{99}$$

$$= 1\frac{81}{99} = 1.\overline{81}$$

45. (4) Let (4.53 – 3.07) = a
(3.07 – 2.15) = b and
(2.15 – 4.53) = c $\therefore$ $a + b + c = 0$
$\therefore$ Expression

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

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

[If $a + b + c = 0$, $a^3 + b^3 + c^3 = 3\ abc$]

46. (2) Using Rule 1,
Expression

$= \frac{17}{15} \times \frac{17}{15} + \frac{2}{15} \times \frac{2}{15} - 2 \times \frac{17}{15} \times \frac{2}{15}$

$= \left(\frac{17}{15} - \frac{2}{15}\right)^2$

$= \left(\frac{17-2}{15}\right)^2 = \left(\frac{15}{15}\right)^2 = 1$

47. (4) Using (v) of Basic Formulae

Let $4\frac{11}{15} = a$ and $\frac{15}{71} = b$.

$\therefore$ Expression
$= (a + b)^2 - (a - b)^2$
$= (a^2 + b^2 + 2ab) - (a^2 + b^2 - 2ab) = 4ab$

$= 4 \times 4\frac{11}{15} \times \frac{15}{71} = 4 \times \frac{71}{15} \times \frac{15}{71} = 4$

48. (2) Let $0.1 = a \Rightarrow 0.2 = 2a$
and $0.02 = b \Rightarrow 0.04 = 2b$
$\therefore$ Expression

$= \frac{a^3 + b^3}{8a^3 + 8b^3}$

$= \frac{a^3 + b^3}{8(a^3 + b^3)} = \frac{1}{8} = 0.125$

49. (1) $5\frac{3}{*} \times \frac{7}{2} = 19$

$\Rightarrow 5\frac{3}{*} = \frac{19 \times 2}{7}$

$\Rightarrow 5\frac{3}{*} = \frac{38}{7} = 5\frac{3}{7}$

$\Rightarrow * = 7$

50. (3) Using Rule 7,

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

$= 2 + \frac{1}{2} + 2 \times \sqrt{2} \times \frac{1}{\sqrt{2}} = 4\frac{1}{2}$

51. (4) Expression
$= (0.98)^3 + (0.02)^3 + 3 \times 0.98 \times 0.02 - 1$
$= (0.98)^3 + (0.02)^3 + 3 \times 0.98 \times 0.02\ (0.98+0.02) - 1$
$= (0.98 + 0.02)^3 - 1 = 1 - 1 = 0$

52. (3) Expression
$= 71 \times 29 + 27 \times 15 + 8 \times 4$
$= 2059 + 405 + 32 = 2496$

53. (2) Expression
$= 0.05 \times 5 - 0.005 \times 5$
$= 0.25 - 0.025 = 0.225$

54. (1) Let $0.2 = a$ and $0.04 = b$
$\Rightarrow 0.4 = 2a$ and $0.08 = 2b$
$\therefore$ Expression

$= \sqrt[3]{\frac{a \times a \times a + b \times b \times b}{2a \times 2a \times 2a + 2b \times 2b \times 2b}}$

$= \sqrt[3]{\frac{a^3 + b^3}{8(a^3 + b^3)}} = \sqrt[3]{\frac{1}{8}} = \frac{1}{2} = 0.5$

55. (1) Expression
$= (256)^{0.16} \times (16)^{0.18}$
$= (2^8)^{0.16} \times (2^4)^{0.18}$
$= (2)^{8 \times 0.16} \times (2)^{4 \times 0.18}$
$= (2)^{1.28} \times (2)^{0.72} = (2)^{1.28+0.72}$
$= (2)^2 = 4$

56. (4) Expression

$\left(\frac{1}{3.5} + \frac{1}{5.7} + \frac{1}{7.9} + \frac{1}{9.11} + \frac{1}{11.13} + \frac{1}{13.15}\right)$

$= \frac{1}{2}\left(\frac{2}{3.5} + \frac{2}{5.7} + \frac{2}{7.9} + \frac{2}{9.11} + \frac{2}{11.13} + \frac{2}{13.15}\right)$

$= \frac{1}{2}\left(\frac{1}{3} - \frac{1}{5} + \frac{1}{5} - \frac{1}{7} + \frac{1}{7} - \frac{1}{9} + \frac{1}{9} - \frac{1}{11} + \frac{1}{11} - \frac{1}{13} + \frac{1}{13} - \frac{1}{15}\right)$

$= \frac{1}{2}\left(\frac{1}{3} - \frac{1}{15}\right) = \frac{1}{2}\left(\frac{5-1}{15}\right)$

$= \frac{1}{2} \times \frac{4}{15} = \frac{2}{15}$

Aliter :
Using Rule 3,

$\frac{1}{3.5} + \frac{1}{5.7} + \frac{1}{7.9} + \frac{1}{9.11} + \frac{1}{11.13} + \frac{1}{13.15}$

Here, n = 3 and r = 6

$\Rightarrow \frac{1}{2}\left(\frac{1}{n} - \frac{1}{n + 2r}\right)$

$= \frac{1}{2}\left(\frac{1}{3} - \frac{1}{3 + 2 \times 6}\right)$

$= \frac{1}{2}\left(\frac{1}{3} - \frac{1}{15}\right)$

$= \frac{1}{2}\left(\frac{5-1}{15}\right) = \frac{2}{15}$

57. (3) Expression
$= (53 \times 87 + 159 \times 21 + 106 \times 25)$
$= 53\ (87 + 3 \times 21 + 2 \times 25)$
$= 53\ (87 + 63 + 50)$
$= 53 \times 200 = 10600$

58. (4) Using Rule 4,
Expression

$= \frac{(0.5)^3 + (0.3)^3}{(0.5)^2 - 0.5 \times 0.3 + (0.3)^2}$

Let $0.5 = a$,and $0.3 = b$

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

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

$= a + b = 0.5 + 0.3 = 0.8$

59. (4) Using Rule 4,

Expression $= \frac{8(3.75)^3 + 1}{(7.5)^2 - 6.5}$

$= \frac{(2 \times 3.75)^3 + 1}{(7.5)^2 - 7.5 \times 1 + 1^2}$

$= \frac{(7.5)^3 + 1}{(7.5)^2 - 7.5 \times 1 + 1^2}$

$\left[a^3 + b^3 = (a + b)(a^2 - ab + b^2)\right]$

$= 7.5 + 1 = 8.5$

60. (2) Using Rule 6,
Let $2.697 = a$ and $0.498 = b$
$\therefore$ Expression

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

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

61. (1) Using Rule 1,
Expression

$= \frac{\frac{13}{4} - \frac{4}{5} \times \frac{5}{6}}{\frac{13}{3} \times 5 - \left(\frac{3}{10} + \frac{106}{5}\right)}$

$= \frac{\frac{13}{4} - \frac{2}{3}}{\frac{65}{3} - \frac{3}{10} - \frac{106}{5}}$

$= \frac{\frac{39-8}{12}}{\frac{650-9-636}{30}}$

$= \frac{31}{12} \times \frac{30}{5} = \frac{31}{2} = 15\frac{1}{2}$

$\therefore$ Required answer

$= 15\frac{1}{2} - 15 = \frac{1}{2}$

62. (2) $\sqrt[2]{0.014 \times 0.14x}$

$= 0.014 \times 0.14 \ \sqrt[2]{y}$

On squaring both sides,

$0.014 \times 0.14x$

$= (0.014)^2 \times (0.14)^2 \times y$

$\therefore \ \frac{x}{y} = 0.014 \times 0.14 = 0.00196$

63. (1)

$$\frac{4.41 \times 0.16}{2.1 \times 1.6 \times 0.21} = \frac{441 \times 16}{21 \times 16 \times 21} = 1$$

64. (4) $0.1 \times 0.01 \times 0.001 \times 10^7$

$= 10^{-6} \times 10^7 = 10$

65. (4) Expression

$$= \frac{3.20(3.25 - 3.05)}{0.064}$$

$$= \frac{3.20 \times 0.20}{0.064} = 10$$

66. (4) $\frac{0.01 - 0.0001}{0.0001} + 1 = \frac{0.0099}{0.0001} + 1$

$= 99 + 1 = 100$

67. (1) Expression

$= 0.5 \ (5 + 0.25 + 4 + 0.75)$

$= 0.5 \times 10 = 5$

68. (4) Using Rule 1,

Expression

$$= \frac{20 \div 5}{9 + 3 \div 3} = \frac{4}{10} = \frac{2}{5}$$

69. (3) Expression

$$= \frac{(100-1)(100-2)(100-3)\ldots}{(100-100)\ldots(100-200)}$$

$$= \frac{}{100 \times 99 \times 98 \times \ldots \times 3 \times 2 \times 1}$$

$= 0$ [$\because 100 - 100 = 0$]

70. (1) $(0.9)^3 + (0.1)^3$

$= 0.729 + 0.001 = 0.73$

71. (4) Using Rule 4,

Let $0.0347 = a$

and, $0.9653 = b$

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

$$= \frac{(a+b)\left(a^2 - ab + b^2\right)}{a^2 - ab + b^2} = a + b$$

$= 0.0347 + 0.9653 = 1$

72. (4) Using Rule 5,

Expression

$$= \frac{(3.2)^3 - (0.2)^3}{(3.2)^2 + 3.2 \times 0.2 + (0.2)^2}$$

Let $3.2 = a$ and $0.2 = b$

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

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

$= 3.2 - 0.2 = 3$

73. (1) Using Rule 1,

$$\text{Expression} = \frac{\frac{1}{3} + \frac{1}{4}\left[\frac{4-5}{10}\right]}{\frac{3}{4} \times \frac{5}{3} - \frac{4}{5} \times \frac{3}{4}}$$

$$= \frac{\frac{1}{3} - \frac{1}{4} \times \frac{1}{10}}{\frac{5}{4} - \frac{3}{5}} = \frac{\frac{1}{3} - \frac{1}{40}}{\frac{5}{4} - \frac{3}{5}} -$$

$$= \frac{\frac{40-3}{120}}{\frac{25-12}{20}} = \frac{37}{120} \times \frac{20}{13} = \frac{37}{78}$$

74. (2) Using Rule 1,

Expression

$$= \frac{0.04}{0.03} \times \frac{\left(\frac{10}{3} - \frac{5}{2}\right) \div \frac{5}{4} \times \frac{1}{2}}{\frac{1}{3} + \frac{1}{9} \times \frac{1}{5}}$$

$$= \frac{4}{3} \times \frac{\left(\frac{20-15}{6}\right) \div \frac{5}{8}}{\frac{1}{3} + \frac{1}{45}}$$

$$= \frac{4}{3} \times \frac{\frac{5}{6} \times \frac{8}{5}}{\frac{15+1}{45}} = \frac{4}{3} \times \frac{45}{16} \times \frac{4}{3} = 5$$

75. (3) Expression

$$= \frac{0.3555 \times 0.5555 \times 2.025}{0.225 \times 1.7775 \times 0.2222}$$

$$= \frac{3555 \times 5555 \times 2025}{225 \times 17775 \times 2222} = 4.5$$

76. (2) Using Rule 1,

$100 \times 10 - 100 + 2000 \div 100$

$= 100 \times 10 - 100 + 20$

$= 100 \ (10 - 1) + 20$

$= 100 \times 9 + 20$

$= 900 + 20 = 920$

77. (4) $\frac{547.527}{0.0082} = x$

$\Rightarrow \frac{5475270}{82} = x$

$\Rightarrow \frac{547527}{82} = \frac{x}{10}$

78. (3) $\frac{1}{1 + 2^{a-b}} + \frac{1}{1 + 2^{b-a}}$

$$= \frac{1}{1 + \frac{2^a}{2^b}} + \frac{1}{1 + \frac{2^b}{2^a}}$$

$$= \frac{2^b}{2^b + 2^a} + \frac{2^a}{2^a + 2^b} = \frac{2^b + 2^a}{2^b + 2^a} = 1$$

79. (1) Using Rule 1,

Expression

$$= \frac{7}{2} - \left[\frac{9}{4} \div \left\{\frac{5}{4} - \frac{1}{2}\left(\frac{3}{2} - \frac{1}{3} - \frac{1}{6}\right)\right\}\right]$$

$$= \frac{7}{2} - \left[\frac{9}{4} \div \left\{\frac{5}{4} - \frac{1}{2}\left(\frac{9-2-1}{6}\right)\right\}\right]$$

$$= \frac{7}{2} - \left[\frac{9}{4} \div \left\{\frac{5}{4} - \frac{1}{2}\right\}\right]$$

$$= \frac{7}{2} - \left[\frac{9}{4} \div \left\{\frac{5-2}{4}\right\}\right]$$

$$= \frac{7}{2} - \left[\frac{9}{4} \div \frac{3}{4}\right]$$

$$= \frac{7}{2} - \frac{9}{4} \times \frac{4}{3}$$

$$= \frac{7}{2} - 3 = \frac{7-6}{2} = \frac{1}{2}$$

80. (2) Using Rule 7,

Let $3\frac{3}{5} = a$ and $\frac{2}{5} = b$, then

Expression $= a^2 + 2ab + b^2$

$= (a + b)^2$

$$= \left(3\frac{3}{5} + \frac{2}{5}\right)^2 = (4)^2 = 16$$

81. (2)

$$\left(1 - \frac{1}{n+1}\right) + \left(1 - \frac{2}{n+1}\right) + \left(1 - \frac{3}{n+1}\right) + \ldots\ldots \left(1 - \frac{n}{n+1}\right)$$

$$= n - \left(\frac{1}{n+1} + \frac{2}{n+1} + \frac{3}{n+1} + \ldots + \frac{n}{n+1}\right)$$

$$= n - \frac{1 + 2 + 3 + \ldots\ldots + n}{n+1}$$

$$= n - \frac{n(n+1)}{2(n+1)} = n - \frac{n}{2} = \frac{n}{2} = \frac{1}{2}n$$

82. (1) Using Rule 1,
Expression

$$= \frac{16}{3} \div \frac{11}{9} \times \frac{1}{4}\left(10 + \frac{3}{\frac{5-1}{5}}\right)$$

$$= \frac{16}{3} \times \frac{9}{11} \times \frac{1}{4}\left(10 + \frac{15}{4}\right)$$

$$= \frac{16}{3} \times \frac{9}{11} \times \frac{1}{4}\left(\frac{40+15}{4}\right)$$

$$= \frac{16}{3} \times \frac{9}{11} \times \frac{1}{4} \times \frac{55}{4} = 15$$

83. (2) Using Rule 1,
$x[-2\{-4(-a)\}] + 5[-2\{-2(-a)\}] = 4a$
$\Rightarrow x \times (-8a) + 5 \times (-4a) = 4a$
$\Rightarrow x \times (-2) + 5 \times (-1) = 1$
$\Rightarrow 2x + 5 = -1$
$\Rightarrow 2x = -5 - 1 = -6$

$$\Rightarrow x = \frac{-6}{2} = -3$$

84. (*) Using Rule 1,
Expression

$$= 3 \div \left[(8-5) \div \left\{(4-2) + \left(2 + \frac{8}{13}\right)\right\}\right]$$

$$= 3 \div \left[3 \div \left\{2 + \frac{26+8}{13}\right\}\right]$$

$$= 3 \div \left[3 \div \left\{2 + \frac{34}{13}\right\}\right]$$

$$= 3 \div \left[3 \div \left\{\frac{26+34}{13}\right\}\right]$$

$$= 3 \div \left[3 \div \frac{60}{13}\right]$$

$$= 3 \div \left[\frac{3 \times 13}{60}\right]$$

$$= 3 \div \frac{13}{20} = 3 \times \frac{20}{13} = \frac{60}{13}$$

85. (4) Using Rule 1,
$? = 9 + 3 \div 4 - 8 \times 2$
After respective substitutions,
$? = 9 \div 3 \times 4 + 8 - 2$

$$= \frac{9}{3} \times 4 + 8 - 2$$

$= 20 - 2 = 18$

86. (1) Using Rule 1,
Expression

$$= \frac{4}{15} \text{ of } \frac{5}{8} \times 6 + 15 - 10$$

$= 1 + 15 - 10 = 16 - 10 = 6$

87. (4) Expression

$$= \frac{0.2 \times 0.02 \times 0.002 \times 32}{0.4 \times 0.04 \times 0.004 \times 16}$$

$$= \frac{32}{2 \times 2 \times 2 \times 16} = \frac{1}{4} = 0.25$$

88. (4) $a^2 + b^2 + c^2 - ab - bc - ac$

$$= \frac{1}{2}(2a^2 + 2b^2 + 2c^2 - 2ab - 2bc - 2ac)$$

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

$$= \frac{1}{2}[(113-115)^2 + (115-117)^2 + (117-113)^2]$$

Where, $a = 113$, $b = 115$, $c = 117$.

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

$$= \frac{1}{2}(4 + 4 + 16)$$

$$= \frac{1}{2} \times 24 = 12$$

TYPE-III

1. (3) $\sqrt{1.3} + \sqrt{1300} + \sqrt{0.013}$

$$= \sqrt{\frac{130}{100}} + 10\sqrt{13} + \sqrt{\frac{130}{10000}}$$

$$= \frac{1}{10}\sqrt{130} + 10\sqrt{13} + \frac{1}{100}\sqrt{130}$$

$$= \frac{11.40}{10} + 3.605 \times 10 + \frac{11.40}{100}$$

$= 1.140 + 36.05 + 0.1140$
$= 37.304$

2. (3) $? = \dfrac{(2.644)^2 - (2.356)^2}{0.288}$

$$= \frac{(2.644 - 2.356)(2.644 + 2.356)}{0.288}$$

$$= \frac{0.288 \times 5}{0.288} = 5$$

Aliter :
Using Rule 8,

$$\frac{(2.644)^2 - (2.356)^2}{0.288}$$

$$= \frac{(2.644)^2 - (2.356)^2}{(2.644 - 2.356}$$

$= (2.\ 644 + 2.356) = 5$

3. (1)

$$? = \frac{(3.4567 + 3.4533)(3.4567 - 3.4533)}{0.0034}$$

$$= \frac{6.9100 \times 0.0034}{0.0034} = 6.91$$

Aliter :
Using Rule 8,

$$\frac{(3.4567 + 3.4533)(3.4567 - 3.4533)}{0.0034}$$

$$= \frac{3.4567^2 - 3.4533^2}{(3.4567 - 3.4533)}$$

$= 3.4567 + 3.4533 = 6.91$

4. (4) $\dfrac{(0.03)^2 - (0.01)^2}{0.03 - 0.01}$

[Using $a^2 - b^2 = (a + b)(a - b)$]

$$= \frac{(0.03 + 0.01)(0.03 - 0.01)}{0.03 - 0.01}$$

$= 0.03 + 0.01 = 0.04$

Aliter :
Using Rule 8,

$$\frac{(0.03)^2 - (0.01)^2}{0.03 - 0.01}$$

$= (0.03 + 0.01 = 0.04$

5. (4) $\left(\sqrt{72} - \sqrt{18}\right) \div \sqrt{12}$

$$= \frac{\sqrt{72} - \sqrt{18}}{\sqrt{12}}$$

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

6. (3) $\dfrac{\sqrt{80} - \sqrt{112}}{\sqrt{45} - \sqrt{63}}$

$$= \frac{\sqrt{16 \times 5} - \sqrt{16 \times 7}}{\sqrt{9 \times 5} - \sqrt{9 \times 7}}$$

$$= \frac{4\sqrt{5} - 4\sqrt{7}}{3\sqrt{5} - 3\sqrt{7}} = \frac{4\left(\sqrt{5} - \sqrt{7}\right)}{3\left(\sqrt{5} - \sqrt{7}\right)}$$

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

7. (2)

$$\sqrt{\frac{(0.1)^2+(0.01)^2+(0.009)^2}{(0.01)^2+(0.001)^2+(0.0009)^2}}$$

$$=\sqrt{\frac{0.01+0.0001+0.000081}{0.0001+0.000001+0.00000081}}$$

$$=\sqrt{\frac{0.010181}{0.00010181}}=\sqrt{100}=10$$

8. (2) Let $0.03 = x \Rightarrow 0.003 = \frac{x}{10}$

$0.21 = y \Rightarrow 0.021 = \frac{y}{10}$

and $0.065 = z \Rightarrow 0.0065 = \frac{z}{10}$

$\therefore$ Expression

$$=\sqrt{\frac{x^2+y^2+z^2}{\left(\frac{x}{10}\right)^2+\left(\frac{y}{10}\right)^2+\left(\frac{z}{10}\right)^2}}$$

$$=\sqrt{100\frac{\left(x^2+y^2+z^2\right)}{\left(x^2+y^2+z^2\right)}}$$

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

9. (2)

$\sqrt{0.01}+\sqrt{0.81}+\sqrt{1.21}+\sqrt{0.0009}$

$= 0.1 + 0.9 + 1.1 + 0.03$

$= 2.13$

10. (3) $\sqrt{\frac{(6.1)^2+(61.1)^2+(611.1)^2}{(0.61)^2+(6.11)^2+(61.11)^2}}$

$$=\sqrt{\frac{(10\times0.61)^2+(10\times6.11)^2+(10\times61.11)^2}{(0.61)^2+(6.11)^2+(61.11)^2}}$$

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

11. (4) $\sqrt{\frac{20.2\times4}{0.25\times20.2}}=\sqrt{\frac{4}{0.25}}$

$$=\sqrt{\frac{400}{25}}=\sqrt{16}=4$$

12. (2) Using Rule 4,

Let $0.051 = x$ and $0.041 = y$

$\therefore$ The given expression

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

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

$= x + y = 0.051 + 0.041$

$= 0.092$

13. (1) $\sqrt{5+\sqrt{11+\sqrt{19+\sqrt{29+7}}}}$

$$=\sqrt{5+\sqrt{11+\sqrt{19+6}}}$$

$$=\sqrt{5+\sqrt{11+\sqrt{25}}}$$

$$=\sqrt{5+\sqrt{11+5}}=\sqrt{5+4}$$

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

14. (4) $\frac{(75\cdot8)^2-(55\cdot8)^2}{20}$

$$=\frac{(75\cdot8-55\cdot8)(75\cdot8+55\cdot8)}{20}$$

$$=\frac{20\times131\cdot6}{20}=131\cdot6$$

Aliter :

Using Rule 8,

$$\frac{(75.8)^2-(55.8)^2}{(75.8-55.8)}$$

$= 75.8 + 55.8 = 131.6$

15. (4) Expression

$$=\sqrt{\frac{(0.25\times0.09)}{0.0009\times0.36}}$$

$$=\sqrt{\frac{\frac{25}{100}\times\frac{9}{100}}{\frac{9}{10000}\times\frac{36}{100}}}$$

$$=\sqrt{\frac{25\times9\times1000000}{9\times36\times10000}}$$

$$=\frac{5\times10}{6}=\frac{25}{3}=8\frac{1}{3}$$

16. (4) Using Rule 8,

Let $3.63 = a$ and $2.37 = b$

$\therefore$ Expression $= \frac{a^2-b^2}{a+b}$

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

$= a - b = 3.63 - 2.37 = 1.26$

17. (4) Expression

$$=\sqrt{\frac{0.081\times0.484}{0.0064\times6.25}}$$

$$=\sqrt{\frac{81\times484}{64\times625}}=\frac{9\times22}{8\times25}=0.99$$

18. (2) Expression

$= \sqrt{900}+\sqrt{0.09}-\sqrt{0.000009}$

$= 30 + 0.3 - 0.003$

$= 30.297$

19. (2) Expression

$$=\sqrt{\frac{0.009\times0.036\times0.016\times0.08}{0.002\times0.0008\times0.0002}}$$

$$=\sqrt{\frac{9\times36\times16\times8}{2\times8\times2}}$$

$= 3 \times 2 \times 3 \times 2 = 36$

20. (2) Expression

$$=\sqrt{\frac{5}{4}\times\frac{64}{125}\times1.44}$$

$$=\sqrt{\frac{16}{25}\times\frac{144}{100}}=\frac{4}{5}\times\frac{12}{10}=\frac{24}{25}$$

21. (1) Expression

$$=2\sqrt{54}-6\sqrt{\frac{2}{3}}-\sqrt{96}$$

$$=2\sqrt{9\times6}-\sqrt{\frac{2\times6\times6}{3}}-\sqrt{16\times6}$$

$= 2\times3\sqrt{6}-2\sqrt{6}-4\sqrt{6} = 0$

22. (4) $\frac{\sqrt{24}+\sqrt{216}}{\sqrt{96}}=\frac{2\sqrt{6}+6\sqrt{6}}{4\sqrt{6}}$

$$=\frac{8\sqrt{6}}{4\sqrt{6}}=2$$

23. (2) $\frac{4-\sqrt{0.04}}{4+\sqrt{0.4}}=\frac{4-0.2}{4+\sqrt{0.4}}$

$$=\frac{3.8}{4+0.632}=\frac{3.8}{4.632}=0.8$$

$= (a + b) = 0.08 + 0.02 = 0.1$

24. (4) $\frac{1}{3-\sqrt{8}}=\frac{3+\sqrt{8}}{\left(3-\sqrt{8}\right)\left(3+\sqrt{8}\right)}$

(Rationalising the denominator)

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

$\therefore$ Expression

$= 3+\sqrt{8}+3+\sqrt{8}-6-4\sqrt{2}$

$= 6+2\sqrt{8}-6-4\sqrt{2}=2\sqrt{8}-4\sqrt{2}$

$= 2\times2\sqrt{2}-4\sqrt{2}=0$

25. (1) $\sqrt{0.09} = \sqrt{0.3 \times 0.3} = 0.3$

26. (3) Expression

$$= \frac{(0.75)^3 + (1-0.75)\left((0.75)^2 + 0.75 \times 1 + 1^2\right)}{1-0.075}$$

$$= \frac{(0.75)^3 + 1^3 - (0.75)^3}{0.25}$$

$$= \frac{1}{0.25} = \frac{100}{25} = 4$$

$\therefore$ Required square root

$= \sqrt{4} = 2$

27. (3) $? = \sqrt{\left(272^2 - 128^2\right)}$

$$= \sqrt{(272+128)(272-128)}$$

$$= \sqrt{400 \times 144} = 20 \times 12 = 240$$

28. (3) $\sqrt{0.000441}$

$= \sqrt{0.021 \times 0.021}$

$= 0.021$

29. (2) Expression $= \frac{\sqrt{0.441}}{\sqrt{0.625}}$

$$= \sqrt{\frac{0.441}{0.625}} = \sqrt{\frac{441}{625}}$$

$$= \frac{21}{25} = 0.84$$

30. (3) $\sqrt{\frac{0.342 \times 0.684}{0.000342 \times 0.000171}}$

$$= \sqrt{\frac{342 \times 684 \times 10^6}{342 \times 171}}$$

$$= \sqrt{4 \times 10^6} = 2 \times 10^3 = 2000$$

31. (1) $\sqrt{0.00060516} = 0.0246$

32. (3) $= \sqrt{\frac{9.5 \times 0.085}{0.017 \times 0.019}} = \sqrt{2500}$

$= 50$

33. (2) $\sqrt{248 + \sqrt{52 + \sqrt{144}}}$

$$= \sqrt{248 + \sqrt{52+12}}$$

$$= \sqrt{248 + \sqrt{64}} = \sqrt{248+8}$$

$\sqrt{256} = \pm 16$

34. (4) $\because (102)^2 = 10404$

$\Rightarrow \sqrt{10404} = 102$

$\sqrt{104.04} + \sqrt{1.0404} + \sqrt{0.010404}$

$= 10.2 + 1.02 + 0.102$

$= 11.322$

35. (2) $\sqrt{0.00004761} = \sqrt{\frac{4761}{10^8}}$

$$= \sqrt{\frac{3 \times 3 \times 23 \times 23}{10^4 \times 10^4}}$$

$$= \frac{69}{10^4} = 0.0069$$

36. (1) $\sqrt{2} = 1.414$ (Given)

Now,

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

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

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

$= 3 - 2\sqrt{2}$

$= 3 - 2 \times 1.44$

$= 3 - 2.828$

$= 0.172$

37. (2) $\sqrt{\frac{0.00001225}{0.00005329}}$

$$= \sqrt{\frac{\frac{1225}{10^8}}{\frac{5329}{10^8}}} = \sqrt{\frac{1225}{5329}} = \frac{35}{73}$$

38. (2) $0.\overline{4} = \frac{4}{9}$

$$\therefore \sqrt{\frac{4}{9}} = \frac{2}{3} = \frac{2 \times 3}{3 \times 3} = \frac{6}{9} = 0.\overline{6}$$

39. (2) Given expression

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

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

$$\left[\because a^2 - b^2 = (a+b)(a-b)\right]$$

$$= \left(3\frac{1}{4}\right)^2 + \left(4\frac{1}{3}\right)^2 = \left(\frac{13}{4}\right)^2 + \left(\frac{13}{3}\right)^2$$

$$= \frac{169}{16} + \frac{169}{9} = 169\left(\frac{1}{16} + \frac{1}{9}\right)$$

$$= 169\left(\frac{9+16}{144}\right) = \frac{169 \times 25}{144}$$

$\therefore$ Required answer

$$= \sqrt{\frac{169 \times 25}{144}} = \frac{13 \times 5}{12} = \frac{65}{12} = 5\frac{5}{12}$$

40. (2) Expression $= 0.6 \times 0.6 \times 0.6 + 0.4 \times 0.4 \times 0.4 + 3 \times 0.6 \times 0.4 (0.6 + 0.4) = (0.6+0.4)^3 = 1$

$\therefore$ Required square root $= 1$

41. (2) $\sqrt{\frac{0.49}{0.25}} + \sqrt{\frac{0.81}{0.36}}$

$$= \frac{0.7}{0.5} + \frac{0.9}{0.6} = \frac{42+45}{30} = \frac{87}{30}$$

$$= \frac{29}{10} = 2\frac{9}{10}$$

42. (4) $\sqrt{x} \div \sqrt{441} = 0.02$

$\Rightarrow \sqrt{x} = 0.02 \times 21$

$\Rightarrow x = 0.1764$

43. (3) $? = \sqrt{4 + \sqrt{44 + 100}}$

$= \sqrt{4 + \sqrt{144}} = \sqrt{4+12} = 4$

44. (4) $\sqrt{0.00005746} = \sqrt{5746 \times 10^{-8}}$

$= 75.8 \times 10^{-4} = 0.00758$

45. (2)

$$\sqrt{(0.798)^2 + 0.404 \times 0.798 + (0.202)^2} + 1$$

$$= \sqrt{(0.798)^2 + 2 \times 0.798 \times 0.202 + (0.202)^2} + 1$$

$$= \sqrt{(0.798+0.202)^2} + 1$$

$$= \sqrt{(1.000)^2} + 1 = 1 + 1 = 2$$

46. (3) $\sqrt{11.981 + 7\sqrt{1.2996}}$

$$= \sqrt{11.981 + 7 \times 1.14}$$

$$= \sqrt{11.981 + 7.98}$$

$$= \sqrt{19.961}$$

$= 4.467 \approx 4.5$

47. (3) Expression

$= 4\sqrt{2} - 8\sqrt{2} + 5\sqrt{2}$

$= \sqrt{2}(4 - 8 + 5) = \sqrt{2}$

$= 1.414$

48. (4)

$$(7 + 3\sqrt{5})(7 - 3\sqrt{5}) = (7)^2 - \left(3\sqrt{5}\right)^2$$

$= 49 - 45 = 4$

$\therefore$ Required square root

$= \sqrt{4} = 2$

49. (3) Expression
$= \sqrt{400} + \sqrt{0.0400} + \sqrt{0.000004}$
$= 20 + 0.2 + 0.002$
$= 20.202$

50. (3) Expression
$= \sqrt{192} - \frac{1}{2}\sqrt{48} - \sqrt{75}$
$= \sqrt{64 \times 3} - \frac{1}{2}\sqrt{16 \times 3} - \sqrt{25 \times 3}$
$= 8\sqrt{3} - \frac{1}{2} \times 4\sqrt{3} - 5\sqrt{3}$
$= 8\sqrt{3} - 2\sqrt{3} - 5\sqrt{3}$
$= \sqrt{3} = 1.7321$

51. (3) $\sqrt{\frac{48.4}{0.289}} = \sqrt{\frac{484}{2.89}}$
$= \frac{22}{1.7} = \frac{220}{17} = 12\frac{16}{17}$

52. (2) $10^2 + 11^2 + 12^2$
$= 100 + 121 + 144 = 365$
$\therefore$ Required sum = 10+11+12= 33

53. (3) $\sqrt{4096} = 64$
$\therefore \sqrt{40.96} = 6.4$ and
$\sqrt{0.4096} = 0.64$ etc.
$\therefore$ Expression
$= 6.4 + 0.64 + 0.064 + 0.0064$
$= 7.1104$

54. (2) $\sqrt{13} = 3.6$ and $\sqrt{130} = 11.4$
$\therefore \sqrt{1.3} + \sqrt{1300} + \sqrt{0.013}$
$= \sqrt{\frac{130}{100}} + \sqrt{13 \times 100} + \sqrt{\frac{130}{10000}}$
$= \frac{11.4}{10} + 3.6 \times 10 + \frac{11.4}{100}$
$= 1.14 + 36 + 0.114$
$= 37.254$

55. (1) Expression
$= \sqrt{5 + \sqrt{11 + \sqrt{19 + \sqrt{29 + 7}}}}$
$= \sqrt{5 + \sqrt{11 + \sqrt{19 + 6}}}$
$= \sqrt{5 + \sqrt{11 + 5}}$
$= \sqrt{5 + 4} = \sqrt{9} = 3$

56. (4) $\sqrt{110\frac{1}{4}} = \sqrt{\frac{441}{4}} = \sqrt{\frac{21 \times 21}{2 \times 2}}$
$= \frac{21}{2} = 10\frac{1}{2} = 10.5$

57. (1) Expression
$= \sqrt{8 + \sqrt{57 + \sqrt{38 + \sqrt{108 + \sqrt{169}}}}}$
$= \sqrt{8 + \sqrt{57 + \sqrt{38 + \sqrt{108 + 13}}}}$
$= \sqrt{8 + \sqrt{57 + \sqrt{38 + \sqrt{121}}}}$
$= \sqrt{8 + \sqrt{57 + \sqrt{38 + 11}}}$
$= \sqrt{8 + \sqrt{57 + \sqrt{49}}}$
$= \sqrt{8 + \sqrt{57 + 7}} = \sqrt{8 + \sqrt{64}}$
$= \sqrt{8 + 8} = \sqrt{16} = 4$

58. (3) $(10.15)^2 = 103.0225$
$\Rightarrow (1.015)^2 = 1.030225$
and $(101.5)^2 = 10302.25$
$\therefore \sqrt{1.030225} + \sqrt{10302.25}$
$= \sqrt{(1.015)^2} + \sqrt{(101.5)^2}$
$= 1.015 + 101.5$
$= 102.515$

59. (3) The number of digits in 625686734489 is 12.
$\therefore$ Number of digits in its square root = 6
i.e., $\sqrt{625686734489} = 791003.625$

60. (2) $\sqrt{841} = 29$
$\frac{\sqrt{841}}{10000} = \frac{29}{10000}$
$\Rightarrow \frac{\sqrt{841}}{100000000} = \frac{29}{10000}$
$\therefore \sqrt{0.00000841} = 0.0029$

61. (3) Expression
$= \sqrt{\frac{0.324 \times 0.081 \times 4.624}{1.5625 \times 0.0289 \times 72.9 \times 64}}$
$= \sqrt{\frac{324 \times 81 \times 4624}{15625 \times 289 \times 729 \times 64}}$
$= \frac{18 \times 9 \times 68}{125 \times 17 \times 27 \times 8} = 0.024$

62. (3) $\sqrt{0.25 \times 2.25} = 0.5 \times 1.5$
$= 0.75$

63. (2) $\sqrt{64} - \sqrt{36} = 8 - 6 = 2$

64. (2) $\sqrt{18225} = 135$
$\therefore \sqrt{182.25} = 13.5$;
$\sqrt{1.8225} = 1.35$;
$\sqrt{0.018225} = 0.135$
$\therefore$ Expression
$= 135 + 13.5 + 1.35 + 0.135$
$= 149.985$

65. (2) $21\frac{51}{169} = \frac{21 \times 169 + 51}{169}$
$= \frac{3600}{169}$
$\therefore \sqrt{21\frac{51}{169}} = \sqrt{\frac{3600}{169}} = \frac{60}{13} = 4\frac{8}{13}$

66. (2) $(1101)^2 = 1212201$
$\Rightarrow 1101 = \sqrt{1212201}$
$= \sqrt{121.2201}$
$\Rightarrow \sqrt{\frac{121.2201}{10000}} = \frac{1101}{100} = 11.01$

67. (1) Expression
$= \sqrt{\frac{0.064 \times 0.256 \times 15.625}{0.025 \times 0.625 \times 4.096}}$
$= \sqrt{\frac{64 \times 256 \times 15625}{25 \times 625 \times 4096}}$
$= \frac{8 \times 16 \times 125}{5 \times 25 \times 64} = 2$

68. (3)
$\sqrt{19.36} + \sqrt{0.1936} + \sqrt{0.001936}$
$+ \sqrt{0.00001936}$
$= 4.4 + 0.44 + 0.044 + 0.0044$
$= 4.8884$

69. (2) Let the numbers be x and y where $x > y$
$\therefore x^2 - y^2 = 45$
$\Rightarrow (x + y)(x - y) = 45$
Now, $45 = 5 \times 9$
$= 15 \times 3 = 45 \times 1$
$\therefore$ Number of pairs = 3

70. (3) Expression $= \frac{\sqrt{24} + \sqrt{216}}{\sqrt{96}}$
$= \frac{2\sqrt{6} + 6\sqrt{6}}{4\sqrt{6}} = \frac{8\sqrt{6}}{4\sqrt{6}} = 2$

71. (4) Expression

$$= \sqrt{3\frac{33}{64}} \div \sqrt{9\frac{1}{7}} \times 2\sqrt{3\frac{1}{9}}$$

$$= \sqrt{\frac{225}{64}} \div \sqrt{\frac{64}{7}} \times 2\sqrt{\frac{28}{9}}$$

$$= \sqrt{\frac{225}{64} \times \frac{7}{64} \times \frac{28}{9}} \times 2$$

$$= \frac{5 \times 7}{8 \times 4} \times 2 = \frac{35}{16} = 2\frac{3}{16}$$

72. (2) Expression

$$= \frac{\sqrt{32} + \sqrt{48}}{\sqrt{8} + \sqrt{12}}$$

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

73. (1) Number of digits in 62478078 = 8
$\therefore$ Number of digits in its square root = 4

$\Rightarrow \sqrt{62478078} \approx 7904$

$\Rightarrow \sqrt{62473216} = 7904$

74. (4) For $n^r - tn + \frac{1}{4}$ to be a perfect square,
$r = 2$ and $t = \pm 1$

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

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

$$n^2 + n + \frac{1}{4} = n^2 + 2.n.\frac{1}{2} + \frac{1}{4}$$

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

75. (4) $33 - 4\sqrt{35}$

$= 33 - 2 \times 2\sqrt{5 \times 7}$

$= 33 - 2 \times 2\sqrt{7} \times \sqrt{5}$

$= 28 + 5 - 2 \times 2\sqrt{7} \times \sqrt{5}$

$= \left(2\sqrt{7}\right)^2 + \left(\sqrt{5}\right)^2 - 2 \times 2\sqrt{7} \times \sqrt{5}$

$= \left(2\sqrt{7} - \sqrt{5}\right)^2$

$\therefore \sqrt{33 - 4\sqrt{35}}$

$= \sqrt{\left(2\sqrt{7} - \sqrt{5}\right)^2}$

$= \pm\left(2\sqrt{7} - \sqrt{5}\right)$

76. (3) Expression

$= \sqrt{156.25} + \sqrt{0.0081} - \sqrt{0.0361}$

$= 12.5 + 0.09 - 0.19 = 12.4$

77. (4) $\sqrt{24010000} = 4900$

Again, $\sqrt{4900} = 70$

$\therefore \sqrt[4]{24010000} = 70$

78. (2) $\sqrt{15876} = 126$
The digit at the unit's place is 6.

1	1 $\overline{58}$ $\overline{76}$	126
1	1	
22	58	
2	44	
246	1476	
6	1476	
252	×	

79. (1) Unit's digit in $(1570)^2 = 0$
Unit's digit in $(1571)^2 = 1$
Unit's digit in $(1572)^2 = 4$
Unit's digit in $(1573)^2 = 9$
$\therefore$ Required unit's digit
= Unit's digit in $(0 + 1 + 4 + 9) = 4$

80. (3) The smallest 4-digit number = 1000
The smallest 4 digit perfect square number = $2^{10} = 1024$

81. (1)

8	$\overline{68}$ $\overline{06}$ $\overline{21}$	824
8	64	
162	406	
2	324	
1644	8221	
	6576	
	1645	

$\therefore (824)^2 < 680621 < (825)^2$
$\therefore$ Required number
$= [(825)^2 - 680621] = 4$

82. (4) $392 = 2 \times 2 \times 2 \times 7 \times 7$
$= 2^2 \times 7^2 \times 2$
Clearly, when 392 is multiplied by 2, the product is a perfect square.

83. (3) $47 \times 47 = 2209$
Clearly, 6 should be added to 2203 to get a perfect square.

84. (4) Perfect square numbers between 50 and 1000 start from 64 to 961 i.e., $(8)^2$ to $(31)^2$
$\therefore$ The required number
$= (31 - 8) + 1 = 24$

85. (2)

9	$\overline{89}$ $\overline{58}$	94
9	81	
184	× 858	
4	736	
188	122	

Now, $95 \times 95 = 9025$
$\therefore$ Required number
$= 9025 - 8958 = 67$

86. (3) Largest 5-digit number = 99999
Now,

3	9 $\overline{99}$ $\overline{99}$	316
3	9	
61	× 99	
1	62	
626	3799	
6	3756	
632	× 43	

$\therefore$ Required number
$= 99999 - 43 = 99856$

87. (3) $11^2 = 121$, $12^2 = 144$,
$13^2 = 169$, $14^2 = 196$
$15^2 = 225$, $16^2 = 256$,
$17^2 = 289$
So, total perfect squares = 7

88. (3) $31^2 = 961$
$32^2 = 1024$
$\therefore$ Required number
$= 1000 - 961 = 39$

89. (3) $(31)^2 < 1000 < 32^2$
$32 \times 32 = 1024$
$\therefore$ Required number
$= 1024 - 1000 = 24$

90. (3) $99 \times 99 = 9801$

91. (1) $a^2 - 2ab + b^2 = (a - b)^2$
$\therefore 16a^2 - 12a$

$= (4a)^2 - 2 \times 4a \times \frac{3}{2}$

Hence, on adding $\left(\frac{3}{2}\right)^2 = \frac{9}{4}$, expression will be a perfect square.

92. (3) $p = q + 5$
$\Rightarrow p - q = 5$
$p^2 + q^2 = 55$
$\therefore (p - q)^2 + 2pq = 55$
$\Rightarrow 25 + 2pq = 55$
$\Rightarrow 2pq = 30$
$\Rightarrow pq = 15$

93. (3) Since the numbers between –10 and 10 will be single digit and the numbers below 100 will be either one digit or two digit. We know that the square root of one or two digit number is always single digit number. Therefore, required answer is option (3).

94. (1) Let the two numbers be A and B.
Then, A + B = 22
and $A^2 + B^2 = 404$
We know that
$(A + B)^2 = A^2 + B^2 + 2AB$
or $(22)^2 = 404 + 2AB$
or 484 = 404 + 2 AB
or 2AB = 80
or AB = 40
∴ The product of the two numbers = 40

95. (4) According to question,

$$\frac{1}{3} \times \sqrt{x} = 0.001$$

$$\Rightarrow \sqrt{x} = 0.003 \Rightarrow x = 0.000009$$

96. (3) Let the number be x
According to the question

$$\frac{3}{5} \text{ of } x^2 = 126.15$$

$$\Rightarrow x^2 = \frac{126.15 \times 5}{3}$$

$$\Rightarrow x^2 = 210.25$$

$$\therefore x = \sqrt{210.25} = 14.5$$

97. (1) Multiples of 11 whose square root are whole number
First = 11 × 11 = 121
Second = 11 × 11 × 4 = 484

98. (3) Let the number be *x*. Then,
$x^2 = (75.15)^2 - (60.12)^2$
= (75.15 + 60.12) (75.15 – 60.12)
= 135.27 × 15.03
= 2033.1081

$$\Rightarrow x = \sqrt{2033.1081}$$

= 45.09

99. (2) Let the required number be *x*. Then,
$x^2 + 5^2 = 386$
$\Rightarrow x^2 = 386 - 25$
$\Rightarrow x^2 = 361$

$$\Rightarrow x = \sqrt{361} = 19$$

100. (1) Let the required number be *x*.
As per given information,
$x^2 = (975)^2 - (585)^2$
$\Rightarrow x^2 = (975 + 585)(975 - 585)$
$\Rightarrow x^2 = 1560 \times 390$

$$\Rightarrow x = \sqrt{1560 \times 390}$$

$$= \sqrt{13 \times 12 \times 3 \times 13 \times 10 \times 10}$$

= 780

101. (4) Let $x + y = 20$ and
$x - y = 8$
$\therefore (x + y)(x - y) = 20 \times 8$
$\Rightarrow x^2 - y^2 = 160$

102. (3) Let the numbers be *x* and *y*. Then,
$x^2 + y^2 = 100$ ...(i)
$x^2 - y^2 = 28$ ...(ii)
On adding,
$2x^2 = 128$
$\Rightarrow x^2 = 64 \Rightarrow x = 8$
From equation (i),
$64 + y^2 = 100$
$\Rightarrow y^2 = 36 \Rightarrow y = 6$
∴ Required sum
= 8 + 6 = 14

103. (3) Check through options
When $x = 9$,
$2x - 3 = 2 \times 9 - 3 = 15 < 17$

104. (4) 1× 2 × 3 × 4 = 24
$\Rightarrow 24 + 1 = 25 = 5^2$;
2 × 3 × 4 × 5 = 120
$\Rightarrow 120 + 1 = 121 = 11^2$
∴ P = 1

105. (3) Expression

$$= \sqrt{\frac{8}{3}} = \sqrt{\frac{8 \times 3}{3 \times 3}} = \frac{\sqrt{24}}{3}$$

$$= \frac{4.898}{3} = 1.6326 \approx 1.633$$

106. (2) Let the number of boys and girls in the room be *x* and *y* respectively.
According to the question,
$x^2 = y^2 + 28$
$\Rightarrow x^2 - y^2 = 28$ .....(i)
and $x = y + 2$
$\Rightarrow x - y = 2$ .....(ii)
On dividing equation (i) by equation (ii), we have

$$\frac{x^2 - y^2}{x - y} = \frac{28}{2}$$

$$\Rightarrow \frac{(x+y)(x-y)}{x-y} = 14$$

$\Rightarrow x + y = 14$
∴ Total number of boys and girls = 14

107. (4) From the given alternatives,
$5^2 + 6^2 + 7^2 = 110$
∴ The smallest number = 5

108. (3) 37 is a prime number.
∴ 37 = 1 × 37
∴ Required answer

$$= \sqrt{37 - 1} = \sqrt{36} = 6$$

109. (3) According to the question,
$= 68^2 - 32^2 = (68 + 32)(68 - 32)$
= 100 × 36
$= 3600 = (60)^2$

110. (3) $x^2 + x = 2450$
$\Rightarrow x(x + 1) = 2450 = 49 \times 50$
$\therefore x = 49$

111. (4) Let the numbers be *x* and *y* and $x > y$.
$\therefore xy = 45$
and $x - y = 4$
$\therefore x^2 + y^2 = (x - y)^2 + 2xy$
$= (4)^2 + 2 \times 45 = 16 + 90$
= 106

112. (4) 1008 = 4 × 4 × 3 × 3 × 7

$$\therefore \frac{1008}{7} = (4 \times 3)^2 = (12)^2$$

113. (1) Obviously, 16 must be subtracted to make the result a perfect square.

i.e. $63520 - 16 = \sqrt{63504} = 252$

114. (2) The given number has 6 decimal places.

Now,

1	326	18
1	1	
28	226	
8	224	
36	2	

i.e. 326 – 2 = 324 Which is a perfect square of 18.
Therefore, 0.000002 should be subtracted from 0.000326 to make it a perfect square of 0.018.

115. (4) 5808 = 2 × 2 × 2 × 2 × 3 × 11 × 11 = $2^2 \times 2^2 \times 11^2 \times 3$
Therefore, when 5808 is multiplied by 3, then it will be perfect square number.

116. (4)

2	20184
2	10092
2	5046
3	2523
29	841
	29

∴ 20184 = 2 × 2 × 2 × 3 × 29 ×29 × = $2^2 \times 29^2 \times 2 \times 3$.
∴ Required number
= 2 × 3 = 6

117. (1) $41 \times 41 = 1681$
$42 \times 42 = 1764$
$\therefore$ Required answer
$= 1764 - 1728 = 36$

118. (1) $a = 64$ and $b = 289$

$\therefore \sqrt{a} = \sqrt{64} = 8$ and

$\sqrt{b} = \sqrt{289} = 17$

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

$$= \left(\sqrt{8+17} - \sqrt{17-8}\right)^{\frac{1}{2}}$$

$$= \left(\sqrt{25} - \sqrt{9}\right)^{\frac{1}{2}}$$

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

119. (3)

2	$6\ \overline{40}\ \overline{09}$ | 253
2	4
45	240
5	225
503	1509
3	1509
506	×

$\therefore \sqrt{64009} = 253$

120. (2) Let the number of days of tour be x.
$\therefore$ Total expenditure $= x^2$
$\therefore x^2 = 361 \Rightarrow x = \sqrt{361} = 19$

121. (2) Expression $= \sqrt{10^{-6} \times 0.25}$

$$= \sqrt{\frac{0.25}{10^6}} = \sqrt{\frac{25}{10^6 \times 10^2}}$$

$$= \sqrt{\frac{25}{10^8}} = \frac{5}{10^4} = 0.0005$$

122. (4) $\dfrac{3\sqrt{2}}{\sqrt{6}+\sqrt{3}}$

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

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

$$= \sqrt{2}\left(\sqrt{6}-\sqrt{3}\right) = \sqrt{12} - \sqrt{6}$$

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

$$\frac{4\sqrt{3}}{\sqrt{6}+\sqrt{2}}$$

$$= \frac{4\sqrt{3}(\sqrt{6}-\sqrt{2})}{(\sqrt{6}+\sqrt{2})(\sqrt{6}-\sqrt{2})}$$

$$= \frac{4\sqrt{3}(\sqrt{6}-\sqrt{2})}{6-2}$$

$= \sqrt{3}\left(\sqrt{6}-\sqrt{2}\right) = \sqrt{18} - \sqrt{6}$

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

$$\frac{\sqrt{6}}{\sqrt{3}+\sqrt{2}}$$

$$= \frac{\sqrt{6}\left(\sqrt{3}-\sqrt{2}\right)}{\left(\sqrt{3}+\sqrt{2}\right)\left(\sqrt{3}-\sqrt{2}\right)}$$

$$= \frac{\sqrt{18}-\sqrt{12}}{3-2}$$

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

$\therefore$ Expression

$= 2\sqrt{3} - \sqrt{6} - \left(3\sqrt{2} - \sqrt{6}\right) +$

$3\sqrt{2} - 2\sqrt{3}$

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

$3\sqrt{2} - 2\sqrt{3} = 0$

123. (2) Expression $= \dfrac{4-\sqrt{0.04}}{4+\sqrt{0.4}}$

$$= \frac{4-0.2}{4+0.6}$$

$$= \frac{3.8}{4.6} = \frac{38}{46} = \frac{19}{23}$$

$\approx 0.83 \approx 0.8$

124. (2) $\sqrt{0.05 \times 0.5 \times a}$

$= 0.5 \times 0.05 \times \sqrt{b}$

On squaring both sides,
$0.05 \times 0.5 \times a = 0.5 \times 0.5 \times 0.05 \times 0.05 \times b$
$\Rightarrow a = 0.5 \times 0.05b$

$$\Rightarrow \frac{a}{b} = 0.5 \times 0.05 = 0.025$$

125. (1) Number of students in the last row $= \sqrt{1369} = 37$

Illustration :

3	$\overline{13}\ \overline{69}$ | 37
3	9
67	469
7	469
74	×

126. (1) $\sqrt{5} = 2.24$

$\sqrt{3} = 1.73$

$\sqrt{6} = 2.45$

$\sqrt{2} = 1.41$

$\therefore \sqrt{5} + \sqrt{3} = 2.24 + 1.73$
$= 3.97$

$\sqrt{6} + \sqrt{2} = 2.45 + 1.41 = 3.86$
Clearly, $3.97 > 3.86$

127. (4)

2	20184
2	10092
2	5046
3	2523
29	841
	29

$\therefore 20184 = 2 \times 2 \times 2 \times 3 \times 29 \times 29$
$= 2^2 \times 29^2 \times 2 \times 3$
$\therefore$ For making it a perfect square, 20184 should be multiplied by $2 \times 3 = 6$
$20184 \times 6 = 121104$;

$\sqrt{121104} = 348$

128. (4)

2	1008
2	504
2	252
2	126
3	63
3	21
	7

$\therefore 1008$
$= 2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 7$
$= 2^2 \times 2^2 \times 3^2 \times 7$
$\therefore$ Required answer $= 7$

129. (3) Let the numbers be x and y where $x > y$.
According to the question,
$x + y = 37$
and
$x^2 - y^2 = 185$
$\Rightarrow (x + y)(x - y) = 185$
$\Rightarrow 37(x - y) = 185$

$$\Rightarrow x - y = \frac{185}{37} = 5$$

130. (1)

1	$\overline{36}\,\overline{56}\,\overline{2}$ | 191
1	1
29	265
9	261
381	462
1	381
	81

$\therefore$ Number of armies left = 81

131. (3) $\dfrac{2+\sqrt{3}}{2} = \dfrac{2(2+\sqrt{3})}{4}$

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

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

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

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

132. (3) $11^2 = 121$
$111^2 = 12321$
$1111^2 = 1234321$
$11111^2 = 123454321$

133. (4)

5	59535
3	11907
3	3969
3	1323
3	441
3	147
7	49
	7

$\therefore 59535 = 3\times3\times3\times3\times7^2\times3\times5$
$= 3^2\times3^2\times7^2\times3\times5$
$\therefore$ According to the question,
$x = 3\times5 = 15$
$\therefore$ Sum of digits = 1 + 5 = 6

134. (2)

2	$\overline{6}\ \overline{60}\ \overline{49}$ | 257
2	4
45	260
5	225
507	3549
7	3549
514	×

$\therefore \sqrt{66049} = 257$
$\therefore$ Unit place digit = 7

135. (4) $\sqrt{0.000441} = \sqrt{\dfrac{441}{1000000}}$

$$= \frac{21}{1000} = 0.021$$

136. (1) Required sum = 121 + 144 + 169 + 196 + 225 + 256 + 289 = 1400

137. (2) $\sqrt{32146} > 179$
$179\times179 = 32041$
$\therefore$ Required answer
= 32146 – 32041 = 105

138. (1)

7	$\overline{54}\,\overline{16}\ *\ \overline{6}$ | 736
7	49
143	516
3	429
1466	87*6

$\because 1466\times6 = 8796$
$\therefore * = 9$

139. (2) Number of boys = $\sqrt{12544}$
= 112
Illustration :

1	$1\overline{25}\,\overline{44}$ | 112
1	1
21	× 25
1	21
222	444
2	444
224	×

140. (2) Let three positive integers be x, y and z.
According to the question,
$x + y + z = 18$ ..... (i)
$xyz = 162$ ..... (ii)
and $x + y = z$ ..... (iii)
From equation (i),
$z + z = 18 \Rightarrow 2z = 18 \Rightarrow z = 9$
$\therefore xyz = 162$
$\Rightarrow xy\times9 = 162$

$$\Rightarrow xy = \frac{162}{9} = 18 \quad \text{..... (iv)}$$

$\therefore (x-y)^2 = (x+y)^2 - 4xy$
$= (9)^2 - 4\times18$
$= 81 - 72 = 9$
$\therefore x - y = 3$
$\therefore x + y + x - y = 9 + 3$
$\Rightarrow 2x = 12 \Rightarrow x = 6$
$\therefore x + y + z = 18$
$\Rightarrow 6 + y + 9 = 18$
$\Rightarrow y = 18 - 15 = 3$
$\therefore x^2 + y^2 + z^2$
$= (6)^2 + (3)^2 + (9)^2$
$= 36 + 9 + 81 = 126$

141. (3) $x + y + z = 50$; $xyz = 3750$

$$\therefore \frac{1}{x}+\frac{1}{y}+\frac{1}{z} = \frac{yz+zx+xy}{xyz}$$

$$= \frac{31}{150}$$

$$\Rightarrow xy + yz + zx = \frac{31}{150}xyz$$

$$= \frac{31}{150}\times3750 = 775$$

$\therefore (x+y+z)^2 = x^2 + y^2 + z^2 + 2(xy + yz + zx)$
$\Rightarrow (50)^2 = x^2 + y^2 + z^2 + 2\times775$
$\Rightarrow 2500 = x^2 + y^2 + z^2 + 1550$
$\Rightarrow x^2 + y^2 + z^2 = 2500 - 1550$
$= 950$

142. (2) Largest 6-digit number
= 999999

9	$\overline{99}\,\overline{99}\,\overline{99}$ | 999
9	81
189	1899
9	1701
1989	19899
9	17901
1998	1998
	0

$\therefore$ Required perfect square number = 999999 – 1998
= 998001

143. (3) Remainder on dividing $3^2 = 9$ by 6 = 3
Remainder on dividing $4^2 = 16$ by 6 = 4
Remainder on dividing $5^2 = 25$ by 6 = 1

144. (3)

1	18265	135
1	1	
23	× 82	
3	69	
265	1365	
5	1325	
	(40)	

∴ Required answer = 40

145. (3) Let the two real numbers be x and y.
According to the question,
$x^2 + y^2 = 41$
$x + y = 9$
$\therefore (x + y)^2 = x^2 + y^2 + 2xy$
$\Rightarrow 81 = 41 + 2xy$
$\Rightarrow 2xy = 81 - 41 = 40$

$$\Rightarrow xy = \frac{40}{2} = 20$$

$\therefore x^3 + y^3 = (x + y)^3 - 3xy(x + y)$
$= (9)^3 - 3 \times 20 (9)$
$= 729 - 540 = 189$

146. (1) Let the smaller number be x.
$\therefore$ Larger number = $2x$
According to the question,
$2x^2 = 2048$

$$\Rightarrow x^2 = \frac{2048}{2} = 1024$$

$$\therefore x = \sqrt{1024} = 32$$

147. (4) Let the number (n) be 6m + 3 where m = quotient.
On squaring both sides,
$n^2 = (6m + 3)^2$
$= 36\ m^2 + 36\ m + 3^2$
$\therefore$ Required remainder = 3^2
$\therefore$ Remainder on dividing 9 by 6 = 3

148. (4) Number of members in the club = x (let)
According to the question,

$$x^2 + \frac{x^2}{100} = 2525$$

$$\Rightarrow \frac{100x^2 + x^2}{100} = 2525$$

$$\Rightarrow 101x^2 = 252500$$

$$\Rightarrow x^2 = \frac{252500}{101} = 2500$$

$$\Rightarrow x = \sqrt{2500} = 50$$

149. (1) Let the positive numbers be x, y and z (respectively).
$\therefore x^2 + y^2 + z^2 = 323$ ... (i)
and, $x^2 + y^2 = 2z$ ... (ii)
$\therefore z^2 + 2z = 323$
$\Rightarrow z^2 + 2z - 323 = 0$
$\Rightarrow z^2 + 19z - 17z - 323 = 0$
$\Rightarrow z(z + 19) - 17(z + 19) = 0$
$\Rightarrow (z - 17)(z + 19) = 0$
$\Rightarrow z = 17$ because $z \neq -19$
$\therefore x^2 + y^2 = 2 \times 17 = 34$
$= 3^2 + 5^2$
$\therefore xyz = 3 \times 5 \times 17 = 255$

150. (2) Let the numbers be a and b where $a > b$.
According to the question,
$a - b = 9$ .... (i)
and $a^2 - b^2 = 207$
$\Rightarrow (a + b)(a - b) = 207$
$\Rightarrow 9(a + b) = 207$

$$\Rightarrow a + b = \frac{207}{9} = 23 \text{ .... (ii)}$$

On adding equations (i) and (ii),
$a + b + a - b = 23 + 9$
$\Rightarrow 2a = 32 \Rightarrow a = 16$
$\therefore a - b = 9$
$\Rightarrow 16 - b = 9$
$\Rightarrow b = 16 - 9 = 7$

151. (4)

2	$\overline{63}\overline{52}\overline{0}$	252
2	4	
45	235	
5	225	
502	1020	
2	1004	
504	16	

Now, 63520 − 16 = 63504
and $\sqrt{63504} = 252$
$\therefore$ Required number = 16

152. (1) The smallest 6-digit number = 100000

3	$\overline{10}\overline{00}\overline{00}$	316
3	9	
61	100	
1	61	
626	3900	
6	3756	
632	144	

Clearly,
$316 < \sqrt{100000} < 317$
$317 \times 317 = 100489$
$\therefore$ Required number = 100489

153. (2) Let the numbers be x and y where $x > y$.
$\therefore x + y = 80$
$x - y = 20$
$\therefore (x + y)(x - y) = 80 \times 20$
$\Rightarrow x^2 - y^2 = 1600$

154. (1) Suppose, the positive number be x.
According to the question,
$x^2 - 21x = 100$
$\Rightarrow x^2 - 21x - 100 = 0$
$\Rightarrow x^2 - 25x + 4x - 100 = 0$
$\Rightarrow x(x - 25) + 4(x - 25) = 0$
$\Rightarrow (x - 25)(x + 4) = 0$
$\Rightarrow x = 25$ because $x \neq -4$

155. (3) Let's find the square root of 36562.

1	$\overline{3}\ \overline{65}\ \overline{62}$	191
1	1	
29	265	
9	261	
381	462	
1	381	
382	81	

Clearly, the remaining army men = 81

156. (3)

1	$1\ \overline{6}\ \overline{8}\ \overline{0}\ \overline{0}$	129
1	1	
22	×68	
2	44	
249	2400	
9	2241	
258	159	⇒ Remainder

$\therefore$ Required number = 159
16800 − 159 = 16641
and $\sqrt{16641} = 129$

TYPE-IV

1. (1) Here, 22 − 15 − 7 = 0
We know that
$a^2 + b^3 + c^3 = 3abc$,
if $a + b + c = 0$
$\therefore (22)^3 + (-15)^3 + (-7)^3$
$= 3 \times 22 \times (-15)(-7) = 6930$

2. (2) On simplification,

$$\text{Expression} = \frac{2}{4} \times \frac{7}{10} \times 5$$

$$= \frac{7}{4} = 1\frac{3}{4}$$

3. (2) $\sqrt[3]{\frac{72.9}{0.4096}} = \sqrt[3]{\frac{729000}{4096}}$

$$= \sqrt[3]{\frac{(90)^3}{(16)^3}} = \frac{90}{16} = \frac{45}{8} = 5.625$$

4. (4) $(5.5)^3 - (4.5)^3$
$= (5.5 - 4.5)^3 + 3 \times 5.5 \times 4.5 (5.5 - 4.5)$
$= (1)^3 + 74.25 (1)$
$= 1 + 74.25 = 75.25$

5. (4) $\sqrt[3]{\frac{7}{875}} = \left(\frac{7}{875}\right)^{\frac{1}{3}}$

$$= \left(\frac{1}{125}\right)^{\frac{1}{3}} = \frac{1}{5}$$

6. (2) $\sqrt[3]{\frac{19}{513}} = \sqrt[3]{\frac{1}{27}} = \frac{1}{3}$

7. (3) We know that

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

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

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

$\therefore \sqrt[3]{(333)^3+(333)^3+(334)^3 - 3\times 333\times 333\times 334}$

$= \sqrt[3]{\frac{1}{2}(333+333+334)\ [(333-333)^2 + (333-334)^2 + (334-333)^2]}$

$= \sqrt[3]{\frac{1}{2}\times 1000\times 2} = \sqrt[3]{1000}$

$= \sqrt[3]{10\times 10\times 10} = 10$

8. (3) Here, $\sqrt[3]{175616} = 56$

$\therefore \sqrt[3]{175.616} = 5.6$

$\sqrt[3]{0.175616} = 0.56$

and $\sqrt[3]{0.000175616} = 0.056$

$\therefore$ Required sum

$= 56. + 0.56 + 0.056 = 6.216$

9. (4) $\sqrt[3]{\sqrt{0.000064}} = \sqrt[3]{0.008}$

$= \sqrt[3]{0.2\times 0.2\times 0.2}$

$= 0.2$

10. (2) Expression

$= \sqrt[3]{15612 + \sqrt{154+\sqrt{225}}}$

$= \sqrt[3]{15612 + \sqrt{154+15}}$

$= \sqrt[3]{15612+13}$

$= \sqrt[3]{15625} = 25$

11. (3)

$\sqrt[3]{0.000125} = \sqrt[3]{0.05\times 0.05\times 0.05}$

$= 0.05$

12. (3) First number $= (\sqrt{5})^2 = 5$

Let the second number be x.

$\therefore x^2 + 5^2 = 146$

$\Rightarrow x^2 = 146 - 25 = 121$

$\Rightarrow x = \sqrt{121} = 11$

$\therefore$ Cube of 11 $= 1331$

13. (1) $\sqrt[3]{1000} + \sqrt[3]{0.008} - \sqrt[3]{0.125}$

$= 10 + 0.2 - 0.5 = 9.7$

14. (2) Expression

$= \sqrt[3]{1 - \frac{127}{343}} = \sqrt[3]{\frac{343-127}{343}}$

$= \sqrt[3]{\frac{216}{343}} = \sqrt[3]{\frac{(6)^3}{(7)^3}} = \frac{6}{7} = 1 - \frac{1}{7}$

15. (1) $\sqrt[3]{3^n} = 27$

$\Rightarrow (3)^{\frac{n}{3}} = 3^3$

$\Rightarrow \frac{n}{3} = 3 \Rightarrow n = 3\times 3 = 9$

16. (2) Expression

$= \sqrt{\sqrt[3]{0.000729}}$

$= \sqrt{\sqrt[3]{0.09\times 0.09\times 0.09}}$

$= \sqrt{0.09} = \sqrt{0.3\times 0.3}$

$= 0.3$

17. (1) Expression $= \left(\sqrt{4^3+15^2}\right)^3$

$= \left(\sqrt{64+225}\right)^3 = \left(\sqrt{289}\right)^3$

$= (17)^3 = 4913$

18. (2) Expression $= \sqrt[3]{4\frac{12}{125}}$

$= \sqrt[3]{\frac{512}{125}} = \sqrt[3]{\frac{8\times 8\times 8}{5\times 5\times 5}} = \frac{8}{5} = 1.6$

19. (4) $1323 = 3\times 3\times 3\times 7\times 7$

$\therefore$ It must be multiplied by 7.

20. (2) $1440 = 2\times 2\times 2\times 2\times 2\times 3\times 3\times 5 = 2^3\times 2^2\times 3^2\times 5$

To make 1440 a perfect cube, it must be mulitplied by $2\times 3\times 5\times 5 = 150$.

$\therefore$ The required sum $= 1+5+0 = 6$

21. (3) $1800 = 2\times 2\times 2\times 3\times 3\times 5\times 5 = 2^3\times 3^2\times 5^2$

To make 1800 a perfect cube, it must be multiplied by 15 (least number).

$\therefore$ Required sum $= 1 + 5 = 6$

22. (2) Clearly, $\sqrt[3]{729} = 9$

$\therefore$ 19 should be added to 710 to get a perfect cube.

23. (2)

2	1944
2	972
2	486
3	243
3	81
3	27
3	9
	3

$\therefore 1944 = 2\times 2\times 2\times 3\times 3\times 3\times 3\times 3$

$= 2^3\times 3^3\times 3^2$

Clearly, 1944 should be multiplied by 3 to make the result a perfect cube.

24. (1) $3000 = 3\times 1000 = 3\times 10^3$

Clearly, when we divide 3000 by natural number 3, the quotient is 1000 which is a perfect cube.

25. (2)

2	864
2	432
2	216
2	108
2	54
3	27
3	9
	3

$\therefore 864 = 2^3\times 3^3\times 2^2$

For $864n$ to be a perfect cube, $n = 2$

26. (2) $675 = 5\times 5\times 3\times 3\times 3$

$\therefore$ Required number $= 5$

27. (2) $12\times 12\times 12 = 1728$

$\therefore$ Required number

$= 1728 - 1720 = 8$

28. (2) $4320 = 2\times 2\times 2\times 2\times 2\times 3\times 3\times 3\times 5$

$= 2^3\times 3^3\times 2^2\times 5$

$\therefore$ Required number $= 2\times 5\times 5 = 50$

29. (4) $343 = 7\times 7\times 7$

$125 = 5\times 5\times 5$

$81 = 3\times 3\times 3\times 3$

$64 = 8\times 8 = 4\times 4\times 4$

We see that 343 and 125 are only perfect cubes of 7 and 5 respectively. 81 is only a perfect square of 9.

64 is a perfect square of 8 as well as a perfect cube of 4.

30. (4) Let number be x

$\therefore$ According to question,

$x^3 - x^2 = 48 \quad \therefore x = 4$

31. (2) The number = 90 × A
= 3 × 3 × 2 × 5 × A
The least value of A for which the given number is a perfect cube
= 3 × 2^2 × 5^2
= 3 × 4 × 25 = 300

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

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

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

$\Rightarrow x^3 = y^2$

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

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

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

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

$= 2\sqrt{2}$

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

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

$= 16\sqrt{2} + 6\sqrt{2} = 22\sqrt{2}$

34. (1) **Look at the pattern :**
1001 × 1001 = 1002001
1001×1001 × 1001 = 1003003001

35. (2)

5	625
5	125
5	25
	5

$\therefore$ 625 = 5 × 5 × 5 × 5 = 5^3 × 5
For the smallest cube number, 625 should be divided 5,
625 ÷ 5 = 125 = 5^3

36. (3) Let the numbers be a and b where $a > b$.
According to the question,
$a^3 + b^3 = 793$
and $a + b = 13$
$\therefore (a+b)^3 = a^3 + b^3 + 3ab(a+b)$
$\Rightarrow (13)^3 = 793 + 3ab \times 13$
$\Rightarrow 2197 = 793 + 39ab$
$\Rightarrow 39ab = 2197 - 793 = 1404$
$\Rightarrow ab = \frac{1404}{39} = 36$
$\therefore (a+b)^2 = (a+b)^2 - 4ab$
$= (13)^2 - 4 \times 36$
$= 169 - 144 = 25$
$\Rightarrow a - b = \sqrt{25} = 5$

37. (3) 243000 = 243 × 1000
= 3 × 3 × 3 × 3 × 3 × 10 × 10 × 10
= $3^3 \times 3^2 \times 10^3$
$\therefore$ Required number = 3^2 = 9

38. (4) Expression

$= \left(2 - \frac{1}{3}\right)\left(2 - \frac{3}{5}\right)\left(2 - \frac{5}{7}\right)....\left(2 - \frac{997}{999}\right)$

$= \left(\frac{6-1}{3}\right)\left(\frac{10-3}{5}\right)$

$\left(\frac{14-5}{7}\right)...\left(\frac{1998-997}{999}\right)$

$= \frac{5}{3} \times \frac{7}{5} \times \frac{9}{7} \times .... \times \frac{1001}{999}$

$= \frac{1001}{3}$

39. (4) $\sqrt[3]{79507} = 43$

$\therefore \sqrt[3]{79.507} + \sqrt[3]{0.079507} + \sqrt[3]{0.000079507}$
= 4.3 + 0.43 + 0.043
= 4.773

40. (4)

2	13824
2	6912
2	3456
2	1728
2	864
2	432
2	216
2	108
2	54
3	27
3	9
	3

$\therefore$ 13824 = $2^3 \times 2^3 \times 2^3 \times 3^3$
$\therefore \sqrt[3]{-13824}$
$= \sqrt[3]{(-1)^3 2^3 \times 2^3 \times 2^3 \times 3^3}$
= (–1) 2 × 2 × 2 × 3 = –24

41. (1) $(105)^3 = (100+5)^3$
$= (100)^3 + (5)^3 + 3 \times 100 \times 5 (100 + 5)$
$[\because (a+b)^3 = a^3 + b^3 + 3ab(a+b)]$
= 1000000 + 125 + 1500 × 105
= 1000000 + 125 + 157500
= 1157625

42. (2)

2	37044
2	18522
3	9261
3	3087
3	1029
7	343
7	49
	7

$\therefore$ 37044 = 3 × 3 × 3 × 7 × 7 × 7 × 2 × 2
= $3^3 \times 7^3 \times 2^2$
$\therefore$ Required number = 2 × 2
= 4

43. (1) $(997)^3 = (1000-3)^3$
$= (1000)^3 - (3)^3 - 3 \times 1000 \times 3 (1000 - 3)$
= 1000000000 – 27 – 9000 × 997
= 1000000000 – 27 – 8973000
= 991026973

44. (2) Let the numbers be $3x$ and $4x$.
According to the question,
$(3x)^3 + (4x)^3 = 5824$
$\Rightarrow 27x^3 + 64x^3 = 5824$
$\Rightarrow 91x^3 = 5824$
$\Rightarrow x^3 = \frac{5824}{91} = 64$
$\Rightarrow x = \sqrt[3]{64} = 4$
$\therefore$ Sum of numbers
$= 3x + 4x = 7x$
= 7 × 4 = 28

TYPE-V

1. (3) ? =

$$\frac{(0.0539 - 0.002) \times 0.4 + 0.56 \times 0.07}{0.04 \times 0.25}$$

$= \frac{0.0519 \times 0.4 + 0.0392}{0.01}$

$= \frac{0.02076 + 0.0392}{0.01}$

$= \frac{0.05996}{0.01} = 5.996$

TEST YOURSELF

1. Simplify :

$$\frac{3.5\times1.5}{0.025\div0.125\times7.5}\times\frac{1}{3+\frac{1}{1+\frac{1}{2}}}$$

(1) 0.9 (2) 0.95
(3) 0.095 (4) 0.082

2. Simplify :

$$\frac{3}{4+\frac{5}{6+\frac{7}{8}}}-\frac{3}{5}\div\frac{1}{2}\text{ of }1\frac{1}{5}+1\frac{3}{26}$$

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

3. Simplify :

$$999\frac{998}{999}\times999+999$$

(1) 999997 (2) 999998
(3) 99998 (4) 999994

4. Simplify

$$2\div\frac{3}{17}\text{ of }\left(2\frac{3}{4}+3\frac{5}{8}\right)+\frac{2}{5}\div2\frac{1}{5}+\frac{2}{9}$$

(1) $\frac{9}{17}$ (2) $\frac{7}{11}$
(3) $\frac{13}{11}$ (4) $\frac{24}{11}$

5. Simplify :

$$120+3\,of\,5\div\left[7\times2\left\{10\div5\left(24-10\times2+\overline{7+3\times10\div5}\right)\right\}\right]$$

(1) 120.03 (2) 116.04
(3) 118 (4) 125

6. $\frac{2.5\times3+7.5\div2.5-0.5\text{ of }3}{47+12\div1.5-6\text{ of }2\times3}=?$

(1) $\frac{3}{17}$ (2) $\frac{9}{19}$
(3) $\frac{4}{11}$ (4) $\frac{3}{11}$

7. Simplilfy :

$$\frac{17}{7+\frac{3}{4-2\frac{3}{4}}}\times\frac{2021}{2193}\div\left(1\frac{37}{48}-\frac{15}{16}\right)$$

$$+\frac{3}{4}\,of\,\frac{3\frac{1}{2}}{2\frac{1}{2}}$$

(1) $2\frac{1}{8}$ (2) $4\frac{1}{8}$
(3) $3\frac{1}{8}$ (4) $3\frac{1}{7}$

8. $\frac{1\frac{7}{9}\text{ of }\frac{27}{64}}{\frac{11}{12}\times9\frac{9}{11}}\div\frac{4\frac{4}{7}\text{ of }\frac{21}{160}}{2\frac{5}{6}\div2\frac{2}{15}}=?$

(1) $\frac{425}{2344}$ (2) $\frac{425}{2434}$
(3) $\frac{421}{2443}$ (4) $\frac{425}{2304}$

9. Simplify :

$$\frac{8\frac{3}{5}+7\frac{3}{4}+5\frac{2}{3}-4\frac{1}{2}}{13-11\frac{9}{10}+10\frac{7}{9}-9\frac{17}{20}}\,of\,\frac{2}{11}\,of\,365$$

(1) $573\frac{3}{11}$ (2) $571\frac{7}{11}$
(3) $572\frac{3}{11}$ (4) $575\frac{4}{11}$

10. Simplify :

$$\frac{1}{8}of\left(\frac{1}{10}-\frac{1}{11}\right)\div\frac{\frac{1}{7}-\frac{1}{9}\div\left(\frac{4}{9}+\frac{4}{11}\right)}{\frac{1}{7}+\frac{1}{9}\div\left(\frac{4}{9}-\frac{4}{11}\right)}\times\frac{\frac{1}{3}+\frac{1}{7}\div\left(\frac{1}{7}-\frac{1}{9}\right)}{\left(\frac{1}{3}+\frac{1}{7}\right)\div\frac{1}{7}-\frac{1}{9}}$$

(1) $\frac{85}{176}$ (2) $\frac{83}{176}$
(3) 83 (4) 86

11. Simplify

$$\frac{2\frac{4}{9}\div3\frac{2}{3}\text{ of }\frac{2}{5}\times\frac{3}{5}+1\frac{1}{9}}{1\frac{1}{9}\times\frac{3}{4}\text{ of }1\frac{2}{5}\div\frac{21}{38}-\frac{1}{3}}-\frac{5\frac{1}{2}-\frac{3}{4}}{2\frac{1}{5}\times1\frac{9}{11}}$$

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

12. Simplify :

$$\frac{\frac{5}{6}+\frac{7}{8}\,of\,\frac{4}{5}\div\frac{3}{4}\,of\,\frac{9}{10}}{8\frac{1}{3}-\left(\frac{4}{1-\frac{7}{8}}\,of\,2\frac{1}{4}\right)\div\frac{7}{9}\,of\,12}\,of\,6\frac{1}{2}+5\frac{1}{9}$$

(1) $24\frac{1}{4}$ (2) $24\frac{3}{4}$
(3) $22\frac{1}{2}$ (4) $23\frac{1}{3}$

13. Simplify :

$$\frac{\frac{2}{3}\div\frac{3}{4}\text{of}\frac{5}{6}}{\frac{2}{3}\div\frac{3}{4}\times\frac{5}{6}}+\frac{2+2\times2}{2\div2\times2}\div\frac{\frac{1}{2}\div\frac{1}{2}\text{of}\frac{1}{2}}{\frac{1}{2}+\frac{1}{2}\text{of}\frac{1}{2}}$$

(1) 2 (2) 2.5
(3) 4 (4) 4.5

14. Simplify :

$$\frac{5+5\times5}{5\times5+5}\times\frac{\frac{1}{5}\div\frac{1}{5}\,of\,\frac{1}{5}}{\frac{1}{5}\,of\,\frac{1}{5}\div\frac{1}{5}}\times\left(5-\frac{1}{5}\right)\times\frac{1}{\frac{46}{5}-\frac{3}{1-\frac{2}{3}}}$$

(1) 400 (2) 500
(3) 600 (4) 300

15. Simplify $1+\frac{1}{1+\frac{1}{1+\frac{1}{9}}}$

(1) $1\frac{9}{19}$ (2) $1\frac{10}{19}$
(3) $2\frac{9}{19}$ (4) $3\frac{9}{19}$

16. Compute the following :

$$7+\frac{2}{5+\frac{3}{4+\frac{2}{3+\frac{1}{4}}}}$$

(1) $3\frac{40}{113}$ (2) $6\frac{40}{113}$
(3) $7\frac{40}{113}$ (4) $5\frac{40}{113}$

17. Simplify :

$$7\frac{1}{2}-\left[2\frac{1}{4}\div\left\{1\frac{1}{4}-\frac{1}{2}\left(1\frac{1}{2}-\frac{1}{3}-\frac{1}{6}\right)\right\}\right]$$

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

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

18. Simplify :

$$3\div\left[(8-5)\div\left\{(4-2)\div\left(2+\frac{8}{13}\right)\right\}\right]=?$$

(1) $\frac{17}{13}$ (2) $\frac{13}{17}$

(3) $\frac{15}{17}$ (4) $\frac{17}{15}$

19. Simplify

$$5\frac{1}{2}-\left[2\frac{1}{3}\div\left\{\frac{3}{4}-\frac{1}{2}\left(\frac{2}{3}-\overline{\frac{1}{6}-\frac{1}{8}}\right)\right\}\right]$$

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

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

SHORT ANSWERS

1. (2)	**2.** (1)	**3.** (2)	**4.** (4)
5. (1)	**6.** (2)	**7.** (3)	**8.** (4)
9. (1)	**10.** (1)	**11.** (2)	**12.** (2)
13. (2)	**14.** (3)	**15.** (2)	**16.** (3)
17. (1)	**18.** (2)	**19.** (3)	

EXPLANATIONS

1. (2) Expression =

$$\frac{3.5\times1.5}{0.025\times\frac{1}{0.125}\times7.5}\times\frac{1}{3+\frac{1}{1+\frac{1}{2}}}$$

$$=\frac{3.5\times1.5\times125}{25\times7.5}\times\frac{1}{3+\frac{1}{\frac{3}{2}}}$$

$$=3.5\times\frac{1}{3+\frac{2}{3}}=3.5\times\frac{1}{\frac{9+2}{3}}$$

$$=\frac{3.5\times3}{11}=\frac{10.5}{11}=0.95$$

2. (1) $\frac{3}{4+\frac{5}{6+\frac{7}{8}}}=\frac{3}{4+\frac{5}{\frac{48+7}{8}}}$

$$=\frac{3}{4+\frac{5\times8}{55}}$$

$$=\frac{3}{4+\frac{8}{11}}$$

$$=\frac{3}{\frac{44+8}{11}}=\frac{3\times11}{52}=\frac{33}{52}$$

$\therefore$ Expression $=\frac{33}{52}-\frac{3}{5}\div\frac{1}{2}$ of $1\frac{1}{5}+1\frac{3}{26}$

$$=\frac{33}{52}-\frac{3}{5}\div\frac{1}{2}\times\frac{6}{5}+\frac{29}{26}$$

$$=\frac{33}{52}-\frac{3}{5}\times\frac{5}{3}+\frac{29}{26}$$

$$=\frac{33}{52}-1+\frac{29}{26}$$

$$=\frac{33-52+58}{52}=\frac{39}{52}=\frac{3}{4}$$

3. (2) $\left(999+\frac{998}{999}\right)999+999$

$= (999)^2 + 998 + 999$
$= (1000 - 1)^2 + 998 + 999$
$= 1000000 + 1 - 2000 + 998 + 999$
$= 999998$

4. (4) The given expression

$$=2\div\frac{3}{17}\text{ of }\left(\frac{11}{4}+\frac{29}{8}\right)+\frac{2}{5}\div\frac{11}{5}+\frac{2}{9}$$

$$=2\div\frac{3}{17}\text{ of }\left(\frac{22+29}{8}\right)+\frac{2}{5}\div\frac{11}{5}+\frac{2}{9}$$

$$=2\div\frac{3}{17}\text{ of }\frac{51}{8}+\frac{2}{5}\div\frac{11}{5}+\frac{2}{9}$$

$$=2\div\frac{3}{17}\times\frac{51}{8}+\frac{2}{5}\div\frac{11}{5}+\frac{2}{9}$$

$$=2\div\frac{9}{8}+\frac{2}{5}\div\frac{11}{5}+\frac{2}{9}$$

$$=2\times\frac{8}{9}+\frac{2}{5}\times\frac{5}{11}+\frac{2}{9}$$

$$=\frac{16}{9}+\frac{2}{11}+\frac{2}{9}=\frac{176+18+22}{99}$$

$$=\frac{216}{99}=\frac{24}{11}$$

5. (1) The given expression

$120 + 3 \text{ of } 5 \div \left[7\times2\left\{10\div5\left(24-10\times2+\overline{7+3\times10\div5}\right)\right\}\right]$

$= 120 + 3 \text{ of } 5 \div \left[7\times2\left\{10\div5\left(24-10\times2+\overline{7+3\times2}\right)\right\}\right]$

$= 120 + 3 \text{ of } 5 \div \left[7\times2\left\{10\div5\left(24-10\times2+\overline{7+6}\right)\right\}\right]$

$= 120 + 3 \text{ of } 5 \div \left[7\times2\left\{10\div5\left(24-10\times2+13\right)\right\}\right]$

$= 120 + 3 \text{ of } 5 \div \left[7\times2\left\{10\div5\left(24-20+13\right)\right\}\right]$

$= 120 + 3 \text{ of } 5 \div \left[7\times2\left\{10\div5\times17\right\}\right]$

$= 120 + 3 \text{ of } 5 \div \left[7\times2\left\{10\times\frac{1}{5}\times17\right\}\right]$

$= 120 + 3 \text{ of } 5 \div \left[7\times2\left\{2\times17\right\}\right]$

$= 120 + 3 \text{ of } 5 \div \left[7\times2\times34\right]$

$= 120 + 3 \times 5 \div 476 = 120 + 15 \div 476$

$$=120+\frac{15}{476}=120\frac{15}{476}$$

$= 120.03$

6. (2) The given expression

$$=\frac{2.5\times3+7.5\div2.5-0.5\text{ of }3}{47+12\div1.5-6\text{ of }2\times3}$$

$$=\frac{2.5\times3+7.5\times\frac{1}{2.5}-0.5\times3}{47+12\times\frac{1}{1.5}-6\times2\times3}$$

$$=\frac{7.5+3-1.5}{47+8-36}=\frac{9}{19}$$

7. (3)

$$\frac{17}{7+\frac{3}{4-\frac{11}{4}}}\times\frac{2021}{2193}\div\left(\frac{85}{48}-\frac{15}{16}\right)+\frac{3}{4}\text{ of }\frac{3\frac{3}{2}}{\frac{5}{2}}$$

$$=\frac{17}{7+\frac{3}{\frac{16-11}{4}}}\times\frac{47}{51}\div\left(\frac{85}{48}-\frac{15}{16}\right)+\frac{3}{4}\text{ of }\frac{3\frac{3}{4}}{\frac{5}{2}}$$

$$=\frac{17}{7+\frac{12}{5}}\times\frac{47}{51}\div\left(\frac{85-45}{48}\right)+\frac{3}{4}\times\frac{15}{4}\times\frac{2}{5}$$