## Chapter-1 Rational Numbers

### Exercise = 1.1

1. (i) $\frac{1}{7}=\frac{2}{14}=\frac{3}{21}=\frac{4}{28}$ (ii) $\frac{2}{5}=\frac{4}{10}=\frac{6}{15}=\frac{8}{20}$

(iii) $\frac{-2}{3}=\frac{-4}{6}=\frac{-8}{12}=\frac{-6}{9}$ (iv) $\frac{-3}{4}=\frac{-6}{8}=\frac{-9}{12}=\frac{-12}{16}$

(v) $\frac{-1}{2}=\frac{-2}{4}=\frac{-3}{6}=\frac{-4}{8}$

**2.** (i) $\frac{\cancel{-48}^{\,4^2}}{\cancel{-72}_{\,6}}=\frac{2}{3}$ (ii) $\frac{\cancel{50}^{\,2}}{\cancel{-125}_{\,5}}=\frac{-2}{5}$ (iii) $\frac{\cancel{45}^{\,9}}{\cancel{-70}_{\,14}}=\frac{-9}{14}$

(iv) $\frac{\cancel{64}^{\,8^4}}{\cancel{-80}_{\,10^5}}=\frac{-4}{5}$ (v) $\frac{\cancel{-72}^{\,8^2}}{\cancel{-329}_{\,27\,9}}=\frac{2}{9}$ (vi) $\frac{\cancel{-100}}{\cancel{700}}=\frac{-1}{7}$

**3.** (i) $\frac{8}{7}<\frac{12}{9}$ (ii) $\frac{-2}{3}<\frac{4}{-7}$ (iii) $\frac{10}{11}<\frac{13}{-15}$

(iv) $0<\frac{-3}{8}$ (v) $-1>\frac{-15}{7}$ (vi) $\frac{-12}{17}>\frac{-15}{19}$

**4.** (i) $\frac{-2}{3}<\frac{4}{-9}<\frac{-5}{12}<\frac{7}{-18}$ (ii) $\frac{-3}{4}<\frac{-7}{16}<\frac{5}{12}<\frac{9}{-24}$

(iii) $\frac{-11}{15}<\frac{-7}{10}<\frac{-13}{20}<\frac{3}{-5}$ (iv) $\frac{-9}{14}<\frac{-4}{7}<\frac{-23}{42}<\frac{13}{-28}$

**5.** (i) $\frac{1}{3}>-2>\frac{-13}{6}>\frac{8}{-3}$ (ii) $\frac{-3}{10}>\frac{7}{-15}>\frac{-11}{20}>\frac{17}{-30}$

(iii) $\frac{-7}{12}>\frac{-13}{18}>\frac{-5}{6}>\frac{23}{-24}$ (iv) $\frac{-23}{33}>\frac{-19}{22}>\frac{-39}{44}>\frac{-10}{11}$

**6.** $\frac{-7}{5}$

(i) Numerator = – 14
Denominator = 2 × 5 = 10
$\frac{-7}{5}=\frac{-14}{10}$

(ii) Numerator = 28
Denominator = – 4 × 5 = –20
$\frac{-7}{5}=\frac{28}{-20}$

(iii) Numinator = –21
Denominator = 3 × 5 = 15
$\frac{-7}{5}=\frac{-21}{15}$

(iv) Numinator = 56
Denominator = –5 × 8 = – 40
$\frac{-7}{5}=\frac{56}{-40}$

**7.** (i) Denominator =7
Numinator = 4
$\frac{-4}{-7}=\frac{4}{7}$

(ii) Denominator = –14
Numinator = –4 × 2 = 8
$\frac{-4}{-7}=\frac{-8}{-14}$

(iii) Denominator = 42
Numinator = 6 × 4 = 24
$\frac{-4}{-7} = \frac{24}{42}$

(iv) Denominator = – 35
Numinator = – 5 × 4 = – 20
$\frac{-4}{-7} = \frac{-35}{-20}\ \frac{-20}{-35}$

**8.** (i) $x = \frac{3}{5},\ y = \frac{-4}{15}$

$|x+y| \leq |x|+|y|$

$\Rightarrow \left|\frac{3}{5}-\frac{4}{15}\right| \leq \left|\frac{3}{5}\right| + \left|\frac{-4}{15}\right| \qquad \Rightarrow \left|\frac{9-4}{15}\right| \leq \frac{3}{5}+\frac{-4}{15}$

$\Rightarrow \frac{5}{15} \leq \frac{9+4}{15} \qquad \Rightarrow \frac{1}{3} \leq \frac{13}{15}$

(ii) $x = \frac{-5}{12}, \quad y = \frac{-7}{18}$

$\Rightarrow \left|\frac{-5}{12}-\frac{7}{18}\right| \leq \left|\frac{-5}{12}\right| + \left|\frac{-7}{18}\right| \Rightarrow \frac{15+14}{36} \leq \frac{5}{12}+\frac{7}{18} \Rightarrow \frac{29}{36} \leq \frac{29}{36}$

**9.** $\left|\frac{-3}{4}\right| = \frac{3}{4}$

$\left|\frac{3}{4}\right| = \frac{3}{4}$ Hence, $\frac{-3}{4}, \frac{3}{4}$.

## Exercise = 1.2

**1.** (i) $\frac{-3}{4}+\frac{1}{4} = \frac{-3+1}{4} = \frac{-2}{4_2} = \frac{-1}{2}$

(ii) $\frac{-7}{11}+\frac{-5}{11} = \frac{-7-5}{11} = \frac{-12}{11}$

(iii) $\frac{-5}{8}+\frac{17}{8} = \frac{-5+17}{8} = \frac{12}{8} = \frac{3}{2}$

(iv) $\frac{-5}{16}+\frac{7}{24} = \frac{-15+14}{48} = \frac{-1}{48}$

(v) $\frac{7}{-18}+\frac{8}{27} = \frac{-21+16}{54} = \frac{-5}{54}$

(vi) $\frac{1}{-12}+\frac{2}{-15} = \frac{-5-4}{60} = \frac{-9^3}{60_{20}} = \frac{-3}{20}$

(vii) $-1+\frac{3}{4} = \frac{-4+3}{4} = \frac{-1}{4}$

(viii) $2+\frac{(-5)}{4} = \frac{8-5}{4} = \frac{3}{4}$

**2.** (i) $\frac{1}{3}-\frac{3}{4} = \frac{4-9}{12} = \frac{-5}{12}$

(ii) $\frac{1}{3}-\left(\frac{-5}{6}\right) = \frac{2+5}{6} = \frac{7}{6}$

(iii) $\frac{-3}{5}-\left(\frac{-8}{9}\right) = \frac{-27+40}{45} = \frac{13}{45}$

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

(v) $1-\left(\frac{-18}{11}\right) = \frac{11+18}{11} = \frac{29}{11}$

(vi) $0-\left(\frac{-13}{9}\right) = \frac{13}{9}$

(vii) $\frac{-6}{5}-\left(\frac{-32}{13}\right) = \frac{-72+160}{65} = \frac{88}{65}$

(viii) $\frac{-4}{7}-(-7) = \frac{-4+49}{7} = \frac{45}{7}$

**3.** (i) $\frac{4}{9} \to \frac{-4}{9}$ (ii) $\frac{-15}{17} \to \frac{15}{17}$ (iii) $\frac{11}{-15} \to \frac{11}{15}$ (iv) $\frac{-31}{-50} \to \frac{-31}{50}$

**4.** (i) $\frac{31}{33}$ (ii) $\frac{-1}{9}$ (iii) $\frac{7}{8}$ (iv) 8 (v) $\frac{7}{9}$

**5.** (i) Additive inverse (ii) Identity property

(iii) Commutative property (iv) Associative property

(v) Closure property

**6.** (i) $\frac{-11}{12}+\frac{3}{-8}+\frac{1}{4}$

$=\frac{-11}{12}-\frac{3}{8}+\frac{1}{4}=\frac{-22-9+6}{24}=\frac{-25}{24}$

(ii) $\frac{-7}{10}+\frac{13}{15}+\frac{27}{20}$

$=\frac{-42+52+81}{60}=\frac{-42+133}{60}=\frac{91}{60}$

(iii) $\frac{4}{7}+0+\frac{-8}{9}+\frac{-13}{7}+\frac{17}{21}$

$=\frac{4}{7}-\frac{8}{9}-\frac{13}{7}+\frac{17}{21}=\frac{36-56-117+51}{63}=\frac{87-173}{63}=\frac{86}{63}$

(iv) $\frac{-2}{7}+\frac{1}{4}+\frac{5}{8}-\frac{3}{4}$

$=\frac{-8+14+35-42}{56}=\frac{-1}{56}$

(v) $\frac{4}{7}+\frac{-8}{9}+\frac{-5}{21}+\frac{1}{3}$

$=\frac{4}{7}-\frac{8}{9}-\frac{5}{21}+\frac{1}{3}=\frac{36-56-15+21}{63}=\frac{-14^{2}}{63_{9}}=\frac{-2}{9}$

**7.** (i) $\frac{1}{2}+\frac{-3}{5}+\frac{3}{2}$

$=\frac{5-6+15}{10}=\frac{14^{7}}{10_{5}}=\frac{7}{5}$

(ii) $\frac{28}{17}+\frac{35}{17}+\frac{-16}{17}+\frac{-23}{17}$

$=\frac{28+35-16-23}{17}=\frac{24}{17}$

(iii) $\frac{2}{3}+\frac{-3}{5}+\frac{1}{6}+\frac{-8}{15}$

$=\frac{20-18+5-16}{30}=\frac{-9}{30}=\frac{-3}{10}$

(iv) $\frac{3}{5}+\frac{5}{3}+\frac{-11}{5}+\frac{-2}{3}$

$=\frac{9+25-33-10}{15}=\frac{-9^{3}}{15_{5}}=\frac{-3}{5}$

(v) $\frac{4}{3}+\frac{3}{5}+\frac{-2}{3}+\frac{-11}{5}$

$=\frac{20+9-10-33}{15}=\frac{-14}{15}$

(vi) $\frac{4}{9}+\frac{5}{3}+\frac{-4}{5}+\frac{7}{9}+\frac{-2}{3}+\frac{9}{5}$

$=\frac{20+75-36+35-30+81}{45}=\frac{145^{29}}{45_{9}}=\frac{29}{9}$

**8.** (i) $\frac{-5}{8}+\frac{-9}{13}=\frac{-9}{13}+\frac{-5}{8}$

$\frac{-65-56}{104}=\frac{-56-65}{104}\Rightarrow\frac{-121}{104}=\frac{-121}{104}$ LHS = RHS

(ii) $3+\frac{-7}{12}=\frac{-7}{12}+3$

$\frac{36-7}{12}=\frac{-7+36}{12}\Rightarrow\frac{29}{12}=\frac{29}{12}$ LHS = RHS

(iii) $\frac{2}{-7}+\frac{12}{-35}=\frac{12}{-35}+\frac{2}{-7}$

$\frac{-10-12}{35}=\frac{-12-10}{35}\Rightarrow\frac{-22}{35}=\frac{-22}{35}$ LHS = RHS

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

$\left(\frac{3-2}{6}\right)+\frac{3}{4}=\frac{-1}{3}+\left(\frac{2+3}{4}\right)\Rightarrow\frac{1}{6}+\frac{3}{4}=\frac{-1}{3}+\frac{5}{4}\quad\frac{2+9}{12}=\frac{-4+15}{12}\Rightarrow\frac{11}{12}=\frac{11}{12}$

LHS = RHS

(v) $\left(\frac{3}{4}+\frac{-2}{5}\right)+\frac{-7}{10}=\frac{3}{4}+\left(\frac{-2}{5}+\frac{-7}{10}\right)$

$\left(\frac{15-8}{20}\right)\frac{-7}{10}=\frac{3}{4}+\left(\frac{-4-7}{10}\right)\Rightarrow\frac{7}{20}-\frac{7}{10}=\frac{3}{4}-\frac{11}{10}\Rightarrow\frac{7-14}{20}=\frac{15-22}{20}\Rightarrow\frac{-7}{20}=\frac{-7}{20}$

LHS = RHS

(vi) $\left(\frac{-7}{11}+\frac{2}{-5}\right)+\frac{-13}{22}=\frac{-7}{11}+\left(\frac{2}{5}+\frac{-13}{22}\right)$

$\left(\frac{-35-22}{55}\right)-\frac{13}{22}=\frac{-7}{11}+\left(\frac{44-65}{110}\right)\Rightarrow\frac{-57}{55}-\frac{13}{22}=\frac{-7}{11}-\frac{21}{110}\Rightarrow\frac{-114-65}{110}=\frac{-70-21}{110}$

$\Rightarrow\frac{-179}{110}=\frac{-91}{110}$

LHS = RHS

**9.** (i) $x=\frac{-5}{12},\quad y=\frac{2}{3}$

$x+y=y+x$

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

$\frac{-5+8}{12}=\frac{8-15}{12}$

$\frac{3}{12}=\frac{3}{12}$

LHS = RHS

(ii) $x=\frac{-7}{18},\ y=\frac{-4}{15}$

$x+y=y+x$

$\frac{-7}{18}+\frac{-4}{15}=\frac{-4}{15}+\frac{-7}{18}$

$\frac{-3-24}{90}=\frac{-24-3}{90}$

$\frac{-27}{90}=\frac{-27}{90}$

LHS = RHS

**10.** (i) $x=\frac{-5}{12},\ y=\frac{2}{3}$

$x-y=\frac{-5}{12}-\frac{2}{3}=\frac{-5-8}{12}$

$=\frac{-13}{12}$ is a rational number

(ii) $x=\frac{7}{9},\ y=\frac{-2}{3}$

$x-y=\frac{7}{9}-\left(\frac{-2}{3}\right)=\frac{7}{9}+\frac{2}{3}=\frac{7+6}{9}$

$=\frac{13}{9}$ is rational number

**11.** (i) $x-y=\frac{-3}{2}\ \frac{-4}{5}$

$=\frac{-15-8}{10}=\frac{-23}{10}$

(ii) $x-y=\frac{5}{7}-\left(\frac{-8}{21}\right)=\frac{15+8}{21}=\frac{23}{21}$

$y-x=\frac{4}{5}-\left(-\frac{3}{2}\right)=\frac{8+15}{10}=\frac{23}{10}$ $\qquad$ $y-x=\frac{-8}{21}-\frac{5}{7}=\frac{-8-15}{21}=\frac{-23}{21}$

$x-y\neq y-x$ $\qquad$ $x-y\neq y-x$

**12.** $(x-y)-z=\left(\frac{2}{3}-\frac{13}{21}\right)-\frac{5}{7}$

$=\frac{14-13}{21}-\frac{5}{7}=\frac{1}{21}-\frac{5}{7}=\frac{1-15}{21}=\frac{-14^{2}}{\cancel{21}_{3}}=\frac{-2}{3}$

$x-(y-z)=\frac{2}{3}-\left(\frac{13}{21}-\frac{5}{7}\right)$

$=\frac{2}{3}-\left(\frac{13-15}{21}\right)=\frac{2}{3}+\frac{2}{21}=\frac{14+2}{21}=\frac{16}{21}$

$(x-y)-z\neq x-(y-z)$

**13.** (i) $-(x+y)=-\left(\frac{3}{4}+\frac{6}{7}\right)=-\left(\frac{21+24}{28}\right)=\frac{-45}{28}$

$(-x)+(-y)=\left(\frac{-3}{4}\right)+\left(\frac{-6}{7}\right)=\frac{-21-24}{28}=\frac{-45}{28}$

(ii) $-(x+y)=-\left(\frac{-3}{4}-\frac{6}{7}\right)=-\left(\frac{-21-24}{28}\right)=\frac{45}{28}$

$(-x)+(-y)=\frac{3}{4}+\frac{6}{7}=\frac{21+24}{28}=\frac{45}{28}$

**14.** Closure property—

(i) $\frac{3}{5}+\frac{7}{9}=\frac{27+35}{45}=\frac{62}{45}$ $\qquad$ (ii) $\frac{-2}{7}+\frac{11}{3}=\frac{-6+77}{21}=\frac{71}{21}$ $\qquad$ (iii) $\frac{7}{4}-\frac{5}{6}=\frac{21-10}{12}=\frac{11}{12}$

Commutative property—

(i) $\frac{3}{5}+\frac{7}{9}=\frac{7}{9}+\frac{3}{5}$ $\qquad$ (ii) $\frac{-2}{7}+\frac{11}{3}=\frac{11}{3}+\frac{-2}{7}$ $\qquad$ (iii) $\frac{7}{4}+\frac{-5}{6}=\frac{-5}{6}+\frac{7}{4}$

## Exercise = 1.3

**1.** (i) $\frac{\cancel{3}}{5}\times\frac{-7}{\cancel{18}_{6}}=\frac{-7}{30}$ $\qquad$ (ii) $\frac{-9}{2}\times\frac{5}{4}=\frac{-45}{8}$ $\qquad$ (iii) $\frac{\cancel{-6}^{2}}{11}\times\frac{-5}{\cancel{3}}=\frac{10}{11}$

(iv) $\frac{-2}{\cancel{3}}\times\frac{\cancel{6}^{2}}{7}=\frac{-4}{7}$ $\qquad$ (v) $\frac{\cancel{-12}^{7}}{\cancel{5}}\times\frac{\cancel{10}^{2}}{\cancel{-3}}=8$ $\qquad$ (vi) $\frac{\cancel{25}^{5}}{\cancel{-9}_{3}}\times\frac{\cancel{3}}{\cancel{-10}_{2}}=\frac{5}{6}$

(vii) $\frac{\cancel{5}}{\cancel{-18}_{2}}\times\frac{\cancel{-9}}{\cancel{20}_{4}}=\frac{1}{8}$ $\qquad$ (viii) $\frac{\cancel{-13}}{\cancel{15}_{3}}\times\frac{\cancel{-25}^{5}}{\cancel{20}_{2}}=\frac{5}{6}$ $\qquad$ (ix) $\frac{16}{\cancel{-21}_{3}}\times\frac{\cancel{14}^{2}}{5}=\frac{-32}{15}$

(x) $\frac{-7}{\cancel{6}}\times\cancel{24}^{4}=-28$ $\qquad$ (xi) $\frac{7}{\cancel{24}}\times(\cancel{-48})^{2}=-14$ $\qquad$ (xii) $\frac{-13}{\cancel{5}}\times(\cancel{-10})^{2}=26$

**2.** (i) $\frac{15}{7}\div\frac{-5}{7}=\frac{\cancel{15}^{3}}{\cancel{7}}\times\frac{\cancel{7}}{\cancel{-5}}=-3$ $\qquad$ (ii) $\frac{-1}{8}\div\frac{3}{4}=\frac{-1}{\cancel{8}_{2}}\times\frac{\cancel{4}}{3}=\frac{-1}{6}$

(iii) $-4 \div \frac{-3}{5} = -4 \times \frac{5}{-3} = \frac{20}{3}$

(v) $\frac{2}{3} \div \left(\frac{-4}{5}\right) = \frac{\cancel{2}}{3} \times \frac{-5}{\cancel{4}^{2}} = \frac{-5}{6}$

(vi) $\frac{-6}{7} - 15 = \frac{\cancel{-6}^{2}}{7} \times \frac{1}{\cancel{-15}_{5}} = \frac{2}{35}$

(vi) $\frac{3}{\cancel{13}} \div \frac{-4}{65} = \frac{3}{\cancel{13}} \times \frac{\cancel{65}^{5}}{-4} = \frac{-15}{4}$

**3.** (i) Distributive property (ii) Multiplicative property

(iii) Commutative property (iv) Associative property

(v) Identity property

**4.** (i) $\frac{3}{5} \times \left(\frac{\cancel{2}}{3} \times \frac{1}{\cancel{4}^{2}}\right) = \left(\frac{3}{5} \times \frac{1}{4}\right) \times \frac{-2}{3}$

$\frac{\cancel{3}}{5} \times \frac{-1}{\cancel{6}_{2}} = \frac{\cancel{3}}{\cancel{20}_{10}} \times \frac{\cancel{-2}}{\cancel{3}} \qquad \frac{-1}{10} = \frac{-1}{10}$ LHS = RHS

(ii) $\left(\frac{1}{3} \times \frac{-1}{2}\right) \times \frac{5}{6} = \left(\frac{5}{6} \times \frac{1}{3}\right) \times \frac{-1}{2}$

$\frac{-1}{6} \times \frac{5}{6} = \frac{5}{18} \times \frac{-1}{2} \Rightarrow \frac{-5}{36} = \frac{-5}{36}$

(iii) $\left(\frac{2}{5} \times \frac{-1}{3}\right) \times \left(\frac{1}{4} \times \frac{5}{6}\right) = \left(\frac{1}{-3} \times \frac{5}{6}\right) \times \left(\frac{\cancel{2}}{5} \times \frac{1}{\cancel{4}_{2}}\right)$

$\frac{\cancel{-2}}{\cancel{15}_{3}} \times \frac{\cancel{5}}{\cancel{24}_{12}} = \frac{\cancel{-5}}{18} \times \frac{1}{\cancel{10}_{2}} \Rightarrow \frac{-1}{36} = \frac{-1}{36}$ LHS = RHS

(iv) $\left(\frac{12}{13} \times \frac{1}{-5}\right) \times \frac{1}{2} = \frac{12}{13} \times \left(\frac{1}{-5} \times \frac{1}{2}\right)$

$= \frac{\cancel{-12}^{6}}{65} \times \frac{1}{\cancel{2}} = \frac{\cancel{12}^{6}}{13} \times \frac{-1}{\cancel{10}_{5}} \Rightarrow \frac{-6}{65} = \frac{-6}{65}$ LHS = RHS

(v) $\frac{2}{5} \times \left(\frac{1}{2} - \frac{1}{3} - \frac{1}{4}\right) = \frac{\cancel{2}}{5} \times \frac{1}{\cancel{2}} - \frac{2}{5} \times \frac{1}{3} - \frac{2}{5} \times \frac{1}{\cancel{4}_{2}}$

$\frac{2}{5} \times \left(\frac{6-4-3}{12}\right) = \frac{1}{5} - \frac{2}{15} - \frac{1}{10} \qquad \frac{\cancel{2}}{5} \times \frac{-1}{\cancel{12}_{6}} = \frac{6-4-3}{30} \qquad \frac{-1}{30} = \frac{-1}{30}$ LHS = RHS

(vi) $\frac{3}{5} \times \left(\frac{7}{8} + \frac{1}{4}\right) = \frac{3}{5} \times \frac{7}{8} + \frac{3}{5} \times \frac{1}{4}$

$\frac{3}{5} \times \left(\frac{7+2}{8}\right) = \frac{21}{40} + \frac{3}{20} \qquad \frac{3}{5} \times \frac{9}{8} = \frac{21+6}{40} \qquad \frac{27}{40} = \frac{27}{40}$ LHS = RHS

**5.** (i) $\frac{\cancel{3}}{\cancel{14}_{2}} \times \frac{\cancel{-5}}{\cancel{9}_{3}} \times \frac{\cancel{-21}^{3}}{\cancel{10}_{5}} \times \frac{\cancel{4}^{2}}{\cancel{-3}} = -\frac{2}{3}$

(ii) $\frac{-9}{\cancel{11}} \times \frac{\cancel{13}}{\cancel{8}_{2}} \times \frac{\cancel{12}^{4}}{\cancel{13}} \times \frac{\cancel{22}^{2}}{\cancel{3}} = -9$

(iii) $\frac{-3}{2} \times \frac{5}{4} + \frac{\cancel{-3}}{2} \times \frac{-7}{\cancel{6}_{2}} = \frac{-15}{8} + \frac{7}{4} = \frac{-15+14}{8} = \frac{-1}{8}$

(iv) $\frac{\cancel{-5}}{9} \times \frac{4}{\cancel{15}_{3}} - \frac{\cancel{3}}{\cancel{10}_{2}} \times \frac{\cancel{-5}}{\cancel{9}_{3}} = \frac{-4}{27} + \frac{1}{60} = \frac{-8+9}{54} = \frac{1}{54}$

**6.** (i) $\frac{-7}{12} \div \frac{-2}{3} = \frac{-7}{\cancel{12}_{4}} \times \frac{\cancel{-3}}{2} = \frac{7}{8} \qquad \frac{7}{8} \rightarrow \frac{8}{7}$

(ii) $\left(\frac{3}{13}\right)-\frac{4}{65}=\frac{15-4}{65}=\frac{11}{65}\rightarrow\frac{65}{11}$

(iii) $\left|\frac{-3}{7}\right|=\frac{3}{7}\rightarrow\frac{7}{3}$ (iv) $-\left|\frac{6}{11}\right|=\frac{-6}{11}\rightarrow\frac{-11}{6}$

**7.** (i) $(x\times y)^{-1}=x^{-1}-y^{-1}$

$\left(\frac{11}{23}\times\frac{-17}{5}\right)^{-1}=\left(\frac{11}{23}\right)^{-1}-\left(\frac{-17}{5}\right)^{-1}$

$\left(\frac{-187}{115}\right)^{-1}=\frac{23}{11}+\frac{5}{17}$ $\frac{-115}{187}=\frac{391+55}{187}$ $\frac{-115}{187}\neq\frac{446}{187}$

(ii) $(x\div y)^{-1}=x^{-1}\div y^{-1}$

$\left(\frac{11}{23}\div\frac{-17}{5}\right)^{-1}=\left(\frac{11}{23}\right)^{-1}\div\left(\frac{-17}{5}\right)^{-1}$

$\left(\frac{11}{23}\times\frac{5}{-17}\right)^{-1}=\frac{23}{11}\times\frac{-17}{5}$ $\left(\frac{55}{459}\right)^{-1}=\frac{459}{55}$ $\frac{459}{55}=\frac{459}{55}$

LHS = RHS

**8.** $(x-y)^{-1}=\left(\frac{-7}{19}-\frac{-11}{13}\right)^{-1}=\left(\frac{-91+209}{247}\right)^{-1}=\left(\frac{118}{247}\right)^{-1}=\frac{247}{118}$

$x^{-1}-y^{-1}=\left(\frac{-7}{19}\right)^{1}-\left(\frac{-11}{13}\right)^{1}=\frac{-19}{7}+\frac{13}{11}=\frac{-209+91}{77}=\frac{-118}{77}$

**9.** (i) $\frac{-23}{17}$ (ii) $-38$ (iii) $\frac{15}{7}$ (iv) $\frac{25}{-16}$

**10.** (i) $\frac{24}{35}\div\frac{20}{21}=\frac{20}{21}\div\frac{24}{35}$

$\frac{\cancel{24}^{6}}{\cancel{35}_{5}}\times\frac{\cancel{21}^{3}}{\cancel{20}_{5}}\times\frac{\cancel{20}^{5}}{\cancel{21}^{3}}\times\frac{35^{5}}{24_{6}}$ $\frac{18}{25}\neq\frac{25}{18}$ False

(ii) $\left(\frac{2}{5}\div\frac{26}{15}\right)\div\frac{39}{12}=\frac{2}{5}\div\left(\frac{26}{15}\div\frac{39}{12}\right)$

$\frac{\cancel{2}}{\cancel{5}}\times\frac{\cancel{15}^{3}}{\cancel{26}_{13}}\times\frac{12}{\cancel{39}_{13}}=\frac{2}{\cancel{5}}\times\frac{\cancel{15}^{3}}{\cancel{26}_{13}}\times\frac{39}{\cancel{12}_{4}}$ $\Rightarrow\frac{12}{169}\neq\frac{39}{52}$ False

(iii) $\frac{26}{15}\div\left(\frac{1}{5}+\frac{7}{3}\right)=\frac{26}{15}\div\frac{1}{5}+\frac{26}{15}\div\frac{7}{3}$

$\frac{26}{\cancel{15}}\times\frac{\cancel{15}}{38}=\frac{26}{\cancel{15}_{3}}\times\cancel{5}+\frac{26}{\cancel{15}_{5}}\times\frac{\cancel{3}}{7}$ $\frac{26}{38}\neq\frac{26}{3}+\frac{26}{35}$ $\frac{26}{38}\neq\frac{988}{105}$ False

(iv) $\frac{-22}{7}\div\left(\frac{9}{14}-\frac{5}{21}\right)=\left(\frac{-22}{7}\div\frac{9}{14}\right)-\left(\frac{-22}{7}\div\frac{5}{21}\right)$

$\frac{-22}{7}\div\left(\frac{27-10}{42}\right)=\frac{-22}{\cancel{7}}\times\frac{\cancel{14}^{2}}{9}+\frac{22}{\cancel{7}}\times\frac{\cancel{21}^{3}}{5}$

$\frac{-22}{\cancel{7}}\times\frac{\cancel{42}^{6}}{17}=\frac{-44}{9}+\frac{66}{5}$ $\frac{-132}{17}=\frac{-220+594}{45}$ $\frac{-132}{17}\neq\frac{374}{45}$ False

(v) $\left(\frac{9}{5}+\frac{4}{25}\right)\div\left(\frac{-5}{7}\right)=\frac{9}{5}\div\left(\frac{-5}{7}\right)+\frac{4}{25}\div\left(\frac{-5}{7}\right)$

$\frac{45+4}{25}\times\frac{-7}{5}=\frac{9}{5}\times\frac{-7}{5}+\frac{-4}{25}\times\frac{7}{-5}$

$\frac{49}{25}\times\frac{-7}{5}=\frac{-63}{25}-\frac{28}{125}\qquad\frac{-343}{125}=\frac{-315-28}{125}\qquad\frac{-343}{125}=\frac{-343}{125}$ True

**12.** (i) 1 (ii) $\frac{-11}{13}$ (iii) $\frac{-13}{15}$ (iv) 1 (v) $\frac{-21}{31}$ (vi) $\frac{-27}{29}$

**13.** (a) (i) $x\times y=y\times x$

$\frac{1}{\cancel{2}}\times\frac{\cancel{4}^{2}}{3}=\frac{\cancel{4}^{2}}{3}\times\frac{1}{\cancel{2}}\qquad\frac{2}{3}=\frac{2}{3}$

(ii) $0\times\frac{-8}{3}=\frac{-8}{3}\times 0\qquad 0=0$

(b) (i) $x\times(y\times z)=(x\times y)\times z$

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

$\frac{1}{\cancel{2}}\times\frac{\cancel{-4}^{2}}{5}=\frac{2}{\cancel{3}}\times\frac{\cancel{-3}}{5}\qquad\frac{-2}{5}=\frac{-2}{5}$

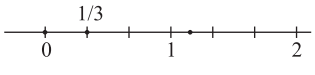
(ii) $0\times\left(\frac{-8}{3}\times 1\right)=\left(0\times\frac{-8}{3}\right)\times 1\qquad 0=0$

**14.** (i) 1 (ii) not (iii) 1 or –1 (iv) not

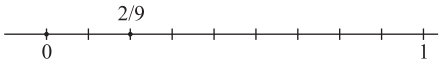
(v) $\frac{1}{a}$ (vi) a (vii) Positive (viii) Negative

## Exercise = 1.4

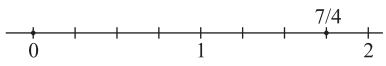
**1.** (i) $\frac{1}{3}$



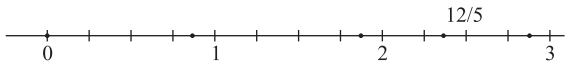

(ii) $\frac{2}{9}$



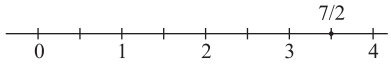

(iii) $1\frac{3}{4}=\frac{7}{4}$



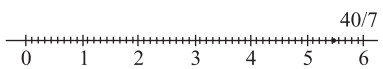

(iv) $2\frac{2}{5}=\frac{12}{5}$



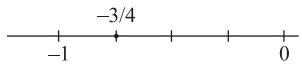

(v) $3\frac{1}{2}=\frac{7}{2}$



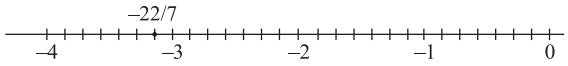

(vi) $5\frac{5}{7}=\frac{40}{7}$



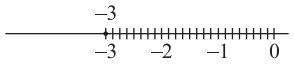

(vii) $\frac{-3}{4}$



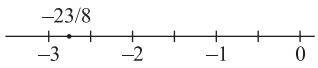
(viii) $-3\frac{1}{7}=\frac{-22}{7}$




(ix) $-3$




(x) $-2\frac{7}{8}=\frac{-23}{8}$




**2.** (i) $a=\frac{1}{5},\ b=\frac{1}{4}$

$\frac{a+b}{2}=\frac{1}{2}\left(\frac{1}{5}+\frac{1}{4}\right)=\frac{1}{2}\left(\frac{4+5}{20}\right)=\frac{9}{40}$ $\qquad \frac{1}{5},\frac{9}{40},\frac{1}{4}$

(ii) $a=\frac{1}{8},\quad b=\frac{7}{12}$

$\frac{a+b}{2}=\frac{1}{2}\left(\frac{1}{8}+\frac{7}{12}\right)=\frac{1}{2}\left(\frac{3+14}{24}\right)=\frac{17}{48}$ $\qquad \frac{1}{8},\frac{17}{48},\frac{7}{12}$

(iii) $a=\frac{-5}{6},\ b=\frac{-2}{5}$

$\frac{a+b}{2}=\frac{1}{2}\left(\frac{-5}{6}-\frac{2}{5}\right)=\frac{1}{2}\left(\frac{-25-12}{30}\right)=\frac{-37}{60}$ $\qquad \frac{-5}{6},\frac{-37}{60},\frac{-2}{5}$

(iv) $a=\frac{-4}{9},\ b=\frac{11}{6}$

$\frac{a+b}{2}=\frac{1}{2}\left(\frac{-4}{9}+\frac{11}{6}\right)=\frac{1}{2}\left(\frac{-8+33}{18}\right)=\frac{25}{36}$ $\qquad \frac{-4}{9},\frac{25}{36},\frac{11}{6}$

**3.** $\frac{-2}{3}$ and $\frac{1}{4}$

$\frac{1}{2}\left(\frac{-2}{3}+\frac{1}{4}\right)=\frac{1}{2}\left(\frac{-8+3}{12}\right)=\frac{-5}{12}$ $\qquad \frac{1}{2}\left(\frac{-5}{12}+\frac{1}{4}\right)=\frac{1}{2}\left(\frac{-5+3}{12}\right)=\frac{1}{2}\times\frac{-2}{12}=\frac{-1}{12}$

$\frac{-2}{3},\frac{-5}{12},\frac{-1}{12},\frac{1}{4}$

**4.** $\frac{1}{4},\ \frac{5}{3}$

$\frac{1}{2}\left(\frac{1}{4}+\frac{5}{3}\right)=\frac{1}{2}\left(\frac{3+20}{12}\right)=\frac{23}{24}$ $\qquad \frac{1}{2}\left(\frac{1}{4}+\frac{23}{24}\right)=\frac{1}{2}\left(\frac{6+23}{24}\right)=\frac{29}{48}$

$\frac{1}{2}\left(\frac{23}{24}+\frac{5}{3}\right)=\frac{1}{2}\left(\frac{23+40}{24}\right)=\frac{63}{48}$ $\qquad \frac{1}{4},\frac{29}{48},\frac{23}{24},\frac{63}{48},\frac{5}{3}$

**5.** $-4$ and $\frac{1}{3}$

$\frac{1}{2}\left(-4+\frac{1}{3}\right)=\frac{1}{2}\left(\frac{-12+1}{3}\right)=\frac{11}{6}$ $\qquad \frac{1}{2}\left(-4+\frac{-11}{6}\right)=\frac{1}{2}\left(\frac{-24-11}{6}\right)=\frac{-35}{12}$

$\frac{1}{2}\left(\frac{-11}{6}-\frac{35}{12}\right)=\frac{1}{2}\left(\frac{-22-35}{12}\right)=\frac{-57}{24}$ $\qquad \frac{1}{2}\left(\frac{-57}{24}+\frac{1}{3}\right)=\frac{1}{2}\left(\frac{-57+8}{24}\right)=\frac{-49}{48}$

**6.** $\frac{1}{6}$ and $\frac{1}{3}$

$\frac{1}{2}\left(\frac{1}{6}+\frac{1}{3}\right)=\frac{1}{2}\left(\frac{1+2}{6}\right)=\frac{1}{2}\times\frac{3}{6_2}=\frac{1}{4}$ $\frac{1}{2}\left(\frac{1}{6}+\frac{1}{4}\right)=\frac{1}{2}\left(\frac{2+3}{12}\right)=\frac{5}{24}$

$\frac{1}{2}\left(\frac{5}{24}+\frac{1}{3}\right)=\frac{1}{2}\left(\frac{5+8}{24}\right)=\frac{13}{48}$

**7.** $\frac{-1}{3}$ and $\frac{1}{2}$

$\frac{1}{2}\left(\frac{-1}{3}+\frac{1}{2}\right)=\frac{1}{2}\left(\frac{-2+3}{6}\right)=\frac{1}{12}$ $\frac{1}{2}\left(\frac{-1}{3}+\frac{1}{12}\right)=\frac{1}{2}\left(\frac{-4+1}{12}\right)=\frac{-3}{2\times12_4}=\frac{-1}{8}$

$\frac{1}{2}\left(\frac{1}{12}-\frac{1}{8}\right)=\frac{1}{2}\left(\frac{2-3}{24}\right)=\frac{-1}{48}$ $\frac{1}{2}\left(\frac{-1}{8}+\frac{1}{2}\right)=\frac{1}{2}\left(\frac{-1+4}{8}\right)=\frac{3}{16}$

**8.** Do yourself.

**9.** Do yourself.

## Exercise = 1.5

**1.** $0-\left(\frac{-4}{5}\right)=\frac{4}{5}$ **2.** $\frac{3}{7}-\frac{1}{3}=\frac{9-7}{21}=\frac{2}{21}$

**3.** $\frac{1}{-3}+\frac{-2}{3}=\frac{-1-2}{3}=\frac{-3}{3}=-1$

$\frac{-1}{5}+\frac{-1}{7}=\frac{-7-5}{35}=\frac{-12}{35}$ $-1-\left(\frac{-12}{35}\right)=-1+\frac{12}{35}=\frac{-35+12}{35}=\frac{-23}{35}$

**4.** $\frac{-5}{7}\div\left(\frac{-15}{28}\right)=\frac{-\cancel{5}}{\cancel{7}}\times\frac{\cancel{28}^{7}}{\cancel{15}_{3}}=\frac{4}{3}$ **5.** $\frac{-8}{9}\div\left(\frac{-4}{15}\right)=\frac{-\cancel{8}^{2}}{\cancel{9}^{3}}\times\frac{\cancel{15}^{5}}{\cancel{-4}}=\frac{10}{3}$

**6.** $\frac{7}{-9}\div-3=\frac{7}{-9}\times\frac{-1}{3}=\frac{7}{27}$

**7.** $\frac{4}{5}\times m=\frac{7}{8}$ $m=\frac{7}{8}\times\frac{5}{4}=\frac{35}{32}$

**8.** $\frac{5}{6}\div\left(\frac{3}{5}\right)=\frac{5}{6}\times\frac{5}{3}=\frac{25}{18}$

**9.** Cost of potatoes $=\cancel{10}^{5}\times\frac{5}{\cancel{2}}=25$ Rs

Cost of tomatoes $=\frac{\cancel{184}^{23}}{\cancel{11}}\times\frac{\cancel{11}}{8}=23$ Rs

Total money = 25 + 23 = 48 Rs

**10.** Area $=6\frac{3}{4}\times3\frac{1}{5}=\frac{27}{\cancel{4}}\times\frac{\cancel{16}^{4}}{5}=\frac{108}{5}\ m^2$

**11.** No. of pieces $=44\div5\frac{1}{6}=44\times\frac{6}{31}$

**12.** Other edge $=45\frac{5}{16}\div6\frac{1}{4}$

$=\frac{\cancel{725}^{29}}{\cancel{16}_{4}}\times\frac{\cancel{4}}{\cancel{25}}=\frac{29}{4}=7\frac{1}{4}$ m

**13.** Area $= 5\frac{1}{4} \times 2\frac{1}{3} = \frac{\cancel{21}^{7}}{4} \times \frac{7}{\cancel{3}} = \frac{49}{4}\ m^2$

Perimeter $= 2\left(5\frac{1}{4} + 2\frac{1}{3}\right) = 2\left(\frac{21}{4} + \frac{7}{3}\right) = \cancel{2}\left(\frac{63+28}{\cancel{12}_{6}}\right) = \frac{91}{6}$ m

**14.** Speed $= \frac{350}{3\frac{1}{2}} = \frac{\cancel{350}^{50}}{\cancel{7}} \times \frac{2}{\cancel{1}} = 100$ km/hrs

Distance = 100 × 5 = 500 km

## Chapter-2 Exponents and Powers

### Exercise = 2.1

**1.** (i) Base = 3, Exp. = 5 (ii) Base = – 5, Exp. = 5

(iii) Base $= \frac{1}{5}$, Exp. = 6 (iv) Base $= \frac{2}{7}$, Exp. = 5

(v) Base $= \frac{-3}{5}$, Exp.= 3 (vi) Base = 13, Exp. = – 5

**2.** (i) $5 \times 5 \times 5 \times 5 \times 5 \times 5 = 5^6$ (ii) $(-2)\times(-2)\times(-2)\times(-2)\times(-2)\times(-2) = (-2)^6$

(iii) $\frac{2}{7}\times\frac{2}{7}\times\frac{2}{7}\times\frac{2}{7} = \left(\frac{2}{7}\right)^4$ (iv) $\frac{81}{625} = \frac{3\times3\times3\times3}{5\times5\times5\times5} = \left(\frac{3}{5}\right)^4$

(v) $\frac{729}{4096} = \frac{3\times3\times3\times3\times3\times3}{4\times4\times4\times4\times4\times4} = \left(\frac{3}{4}\right)^6$ (vi) $\frac{1}{6561} = \frac{1}{9\times9\times9\times9} = \left(\frac{1}{9}\right)^4$

**3.** (i) $4^2 \times \frac{1}{4^5} \times (4^3)^4 = 4^2 \times 4^{-5} \times 4^{12} = 4^{2-5+12} = 4^9$

(ii) $(-6)^4 \times (-6)^3 \times (-6)^2 = (-6)^{4+3+2} = (-6)^9$

(iii) $\left(\frac{2}{5}\right)^2 \times \left(\frac{2}{5}\right)^3 \times \left(\frac{2}{5}\right)^4 = \left(\frac{2}{5}\right)^{2+3+7} = \left(\frac{2}{5}\right)^9$

(iv) $\left[\left(\frac{1}{4}\right)^1\right]^2 = \left(\frac{1}{4}\right)^2$ (v) $\left(\frac{1}{5}\right)^3 \times \left(\frac{1}{5}\right)^7 \times \left(\frac{1}{5}\right) = \left(\frac{1}{5}\right)^{11}$

**4.** (i) $2^{x-2} = 4$

$2^{x-2} = 2^2$ $x - 2 = 2$ $x = 2 + 2$ $x = 4$

(ii) $2^{5n} \div 2^x = 2^8$

$2^{5-x} = 2^8$ $2^{4x} = 2^8$ 4 x = 8 x = 2

(iii) $(2)^x = (2^3)^6$

$2^x = 2^{18}$ x = 18

(iv) $27^x = \frac{9^x}{3}$

$(3^3)^x = (3^2)^x - 3$ $3^{3x} = 3^{2x-1}$ $3x = 2x - 1$ $3x - 2x = 1$ x = – 1

**5.** (i) $6^{15} \div 6^7 = 6^{15-7} = 6^8$

(ii) $\left(\frac{2}{5}\right)^3 \div \left(\frac{2}{5}\right)^5 = \left(\frac{2}{5}\right)^{-2} = \left(\frac{5}{2}\right)^2 = \frac{25}{4}$

(iii) $\left(\frac{-3}{8}\right)^5 \div \left(\frac{-3}{8}\right)^7 = \left(\frac{-3}{8}\right)^{5-7} = \left(\frac{-3}{8}\right)^{-2} = \left(\frac{-8}{3}\right)^2 = \frac{64}{9}$

(iv) $(ab)^6 \div (ab) = (ab)^{6-1} = (ab)^5 = a^5 b^5$

**6.** (i) $(a^3 \times a^2)^2 = (a^{3+2})^2 = (a^5)^2 = a^{10}$

(ii) $\frac{4^3 \times a^5 \times b^3}{4^2 \times a^3 \times b^2} = 4^{3-2}\, a^{5-3}\, b^{3-2} = 4a^2 b = 4a^2 b$

(iii) $(6^0 + 7^0)^2 = (1+1)^2 = 2^2 = 4$

**7.** $\frac{a}{b}\left(\frac{3}{4}\right)^2 \div \left(\frac{3}{4}\right)^0 = \frac{9}{4} \times 1 = \frac{9}{4} \qquad \left(\frac{a}{b}\right)^3 = \left(\frac{9}{4}\right)^3 = \frac{729}{64}$

**8.** b = 1.1

$b^2 - a(b-1)^2 = (1{\cdot}1)^2 - 9(1{\cdot}1-1)^2$

$= 1{\cdot}21 - 9 \times 0{\cdot}1 = 1{\cdot}21 - 0{\cdot}9 = 0.31$

## Exercise = 2.2

**1.** (i) $\left(\frac{3}{11}\right)^4 \div \left(\frac{3}{11}\right)^{-3} = \left(\frac{3}{11}\right)^{4+3} = \left(\frac{3}{11}\right)^7$ (ii) $\left(\frac{-5}{9}\right)^6 \div \left(\frac{-5}{9}\right)^5 = \left(\frac{-5}{9}\right)^{6-5} = \frac{-5}{9}$

(iii) $\left(\frac{-4}{7}\right)^{-4} \div \left(\frac{-4}{7}\right)^{-10} = \left(\frac{-4}{7}\right)^{-4+10} = \left(\frac{4}{-7}\right)^6$

**2.** (i) $\left[\left(\frac{2}{5}\right)^{-3}\right]^4 = \left(\frac{2}{5}\right)^{-12} = \left(\frac{5}{2}\right)^{12}$ (ii) $\left[\left(\frac{-6}{11}\right)^{-5}\right]^{-3} = \left(\frac{-6}{11}\right)^{15}$

(iii) $\left(\frac{-2}{3}\right)^{-4} \times \left(\frac{1}{8}\right)^{-4} = \left(\frac{-2}{3}\right)^{-4} \times \left[\left(\frac{1}{2}\right)^3\right]^{-4} = \left(\frac{-2}{3}\right)^{-4} \times \frac{1}{2^{-12}}$

(iv) $\left(\frac{5}{7}\right)^{-1} \times \left(\frac{7}{3}\right)^{-1} = \frac{\cancel{7}}{5} \times \frac{3}{\cancel{7}} = \frac{3}{5}$

**3.** (i) $\left(\frac{3}{8}\right)^{-2} \times \left(\frac{4}{5}\right)^{-3} = \left(\frac{8}{3}\right)^2 \times \left(\frac{5}{4}\right)^3 = \frac{\cancel{64}}{9} \times \frac{125}{\cancel{64}} = \frac{125}{9}$

(ii) $\left(\frac{-2}{7}\right)^{-4} \times \left(\frac{-5}{7}\right)^2 = \left(\frac{-7}{2}\right)^4 \times \left(\frac{-5}{7}\right)^2 = \frac{7 \times 7 \times \cancel{7 \times 7}}{2 \times 2 \times 2 \times 2} \times \frac{5 \times 5}{\cancel{7 \times 7}} = \frac{49 \times 25}{16} = \frac{1225}{16}$

(iii) $\left(\frac{-1}{4}\right)^{-3} \times \left(\frac{-1}{4}\right)^{-2} = \left(\frac{-1}{4}\right)^{-5}$ (iv) $\left\{\left(\frac{-3}{2}\right)^2\right\}^{-3} = \left(\frac{-3}{2}\right)^{-6}$

**4.** (i) $\left(2^{-1} \times 2^{-1}\right) \div 2^{-2} \qquad 2^{-1-1} \div 2^{-2} \qquad 2^{-2+2} = 2^0 = 1$

(ii) $\left(\frac{-2}{7}\right)^{-4} \times \left(\frac{-5}{7}\right)^2 \div \left(\frac{1}{4}\right)^{-2}$

$= \left(\frac{-7}{2}\right)^4 \times \left(\frac{5}{7}\right)^2 \times 4^2 = \frac{7^2}{2^4} \times 5^2 \times 4^2 = 7^2 \times 5^2 \times \frac{\cancel{2^2} \times 2^2}{\cancel{2^4}} = 49 \times 25 = 1225$

(iii) $\frac{8^{-1}\times 5^3}{2^{-4}} = \frac{5^3\times 2^4}{8} = \frac{5^3\times \cancel{16}^{\,2}}{\cancel{8}} = 125\times 2 = 250$

**5.** (i) $\left[(1^3+2^3+3^3+4^3)^{-1}\right]^0 = 1$

(ii) $\left[5^2\times 2^{-2}\right]^{-2} = \left[(5\times 2)^{-2}\right]^{-2} = (10^{-2})^{-2} = 10^{-4} = \frac{1}{10000}$

(iii) $(8^6\div 5^6)^{-3} \div \left(\frac{8}{5}\right)^{-18}$

$= \left[\left(\frac{8}{5}\right)^6\right]^{-3} \times \left(\frac{5}{8}\right)^{-18} = \left(\frac{8}{5}\right)^{-18} \times \left(\frac{8}{5}\right)^{18} = \left(\frac{8}{5}\right)^0 = 1$

**6.** (i) $7^0\times 9^0 = 1\times 1 = 1$ (ii) $(x^3)^0 = x^0 = 1$

(iii) $\left[\left(\frac{-1}{3}\right)^0 + \left(\frac{1}{5}\right)^0\right] \div 6^0 = 1 + 1 \div 1 = 2 \div 1 = 2$

(iv) $(1^0+2^0+3^0)\div(x^0+y^0) = (1+1+1)\div(1+1) = \frac{3}{2}$

**7.** (i) $\left(\frac{4}{5}\right)^{-7}\times\left(\frac{4}{5}\right)^4 = \left(\frac{4}{5}\right)^{-7+4} \Rightarrow \left(\frac{4}{5}\right)^{-7+4} = \left(\frac{4}{5}\right)^{-3} \Rightarrow \left(\frac{4}{5}\right)^{-3} = \left(\frac{4}{5}\right)^{-3}$

LHS = RHS

(ii) $\left(\frac{-2}{3}\right)^{-3}\times\left(\frac{-2}{3}\right)^{-2} = \left(\frac{-2}{3}\right)^{-3-2} \Rightarrow \left(\frac{-2}{3}\right)^{-3-2} = \left(\frac{-2}{3}\right)^{-5} \Rightarrow \left(\frac{-2}{3}\right)^{-5} = \left(\frac{-2}{3}\right)^{-5}$ LHS = RHS

(iii) $\left(\frac{-1}{3}\right)^{-3}\div\left(\frac{-1}{3}\right)^{-5} = \left(\frac{-1}{3}\right)^{-3+5} \Rightarrow \left(\frac{-1}{3}\right)^{-3+5} = \left(\frac{-1}{3}\right)^2 \Rightarrow \left(\frac{-1}{3}\right)^2 = \left(\frac{-1}{3}\right)^2$ LHS = RHS

(iv) $\left[\left(\frac{6}{7}\right)^{-2}\right]^3 = \left(\frac{6}{7}\right)^{-2\times 3} \Rightarrow \left(\frac{6}{7}\right)^{-6} = \left(\frac{6}{7}\right)^6$ LHS = RHS

(v) $(3\times 5)^{-2} = 3^{-2}\times 5^{-2}$ $(15)^{-2} = (3\times 5)^{-2}$

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

**8.** $\frac{p}{q} = \left(\frac{3}{2}\right)^{-2} \div \left(\frac{6}{7}\right)^0 = \left(\frac{3}{2}\right)^{-2} \div 1 = \left(\frac{2}{3}\right)^2$ $\left(\frac{p}{q}\right)^{-3} = \left[\left(\frac{2}{3}\right)^2\right]^{-3} = \left(\frac{2}{3}\right)^{-6}$

**9.** $\left(\frac{8}{11}\right)^{-5}\times\left(\frac{8}{11}\right)^m = \left(\frac{8}{11}\right)^{-2}$

$\left(\frac{8}{11}\right)^{-5+m} = \left(\frac{8}{11}\right)^{-2}$ $-5+m=-2$ m = 5 – 2 m = 3

**10.** $\left(\frac{2}{7}\right)^{-6}\times\left(\frac{14}{9}\right)^{-6} = \left(\frac{x}{y}\right)^{-6}$

$\frac{x}{y} = \frac{2}{\cancel{7}}\times\frac{\cancel{14}^{\,2}}{9}$ $\frac{x}{y} = \frac{4}{9}$

**11.** $\left(\frac{1}{2}\right)^{-2} \div \left(\frac{2}{3}\right)^{-3} = \left(\frac{1}{2}\right)^{-2} \times \left(\frac{2}{3}\right)^{3} = \left(\frac{1}{2}\right)^{-2} \times \frac{8}{27} = 4 \times \frac{8}{27} = \frac{32}{27}$

Reciprocal $= \frac{27}{32}$

**12.** $\left(\frac{9}{8}\right)^{-2} \div \left(\frac{-3}{2}\right)^{-3} = \left(\frac{9}{8}\right)^{-2} \times \left(\frac{-3}{2}\right)^{-3} = \left(\frac{8}{9}\right)^{2} \times \left(\frac{2}{-3}\right)^{3} = \frac{-8 \times 8}{9 \times 9} \times \frac{2 \times 2 \times 2}{3 \times 3 \times 3} = \frac{(-2)^9}{3^7}$

**13.** $\left(\frac{9}{8}\right)^{-2} \div \left(\frac{-3}{2}\right)^{-3} = \left(\frac{9}{8}\right)^{-2} \times \left(\frac{-3}{2}\right)^{-3} = \left(\frac{8}{9}\right)^{2} \times \left(\frac{2}{-3}\right)^{3} = \frac{-8 \times 8}{9 \times 9} \times \frac{2 \times 2 \times 2}{3 \times 3 \times 3} = \frac{(-2)^9}{3^7}$

## Exercise = 2.3

**1.** (i) 1 micron $= 10^{-6}$ m. (ii) $e^{-} = 1{\cdot}6 \times 10^{-19}$

(iii) Size $= 5 \times 10^{-7}$ m (iv) Size $= 1{\cdot}276 \times 10^{-5}$ m

(v) Thickness $= 0{\cdot}07 \times 10^{-3} = 7{\cdot}0 \times 10^{-5}$m

(vi) Thickness $= 0{\cdot}09 \times 10^{-3} = 9 \times 10^{-5}$ m

(vii) Thickness $= 25 \times 10^{-2} = 2{\cdot}5 \times 10^{-1}$ m

**2.** (i) $6{\cdot}74 \times 10^{-5}$ (ii) $4{\cdot}46 \times 10^{-3}$

(iii) $3{\cdot}162 \times 10^{7}$ (iv) $3{\cdot}57 \times 10^{9}$

(v) $8{\cdot}6 \times 10^{-12}$ (vi) $8{\cdot}5 \times 10^{-12}$

(vii) $7{\cdot}03 \times 10^{15}$ (viii) $9{\cdot}49 \times 10^{8}$

(ix) $4{\cdot}29 \times 10^{10}$ (x) $9{\cdot}7 \times 10^{0}$

**3.** (i) 0.00000407 (ii) 57000

(iii) 0.00000005 (iv) 2000900000

(v) 7900000000000 (v) 5725930

**4.** Size of blood cell $= 7 \times 10^{-6}$ m

Size of plant cell $= 1{\cdot}275 \times 10^{5}$ m

Red blood cell in 1/2 of plant cell in size.

**5.** Thickness of stack $= 24 \times 4 + 6 \times 0.015$

$= 96 + 0.09 = 96.09$ mm

$= 96{\cdot}09 \times 10^{-3}$ m $= 9{\cdot}609 \times 10^{-2}$ m

**6.** Distance b/w moon and sun $= 1{\cdot}496 \times 10^{11} - 3{\cdot}84 \times 10^{8}$ m

$= 1496 \times 10^{8} - 3{\cdot}84 \times 10^{8}$

$= 1492{\cdot}16 \times 10^{8}$ m

$= 1{\cdot}49216 \times 10^{11}$ m

**7.** $6 \times 10^{-6}$ m and $1{\cdot}5 \times 10^{-7}$ m

$\frac{6 \times 10^{-6}}{1{\cdot}5 \times 10^{-7}} = \frac{6}{15} \times 100 = \frac{\cancel{600}^{40}}{\cancel{15}} = \frac{40}{1} = 40{:}1$

**8.** $\frac{4{\cdot}98 \times 10^{21}}{10^{19}} = 4{\cdot}98 \times 10^{2}$

## Exercise = 3.1

**1.** (i)

| | |
|---|---|
| 21 | 441 |
| 21 | 21 |
| | 1 |

$\sqrt{441} = 21$

(ii)

| | |
|---|---|
| 2 | 576 |
| 2 | 288 |
| 2 | 144 |
| 2 | 72 |
| 2 | 36 |
| 2 | 18 |
| 3 | 9 |
| 3 | 3 |
| | 1 |

$\sqrt{576} = 2\times 2\times 2\times 3 = 24$

(iii)

| | |
|---|---|
| 5 | 11025 |
| 5 | 2205 |
| 21 | 441 |
| 21 | 21 |
| | 1 |

$\sqrt{11025} = 5\times 21 = 105$

(iv)

| | |
|---|---|
| 2 | 1176 |
| 2 | 588 |
| 2 | 294 |
| 147 | 147 |
| | 1 |

No

(v)

| | |
|---|---|
| 5 | 5625 |
| 5 | 1125 |
| 5 | 225 |
| 5 | 45 |
| 3 | 9 |
| 3 | 3 |
| | 1 |

$\sqrt{5625} = 5\times 5\times 3 = 75$

(vi)

| | |
|---|---|
| 5 | 9075 |
| 5 | 1815 |
| 3 | 363 |
| 11 | 121 |
| 11 | 11 |
| | 1 |

No

(vii)

| | |
|---|---|
| 5 | 4225 |
| 5 | 845 |
| 13 | 169 |
| 13 | 13 |
| | 1 |

$\sqrt{42255} = 5\times 13 = 65$

(viii)

| | |
|---|---|
| 3 | 1089 |
| 3 | 363 |
| 11 | 121 |
| 11 | 11 |
| | 1 |

$\sqrt{1089} = 3\times 11 = 33$

**2.** (i)

| | |
|---|---|
| 2 | 100 |
| 2 | 50 |
| 5 | 25 |
| 5 | 5 |
| | 1 |

$\sqrt{100} = 2\times 5 = 10$

(ii)

| | |
|---|---|
| 2 | 784 |
| 2 | 392 |
| 2 | 196 |
| 2 | 98 |
| 7 | 49 |
| 7 | 7 |
| | 1 |

$\sqrt{784} = 2\times 2\times 7 = 28$

(iii)

| | |
|---|---|
| 6 | 3600 |
| 6 | 600 |
| 10 | 100 |
| 10 | 10 |
| | 1 |

$\sqrt{3600} = 6\times 10 = 60$

(iv)

| | |
|---|---|
| 9 | 8100 |
| 9 | 900 |
| 10 | 100 |
| 10 | 10 |
| | 1 |

$\sqrt{8100} = 9\times 10 = 90$

**3.** (i)

| | |
|---|---|
| 2 | 512 |
| 2 | 256 |
| 2 | 128 |
| 2 | 64 |
| 2 | 32 |
| 2 | 16 |
| 2 | 8 |
| 2 | 4 |
| 2 | 2 |
| | 1 |

multiplied by 2

(ii)

| | |
|---|---|
| 2 | 700 |
| 2 | 350 |
| 5 | 175 |
| 5 | 35 |
| 7 | 7 |
| | 1 |

multiplied by 7

(iii)

| | |
|---|---|
| 3 | 1323 |
| 21 | 441 |
| 21 | 21 |
| | 1 |

multiplied by 3

(iv)

| | |
|---|---|
| 2 | 3456 |
| 2 | 1728 |
| 2 | 864 |
| 2 | 432 |
| 2 | 216 |
| 2 | 108 |
| 2 | 54 |
| 3 | 27 |
| 3 | 9 |
| 3 | 3 |
| | 1 |

multiplied by 6

(v)

| | |
|---|---|
| 2 | 35280 |
| 2 | 17640 |
| 2 | 8820 |
| 2 | 4410 |
| 3 | 2205 |
| 3 | 735 |
| 5 | 245 |
| 7 | 49 |
| 7 | 7 |
| | 1 |

multiplied by 5

**4.** (i)

| | |
|---|---|
| 2 | 180 |
| 2 | 90 |
| 3 | 45 |
| 3 | 15 |
| 5 | 5 |
| | 1 |

divided by 5

(ii)

| | |
|---|---|
| 2 | 1568 |
| 2 | 784 |
| 2 | 392 |
| 2 | 196 |
| 2 | 98 |
| 7 | 49 |
| 7 | 7 |
| | 1 |

divided by 2

(iii)

| | |
|---|---|
| 2 | 10224 |
| 2 | 5112 |
| 2 | 2556 |
| 2 | 1278 |
| 3 | 639 |
| 3 | 213 |
| 71 | 71 |
| | 1 |

divided by 71

(iv)

| | |
|---|---|
| 2 | 19200 |
| 2 | 9600 |
| 2 | 4800 |
| 2 | 2400 |
| 2 | 1200 |
| 2 | 600 |
| 2 | 300 |
| 2 | 150 |
| 3 | 75 |
| 5 | 25 |
| 5 | 5 |
| | 1 |

divided by 3

(v)

| | |
|---|---|
| 2 | 117600 |
| 2 | 58800 |
| 2 | 49400 |
| 2 | 24700 |
| 2 | 12350 |
| 5 | 6175 |
| 5 | 1235 |
| 19 | 247 |
| 13 | 13 |
| | 1 |

$2 \times 19 \times 13 = 494$

## Exercise = 3.2

**1.** (i)

| | |
|---|---|
| 3 | 2157 |
| | 719 |

2157 is not P.S.

(ii)

| | |
|---|---|
| 2 | 8318 |
| | 4159 |

No

(iii) 22242 not a P.S (iv) 143543 not a P.S (v) 324000 not a P.S

(vi) 79622 not a P.S (vii) 84000 not a P.S (viii) 505050 not a P.S

**2.** (i) 1 (ii) 4 (iii) 1 (iv) 9 (v) 6 (vi) 9

(vii) 4 (viii) 0 (ix) 6 (x) 5

**3.** (i) 484 (ii) 1156 (v) 676 (vi) 12544

**4.** (i) 529 (iv) 1521 (v) 2209 (vi) 12769

**5.** (i) (1,1, 1) No (ii) (2, 2, 3) No

(iii) (3, 4, 5)

$5^2 = 3^2 + 4^2$ $25 = 9 + 16 = 25$ Yes

(iv) (6, 8, 10)

$10^2 = 6^2 + 8^2$ $100 = 36 + 64$ $100 = 100$ Yes

(v) (9, 12, 5)

$12^2 = 9^2 + 5^2$ $144 = 81 + 25$ $144 \neq 106$ No

**6.** $(2m, m^2 - 1, m^2 + 1)$

(i) $2m = 4$

$m = 2$ $m^2 - 1 = 2^2 - 1 = 4 - 1 = 3$ $m^2 + 1 = 2^2 + 1 = 4 + 1 = 5$ (3, 4, 5)

(ii) $2m = 6$

$m = 3$ $m^2 - 1 = 3^2 - 1 = 9 - 1 = 8$ $m^2 + 1 = 3^2 + 1 = 9 + 1 = 10$ (6, 8, 10)

(iii) $m^2 + 1 = 101$ $m^2 - 1 = 10^2 - 1$

$m^2 = 101 - 1$ $= 100 - 1$

$m^2 = 100$ $= 99$

$m = 10$ (20, 99, 101)

$m = 2 \times 10 = 20$

**7.** (i) $36 = 1 + 3 + 5 + 7 + 9 + 11$

(ii) $49 = 1 + 3 + 5 + 7 + 9 + 11 + 13$

(iii) $64 = 1 + 3 + 5 + 7 + 9 + 11 + 13 + 15$

(iv) $81 = 1 + 3 + 5 + 7 + 9 + 11 + 13 + 15 + 17$

**8.** (i) $38^2 - 37^2 = (38 + 37)(38 - 37) = 75$

(ii) $(75)^2 - (74)^2 = (75 + 74)(75 - 74) = 149$

(iii) $(92)^2 - (91)^2 = (92 + 91)(92 - 91) = 183$

(iv) $(105)^2 - (104)^2 = (105 + 104)(105 - 104) = 209$

(v) $(141)^2 - (140)^2 = (141 + 140)(141 - 140) = 281$

(vi) $(218)^2 - (217)^2 = (218 + 217)(218 - 217) = 435$

**9.** (i) $441 = 220 + 221$ (ii) $289 = 144 + 145$

(iii) $4225 = 2112 + 2113$ (iv) $2401 = 1200 + 1201$

(v) $4489 = 2244 + 2245$

**10.** (i) $49^2 - 1 = (49 + 1)(49 - 1) = 50 \times 48 = 2400$

(ii) $61^2 - 1 = (61 + 1)(61 - 1) = 62 \times 60 = 3720$

(iii) $199^2 - 1 = (199 + 1)(199 - 1) = 200 \times 198 = 39600$

**11.** $11^2 = 121$

$101^2 = 10201$

$10101^2 = 102030201$

$1010101^2 = 1020304030201$

$101010101^2 = 10203040504030201$

**12.** $3^2 + 4^2 + \mathbf{12^2} = 13^2$

$4^2 + \mathbf{5^2} + 20^2 = 21^2$

$5^2 + 6^2 + 30^2 = \mathbf{31^2}$

**13.** (i) $100001^2 =$ **10000 200001**

$1000001^2 =$ **100000 2000001**

$10000001^2 =$ **1000000 20000001**

(ii) $1 + 2 + 3 + 4 + 5 + 3 + 2 + 1 = \mathbf{25} = \mathbf{5^2}$

$1 + 2 + 3 + 4 + 5 + 6 + 5 + 4 + 3 + 2 + 1 = \mathbf{36} = \mathbf{6^2}$

$1 + 2 + 3 + 4 + 5 + 6 + 7 + 6 + 5 + 4 + 3 + 2 + 1 = \mathbf{49} = \mathbf{7^2}$

## Exercise = 3.3

**1.** (i) $32 = 30 + 2$

$(30+2)^2 = 30^2 + 2^2 + 2 \times 30 \times 2 = 900 + 4 + 120 = 1024$

(ii) $40^2 = (20+20)^2$

$= 20^2 + 20^2 + 2 \times 20 \times 20 = 400 + 400 + 800 = 1600$

(iii) $57^2 = (50+7)^2$

$= 50^2 + 7^2 + 2 \times 50 \times 7 = 2500 + 49 + 700 = 3249$

(iv) $83^2 = (80+3)^2$

$= 80^2 + 3^2 + 2 \times 80 \times 3 = 1600 + 9 + 480 = 2089$

**2.** (i) $78^2 = 78 \times 78 = 6084$ (ii) $54^2 = 54 \times 54 = 2916$

(iii) $245^2 = 245 \times 245 = 60025$ (iv) $367^2 = 367 \times 367 = 134689$

(v) $6345^2 = 6345 \times 6345 = 40259025$

**3.** (i) $325^2 = 325 \times 325 = 105625$ (ii) $445^2 = 445 \times 445 = 198025$

(iii) $385^2 = 385 \times 385 = 148225$ (iv) $555^2 = 555 \times 555 = 308025$

(v) $235^2 = 235 \times 235 = 55225$

**4.** (i) $51^2 = (5^2 + 1) \times 100 + 1^2$

$= (25 + 1)\ 100 + 1 = 2600 + 1$

(ii) $54^2 = (5^2 + 4) \times 100 + 4^2$

$= (25 + 4)\ 100 + 16 = 2900 + 16 = 2916$

(iii) $56^2 = (5^2 + 6) \times 100 + 6^2$

$= (25 + 6) \times 100 + 36 = 3100 + 36 = 3136$

(iv) $58^2 = (5^2 + 8) \times 100 + 8^2$

$= (25 + 8)\ 100 + 64 = 3300 + 64 = 3364$

(v) $59^2 = (5^2 + 9)\ 100 + 9^2$

$= (25 + 9)\ 100 + 81 = 3400 + 81 = 3481$

**5.** (i) $509^2 = (250 + 9)\ 100 + 9^2 = 25900 + 81 = 25981$

(ii) $515^2 = (250 + 15)\ 100 + 15^2 = 26500 + 225 = 26725$

(iii) $525^2 = (250 + 25)\ 100 + 25^2 = 27500 + 625 = 28125$

(iv) $580^2 = (250 + 80)180 + 80^2 = 33000 + 6400 = 39400$

(v) $534^2 = (250 + 34)\ 100 + 34^2 = 28400 + 1156 = 29556$

**6.** (i) $(305)^2 = (300 + 5)^2$

$= 300^2 + 5^2 + 2 \times 300 \times 5 = 90000 + 25 + 3000 = 93025$

(ii) $(409)^2 = (400 + 9)^2$

$= 400^2 + 9^2 + 2 \times 400 \times 9 = 160000 + 81 + 7200 = 167281$

(iii) $(650)^2 = (600 + 50)^2$

$= 600^2 + 50^2 + 2 \times 600 \times 50 = 360000 + 2500 + 60000 = 422500$

(iv) $1001^2 = (1000 + 1)^2$

$= 1000^2 + 1^2 + 2 \times 1000 \times 1 = 1000000 + 1 + 2000 = 1002001$

(v) $1005^2 = (1000 + 5)^2$

$= 1000^2 + 5^2 + 2 \times 1000 \times 5 = 1000000 + 25 + 10000 = 1010025$

**7.** (i) $395^2 = (400 - 5)^2$

$= 400^2 + 5^2 - 2 \times 400 \times 5 = 160000 + 25 - 4000 = 156025$

(ii) $289^2 = (300 - 11)^2$

$= 300^2 + 11^2 - 2 \times 300 \times 11 = 90000 + 121 - 6600 = 83521$

(iii) $390^2 = (400 - 10)^2$

$= 400^2 + 10^2 - 2 \times 400 \times 10 = 160000 + 100 - 8000 = 152100$

(iv) $450^2 = (500 - 50)^2$

$= 500^2 + 50^2 - 2 \times 500 \times 50 = 250000 + 2500 - 50000 = 202500$

(v) $999^2 = (10000 - 1)^2$

$= 10000^2 + 1^2 - 2 \times 10000 \times 1 = 100000000 + 1 - 20000 = 998001$

## Exercise = 3.4

**1.** (i) $64 - 1 = 63$ $\quad 63 - 3 = 60$ $\quad 60 - 5 = 55$ $\quad 55 - 7 = 48$

$48 - 9 = 39$ $\quad 39 - 11 = 28$ $\quad 28 - 13 = 15$ $\quad 15 - 15 = 0$

$\sqrt{64} = 8$

(ii) $100 - 1 = 99$ $99 - 3 = 96$ $96 - 5 = 91$ $91 - 7 = 84$
$84 - 9 = 75$ $75 - 11 = 64$ $64 - 13 = 51$ $51 - 15 = 36$
$36 - 17 = 19$ $19 - 19 = 0$
$\sqrt{100} = 10$

(iii) $121 - 1 = 120$ $120 - 3 = 117$ $117 - 5 = 112$ $112 - 7 = 105$
$105 - 9 = 96$ $96 - 11 = 85$ $85 - 13 = 72$ $72 - 15 = 57$
$57 - 17 = 40$ $40 - 19 = 21$ $21 - 21 = 0$
$\sqrt{121} = 11$

(iv) $169 - 1 = 168$ $168 - 3 = 165$ $165 - 5 = 160$ $160 - 7 = 153$
$153 - 9 = 144$ $144 - 11 = 133$ $133 - 13 = 120$ $120 - 15 = 106$
$105 - 17 = 88$ $88 - 19 = 69$ $69 - 21 = 48$ $48 - 23 = 25$
$25 - 25 = 0$
$\sqrt{169} = 13$

(v) $225 - 1 = 224$ $224 - 3 = 221$ $221 - 5 = 216$ $216 - 7 = 209$
$209 - 9 = 200$ $200 - 11 = 189$ $189 - 13 = 176$ $176 - 15 = 161$
$161 - 17 = 144$ $144 - 19 = 125$ $125 - 21 = 104$ $104 - 23 = 81$
$81 - 25 = 56$ $56 - 27 = 29$ $29 - 29 = 0$
$\sqrt{225} = 15$

**2.** (i)

| | |
|---|---|
| 2 | 144 |
| 2 | 72 |
| 2 | 36 |
| 2 | 18 |
| 3 | 9 |
| 3 | 3 |
| | 1 |

$\sqrt{144} = 2 \times 2 \times 3 = 12$

(ii)

| | |
|---|---|
| 5 | 2500 |
| 5 | 500 |
| 10 | 100 |
| 10 | 10 |
| | 1 |

$\sqrt{2500} = 5 \times 10 = 50$

(iii)

| | |
|---|---|
| 2 | 256 |
| 2 | 128 |
| 2 | 64 |
| 2 | 32 |
| 2 | 16 |
| 2 | 8 |
| 2 | 4 |
| 2 | 2 |
| | 1 |

$\sqrt{256} = 2 \times 2 \times 2 \times 2 = 16$

(iv)

| | |
|---|---|
| 6 | 3600 |
| 6 | 600 |
| 10 | 100 |
| 10 | 10 |
| | 1 |

$\sqrt{3600} = 6 \times 10 = 60$

(v)

| | |
|---|---|
| 2 | 1936 |
| 2 | 968 |
| 2 | 484 |
| 2 | 242 |
| 11 | 121 |
| 11 | 11 |
| | 1 |

$\sqrt{1936} = 2 \times 2 \times 11 = 44$

(vi)

| | |
|---|---|
| 2 | 2916 |
| 2 | 1458 |
| 3 | 729 |
| 3 | 243 |
| 3 | 81 |
| 3 | 27 |
| 3 | 9 |
| 3 | 3 |
| | 1 |

$\sqrt{2916} = 2 \times 3 \times 3 \times 3 = 54$

(vii)

| | |
|---|---|
| 2 | 2704 |
| 2 | 1352 |
| 2 | 676 |
| 2 | 338 |
| 13 | 169 |
| 13 | 13 |
| | 1 |

$\sqrt{2704} = 2 \times 2 \times 13 = 52$

(viii)

| | |
|---|---|
| 2 | 7056 |
| 2 | 3528 |
| 2 | 1764 |
| 2 | 882 |
| 21 | 441 |
| 21 | 21 |
| | 1 |

$\sqrt{7056} = 2 \times 2 \times 21 = 84$

(ix)

| | |
|---|---|
| 5 | 9025 |
| 5 | 1805 |
| 19 | 361 |
| 19 | 19 |
| | 1 |

$\sqrt{9025} = 5 \times 19 = 95$

(x)

| | |
|---|---|
| 2 | 9216 |
| 2 | 4608 |
| 2 | 2304 |
| 2 | 1152 |
| 2 | 576 |
| 2 | 288 |
| 2 | 144 |
| 2 | 72 |
| 2 | 36 |
| 2 | 18 |
| 3 | 9 |
| 3 | 3 |
| | 1 |

$\sqrt{9216} = 2 \times 2 \times 2 \times 2 \times 2 \times 3 = 96$ **3.**

(i)

| | |
|---|---|
| 2 | 396 |
| 2 | 198 |
| 3 | 99 |
| 3 | 33 |
| 11 | 11 |
| | 1 |

multiplied by 11

(ii)

| | |
|---|---|
| 2 | 252 |
| 2 | 126 |
| 3 | 63 |
| 3 | 21 |
| 7 | 7 |
| | 1 |

multiplied by 7

$252 \times 7 = 1764$

$\sqrt{1764} = 2 \times 3 \times 7 = 42$

(iii)

| | |
|---|---|
| 2 | 1458 |
| 3 | 729 |
| 3 | 243 |
| 3 | 81 |
| 3 | 27 |
| 3 | 9 |
| 3 | 3 |
| | 1 |

multiplied by 2

$1458 \times 2 = 2916$

$\sqrt{2916} = 2 \times 3 \times 3 \times 3 = 54$

(iv)

| | |
|---|---|
| 2 | 2028 |
| 2 | 1014 |
| 3 | 507 |
| 13 | 169 |
| 13 | 13 |
| | 1 |

multiplied by 3

$2028 \times 3 = 6084$

$\sqrt{6084} = 2 \times 3 \times 13 = 78$

(v)

| | |
|---|---|
| 2 | 3528 |
| 2 | 1764 |
| 2 | 882 |
| 21 | 441 |
| 21 | 21 |
| | 1 |

multiplied by 2

$3528 \times 2 = 7056$

$\sqrt{7056} = 2 \times 2 \times 21 = 84$

**4.** (i)

| | |
|---|---|
| 3 | 29403 |
| 3 | 9801 |
| 3 | 3267 |
| 3 | 1089 |
| 3 | 363 |
| 11 | 121 |
| 11 | 11 |
| | 1 |

divided by 3

$3 \overline{)29403} (9801$

27

24

24

03

3

×

$\sqrt{9801} = 3 \times 3 \times 11 = 66$

(ii)

| | |
|---|---|
| 2 | 5120 |
| 2 | 2560 |
| 2 | 1280 |
| 2 | 640 |
| 2 | 320 |
| 2 | 160 |
| 2 | 80 |
| 2 | 40 |
| 2 | 20 |
| 2 | 10 |
| 5 | 5 |
| | 1 |

divided by 5

$5120 \div 5 = 1024$

$\sqrt{1024} = 2 \times 2 \times 2 \times 2 \times 2 = 32$

(iii)

| | |
|---|---|
| 5 | 14175 |
| 5 | 2825 |
| 3 | 567 |
| 3 | 189 |
| 3 | 63 |
| 3 | 21 |
| 7 | 7 |
| | 1 |

divided by 7

$17175 \div 7 = 2025$

$\sqrt{2025} = 5 \times 3 \times 3 = 45$

(iv)

| | |
|---|---|
| 2 | 1134 |
| 3 | 567 |
| 3 | 189 |
| 3 | 63 |
| 3 | 21 |
| 7 | 7 |
| | 1 |

divided by 14

$1134 \div 14 = 81$

$\sqrt{81} = 3 \times 3 = 9$

(v)

| | |
|---|---|
| 2 | 6272 |
| 2 | 3136 |
| 2 | 1568 |
| 2 | 1784 |
| 2 | 1392 |
| 2 | 196 |
| 2 | 98 |
| 7 | 49 |
| 7 | 7 |
| | 1 |

divided by 2

$\sqrt{3136} = 2 \times 2 \times 2 \times 7 = 56$

**5.**

| | |
|---|---|
| 2 | 9, 10, 12, 15 |
| 2 | 9, 5, 6, 15 |
| 3 | 9, 5, 3, 15 |
| 3 | 3, 5, 1, 5 |
| 5 | 1, 5, 1, 5 |
| | 1, 1, 1, 1 |

$2 \times 2 \times 3 \times 3 \times 5 = 180$

## Exercise = 3.5

**1.** (i)

| | |
|---|---|
| | 99 |
| 9 | 9801 |
| +9 | 81 |
| 189 | 1701 |
| 9 | 1701 |
| | × |

(ii)

| | |
|---|---|
| | 129 |
| 1 | 16691 |
| +1 | 1 |
| 22 | 66 |
| 2 | 44 |
| 249 | 2241 |
| 9 | 2241 |
| | × |

(iii)

| | |
|---|---|
| | 212 |
| 1 | 44944 |
| +2 | 4 |
| 41 | 49 |
| | 41 |
| 422 | 844 |
| 2 | 844 |
| | × |

(iv)

| | |
|---|---|
| | 325 |
| 3 | 105625 |
| +3 | 9 |
| 62 | 156 |
| 2 | 124 |
| 645 | 3225 |
| 5 | 3225 |
| | × |

(v)

| | 5 2 2 |
|---|---|
| 5 | 2 7 2 4 8 4 |
| + 5 | 2 5 |
| 1 0 2 | 2 2 4 |
| 2 | 2 0 4 |
| 1 0 4 2 | 2 0 8 4 |
| 2 | 2 0 8 4 |
| | × |

(vi)

| | 8 2 3 |
|---|---|
| 8 | 6 7 7 3 2 9 |
| 8 | 6 4 |
| 1 6 2 | 3 7 3 |
| 2 | 3 2 4 |
| 1 6 4 3 | 4 9 2 9 |
| 3 | 4 9 2 9 |
| | × |

(vii)

| | 1 3 2 5 |
|---|---|
| 1 | 1 7 5 5 6 2 5 |
| 1 | 1 |
| 2 3 | 7 5 |
| 3 | 6 9 |
| 2 6 2 | 6 5 6 |
| 2 | 5 2 4 |
| 2 6 4 5 | 1 3 2 2 5 |
| 5 | 1 3 2 2 5 |
| | × |

(viii)

| | 2 0 5 6 |
|---|---|
| 2 | 4 2 2 7 1 3 6 |
| 2 | 4 |
| 4 0 5 | 2 2 7 1 |
| 5 | 2 0 2 5 |
| 4 1 0 6 | 2 4 6 3 6 |
| 6 | 2 4 6 3 6 |
| | × |

(ix)

| | 3 1 1 6 |
|---|---|
| 3 | 9 7 0 9 4 5 6 |
| 3 | 9 |
| 6 1 | 7 0 |
| 1 | 6 1 |
| 6 2 1 | 9 9 4 |
| 1 | 6 2 1 |
| 6 2 2 6 | 3 7 3 5 6 |
| 6 | 3 7 3 5 6 |
| | × |

(x)

| | 6 0 6 3 |
|---|---|
| 6 | 3 6 7 5 9 9 6 9 |
| 6 | 3 6 |
| 1 2 0 6 | 7 5 9 9 |
| 6 | 7 2 3 6 |
| 1 2 1 2 3 | 3 6 3 6 9 |
| 3 | 3 6 3 2 9 |
| | × |

**2.** (i)

| | 1.7 6 |
|---|---|
| 1 | 3.0 9 7 6 |
| 1 | 2 |
| 2 7 | 2 0 9 |
| 7 | 1 8 9 |
| 3 4 6 | 2 0 7 6 |
| 6 | 2 0 7 6 |
| | × |

(ii)

| | 2.5 3 |
|---|---|
| 2 | 6.4 0 0 9 |
| 2 | 4 |
| 4 5 | 2 4 0 |
| 5 | 2 2 5 |
| 5 0 3 | 1 5 0 9 |
| 3 | 1 5 0 9 |
| | × |

(iii)

| | 1.2 6 |
|---|---|
| 1 | 1.5 8 7 6 |
| 1 | 1. |
| 2 2 | 5 8 |
| 2 | 4 4 |
| 2 4 6 | 1 4 7 6 |
| 6 | 1 4 7 6 |
| | × |

(iv)

| | 0.2 9 7 |
|---|---|
| 2 | 0.0 8 8 2 0 9 |
| 2 | 0 4 |
| 4 9 | 4 8 2 |
| 9 | 4 4 1 |
| 5 8 7 | 4 1 0 9 |
| 7 | 4 1 0 9 |
| | × |

(v)

| | 0.2 3 1 |
|---|---|
| 2 | 0.0 5 3 3 6 1 |
| 2 | 4 |
| 4 3 | 1 3 3 |
| 3 | 1 2 9 |
| 4 6 1 | 4 6 1 |
| 1 | 4 6 1 |
| | × |

(vi)

| | 0.4 1 5 |
|---|---|
| 4 | 0.1 7 2 2 2 5 |
| 4 | 1 6 |
| 8 1 | 1 2 2 |
| 1 | 8 1 |
| 8 2 5 | 4 1 2 5 |
| 5 | 4 1 2 5 |
| | × |

(vii)

| | 0.0 3 1 2 |
|---|---|
| 3 | 0.0 0 0 0 9 7 3 4 4 |
| 3 | 9 |
| 6 1 | 0 7 3 |
| 1 | 6 1 |
| 6 2 2 | 1 2 4 4 |
| 2 | 1 2 4 4 |
| | × |

(viii)

| | 0.0 2 4 3 |
|---|---|
| 2 | 0.0 0 0 0 5 9 0 4 9 |
| 2 | 4 |
| 4 4 | 1 9 0 |
| 4 | 1 7 6 |
| 4 8 3 | 1 4 4 9 |
| 3 | 1 4 4 9 |
| | × |

3. (i)

| | 6 8 |
|---|---|
| 6 | 4 7 2 2 |
| 6 | 3 6 |
| 1 2 8 | 1 1 2 2 |
| 8 | 1 0 2 4 |
| | 9 8 |

4722 – 98 = 4624

98

(ii)

| | 5 0 4 |
|---|---|
| 5 | 2 5 4 4 6 1 |
| 5 | 2 5 |
| 1 0 0 4 | 4 4 6 7 |
| 4 | 4 0 1 6 |
| | 4 5 1 |

254467 – 451 = 254016

451

(iii)

| | 1 9 4 |
|---|---|
| 1 | 3 7 6 4 6 |
| 1 | 1 |
| 2 9 | 2 7 6 |
| 9 | 2 6 1 |
| 3 8 4 | 1 5 4 6 |
| 4 | 1 5 3 6 |
| | 1 0 |

$37646 - 10 = 37636$

10

**4.** (i)

| | 8 1 |
|---|---|
| 8 | 6 7 1 8 |
| 8 | 6 4 |
| 1 6 1 | 3 1 8 |
| 1 | 1 6 1 |
| | 1 5 7 |

$82^2 - 6718$

$= 6724 - 6718 = 6$

(ii)

| | 7 1 |
|---|---|
| 7 | 5 0 4 2 |
| 7 | 4 9 |
| 1 4 1 | 1 4 2 |
| 1 | 1 4 1 |
| | 1 |

$72^2 - 5042$

$= 5184 - 5042 = 142$

(iii)

| | 2 3 7 2 |
|---|---|
| 2 | 5 6 2 6 7 0 1 |
| 2 | 4 |
| 4 3 | 1 6 2 |
| 3 | 1 2 9 |
| 4 6 7 | 3 3 6 7 |
| 7 | 3 2 6 9 |
| 4 7 4 2 | 9 8 0 1 |
| 2 | 9 4 8 4 |
| | 3 1 7 |

$2373^2 - 5626701$

$= 5631129 - 5626701 = 4428$

**5.** (i)

| | 2.2 3 |
|---|---|
| 2 | 5.0 0 0 0 0 0 |
| 2 | 4 |
| 4 2 | 1 0 0 |
| 2 | 8 4 |
| 4 4 3 | 1 6 0 0 |
| 3 | 1 3 2 9 |

(v)

| | 0.6 5 |
|---|---|
| 6 | 0.4 2 8 0 0 |
| 6 | 3 6 |
| 1 2 5 | 6 8 0 |
| 5 | 6 2 5 |
| | 5 5 |

(iii)

| | 4.1 2 |
|---|---|
| 4 | 1 7.0 0 0 0 |
| 4 | 1 6 |
| 8 1 | 1 0 0 |
| 1 | 8 1 |
| 8 2 2 | 1 9 0 0 |
| 2 | 1 6 4 4 |

(iv)

| | 2.4 7 |
|---|---|
| 2 | 6.1 2 0 0 |
| 2 | 4 |
| 4 4 | 2 1 2 |
| 4 | 1 7 6 |
| 4 8 7 | 3 6 0 0 |
| 7 | 3 4 0 9 |

(ii)

| | 2.6 4 |
|---|---|
| 2 | 7.0 0 0 0 0 0 |
| 2 | 4 |
| 4 6 | 3 0 0 |
| 6 | 2 7 6 |
| 5 2 4 | 2 4 0 0 |
| 4 | 2 0 9 6 |

(vi) $\frac{52}{11} = \frac{57}{11} = 5{\cdot}18$

| | 2.2 7 |
|---|---|
| 2 | 5.1 8 0 0 |
| 2 | 4 |
| 4 2 | 1 1 8 |
| 2 | 8 4 |
| 4 4 7 | 3 4 0 0 |
| 7 | 3 1 2 9 |

**6.** (i) $\sqrt{625 \times 121} = 25 \times 11 = 275$ (ii) $\sqrt{441 \times 259} = 21 \times 17 = 357$

(iii) $\sqrt{343 \times 448} = \sqrt{7 \times 49 \times 7 \times 64} = 7 \times 8 \times 7 = 392$

(iv) $\sqrt{5103 \times 1183}$

$= \sqrt{\overline{3 \times 3} \times \overline{3 \times 3} \times \overline{3 \times 3} \times \overline{7 \times 7} \times \overline{13 \times 13}} = 3 \times 3 \times 3 \times 7 \times 13 = 2457$

(v) $\sqrt{\frac{\cancel{1445}^{289}}{\cancel{125}_{25}}} = \sqrt{\frac{289}{25}} = \frac{17}{5}$

(vi) $\sqrt{\frac{\cancel{1573}^{121}}{\cancel{117}_{9}}} = \sqrt{\frac{121}{9}} = \frac{11}{3}$

(vii) $\sqrt{\frac{\cancel{5103}^{729}}{\cancel{1183}_{169}}} = \sqrt{\frac{729}{169}} = \frac{27}{13}$

(viii) $\sqrt{\frac{\cancel{7497}^{441}}{\cancel{8993}_{529}}} = \sqrt{\frac{441}{529}} = \frac{21}{23}$

**7.**

| | |
|---|---|
| 5 | 50625 |
| 5 | 10125 |
| 5 | 2025 |
| 5 | 405 |
| 9 | 81 |
| 9 | 9 |
| | 1 |

$\sqrt{50625} = 5\times 5\times 9 = 25\times 9 = 225$

$\sqrt{506\cdot 25} + \sqrt{5\cdot 0625} = 22.5 + 2.25 = 24.75$

**8.**

| | |
|---|---|
| 2 | 3364 |
| 2 | 1682 |
| 29 | 841 |
| 29 | 29 |
| | 1 |

| | |
|---|---|
| 2 | 1936 |
| 2 | 968 |
| 2 | 484 |
| 2 | 242 |
| 11 | 121 |
| 11 | 11 |
| | 1 |

$\sqrt{3364} = 58 = 2\times 29$ $\quad \sqrt{1936} = 2\times 2\times 11 = 44$

$$\frac{\sqrt{0\cdot 3364} + \sqrt{0\cdot 1936}}{\sqrt{0\cdot 3364} - \sqrt{0\cdot 1936}} = \frac{0\cdot 58 + 0\cdot 44}{0\cdot 58 - 0\cdot 44} = \frac{1\cdot 02}{0\cdot 14} = 7.28$$

**9.**

| | |
|---|---|
| | 31 |
| 3 | 1000 |
| 3 | 9 |
| 61 | 100 |
| 1 | 61 |
| | 39 |

$1000 - 39 = 961$

**10.**

| | |
|---|---|
| | 99 |
| 9 | 9999 |
| 9 | 81 |
| 189 | 1899 |
| 9 | 1701 |
| | 198 |

$9999 - 198 = 9801$

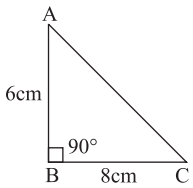
**11.** $AC^2 = AB^2 + C^2$

$= 6^2 + 8^2$

$= 36 + 64$

$AC^2 = 100$

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




**12.** Side of square $= \sqrt{Area} = \sqrt{441} = 21$ m

## Chapter-4 Cube and Cube Roots

### Exercise = 4.1

**1.** (i) 1 (ii) 5 (iii) 7 (iv) 2

**2.** (i) $18^3 = 18\times 18\times 18 = 5832$ (ii) $55^3 = 55\times 55\times 55 = 166375$

(iii) $133^3 = 133\times 133\times 133 = 2352637$ (iv) $(-5)^3 = -5\times -5\times -5 = -125$

(v) $\left(\frac{2}{3}\right)^3 = \frac{2}{3}\times\frac{2}{3}\times\frac{2}{3} = \frac{8}{27}$

(vi) $\left(\frac{-6}{13}\right)^3 = \frac{-6}{13}\times\frac{-6}{13}\times\frac{-6}{13} = \frac{-216}{2197}$

(vii) $(2\cdot 1)^3 = 2\cdot 1\times 2\cdot 1\times 2\cdot 1 = 9\cdot 261$

(vii) $(-1\cdot 3)^3 = -1\cdot 3\times -1\cdot 3\times -1\cdot 3 = -2\cdot 197$

(ix) $2\frac{-1}{3} = \frac{5}{3}$ (x) $3\times\frac{2}{5} = \frac{6}{5}$

$\left(\frac{5}{3}\right)^3 = \frac{5}{3}\times\frac{5}{3}\times\frac{5}{3} = \frac{125}{27}$ $\quad \left(\frac{6}{5}\right)^3 = \frac{6}{5}\times\frac{6}{5}\times\frac{6}{5} = \frac{216}{125}$

**3.** (i) $\sqrt[3]{588}$

| | |
|---|---|
| 2 | 588 |
| 2 | 294 |
| 3 | 147 |
| 7 | 49 |
| 7 | 7 |
| | 1 |

No

(ii)

| | |
|---|---|
| 2 | 540 |
| 2 | 270 |
| 3 | 135 |
| 3 | 45 |
| 3 | 15 |
| 5 | 5 |
| | 1 |

No

(iii)

| | |
|---|---|
| 3 | 900 |
| 3 | 300 |
| 10 | 100 |
| 10 | 10 |
| | 1 |

No

(iv)

| | |
|---|---|
| 2 | 1620 |
| 2 | 810 |
| 3 | 405 |
| 3 | 135 |
| 3 | 45 |
| 3 | 15 |
| 5 | 5 |
| | 1 |

No

(v)

| | |
|---|---|
| 2 | 21952 |
| 2 | 10976 |
| 2 | 5488 |
| 2 | 2744 |
| 2 | 1372 |
| 2 | 686 |
| 7 | 343 |
| 7 | 49 |
| 7 | 7 |
| | 1 |

Yes

(vi)

| | |
|---|---|
| 2 | 13824 |
| 2 | 6912 |
| 2 | 3456 |
| 2 | 1728 |
| 2 | 864 |
| 2 | 432 |
| 2 | 216 |
| 2 | 108 |
| 2 | 54 |
| 3 | 27 |
| 3 | 9 |
| 3 | 3 |
| | 1 |

Yes

**4.** (i) 343 (iv) 729 (vi) 2197 (vii) 1331 (ix) 4913 (x) 9261

**5.** (i) 216 (iii) 512 (v) 1000 (vii) 1728 (ix) 2744

**6.** (i) $44^3 = (40+4)^3$

$= 40^3 + 4^3 + 3\times 40^2 \times 4 + 3\times 40\times 4^2$

$= 64000 + 64 + 19200 + 1920$

$= 85184$

(ii) $53^3 = (50+3)^3$

$= 50^3 + 3^3 + 3\times 50^2 \times 3 + 3\times 50\times 3^2$

$= 125000 + 27 + 22500 + 1350$

$= 274625$

(iii) $65^3 = (60+5)^3$

$= 60^3 + 5^3 + 3\times 60^2 \times 5 + 3\times 60\times 5^2$

$= 216000+125+54000+4500$

$= 148877$

(iv) $84^3 = (80+4)^3$

$= 80^3 + 4^3 + 3\times 80^2 \times 4 + 3\times 80\times 4^2$

$= 512000 + 64 + 76800 + 3840$

$= 592704$

**7.**

| | |
|---|---|
| 2 | 5184 |
| 2 | 2592 |
| 2 | 1296 |
| 2 | 648 |
| 2 | 324 |
| 2 | 162 |
| 3 | 81 |
| 3 | 27 |
| 3 | 9 |
| | 1 |

(i) 1 (ii) 1

**8.**

| | |
|---|---|
| 5 | 46305 |
| 3 | 9261 |
| 3 | 387 |
| 3 | 129 |
| 43 | 43 |
| | 1 |

$5 \times 43 = 215$

**9.**

| | |
|---|---|
| 2 | 106480 |
| 2 | 53240 |
| 2 | 46620 |
| 2 | 23310 |
| 5 | 11655 |
| 3 | 2331 |
| 7 | 777 |
| 111 | 111 |
| | 1 |

Not a perfect cube

$2 \times 5 \times 3 \times 7 \times 111 = 23310$

**10.**

| | |
|---|---|
| 2 | 2560 |
| 2 | 1280 |
| 2 | 640 |
| 2 | 320 |
| 2 | 160 |
| 2 | 80 |
| 2 | 40 |
| 2 | 20 |
| 2 | 10 |
| 5 | 5 |
| | 1 |

By multiplied by $5 \times 5 = 25$

**11.** Ratio = 1:2:3

$x + 2x + 3x = 7776$ $\quad 6x = 7776$ $\quad x = \frac{\cancel{7776}^{1296}}{\cancel{6}}$

x = 1296 $\quad$ 1296, 2592, 3888

**12.** Volume = $3 \cdot 2^3 = 3.2 \times 3.2 \times 3.2 = 32.768\ m^3$

**13.** Edge = $\sqrt{1331} = 11$ cm

## Exercise = 4.2

**1.** (i)

| | |
|---|---|
| 2 | 74088 |
| 2 | 37044 |
| 2 | 18522 |
| 3 | 9261 |
| 3 | 3083 |
| 3 | 1029 |
| 7 | 343 |
| 7 | 49 |
| 7 | 7 |
| | 1 |

$\sqrt[3]{74088} = 2 \times 3 \times 7 = 42$

(ii)

| | |
|---|---|
| 2 | 681472 |
| 2 | 340736 |
| 2 | 170368 |
| 2 | 85184 |
| 2 | 42592 |
| 2 | 21296 |
| 2 | 10648 |
| 2 | 5324 |
| 2 | 2662 |
| 11 | 1331 |
| 11 | 121 |
| 11 | 11 |
| | 1 |

$\sqrt[3]{681472} = 2 \times 2 \times 2 \times 11 = 88$

(iii)

| | |
|---|---|
| 2 | 46656 |
| 2 | 23328 |
| 2 | 11664 |
| 2 | 5832 |
| 2 | 2916 |
| 2 | 1458 |
| 3 | 729 |
| 3 | 243 |
| 3 | 81 |
| 3 | 27 |
| 3 | 9 |
| 3 | 3 |
| | 1 |

$\sqrt[3]{46656} = 2 \times 2 \times 3 \times 3 = 36$

(iv)

| | |
|---|---|
| 7 | 753571 |
| 7 | 107653 |
| 7 | 15379 |
| 13 | 2197 |
| 13 | 169 |
| 13 | 3 |
| | 1 |

$\sqrt[3]{753571} = 7 \times 13 = 91$

(v) same as (i)

(vi)

| | |
|---|---|
| 2 | 64000 |
| 2 | 32000 |
| 2 | 16000 |
| 2 | 8000 |
| 2 | 4000 |
| 2 | 2000 |
| 2 | 1000 |

| | |
|---|---|
| 2 | 500 |
| 5 | 250 |
| 5 | 50 |
| 5 | 10 |
| 2 | 2 |
| | 1 |

$\sqrt[3]{64000} = 2 \times 2 \times 2 \times 5 = 40$

**2.** (i)

| | |
|---|---|
| 7 | 343 |
| 7 | 49 |
| 7 | 7 |
| | 1 |

$\sqrt[3]{343} = 7$

(ii)

| | |
|---|---|
| 3 | 729 |
| 3 | 243 |
| 3 | 81 |
| 3 | 27 |
| 3 | 9 |
| 3 | 3 |
| | 1 |

$\sqrt[3]{729} = 3 \times 3 = 9$

(iii)

| | |
|---|---|
| 2 | 1000 |
| 2 | 500 |
| 2 | 250 |
| 5 | 125 |
| 5 | 25 |
| 5 | 5 |
| | 1 |

$\sqrt[3]{1000} = 2 \times 5 = 10$

(iv)

| | |
|---|---|
| 11 | 1331 |
| 11 | 121 |
| 11 | 11 |
| | 1 |

(v)

| | |
|---|---|
| 2 | 1728 |
| 2 | 864 |
| 2 | 432 |
| 2 | 216 |
| 2 | 108 |
| 2 | 54 |
| 3 | 27 |
| 3 | 9 |
| 3 | 3 |
| | 1 |

(vi)

| | |
|---|---|
| 13 | 2197 |
| 13 | 169 |
| 13 | 13 |
| | 1 |

$\sqrt[3]{1331} = 11$ $\sqrt[3]{1720} = 2 \times 2 \times 3 = 12$ $\sqrt[3]{2197} = 13$

**3.** (i)

| | |
|---|---|
| 2 | 512 |
| 2 | 256 |
| 2 | 128 |
| 2 | 64 |
| 2 | 32 |
| 2 | 16 |
| 2 | 8 |
| 2 | 4 |
| 2 | 2 |
| | 1 |

(ii)

| | |
|---|---|
| 3 | 729 |
| 3 | 243 |
| 3 | 81 |
| 3 | 27 |
| 3 | 9 |
| 3 | 3 |
| | 1 |

(iii)

| | |
|---|---|
| 13 | 793 |
| 61 | 61 |
| | 1 |

$\sqrt[3]{512} = 2 \times 2 \times 2 = 8$ $\sqrt[3]{729} = 3 \times 3 = 9$ No

(iv)

| | |
|---|---|
| 11 | 1331 |
| 11 | 121 |
| 11 | 11 |
| | 1 |

(v)

| | |
|---|---|
| 2 | 1730 |
| 5 | 865 |
| 173 | 173 |
| | 1 |

(vi)

| | |
|---|---|
| 13 | 2197 |
| 13 | 169 |
| 13 | 13 |
| | 1 |

$\sqrt[3]{1331} = 11$ No $\sqrt[3]{2197} = 13$

**4.** (i)

| | |
|---|---|
| 17 | 4913 |
| 17 | 289 |
| 17 | 17 |
| | 1 |

(ii)

| | |
|---|---|
| 2 | 405224 |
| 2 | 202612 |
| 2 | 101306 |
| 37 | 50653 |
| 37 | 1369 |
| 37 | 37 |
| | 1 |

(iii)

| | |
|---|---|
| 3 | 3375 |
| 3 | 1125 |
| 3 | 375 |
| 5 | 125 |
| 5 | 25 |
| 5 | 5 |
| | 1 |

17 $\sqrt[3]{405224} = 2 \times 37 = 74$ $\sqrt[3]{3375} = 3 \times 5 = 15$

(iv)

| | |
|---|---|
| 2 | 238328 |
| 2 | 119164 |
| 2 | 59582 |
| 31 | 29791 |
| 31 | 961 |
| 31 | 31 |
| | 1 |

(v)

| | |
|---|---|
| 2 | 54872 |
| 2 | 27436 |
| 2 | 13718 |
| 19 | 6859 |
| 19 | 361 |
| 19 | 19 |
| | 1 |

(vi)

| | |
|---|---|
| 13 | 2197 |
| 13 | 169 |
| 13 | 13 |
| | 1 |

$\sqrt[3]{238320} = 2 \times 31 = 62$ $\sqrt[3]{54872} = 2 \times 19 = 38$ 13

**5.** (i) $15^3 - 14^3 = 1 + 3 \times 15 \times 14 = 1 + 630 = 631$

(ii) $7^3 - 6^3 = 1 + 3 \times 7 \times 6$

(iii) $12^3 - 11^3 = 1 + 3 \times 12 \times 11$

(iv) $13^3 - 12^3 = 1 + 3 \times 13 \times 12$

**6.** (i) $1^3 + 2^3 + 3^3 + 4^3 + 5^3 + 6^3 + 7^3$

$(1 + 2 + 3 + 4 + 5 + 6 + 7)^2 = (28)^2 = 28 \times 28 = 784$

(ii) $5^3+6^3+7^3+8^3+9^3+10^3$

$=(5+6+7+8+9+10)^2=45^2=2025$

**7.**

| | |
|---|---|
| 2 | 792 |
| 2 | 396 |
| 2 | 198 |
| 3 | 99 |
| 3 | 33 |
| 11 | 11 |
| | 1 |

$3\times3\times11=99$

**8.**

| | |
|---|---|
| 2 | 400 |
| 2 | 200 |
| 2 | 100 |
| 2 | 50 |
| 5 | 25 |
| 5 | 5 |
| | 1 |

$2\times2\times5=20$

**9.** (i) $\sqrt{-125\times1331}=-5\times11=-55$

(ii) $\sqrt{-216\times-1728}=6\times12=72$

**10.** (i) $\sqrt{\frac{729}{4096}}=\frac{9}{16}$ (ii) $\sqrt{\frac{-2197}{2744}}=\frac{13}{14}$ (iii) $\sqrt{\frac{4096}{-9261}}=\frac{-16}{21}$

**11.** side $=\sqrt{262\cdot144}$ $m^3=\sqrt{6\cdot4\times6\cdot4\times6\cdot4}=6.4$ m

## Chapter-5 Playing with Numbers

### Exercise = 5.1

**1.** $x+y=9$ .... (i)

$10x+y=6y$

$10x-5y=0$

$5y=10x$

$y=2x$

using in equation (i)

$x+2x=9$

$3x=9$

$x=3$

$y=2\times3$

$=6$

Number $=10\times3+6$

$=30+6=36$

**2.** $(10x+y)+(10y+x)=110$

$11x+11y=110$

$x+y=10$ .... (i)

$(10x+y)-(10y+x)=6$

$9x-9y=6$

$3x-3y=2$

putting $x=10-y$

$3(10-y)-3y=2$

$30-3y-3y=2$

$30-2=6y$

$6y=28$

$y=\frac{14}{3}$

$x=10-\frac{14}{3}=\frac{30+14}{3}=\frac{16}{3}$

**3.** $x+y=13$ ...(1)

$(10x+y)-(10y+x)=27$

$9x-9y=27$

$x-y=3$

$x+y=13$

$2x=16$

$x=8$

$y=13-x$

$=13-8$

**4.** $x+y=x$

$100x+y+495=100y+x$

$100x+y+495-100y+x=0$

$99x-99y=-495$

$x-y=-5$

$x+y=11$

$2x=6$

$x=3$

$y=11-x$

= 5 = 11 – 3 = 8

digits = 10 × 8 + 5 No = 100 × 3 + 8 = 308

= 85

**6.** x + y + z = 18 .... (i)

x = 2y z = 3y

2y + y + 3y = 18

6y = 18

$y = \frac{\cancel{18}^{3}}{\cancel{6}}$

y = 3

x = 2 × 3 = 6 z = 3 × 3 = 9

digits = 100 × 6 + 103 + 9 = 639

**7.** (i) $x = (17 + 71) \div 11 = \frac{\cancel{88}^{8}}{\cancel{11}} = 8$ (ii) $x = 17 + 71 \div 8 = \frac{\cancel{88}^{11}}{\cancel{8}} = 11$

**8.** (i) $x = (83 - 38) \div 9 = \frac{\cancel{45}^{5}}{\cancel{9}} = 5$ (ii) $x = (83 - 38) \div 5 = \frac{\cancel{45}^{9}}{\cancel{5}} = 9$

**9.** (i) x = (384 + 843 + 438 ) ÷ 3 = 1665 ÷ 3 = 555

(ii) x = 1665 ÷ 37 = 45 (iii) x = 1665 ÷ 45 = 37

(iv) x = 1665 ÷ 555 = 3

**10.** (i) x = (715 – 517) ÷ 9 = 198 ÷ 9 x = 22

(ii) x = 198 ÷ 18 x = 11 (iii) x = 198 ÷ 22 x = 9

## Exercise = 5.2

**1.** (i)
$$\begin{array}{r} 3\ A \\ +\ B\ 6 \\ \hline 8\ 1 \end{array}$$
A = 5, B = 4

(ii)
$$\begin{array}{r} 2\ A\ B \\ +\ C\ 7\ 8 \\ \hline 7\ 1\ 3 \end{array}$$
B = 5, A = 3, C = 4

(iii)
$$\begin{array}{r} 4\ 3\ 2 \\ +\ A\ B\ C \\ \hline 8\ 0\ 9 \end{array}$$
A = 3, B = 7, C = 7

(iv)
$$\begin{array}{r} A\ 2 \\ -\ 3\ B \\ \hline 4\ 7 \end{array}$$
A = 8, B = 5

(v)
$$\begin{array}{r} 5\ 3\ A \\ -\ 1\ B\ 5 \\ \hline C\ 9\ 6 \end{array}$$
A = 1, B = 5, C = 3

(vi)
$$\begin{array}{r} C\ 3\ A \\ -\ 2\ B\ 1 \\ \hline 5\ 6\ 4 \end{array}$$
A = 5, B = 7, C = 8

**2.** (i) A = 2, B = 2, C = 4, D = 1, E = 7, F = 8, G = 1, H = 9, K = 6

(ii) A = 5, B = 2, C = 6, D = 1, E = 2, F = 5, G = 5, H = 2, K = 7, J = 5

**3.** (i) A = 8, B = 6, C = 4

(ii) A = 2, B = 8, C = 3, D = 6, E = 8, F = 5, G = 6

**4.**

| | | | |
|---|---|---|---|
| 12 | 17 | 16 | = 45 |
| 19 | 15 | 11 | = 45 |
| 14 | 13 | 18 | = 45 |
| 45 | 45 | 45 | |

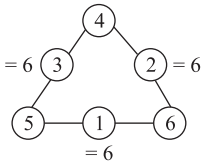
**5.**

| | | | |
|---|---|---|---|
| 47 | 5 | 8 | 38 |
| 14 | 32 | 29 | 23 |
| 26 | 20 | 17 | 35 |
| 11 | 41 | 44 | 2 |

**6.**

| | | | |
|---|---|---|---|
| 3 | 14 | 13 | 0 |
| 8 | 5 | 6 | 11 |
| 4 | 9 | 10 | 7 |
| 15 | 2 | 1 | 12 |

**7.**




**8.**