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Maths

Teacher's Manual

Class VIII

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Chapter 1 Rational Numbers

Exercise – 1A

Q1. **(a)** 0

(b) 1 and –1

(c) 0

Q2. **(a)** $\frac{-5}{7}=\frac{-5\times2}{7\times2}=\frac{-10}{14};\frac{-5\times3}{7\times3}=\frac{-15}{21};\frac{-5\times4}{7\times4}=\frac{-20}{28}$

(b) $\frac{8}{-9}=\frac{8\times2}{-9\times2}=\frac{16}{-18}$ or $\frac{-16}{18}$ (standard form)

$\frac{-8\times3}{9\times3}=\frac{-24}{27};\frac{-8\times4}{9\times4}=\frac{-32}{36}$

(c) $\frac{3}{4}=\frac{3\times2}{4\times2}=\frac{6}{8};\frac{3\times3}{4\times3}=\frac{9}{12};\frac{3\times4}{4\times4}=\frac{12}{16}$

Q3. **(a)** $\frac{3}{5}+\frac{1}{5}=\frac{3+1}{5}$

$=\frac{4}{5}$

(b) $\frac{-8}{11}+\frac{(-4)}{11}=\frac{-8-4}{11}$

$=\frac{-12}{11}$

(c) $3\frac{3}{4}+4\frac{1}{3}=\frac{15}{4}+\frac{13}{3}$ LCM of 4 and 3 = 12

$\frac{15\times3}{4\times3}+\frac{13\times4}{3\times4}=\frac{45}{12}+\frac{52}{12}$

$$= \frac{45+52}{12}$$

$$= \frac{97}{12}$$

$$= 8\frac{1}{12}$$

Q4. **(a)** $\frac{17}{9} = \frac{-17}{9}$

(b) $\frac{8}{-29} = \frac{8}{29}$

(c) $0 = 0$

(d) $\frac{-11}{-21} = \frac{-11}{21}$

(e) $\frac{3}{5} = \frac{-3}{5}$

Q5. **(a)** $\frac{-16}{9} + \frac{-5}{12} = \frac{-16}{9} - \frac{5}{12}$ LCM of 9 and 12 is 36

$$\frac{-16\times4}{9\times4} - \frac{5\times3}{12\times3} = \frac{-64}{36} - \frac{15}{36}$$

$$= \frac{-64-15}{36}$$

$$= \frac{-79}{36}$$

(b) $\frac{7}{9} + \frac{3}{-4} = \frac{7}{9} - \frac{3}{4}$

$$\frac{7\times4}{9\times4} - \frac{3\times9}{4\times9} = \frac{28}{36} - \frac{27}{36}$$

$$= \frac{28-27}{36}$$

$$= \frac{1}{36}$$

(c) $0+\frac{-3}{5}=\frac{0-3}{5}$

$=\frac{-3}{5}$

(d) $\frac{-2}{3}+1\frac{5}{6}+\frac{-3}{2}$

$\frac{-2}{3}+\frac{11}{6}-\frac{3}{2}$

L.C.M. of 3, 6 and 2 is 6

$=\frac{-2\times2}{3\times2}+\frac{11\times1}{6\times1}-\frac{3\times3}{2\times3}$

$=\frac{-4}{6}+\frac{11}{6}-\frac{9}{6}$

$=\frac{-4+11-9}{6}$

$=\frac{-2}{6}$

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

Q6. **(a)** $\frac{3}{5}+\frac{5}{3}+\frac{-11}{5}+\frac{-2}{3}$

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

$=\frac{-8}{5}+\frac{3}{3}$

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

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

$=\frac{-3}{5}$

(b) $\frac{3}{5}+\frac{7}{3}+\frac{9}{5}+\frac{-13}{15}+\frac{-7}{3}$

$$\left(\frac{3}{5}+\frac{9}{5}\right)+\left(\frac{7}{3}-\frac{7}{3}\right)-\frac{13}{15}=\left(\frac{3+9}{5}\right)+0-\frac{13}{15}$$

$$=\frac{12}{5}-\frac{13}{15}$$

$$=\frac{36-13}{15}$$

$$=\frac{23}{15} \text{ or } 1\frac{8}{15}$$

(c) $\frac{5}{3}+\frac{11}{2}+\frac{-9}{4}+\frac{-8}{3}+\frac{-7}{2}$

$$=\left(\frac{5}{3}-\frac{8}{3}\right)+\left(\frac{11}{2}-\frac{7}{2}\right)-\frac{9}{4}$$

$$=\left(\frac{5-8}{3}\right)+\left(\frac{11-7}{2}\right)-\frac{9}{4}$$

$$=\left(\frac{-3}{3}\right)+\left(\frac{4}{2}\right)-\frac{9}{4}$$

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

$$=\frac{-4+8-9}{4}$$

$$=\frac{-5}{4} \text{ or } -1\frac{1}{4}$$

(d) $\frac{-3}{10}+\frac{7}{15}+\frac{3}{-20}+\frac{-9}{10}+\frac{13}{15}+\frac{-13}{20}$

$$\left(\frac{-3}{10}-\frac{9}{10}\right)+\left(\frac{7}{15}+\frac{13}{15}\right)+\left(\frac{-3}{20}-\frac{13}{20}\right)$$

$$\left(\frac{-3-9}{10}\right)+\left(\frac{7+13}{15}\right)+\left(\frac{3-13}{20}\right)$$

$$= \frac{-12}{10} + \frac{20}{15} - \frac{16}{20}$$

$$= \frac{-72 + 80 - 48}{60}$$

$$= \frac{-40}{60}$$

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

Q7. **(a)** $\frac{7}{8} - \frac{2}{3} = \frac{7 \times 3 - 2 \times 8}{24}$

$$= \frac{21 - 16}{24}$$

$$= \frac{5}{24}$$

(b) $\frac{-3}{7} - \left(\frac{-5}{9}\right) = \frac{-3}{7} + \frac{5}{9}$

$$= \frac{(-3 \times 9) + (7 \times 5)}{63}$$

$$= \frac{-27 + 35}{63}$$

$$= \frac{8}{63}$$

(c) $\frac{5}{6} - \frac{3}{4} = \frac{5 \times 2 - 3 \times 3}{12}$

$$= \frac{10 - 9}{12}$$

$$= \frac{1}{12}$$

(d) $\frac{-5}{7} - \left(\frac{-3}{8}\right) = \frac{-5}{7} + \frac{3}{8}$

$$= \frac{(-5 \times 8) + (3 \times 7)}{56}$$

$$= \frac{-40 + 21}{56}$$

$$= \frac{-19}{56}$$

Q8. **(a)** $\frac{3}{5} - \frac{1}{5} = \frac{3-1}{5}$

$$= \frac{2}{5}$$

(b) $\frac{-1}{6} - \frac{4}{9} = \frac{(-1 \times 3) - (4 \times 2)}{18}$

$$= \frac{-3-8}{18}$$

$$= \frac{-11}{18}$$

(c) $\frac{3}{10} - \left(\frac{-4}{15}\right) = \frac{3}{10} + \frac{4}{15}$

$$= \frac{3 \times 3 + 4 \times 2}{30}$$

$$= \frac{9+8}{30}$$

$$= \frac{17}{30}$$

(d) $\frac{4}{5} - \left(\frac{3}{-4}\right) = \frac{4}{5} + \frac{3}{4}$

$$= \frac{(4 \times 4) + (3 \times 5)}{20}$$

$$= \frac{16+15}{20}$$

$$= \frac{31}{20}$$

Q9. The sum of rational numbers = -3

$$\text{One number} = \frac{-11}{5}$$

$$\text{Second number} = \frac{-3}{1} - \left(\frac{-11}{5}\right)$$

$$= \frac{-3}{1} + \frac{11}{5}$$

$$= \frac{-3 \times 5 + 11 \times 1}{5}$$

$$= \frac{-15 + 11}{5}$$

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

Q10. Number added should be

$$\frac{5}{9} - \left(\frac{-5}{8}\right) = \frac{5}{9} + \frac{5}{8}$$

$$= \frac{(8 \times 5) + (5 \times 9)}{72}$$

$$= \frac{40 + 45}{72}$$

$$= \frac{85}{72}$$

Q11. The number subtracted should be

$$\frac{-7}{11} - \left(\frac{-2}{1}\right) = \frac{-7}{11} + \frac{2}{1}$$

$$= \frac{-7 + 22}{11}$$

$$= \frac{15}{11}$$

Q12. (a) $\frac{3}{7} + \frac{-6}{11} + \frac{8}{21} + \frac{-5}{22}$

$$\left(\frac{3}{7} + \frac{8}{21}\right) - \left(\frac{6}{11} + \frac{5}{22}\right) = \left(\frac{3\times3 + 8\times1}{21}\right) - \left(\frac{6\times2 + 5\times1}{22}\right)$$

$$= \left(\frac{9+8}{21}\right) - \left(\frac{12+5}{22}\right)$$

$$= \frac{17}{21} - \frac{17}{22}$$

$$= \frac{17\times22 - 17\times21}{462}$$

$$= \frac{374 - 357}{462}$$

$$= \frac{17}{462}$$

(b) $\frac{2}{5} + \frac{8}{3} - \frac{12}{5} + \frac{4}{5} - \frac{2}{3}$

$$= \left(\frac{2}{5} + \frac{4}{5}\right) + \left(\frac{8}{3} - \frac{2}{3}\right) - \frac{12}{15}$$

$$= \frac{6}{5} + \frac{6}{3} - \frac{12}{15}$$

$$= \frac{(6\times3) + (6\times5) - (12\times1)}{15}$$

$$= \frac{18 + 30 - 12}{15}$$

$$= \frac{48 - 12}{15}$$

$$= \frac{36}{15}$$

(c) $\frac{-7}{4}+\frac{5}{3}+\frac{-5}{6}+\frac{1}{3}+\frac{-1}{2}$

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

$$=\frac{-7}{4}+\frac{6}{3}-\frac{5}{6}-\frac{1}{2}$$

$$=\frac{(-7\times3)+(6\times4)-(5\times2)-(1\times6)}{12}$$

$$=\frac{-21+24-10-6}{12}$$

$$=\frac{-37+24}{12}$$

$$=\frac{-13}{12}$$

(d) $\frac{6}{7}-\frac{2}{1}+\frac{-7}{9}+\frac{19}{21}$

$$=\frac{6}{7}-\frac{2}{1}-\frac{7}{9}+\frac{19}{21}$$

$$=\frac{(6\times9)-(2\times63)-(7\times7)+(19\times3)}{63}$$

$$=\frac{54-126-49+57}{63}$$

$$=\frac{-175+111}{63}$$

$$=\frac{-64}{63}$$

➥ Exercise – 1B

Q1. **(a)** no

(b) $\frac{-1}{5}$

(c) rational no.

(d) positive rational no.

Q2. $\frac{-36}{7} \times \frac{-28}{9} = 16$

Q3. $\frac{6}{13} \times \frac{-16}{7} = \frac{-96}{91}$

Q4. **(a)** $\frac{-5}{9} \times \frac{72}{-125} = \frac{8}{25}$

(b) $\frac{13}{6} \times \frac{-18}{91} = \frac{-3}{7}$

(c) $\left(\frac{-16}{5} \times \frac{20}{8}\right) - \left(\frac{15}{5} \times \frac{-35}{3}\right) = -8 + 35$

$= 27$

(d) $\left(\frac{-3}{2} \times \frac{4}{5}\right) + \left(\frac{9}{5} \times \frac{-10}{3}\right) - \left(\frac{1}{2} \times \frac{3}{4}\right)$

$\frac{-6}{5} + (-6) - \left(\frac{3}{8}\right) = \frac{-6}{5} - \frac{6}{1} - \frac{3}{8}$

$\frac{-6 \times 8 - 6 \times 40 - 3 \times 5}{40} = \frac{-48 - 240 - 15}{40}$

$= \frac{-303}{40}$

Q5. **(a)** -13

Multiplicative inverse $= \frac{-1}{13}$

(b) $\frac{-5}{8} \times \frac{-3}{7} = \frac{15}{56}$

Multiplicative inverse $= \frac{56}{15}$

(c) $\frac{-13}{19}$

Multiplicative inverse $= \frac{-19}{13}$

(d) -1

Multiplicative inverse $= -1$

(e) $-1 \times \frac{-2}{5} = \frac{2}{5}$

Multiplicative inverse $= \frac{5}{2}$

Q6. **(a)** $\frac{2}{5} \times \left(\frac{-3}{7}\right) - \frac{1}{6} \times \frac{3}{2} + \frac{1}{14} \times \frac{2}{5}$

$= \frac{2}{5} \times \left(\frac{-3}{7}\right) + \frac{1}{14} \times \frac{2}{5} - \frac{1}{6} \times \frac{3}{2}$ (By commutativity)

$= \frac{2}{5} \times \left(\frac{-3}{7} + \frac{1}{14}\right) - \frac{1}{4}$

$= \frac{2}{5} \times \left(\frac{-3 \times 2 + 1}{14}\right) - \frac{1}{4}$

$= \frac{2}{5} \times \left(\frac{-5}{14}\right) - \frac{1}{4}$

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

$= \frac{-1 - 7}{28}$

$= \frac{-11}{28}$

(b) $\frac{-2}{3} \times \frac{3}{5} + \frac{5}{2} - \frac{3}{5} \times \frac{1}{6}$

$= \frac{-2}{3} \times \frac{3}{5} - \frac{3}{5} \times \frac{1}{6} + \frac{5}{2}$ (Using commutativity)

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

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

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

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

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

$$= \left(\frac{-3 + 15}{6}\right)$$

$$= \frac{12}{6}$$

$$= 2$$

Q7. **(a)** Existence of multiplicative inverse

(b) Commutativity

(c) Distributivity of multiplication over addition

Q8. **(a)** $\frac{5}{9} \div \frac{25}{1} = \frac{5}{9} \times \frac{1}{25}$

$$= \frac{1}{45}$$

(b) $\frac{-8}{9} \div \frac{4}{3} = \frac{-8}{9} \times \frac{3}{4}$

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

(c) $\frac{-8}{13} \div \frac{3}{-26} = \frac{-8}{13} \times \frac{-26}{3}$

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

Q9. **(a)** $\left(\frac{5}{18} \div \frac{45}{72}\right) \div \left(\frac{-15}{18}\right) = \left(\frac{5}{18} \times \frac{72}{45}\right) \div \left(\frac{-15}{18}\right)$

$$\frac{4}{9} \div \left(\frac{-15}{18}\right) = \frac{4}{9} \times \frac{18}{-15}$$

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

(b) $$\left(\frac{-5}{23} \div \frac{15}{69}\right) \div \frac{-1}{5} = \left(\frac{-5}{23} \times \frac{69}{15}\right) \div \frac{-1}{5}$$

$$= 1 \times \frac{5}{1}$$

$$= 5$$

Q10. Let the number be x.

$$\frac{-8}{13} \times x = 24$$

$$x = \frac{24}{\frac{-8}{13}}$$

$$x = \frac{24 \times 13}{-8}$$

$$x = -39$$

Q11. Sum of $\frac{3}{8}$ and $\frac{-5}{12}$

$$\frac{3}{8} - \frac{5}{12} = \frac{3 \times 3 - 5 \times 2}{24}$$

$$= \frac{9 - 10}{24}$$

$$= \frac{-1}{24}$$

Reciprocal of $\frac{-15}{8} \times \frac{16}{27} = \frac{-10}{9} = \frac{-9}{10}$

$$\frac{-1}{24} \div \frac{-9}{10} = \frac{1}{24} \times \frac{10}{9} = \frac{5}{108}$$

Q12. In 1 hour the train covers = $80\frac{4}{5}$ km or $\frac{404}{5}$ km

In $4\frac{3}{4} = \frac{19}{4}$ hour the train covers = $\frac{404}{5} \times \frac{19}{4}$

$$= \frac{1919}{5}$$

$$= 383\frac{4}{5} \text{ km}$$

➥Exercise – 1C

Q1. Rational number between –2 and 6 is = $\frac{-2+6}{2} = \frac{4}{2} = 2$

Q2. Two rational numbers between –2 and 2 =

$$\frac{-2+2}{2} = 0 \text{ and } \frac{0-2}{2} = -1$$

Q3. Rational number between $\frac{1}{3}$ and $\frac{1}{4}$

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

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

$$= \frac{7}{12} \times \frac{1}{2}$$

$$= \frac{7}{24}$$

Q4. Three rational numbers between –2 and 5

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

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

$$\frac{5}{1} + \frac{3}{2} = \frac{10+3}{2} = \frac{13}{2} \times \frac{1}{2} = \frac{13}{4}$$

So, numbers are $\frac{3}{2}, \frac{-1}{4}, \frac{13}{24}$

Q5. Four rational numbers between $\frac{1}{6}$ and $\frac{1}{3}$

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

$$\frac{1}{6}+\frac{3}{12}=\frac{2+3}{12}=\frac{5}{12}\times\frac{1}{2}=\frac{5}{24}$$

$$\frac{3}{12}+\frac{1}{3}=\frac{3+4}{12}=\frac{7}{12}\times\frac{1}{2}=\frac{7}{24}$$

$$\frac{1}{6}+\frac{5}{24}=\frac{4+5}{24}=\frac{9}{24}\times\frac{1}{2}=\frac{9}{48}$$

Q6. $\frac{1}{5}+\frac{1}{2}=\frac{2+5}{10}=\frac{7}{10}\times\frac{1}{2}=\frac{7}{20}$

$$\frac{1}{5}+\frac{7}{20}=\frac{4+7}{20}=\frac{11}{20}\times\frac{1}{2}=\frac{11}{40}$$

$$\frac{1}{2}+\frac{7}{20}=\frac{10+7}{20}=\frac{17}{20}\times\frac{1}{2}=\frac{17}{40}$$

Q7. Ten rational numbers between $\frac{1}{4}$ and $\frac{1}{2}$

By adopting the same procedure in sums 6 we can get the numbers as

$$\frac{3}{8}, \frac{5}{16}, \frac{7}{16}, \frac{9}{32}, \frac{13}{32}, \frac{15}{32}, \frac{17}{64}, \frac{19}{64}, \frac{25}{64}, \frac{27}{64}$$

Q8. Ten rational numbers between $\frac{2}{5}$ and $\frac{1}{2}$

we have $\frac{1}{20}, \frac{-7}{40}, \frac{-23}{80}, \frac{-5}{80}, \frac{11}{40}, \frac{13}{80}, \frac{31}{80}, \frac{53}{160}, \frac{71}{180}, \frac{115}{320}$

Q9. Do yourself

➥Multiple Choice Questions

Q1. (d)

Q2. (a)

Q3. (c)

Q4. (b)

Q5. (a)

Q6. (b)

Q7. (a)

$x + y$

$$\frac{2}{3} + \frac{3}{5} = \frac{10+9}{15}$$

$$= \frac{19}{15}$$

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

Q8. (b) $\frac{3}{7} \times \frac{-7}{3} = -1$

Q9. (b)

Q10. (d) $\frac{-7}{2} \times x = \frac{-35}{8}$

$$x = \frac{-35 \times 2}{8 \times -7}$$

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

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Chapter 2 Linear Equation in One Variable

➥ Exercise – 2A

Q1. **(a)** $8x = 20 + 3x$

$8x - 3x = 20$

$5x = 20$

(b) $4x - 3 = 2x + 5$

$4x - 2x = 5 + 3$

$2x = 8$

$x = 4$

(c) $5x - (3x - 1) = x - 4$

$5x - 3x + 1 = x - 4$

$5x - 3x - x = -4 - 1$

$x = -5$

(d) $\frac{2}{3}x + 1 = \frac{7}{3}$

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

$\frac{2}{3}x = \frac{7-3}{3} = \frac{4}{3}$

$\frac{2}{3}x = \frac{4}{3}$

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

(e) $\frac{3x}{4} + \frac{x}{6} = 22$

$$\frac{9x+2x}{12}=22$$

$$11x=22\times12$$

$$x=\frac{22\times12}{11}$$

$$x=2\times12$$

$$x=24$$

(f) $$\frac{x-3}{5}+\frac{x-4}{7}=6-\frac{2x-1}{35}$$

$$\frac{7x-21+5x-20+2x-1}{35}=6$$

$$14x-42=210$$

$$14x=252$$

$$x=18$$

(g) $$\frac{5x-3}{2x}=\frac{8}{9}$$

$$45x-27=16x$$

$$29x=27$$

$$x=\frac{27}{29}$$

(h) $$\frac{5+3x}{3-2x}=\frac{5}{3}$$

$$15+9x=15-10x$$

$$15-15=-19x$$

$$0=x$$

(i) $$0.26x+0.09x=8-0.45x$$

$$0.35x+0.45x=8$$

$$0.8x=8$$

$$x=10$$

(j) $$\frac{6x+7}{3x+2}=\frac{4x+5}{2x+3}$$

$$12x^2+14x+18x+21=12x^2+8x+15x+10$$

$$32x+21=23x+10$$

$$9x=-11$$

$$x=\frac{-11}{9}$$

(k) $$\frac{(4+x)(5-x)}{(2+x)(7-x)}=1$$

$$\frac{20-4x+5x-x^2}{14-2x+7x-x^2}=1$$

$$20+x-x^2=14+5x-x^2$$

$$6=4x$$

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

(l) $$\frac{2-7x}{1-5x}=\frac{3+7x}{4+5x}$$

$$8+10x-18x-35x^2=3+7x-15x-35x^2$$

$$-18x+8=3-8x$$

$$10x=5$$

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

Q2. **(a)** $\frac{x^2-9}{5+x^2}=\frac{-5}{9}$

$$9x^2-81=-25-5x^2$$

$$14x^2=56$$

$$x^2=4$$

$$x=2$$

(b) $\dfrac{2x^2-5}{x^2+2}=\dfrac{3}{2}$

$$4x^2-10=3x^2+6$$

$$x^2=16$$

$$x=4$$

➥ Exercise – 2B

Q1. Let the number be x

According to question

$$\frac{2}{3}x+6=36$$

$$\frac{2}{3}x=30$$

$$x=\frac{90}{2}=45$$

$$x=45$$

Q2. Let the numbers are $n, n+2, n+4$

According to question

$$n+n+2+n+4=246$$

$$3n=246-6$$

$$n=\frac{240}{3}$$

$$n=80$$

So, the number are $n=80, n+2=82, n+4=84$

Q3. Let the numbers be $5x$ and $8x$

So, $5x+8x=182$

$$13x=182$$

$$x=\frac{182}{13}$$

$$x=14$$

So numbers are :

$5 \times 14 = 70; \qquad 8 \times 14 = 112$

Q4. Let the ten's digit be $= x$

Unit's digit $= (15 - x)$

Original number $= 10 \times$ ten's digit + unit's digit

$$= 10 \times x + 15 - x = 9x + 15$$

On interchanging digits, new number

$$9x + 15 - 150 + 9x = 27$$

$$18x = 27 - 15 + 150 = 162$$

$$x = \frac{162}{18} = 9$$

So, Ten's digit = 9; Ones digit = 6

The number $= 9 \times 10 + 6 = 96$

Q5. Let the numerator be x

According to question; Denominator $x + 3$

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

$$5x - 15 = x + 5$$

$$4x = 20$$

$$x = 5$$

Numerator = 5, denominator = 8

Required fraction $= \frac{5}{8}$

Q6. Let the breadth be x

then length be $x + 9$

Area of given rectangle is $= x^2 + 9x$

Now, A.T.Q. Area of new rectangle is

$$(x + 9 + 3)(x + 3) = x^2 + 15x + 36$$

As $$x^2 + 9x + 84 = x^2 + 15x + 36$$

$$84 - 36 = 15x - 9x$$

$$48 = 6x$$

$$8 = x$$

So, length $= 8 - 9 = 17$; breadth $= 8$

Q7. A purse has only 2-rupee and 5-rupee coins.

Let the 2 rupee coins be x and 5-rupee coins be y.

So, According to question

$$x + y = 48$$

and $$2x + 5y = ₹\,132$$

From eq. (i)

$$x = 48 - y$$

$$2(48 - y) + 5y = 132$$

$$96 - 2y + 5y = 132$$

$$3y = 36$$

$$y = 12$$

As, $$x = 48 - 12$$

$$x = 36$$

So, the 2 rupees coins are 36.

Q8. The perimeter of a rectangle is 240 cm.

Let the length and breadth be x, y

as $$2(l + b) = 240$$

$$2(x + y) = 240 \quad \text{or} \quad x + y = 120 \quad \ldots(i)$$

$$2\left[\left(x - \frac{10x}{100}\right) + \left(y + \frac{20y}{100}\right)\right] = 240$$

$$x - \frac{10}{100}x + y + \frac{20}{100}y = 120$$

$$x + y - \frac{10x}{100} + \frac{20}{100}y = 120$$

$$9x + 12y = 1200 \qquad \ldots(i)$$

$$x + y = 120 \quad \ldots(ii)$$
$$9x + 12y = 1200$$
$$9x + 9y = 1080$$
$$- \quad - \quad -$$
$$3y = 120$$
$$y = 40$$
$$x + y = 120$$
$$x + 40 = 120$$
$$x = 120 - 40 = 80$$

So, the length = 80 cm, the breadth = 40 cm

Q9. Given speed of the stream = 1.5 km/hr

Let the speed of motor boat = x km/hr

Speed of boat in the direction of stream = $(x + 1.5)$ km/hr

Speed in opposite direction = $(x - 1.5)$ km/hr

Distance travelling in the direction of stream in 5 hours

$$= 5(x + 1.5)$$

Distance travelled in opposite direction in $\frac{11}{2}$ hr

$$= \frac{11}{2}(x - 1.5)$$

As per question

$$5(x + 1.5) = \frac{11}{2}(x - 1.5)$$
$$2(5x + 7.5) = 11x - 16.5$$
$$10x + 15 = 11x - 16.5$$
$$15 + 16.5 = 11x - 10x$$
$$x = 31.5$$

So, speed of the stream in still water = x = 31.5 km/h

Q10. Let Sheeba's age be x years. Therefore, his mother's age will be $6x$ years.

According to the given question,

After 5 years, Sheeba's age

$$= \frac{\text{Sheeba's mother's present age}}{3}$$

$$x + 5 = \frac{6x}{3}$$

$$x + 5 = 2x$$

$$5 = 2x - x$$

$$5 = x$$

$$6x = 6 \times 5 = 30$$

Therefore, the present age of Sheeba and Sheeba's mother will be 5 years and 30 years respectively.

Q11. Let the number of deer be x

Number of deer grazing in the field $= \frac{x}{2}$

Number of deer playing nearby

$$= \frac{3}{4} \times \text{Number of remaining deer}$$

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

$$= \frac{3}{4} \times \frac{x}{2} = \frac{3x}{8}$$

Number of deer drinking water from the pond = 9

$$x - \left(\frac{x}{2} + \frac{3x}{8} \right) = 9$$

$$x - \left(\frac{4x + 3x}{8} \right) = 9$$

$$x - \frac{7x}{8} = 9$$

$$\frac{x}{8} = 9$$

$$x = 72$$

Hence, the total number of deer on the herd is 72.

Q12. Let the common ratio between the number of notes of different denominations be x.

Therefore, number of ₹ 100 notes, ₹ 50 notes and ₹ 10 notes will be $2x$, $3x$ and $5x$ respectively.

Amount of ₹ 100 notes = ₹ $(100 \times 2x)$ = ₹ $200x$

Amount of ₹ 50 notes = ₹ $(50 \times 3x)$ = ₹ $150x$

Amount of ₹ 10 notes = ₹ $(10 \times 5x)$ = ₹ $50x$

It is given that total amount is ₹ 4,00,000

$\therefore \quad 200x + 150x + 50x = 4{,}00{,}000$

$\Rightarrow \qquad 400x = 4{,}00{,}000$

On dividing both sides by 400, we obtain $x = 1000$

Number of ₹ 100 notes = $2x = 2 \times 1000 = 2000$

Number of ₹ 50 notes = $3x = 3 \times 1000 = 3000$

Number of ₹ 10 notes = $5x = 5 \times 1000 = 5000$

➥ Multiple Choice Questions

Q1. (c) $2x + 7 = x + 9$

$x = 2$

Q2. (b) $6(y - 03) - 3(y - 7) = 0$

$6y - 18 - 3y + 21 = 0$

$3y - 3 = 0$

$y = -1$

Q3. (b) $\frac{7m + 2}{5} = \frac{6m - 5}{11}$

$$77m + 22 = 30m - 25$$
$$47m = -47$$
$$m = -1$$

Q4. (a) Let the number be x.

$$3x + 6 = 45$$
$$3x = 39$$
$$x = 13$$

Q5. (a) Let the number be $x, x+2, x+4$

$$x + x + 2 + x + 4 = 24$$
$$3x = 18$$
$$x = 6$$

Numbers are 6, 8, 10

Q6. (b) Let the ratio be x

$$5x + 11x = 160$$
$$x = 10$$

So numbers are, $5 \times 10 = 50; 11 \times 10 = 110$

Q7. (a) Let the ratio be x

$$5x - 2x = 60$$
$$3x = 60$$
$$x = 20$$

So numbers are, 40, 100

Q8. (a)

Let the son age be x; then Ajay age will be $3x$; after 12 years

$$x + 12, 3x + 12$$

A.T.Q. $2(x + 12) = (3x + 12)$

$$2x + 24 = 3x + 12$$
$$12 = x$$

So, Son age = 12; Ajay age = 36

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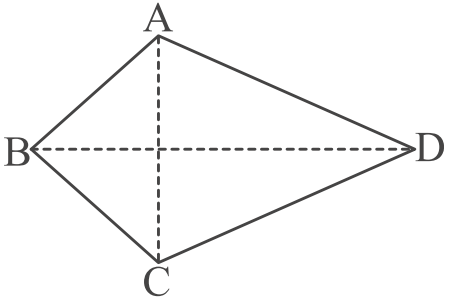
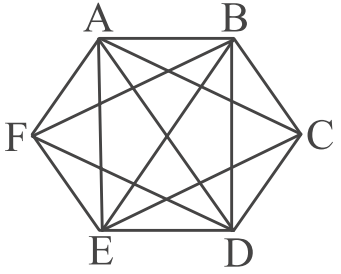
Chapter 3 Understanding Quadrilaterals

➥ Exercise – 3A

Q1. **(a)** There are 2 diagonals in a convex quadrilateral.



(b) There are 9 diagonals in a regular hexagon.



(c) A triangle does not have any diagonal in it.

Q2. **(a)** (i), (ii)

(b) (ii)

(c) (i)

Q3. A polygon with equal sides and equal angles is called a regular polygon.

(a) Equilateral triangle

(b) Square

(c) Regular hexagon.

➥ Exercise – 3B

Q1. **(a)** 4, PQ, QR; QR, RS; RS, SP; SP, PQ

(b) 2; PQ, SR; PS, QR

(c) 2; $\angle P$, $\angle Q$, $\angle Q$, $\angle R$; $\angle R$, $\angle S$; $\angle S$, $\angle P$

(d) 2; $\angle P$, $\angle R$; $\angle Q$, $\angle S$

Q2. Let the two equal angles be x.

So, $60 + 100 + x + x = 360°$

$2x = 200$

$x = 100°$

Angles are $100, 100$

Q3. Let the ratio be x

Then $2x + 3x + 5x + 8x = 360$

$18x = 360$

$x = 20$

So, angles are $40°, 60°, 100°, 160°$

Q4. **(a)** $120 + 50 + 130 + x = 360°$

$x = 360° - 300$

$x = 60°$

(b) $72 + 25 + 30 + x = 360°$

$x = 233°$

(c) $180° - 120° = x$

$60° = x$

$y = 180 - 80 = 100°$

$z = 180 - 60 = 120°$

$80° + 120° + 60° + (180 - w) = 360°$

$w = 80°$

So, $x = 60°, y = 120°, z = 120°, w = 80°$

Q5. Let the angle be $= x$

$$4x = 360°$$

$$x = 90°$$

Q6. $130 + 65 + 65 + x = 360°$

$$x = 100°$$

Q7. $\angle A + \angle B + 100 + 50 = 360°$

$$\angle A + \angle B = 360° - 150° = 210°$$

$$\frac{\angle A + \angle B}{2} = 105° = \frac{210}{2} = 105°$$

So, $$\angle APB = 180° - \left(\frac{\angle A + \angle B}{2}\right)$$

$$\angle APB = 180° - 105° = 75°$$

Q8. **(a)** We know that the length of opposite sides of a parallelogram are equal to each other.

$$GU = SN$$

$$3y - 1 = 26$$

$$3y = 27$$

$$y = 9$$

$$SG = NU$$

$$3x = 18$$

$$x = 6$$

(b) We know that diagonals of a parallelogram bisect each other.

$$y + 7 = 20$$

$$y = 13$$

$$x + y = 16$$

$$x + 13 = 16$$

$$x = 3$$

Q9. Adjacent angles of a parallelogram are supplementary.

In parallelogram RISK, $\angle RKS + \angle ISK = 180°$

$$120°+\angle ISK = 180°$$

$$\angle ISK = 60°$$

Also opposite angles of a parallelogram are equal.

In parallelogram CLUE, $\angle ULC = \angle CEU = 70°$

The sum of the measures of all the interior angles of a triangle is $180°$.

$$x + 60°+70° = 180°$$

$$x = 50°$$

Q10. If a transversal line is intersecting two given lines such that the sum of the measures of the angles on the same side of transversal is $180°$, then the given two lines will be parallel to each other.

Here, $\angle NML + \angle MLK = 180°$

Hence, $NM \,||\, LK$

As quardrilateral $KLMN$ has a pair of parallel lines, therefore it is a trapezium.

➥ Exercise – 3C

Q1. A quadrilateral which has exactly one part of parallel sides, in an isosceles trapezium non parallel sides are equal.

$$60°+\angle B = 180°$$

$$\angle B = 120°$$

$$\angle A = \angle C$$

$$\angle C = 60°$$

$$\angle B = \angle D$$

$$\angle D = 120°$$

Q2. $\angle y = 180 - 100 = 80°$

$\angle x = \angle 100°$

$\angle y = \angle z$ *i.e.,* $\angle z = 80°$

Q3. $25 + 25 + x + x = 150°$

$2x = 100°$

$x = 50°$

So, the sides are 25, 50, 25, 50

Q4. Let the ratio of x

$x + 3x = 180°$

$4x = 180°$

$x = 45°$

or $3x = 45 \times 3 = 135°$

Angles are $= 45°, 135°, 45°, 135°$

➥ Exercise – 3D

Q1. $BO = \frac{1}{2} BD$

i.e., $BO = 8$

$AO = \sqrt{(10)^2 - (8)^2} = \sqrt{100 - 64}$

$AO = \sqrt{36} = 6$

$AO = \frac{1}{2} \times AC$

$6 \times 2 = AC$

$AC = 12$ cm

Q2. $\angle DBC = 90 - \angle BAC = 90 - 28 = 62°$

Q3. $\angle ABD = \frac{1}{2} \angle AC$

$\angle ABD = \frac{1}{2} \times 126 = 63$

$\angle ACD = 90 - 63 = 27$

Q4. $\angle DCA = \frac{90}{2} = 45°$

Q5. **(a)** $\angle DAO = \angle CBO$

$\angle DAO = 90 - 21° = 69°$

$69° = x°$

(b) $180 - 140 = 2x$

$20° = x$

Q6. $\angle A = \angle C = 60°$

$\angle B = \angle D = 120°$

Q7. $\angle ODA = \frac{180 - 60}{2} = \frac{120}{2} = 60°$

Q8. **(a)** False

(b) True

(c) False

(d) False

(e) False

(f) False

(g) True

(h) False

➥Multiple Choice Questions

Q1. (a) rectangle

Q2. (b) Square

Q3. (a) Trapezium

Q4. (c) each other

Q5. (a) Square

Q6. (a) parallelogram

Q7. (a) $60°, 120°, 120°$

Q8. (c) $180 - 70° = 110°$

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Chapter 4

Practical Geometry

➥ Exercise – 4A

Do yourself

➥ Exercise – 4B

Do yourself

➥ Exercise – 4C

Do yourself

✧✧✧

Chapter 5 Data Handling

➥ Exercise – 5A

Do yourself

➥ Exercise – 5B

Q1. Do yourself

Q2. Do yourself

Q3. Do yourself

Q4. **(a)** It depicts the height of 20 students of a class.

(b) 155 cm

(c) 11 students

(d) 3 students

Q5. **(a)** 12

(b) 13 matches

(c) 8 matches

(d) 4 matches

Q6. **(a)** 30 – 35

(b) 6

(c) 5

(d) 20 – 25; 25 – 30; 30 – 35; 35 – 40; 40 – 45; 45 – 50

➥ Exercise – 5C

Q1. Do yourself

Q2. Do yourself

Q3. **(a)** In steel $= \dfrac{540000 \times 45}{360}$

$= ₹\,67500$

Cement $= \dfrac{540000 \times 75}{360}$

$= ₹\,112500$

(b) Timber $= \dfrac{540000 \times 50}{360}$

$= 135000$

Bricks $= \dfrac{540000 \times 50}{360}$

$= 75000$

Difference $= 135000 - 75000$

$= 60000$

Q4. **(a)** Wheat $= \dfrac{81000 \times 120}{360}$

$= 27000$ tonnes

(b) Sugar $= \dfrac{81000 \times 100}{360}$

$= 22500$ tonnes

(c) Rice $= \dfrac{81000 \times 60}{360}$

$= 13500$ tonnes

(d) Grain $= \dfrac{81000 \times 60}{360}$

$= 11250$ tonnes

(e) Maiza $= \dfrac{81000 \times 30}{360}$

$= 6750$ tonnes

➥ Exercise – 5D

Q1. Total number of event = 6

(a) an even number face favourable = 2, 4, 6 *i.e.*, 3

$$\text{Probability} = \frac{3}{6} = \frac{1}{2}$$

(b) a multiple of 3

favourable = 3, 6 *i.e.*, 2

$$\text{Probability} = \frac{2}{6} = \frac{1}{3}$$

(c) an odd number favourable = 1, 3, 5 *i.e.*, 3

$$\text{Probability} = \frac{3}{6} = \frac{1}{2}$$

(d) a number between 3 and 6

favourable = 4, 5 *i.e.*, 2

$$\text{Probability} = \frac{2}{6} = \frac{1}{3}$$

Q2. Total number of events = $2^3 = 8$

(a) All head

Favourable = 1 Probability = $\frac{1}{8}$ HHH

(b) two head HTH

Favourable = 3 Probability = $\frac{3}{8}$ HTT

(c) one head THH

Favourable = 3 Probability = $\frac{3}{8}$ TTH

(d) at least two heads = 4 THT

Favourable = 4 Probability = $\frac{4}{8} = \frac{1}{2}$ TTT

Q3. Total number of possibility = 25

Favourable event = 1, 3, 5, 7, 11, 13, 17, 19, 23 = 9

Probability = $\frac{9}{25}$

Q4. Total number of events = 52

(a) an ace

Favourable event = 4

Probability = $\frac{4}{52} = \frac{1}{13}$

(b) Black

Favourable event = 26

Probability = $\frac{26}{52} = \frac{1}{2}$

(c) either black card or king

Favorable event = $28 = 26 + 2$

Probability = $\frac{7}{13}$

(d) a face card

Favorable event = $3 \times 4 = 12$

Probability = $\frac{12}{52} = \frac{3}{13}$

(e) a red face card = 6

Favourable event = 6

Probability = $\frac{6}{52} = \frac{3}{26}$

Q5. Total number of events = 16

Favourable event = 7

Probability = $\frac{7}{16}$

Q6. Total number of ball = 20

Favourable event for getting white = 5

Probability of white = $\frac{5}{20}$

Probability of getting non white = $\frac{20-5}{20} = \frac{15}{20}$

Q7. Total number of events = $6 \times 6 = 36$

(a) outcome for odd

Favourable events = (1, 6), (3, 6), (5, 6), (2, 5), (4, 5), (6, 5), (1, 4), (3, 4), (5, 4), (2, 3), (4, 3), (6, 3), (1, 2), (3, 2), (5, 2), (2, 1), (4, 1), (6, 1)

(b) $\frac{18}{36}$ or $\frac{1}{2}$

(c) (2, 6), (3, 5), (4, 4), (5, 3), (6, 2)

(d) Probability of total 8

Favourable event = 5

Probability = $\frac{5}{36}$

Q8. Total number of event = 10

(a) odd number

Favourable = 5 *i.e.*, 1, 3, 5, 7, 9

Probability = $\frac{5}{10} = \frac{1}{2}$

(b) getting a prime number

Favoruable = 2, 3, 5, 7, 2

Probability = $\frac{4}{10} = \frac{2}{5}$

(c) Events multiple of 2

Favourable = 5

$$\text{Probability} = \frac{5}{10} = \frac{1}{2}$$

➥ Multiple Choice Questions

Q1. (c)

Q2. (d)

Q3. (a) Total events = 6

Favourable = 1

$$\text{Probability} = \frac{1}{6}$$

Q4. (b) Total events = 12

Favourable = 7

$$\text{Probability} = \frac{7}{12}$$

Q5. (c) Total events = 52

Favourable = 4

$$\text{Probability} = \frac{4}{52} = \frac{1}{13}$$

Q6. (d) black ball

Total event = 15

Favourable = 9

$$\text{Probability} = \frac{9}{15} = \frac{3}{5}$$

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Chapter 6 Squares and Square Roots

➥ Exercise – 6A

Q1. Number which are perfect squares :

(a)

2	256
2	128
2	64
2	32
2	16
2	8
2	4
	2

$2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2$

$= 2 \times 2 \times 2 \times 2 = 16$

So, 256 is a perfect square.

(b)

5	625
5	125
5	25
	5

$5 \times 5 \times 5 \times 5$

$= 5 \times 5 = 25$

So, 625 is a perfect square.

(c)

2	576
2	288
2	144
2	72
2	36
2	18
3	9
	3

$2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 3 \times 3$

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

$= 24$

So, 576 is a perfect square.

(d)

2	1296
2	648
2	324
2	162
3	81
3	27
3	9
	3

$2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 3 \times 3$

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

$= 36$

So, 1296 is a perfect square.

(e)

2	2500
2	1250
5	625
5	125
5	25
	5

$2 \times 2 \times 5 \times 5 \times 5 \times 5$

$= 2 \times 5 \times 5 = 50$

So, 2500 is a perfect square.

(f)

2	2116
2	1058
23	529
	23

$2 \times 2 \times 23 \times 23 = 2 \times 23 = 46$

So, 2116 is a perfect square.

Q2. (a)

2	36
2	18
3	9
	3

$2 \times 2 \times 3 \times 3$

$= 2 \times 3 = 6$ is an even number

(b)

7	49
	7

7×7

$= 7$ is an odd number

(c)

2	324
2	162
3	81
3	27
3	9
	3

$2 \times 2 \times 3 \times 3 \times 3 \times 3 = 2 \times 3 \times 3 = 18$ is an even number

(d)

17	289
	17

$17 \times 17 = 17$ is an odd number

(e)

3	441
3	147
7	49
	7

$3 \times 3 \times 7 \times 7 = 3 \times 7 = 21$ is an odd number

(f)

3	1089
3	363
11	121
	11

$3 \times 3 \times 11 \times 11$

$= 3 \times 11 = 33$ is an odd number

Q3. **(a)**

2	1800
2	900
3	450
3	150
2	50
5	25
	5

$2 \times 2 \times 3 \times 3 \times 2 \times 5 \times 5$

To make it a perfect square it must be multiplied by 2.

(b)

2	2904
2	1452
2	726
3	363
11	121
	11

$2 \times 2 \times 2 \times 3 \times 11 \times 11$

To make it a perfect square it must be multiplied by 6.

(c)

3	1323
3	441
3	147
7	49
	7

$3 \times 3 \times 3 \times 7 \times 7$

So, it must be multiplied by 3.

(d)

2	35280
2	17640
2	8820
3	4410
3	1470
7	490
7	70
2	10
	5

$2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 7 \times 7 \times 5$

So, to make it a perfect square it must be multiplied by 5.

Q4. (a)

2	180
2	90
3	45
3	15
	5

$2 \times 2 \times 3 \times 3 \times 5$

To make it a perfect square it must be divided by 5.

(b)

3	1575
3	525
5	175
5	35
	7

$3 \times 3 \times 5 \times 5 \times 7$

To make it a perfect square it must be divided by 7.

(c)

2	3174
3	1587
23	529
	23

$2 \times 2 \times 3 \times 23 \times 23$

So, it must be divided by $2 \times 3 = 6$

(d)

2	6912
2	3456
2	1728
2	864
2	432
2	216
2	108
2	54
3	27
3	9
	3

$2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 3$

= So, it must be divided by 3.

Q5. Since, perfect square numbers contain their unit's place digit 1, 4, 5, 6, 9 and even numbers of 0.

(a) 64000 is not a perfect square because its unit's place digit is 0.

(b) 89722 is not a perfect square because its unit's place digit is 2.

(c) 33322 is not a perfect square because its unit's place digit is 2.

(d) 222000 is not a perfect square because its unit's place digit is triple 0.

Q6. Pythagorean triplets obey the following relation

$(2m)^2 + (m^2 - 1)^2 = (m^2 + 1)^2$

(a) For a given natural number 'm' other than 1, we get a triplet such as $(2m), (m^2 - 1), (m^2 + 1)$

One member is 8 means $2m = 8$

So, $m = \frac{8}{2} = 4$

$(2m), (m^2 - 1), (m^2 + 1)$

$(2 \times 4), (4^2 - 1), (4^2 + 1)$

$8, 15, 17$

$8^2 + 15^2 = 17^2$

$64 + 225 = 289$

So, other members of triplet are 15 and 17.

(b) Here $2m = 12, m = 6$

So $(m^2 - 1) = (6^2 - 1) = 35$

and $(m^2 + 1) = (6^2 + 1) = 37$

$12^2 + 35^2 = 37^2$

$144 + 1225 = 1369$

So, 35 and 37

(c) Here $2m = 10, m = 5$

So, $(m^2 - 1) = 5^2 - 1 = 24$

and $m^2 + 1 = 5^2 + 1 = 26$

$(10)^2 + (24)^2 = (26)^2$

$100 + 576 = 676$

So, 24 and 26

(d) Here $2m = 14, m = 7$

So, $(m^2 - 1) = 8^2 - 1 = 63$

and $(m^2 + 1) = 8^2 + 1 = 65$

$(16)^2 + (63)^2 = (65)^2$

$256 + 3969 = 4225$

So, 63 and 65

Q7. **(a)** As we know,

Sum of first 5 odd numbers $= (5)^2 = 25$

So, $1 + 3 + 5 + 7 + 9 = 25$

(b) Sum of first 6 odd numbers $= (6)^2 = 36$

So, $1 + 3 + 5 + 7 + 9 + 11 = 36$

(c) Sum of first 7 odd numbers $= (7)^2 = 49$

So, $1 + 3 + 5 + 7 + 9 + 11 + 13 = 49$

(d) Sum of first 8 odd numbers $= (8)^2 = 64$

So, $1 + 3 + 5 + 7 + 9 + 11 + 13 + 15 = 64$

Q8. Given Pattern is :

$$1^2 = 1$$

$$11^2 = 121$$

$$111^2 = 12321$$

So,

(a) $(1111)^2 = 1234321$

(b) $111111^2 = 12345654321$

Q9. **(a)** $(46)^2 = (50-4)^2 = (50-4)(50-4)$

$= 50(50-4) - 4(50-4)$

$= 2500 - 200 - 200 + 16$

$= 2500 - 400 + 16 = 2116$

(b) $(76)^2 = (80-4)^2 = (80-4)(80-4)$

$= 80(80-4) - 4(80-4)$

$= 6400 - 320 - 320 + 16 = 5776$

(c) $(93)^2 = (90+3)^2 = (90+3)(90+3)$

$= 90(90+3) + 3(90+3)$

$= 8100 + 270 + 270 + 9 = 8649$

(d) $(86)^2 = (90-4)^2 = (90-4)(90-4)$

$= 90(90-4) - 4(90-4)$

$= 8100 - 360 - 360 + 16 = 7396$

➥ Exercise – 6B

Q1. **(a)** Prime factorization of

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

$2 \times 2 \times 2 \times 2 \times 3 \times 3$

Square root $= 2 \times 2 \times 3 = 12$

(b) 225 =

3	225
3	75
5	25
5	5
	1

$3 \times 3 \times 5 \times 5$ Square root $= 3 \times 5 = 15$

(c) 324 =

2	324
2	162
3	81
3	27
3	9
3	3
	1

$2 \times 2 \times 3 \times 3 \times 3 \times 3$ Square root $= 2 \times 3 \times 3 = 18$

(d) 729 =

3	729
3	243
3	81
3	27
3	9
3	3
	1

$3 \times 3 \times 3 \times 3 \times 3 \times 3$

Square root = $3 \times 3 \times 3 = 27$

(e) 1296

Prime factors of 1296 = $2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 3 \times 3$

Square root = $2 \times 2 \times 3 \times 3 = 36$

(f) 2304

Prime factors of 2304

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

Square root = $2 \times 2 \times 2 \times 2 \times 3 = 48$

(g) 7056

Prime factors of 7056 = $2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 7 \times 7$

Square root = $2 \times 2 \times 3 \times 7 = 84$

(h) 11025

Prime factors of 11025 = $3 \times 3 \times 5 \times 5 \times 7 \times 7$

Square root = $3 \times 5 \times 7 = 105$

(i) 24336

Prime factors of 24336 = $2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 13 \times 13$

Square root = $2 \times 2 \times 3 \times 13 = 156$

(j) 30625

Prime factors of 30625 = $5 \times 5 \times 5 \times 5 \times 7 \times 7$

Square root = $5 \times 5 \times 7 = 175$

Q2. Prime factors of 396 are

2	396
2	198
3	99
3	33
	11

$396 = 2 \times 2 \times 3 \times 3 \times 11$

To make it perfect square,
we should multiply it by 11
Now, square root = $2 \times 3 \times 11 = 66$

Q3. Prime factors of 1152

2	1152
2	576
2	288
2	144
2	72
2	36
2	18
3	9
	3

$2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 3 \times 3$
So, to make it a perfect square, we should divide it by 2.
Square root = $2 \times 2 \times 2 \times 3 = 24$

Q4. Square root of $1296 = 2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 3 \times 3 = 36$
So, number of rows = 36
and number of plants in each row = 36

Q5. Square root of 202500

2	202500
2	101250
3	5625
3	1875
5	625
5	125
5	25
	5

$2 \times 2 \times 3 \times 3 \times 5 \times 5 \times 5 \times 5$

$= 2 \times 3 \times 5 \times 5 = 150$

So, strength of the class = 150

Q6. LCM of 8, 12, 15, 20

2	8, 12, 15, 20
2	4, 6, 15, 10
2	2, 3, 15, 5
3	1, 3, 15, 5
5	1, 1, 5, 5
	1, 1, 1, 1

To make it perfect square we should multiply it by

$2 \times 3 \times 5 = 30$

So, Least square number which is exactly divisible by each of the numbers 8, 12, 15, 20 is

$2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 5 \times 5 = 3600$

Q7. Total men = 335250

Left over men = 9

So, to arrange the other men in the form of square, we should take square root of $335250 - 9 = 335241$

Prime factors of $335241 = 3 \times 3 \times 193 \times 193$

Square root $= 3 \times 193 = 579$

So, the men in each row = 579

Q8. $\sqrt{100}$

(i) $100 - 1 = 99$ (ii) $99 - 3 = 96$

(iii) $96 - 5 = 91$ (iv) $91 - 7 = 84$

(v) $84 - 9 = 75$ (vi) $75 - 11 = 64$

(vii) $64 - 13 = 51$ (viii) $51 - 15 = 36$

(ix) $36 - 17 = 19$ (x) $19 - 19 = 0$

Therefore $\sqrt{100} = 10$

$\sqrt{169}$

(i) $169 - 1 = 168$

(ii) $168 - 3 = 165$

(iii) $165 - 5 = 160$

(iv) $160 - 7 = 153$

(v) $153 - 9 = 144$

(vi) $144 - 11 = 133$

(vii) $133 - 13 = 120$

(viii) $120 - 15 = 105$

(ix) $105 - 17 = 88$

(x) $88 - 19 = 69$

(xi) $69 - 21 = 48$

(xii) $48 - 23 = 25$

(xiii) $25 - 25 = 0$

$\sqrt{169} = 13$

Q9. (a)

2	252
2	126
3	63
3	21
7	7
	1

$252 = \underline{2 \times 2} \times \underline{3 \times 3} \times 7$

$252 \times 7 = 2 \times 2 \times 3 \times 3 \times 7 \times 7$

Therefore, $252 \times 7 = 1764$ is a perfect square.

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

(b)

2	180
2	90
3	45
3	15
5	5
	1

$180 = \underline{2 \times 2} \times \underline{3 \times 3} \times 5$

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

Therefore, $180 \times 5 = 900$ is a perfect square

$\sqrt{900} = 2 \times 3 \times 5$

$= 30$

(c)

2	1008
2	504
2	252
2	126
3	63
3	21
7	7
	1

$1008 = \underline{2 \times 2} \times \underline{2 \times 2} \times \underline{3 \times 3} \times 7$

$1008 \times 7 = 2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 7 \times 7$

Therefore, $1008 \times 7 = 7056$ is a perfect square.

$\sqrt{7056} = 2 \times 2 \times 3 \times 7$

$= 84$

(d)

2	768
2	384
2	192
2	96
2	48
2	24
2	12
2	6
3	3
	1

$768 = \underline{2\times2}\times\underline{2\times2}\times\underline{2\times2}\times\underline{2\times2}\times3$

$768\times3 = 2\times2\times2\times2\times2\times2\times2\times2\times3\times3$

Therefore, $768\times3 = 2304$ is a perfect square

$\sqrt{2304} = 2\times2\times2\times2\times3 = 48$

➥ Exercise – 6C

Q1. (a)

	234
2	54756
	4
43	147
	129
464	1856
	1856
	×

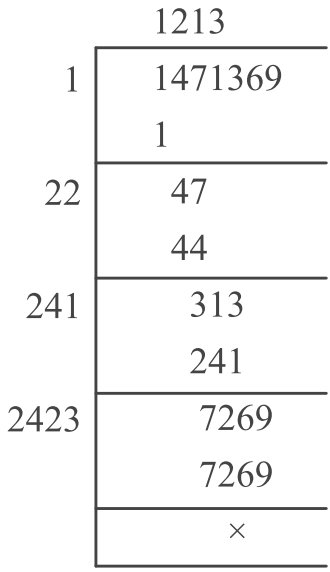
(b)

	625
6	390625
	36
122	306
	244
1245	6225
	6225
	×

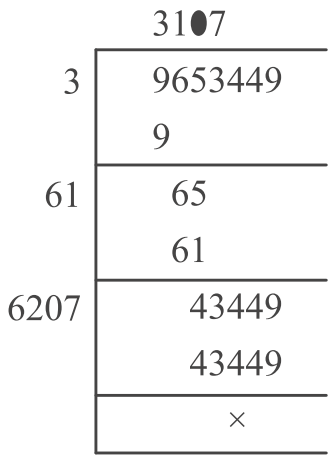
(c)

	222
2	4937284
	4
42	93
	84
442	972
	884
4442	8884
	8884
	×

(d)


1213
1
1471369
1
22
47
44
241
313
241
2423
7269
7269
×

(e)


3107
3
9653449
9
61
65
61
6207
43449
43449
×

(f)

	12351
1	152547201
	1
22	52
	44
243	854
	729
2465	12572
	12325
24701	24701
	24701
	×

(g)

	56804
5	3226694416
	25
106	726
	636
1128	9069
	9024
113604	454416
	454416
	×

(h)

	77●●
7	59413264
	49
147	1041
	1029
15408	123264
	123264
	×

Q2. Number — Number of digits in the square root

(a) 441 $= \frac{3+1}{2} = 2$

(b) 64600 $= \frac{5+1}{2} = 3$

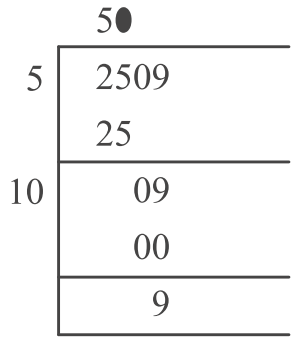
(c) 288369 $= \frac{6}{2} = 3$

Q3. (a)

	4●
4	2361
	16
88	761
	704
	57

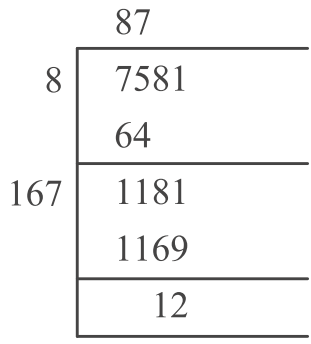
So, 57 should be subtracted.

(b)



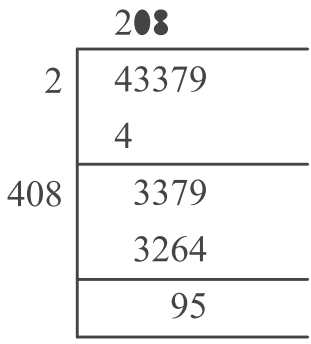
So, 9 should be subtracted.

(c)



So, 12 should be subtracted.

(d)



So, 95 should be subtracted.

Q4. (a)

	71
7	4931
	49
141	31
	141
	-110

So, 110 must be added.

(b)

	79
7	6203
	49
149	1303
	1341
	-38

So, 38 must be added.

(c)

	712
7	506900
	49
141	160
	141
1422	2800
	2844
	-44

So, 44 should be added.

(d)

	443
4	176201
	16
84	362
	336
883	2601
	2649
	-48

So, 48 should be added.

Q5. Least 6-digit number is 100000

	317
3	100000
	9
61	100
	61
621	3900
	4349
	-419

So, 100000 + 419 = 100419 is the perfect square.

Q6.

	89
8	7912
	64
169	1512
	1521
	-9

So, $7912 + 9 = 7921$ is the perfect square and 79 will be the square root.

Q7.

	208
2	43379
	4
408	3379
	3264
	115

So, $43379 - 115 = 43264$ is the perfect square and 208 is the square root.

Q8. First we must subtract 10 from 120419 cause the general need 10 extra men.

So, $120419 - 10 = 120409$

	347
3	120409
	9
64	304
	256
687	4809
	4809
	×

So, in front row 347 men were there.

Q9. Side of the square field is = $\sqrt{60025}$

	245
2	60025
	4
44	200
	176
485	2425
	2425
	×

Side = 245 m

Perimeter = $4 \times 245 = 980$ m

Speed = 18 km/hr or

= 5 m/sec

So, to cover 980 m the time he will take $\frac{980}{5} = 196$ sec

➥ Exercise – 6D

Q1. (a)

	1.11
1	1.2321
	1
21	23
	21
221	221
	221
	×

(b)

```
      2.22
   ┌──────
 2 │ 4.9284
   │ 4
   ├──────
42 │   92
   │   84
   ├──────
442│  884
   │  884
   ├──────
   │    ×
   └──────
```

(c)

```
      3.33
   ┌──────
 3 │ 11.0889
   │  9
   ├──────
63 │   208
   │   189
   ├──────
663│  1989
   │  1989
   ├──────
   │    ×
   └──────
```

(d)

```
      0.85
   ┌──────
 8 │ 0.7225
   │  64
   ├──────
165│  825
   │  825
   ├──────
   │    ×
   └──────
```

(e)

	0.222
2	0.049284
	4
42	92
	84
442	884
	884
	×

(f)

	0.333
3	0.110889
	9
63	208
	189
663	1989
	1989
	×

(g)

	3.767
3	14.190289
	9
67	519
	469
746	5002
	4476
7527	52689
	52689
	×

(h)

	12.35
1	152.5225
	1
22	52
	44
243	852
	729
2465	12325
	12325
	×

Q2. $\sqrt{\frac{3}{7}} = 0.42857142$ (after dividing 3 by 7)

	0.6546
6	0.42857142
	36
125	685
	625
1304	6071
	5216
13086	85542
	78516
	7026

So, 0.6546

Q3.

	125
1	15625
	1
22	56
	44
245	1225
	1225
	×

$\therefore \quad 15625 = 125$

So, $\sqrt{156.25} = 12.5$

and $\sqrt{1.5625} = 1.25$

and $\sqrt{156.25} + \sqrt{1.5625}$

$12.50 + 1.25 = 13.75$

Q4. (a)

	1.732
1	3.000000
	1
27	200
	189
343	1100
	1029
3462	7100
	6924
	176

1.732 Ans.

(b) $10\frac{2}{3} = \frac{32}{3} = 10.666667$

	3.265
3	10.666667
	9
62	166
	124
646	4266
	3876
6525	39067
	32625
	6442

3.265

(c)

	3.162
3	10.00000
	9
61	100
	61
626	3900
	3756
6322	14400
	12644
	1756

So, 3.0162

(d)

	15.414
1	237.615000
	1
25	137
	125
304	1261
	1216
3081	4550
	3081
30821	146900
	123284
	23616

15.414

Q5. $\sqrt{103.0225}$

	10.15
1	103.0225
	1
201	0302
	201
2025	10125
	10125
	×

$\therefore \quad \sqrt{103.0225} = 10.15$

So, $\sqrt{10302.25} = 101.5$

and $\sqrt{1.030225} = 1.015$

Q6. Area of the square field $= 325\text{m}^2$

Side of the square field $= \sqrt{325}$

	18.027
1	325.000000
	1
28	225
	224
3602	10000
	7204
36047	279600
	252329
	27271

So, side 18.027 m

Q7.

	31
3	1000
	-9
61	100
	61
	39

The remainder is 39. It represent that the square of 31 is less than 1000.

The next number is 32 and $32^2 = 1024$

Hence, number to be added to 1000 to make it a perfect square $= 32^2 - 1000 = 1024 - 1000 = 24$

Thus, the required number of plants in 24.

➥ Multiple Choice Questions

Q1. (c) $63 = 3 \times 3 \times 7$

To make it perfect square it must be divided by 7.

Q2. (c) $\sqrt{5^2 \times 4^2 \times 36} = ?$

$$\sqrt{5^2 \times 4^2 \times 6 \times 6} = \sqrt{5^2 \times 4^2 \times 6^2}$$
$$= 5 \times 4 \times 6 = 120$$

Q3. (b)

	15
1	250
	1
25	150
	125
	25

So, 25 must be added to make it a perfect square.

Q4. (d)

	25
2	600
	4
45	200
	225
	25

So, 25 must be added to make it a perfect square.

Q5. (b) 121; ∴ Unit place is odd

Q6. (b) Smallest three-digit number which is a perfect square is 100.

✧✧✧

Chapter 7

Cubes and Cube Roots

Exercise – 7A

Q1. **(a)** $(7)^3 = 7 \times 7 \times 7 = 343$

(b) $(25)^3 = 25 \times 25 \times 25 = 15625$

(c) $(45)^3 = 45 \times 45 \times 45 = 91125$

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

(e) $\left(2\frac{5}{7}\right)^3 = \left(\frac{19}{17}\right)^3 = \frac{19}{17} \times \frac{19}{17} \times \frac{19}{17} = \frac{6859}{343} = 19\frac{342}{343}$

(f) $(0.03)^3 = \frac{3}{100} \times \frac{3}{100} \times \frac{3}{100} = \frac{27}{1000000} = 0.000027$

Q2. **(a)**

2	108
2	54
3	27
3	9
3	3
	1

No

(b)

7	343
7	49
	7

Yes

(c)

2	612
2	306
3	153
3	51
	17

No

(d)

2	5832
2	2916
2	1458
3	729
3	243
3	81
3	27
3	9
	3

Yes

(e)

2	2744
2	1372
2	686
7	343
7	49
	7

Yes

(f)

2	4000
2	2000
2	1000
2	500
2	250
5	125
5	25
	5

No

(g)

3	9261
3	3087
3	1029
7	343
7	49
7	7
	1

Yes

(h)

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

(i)

2	74088
2	37044
2	18522
3	9261
3	3087
3	1029
7	343
7	49
7	7
	1

Yes

Q3. 64, 512, 1000, 1728 and 13824

Q4. 125, 343, 1331, 3375 and 6859

Q5.

3	675
3	225
3	75
5	25
5	5
	1

$3 \times 3 \times 3 \times 5 \times 5$

So, it should be multiplied by 5 to make a perfect cube.

Required perfect cube $= 3 \times 5 = 15$

Q6.

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

$2 \times 2 \times 3 \times 3 \times 3 \times 3 \times 3 \times 3$

It must be divided by $2 \times 2 = 4$

So perfect cube $= 3 \times 3 = 9$

Q7. Side = 3.8 cm

Volume $= a^3$

$= (3.8)^2$

$= 54.872 \text{ cm}^3$

Q8. Volume of cuboid $\times$ No. of cuboids = Volume of cube

Volume of Cuboid Sides are 5, 2, 5 cm

Length = 5 cm

Breadth = 2 cm

Height = 5 cm

Volume $= L \times B \times H = 5 \times 2 \times 5$

Volume of cube

Let side of cube $= a$

Volume = side^3 = a^3

Now,

$5 \times 2 \times 5 \times$ Number of cuboids = a^3

Number of cuboids = $5 \times 2 \times 2 = 20$

➥ Exercise – 7B

Q1. **(a)**

2	216
2	108
2	54
3	27
3	9
3	3
	1

$2 \times 2 \times 2 \times 3 \times 3 \times 3 = 2 \times 3 = 6$

(b) $343 = 7 \times 7 \times 7$; So cube root = 7

(c)

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

$2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 3$

$= 2 \times 2 \times 3$

$= 12$

(d)

2	2744
2	1372
2	686
7	343
7	49
7	7
	1

$2 \times 2 \times 2 \times 7 \times 7 \times 7$

$= 2 \times 7$

$= 14$

(e)

2	10648
2	5324
2	2662
11	1331
11	121
11	11
	1

$2 \times 2 \times 2 \times 11 \times 11 \times 11$

$= 2 \times 11$

$= 22$

(f)

2	27000
2	13500
2	6750
3	3375
3	1125
3	375
5	125
5	25
5	5
	1

$2 \times 2 \times 2 \times 3 \times 3 \times 3 \times 5 \times 5 \times 5$

$= 2 \times 3 \times 5 = 30$

(g)

3	91125
3	30375
3	10125
3	3375
3	1125
3	375
5	125
5	25
5	5
	1

$3 \times 3 \times 3 \times 3 \times 3 \times 3 \times 5 \times 5 \times 5$

$= 3 \times 3 \times 5 = 45$

(h)

17	4913
17	289
17	17
	1

$17 \times 17 \times 17 = 17$ (put $-$ sign)

So cube root $= -17$

(i)

2	5832
2	2916
2	1458
3	729
3	243
3	81
3	27
3	9
3	3
	1

$2 \times 2 \times 2 \times 3 \times 3 \times 3 \times 3 \times 3 \times 3$

$= 2 \times 3 \times 3$

$= 18$ (put $-$ sign)

$= -18$

(j) -32768

2	32768
2	16384
2	8192
2	4016
2	2048
2	1024
2	512
2	256
2	128
2	64
2	32
2	16
2	8
2	4
	2

$$2\times2\times2\times2\times2\times2\times2\times2\times2\times2\times2\times2\times2\times2\times2$$
$$= 2\times2\times2\times2\times2$$
$$= 32 \text{ (put } - \text{ sign)}$$
$$= -32$$

Q2. $\sqrt[3]{0.001331} = \sqrt[3]{\dfrac{1331}{10000000}}$

$$= \sqrt{\frac{11\times11\times11}{100\times100\times100}}$$

$$= \frac{11}{100}$$

$$= 0.11$$

Q3.

2	17496
2	8748
2	4374
3	2187
3	729
3	243
3	81
3	27
3	9
3	3
	1

$2 \times 2 \times 2 \times 3 \times 3 \times 3 \times 3 \times 3 \times 3 \times 3$

So, to make it a perfect we must multiply it by $3 \times 3 = 9$

So, cube root $= 2 \times 3 \times 3 \times 3 = 54$

Q4.

3	1323
3	441
3	147
7	49
7	7
	1

$3 \times 3 \times 3 \times 7 \times 7$

To make it a perfect cube it must be divided by

$$7 \times 7 = 49$$

So, cube root of the number = 3

Q5. Volume of the cubical box = 13.824 cubic metres

Length of each side of the box = $\sqrt[3]{13.824} = \sqrt{\frac{13824}{1000}}$

$$\sqrt[3]{\frac{13824}{1000}} = \sqrt{\frac{24 \times 24 \times 24}{10 \times 10 \times 10}}$$

$$= \frac{24}{10}$$

$$= 2.4 \text{ m}$$

Q6. (a) True

(b) True

(c) True

(d) False

(e) False

Q7. Do yourself

➥Multiple Choice Questions

Q1. (a)

Q2. (c)

Q3. (b)

Q4. (a)

Q5. (a)

Q6. (c)

Q7. (b)

Q8. (b)

✧✧✧

Chapter 8 Comparing Quantities

➥ Exercise – 8A

Q1. **(a)** 30%

$$\frac{30}{100} = \frac{3}{10} \quad \text{or} \quad 3:10$$

(b) 2.5%

$$\frac{25}{1000} = \frac{1}{40} \quad \text{or} \quad 1:40$$

(c) 0.75%

$$\frac{75}{1000} = \frac{3}{4000} \quad \text{or} \quad 3:4000$$

(d) 125%

$$\frac{125}{100} = \frac{5}{4} \quad \text{or} \quad 5:4$$

(e) $12\frac{1}{2}\% = \frac{25}{2}\%$

$$\frac{25}{2\times 100} = \frac{1}{8} \quad \text{or} \quad 1:8$$

Q2. **(a)** $\frac{3}{4} = \frac{3}{4}\times 100 = 75\%$

(b) $\frac{13}{75} = \frac{13}{75}\times 100 = 17\frac{1}{3}\%$

(c) $0.18 = \frac{8}{100}\times 100 = 18\%$

(d) $0.275 = \frac{275}{1000} \times 100 = 27.5\%$

(e) $1.25\% = \frac{1.25}{100} \times 100 = 125\%$

Q3. **(a)** $\frac{12}{100} \times 1200 = ₹\,144$

(b) $\frac{13}{100} \times 6500 = ₹\,845$

(c) $\frac{20}{100} \times 800 = ₹\,160$

Q4. Old price of scooter = 34000

Percentage increase = 20%

$$\text{Percentage increase} = \frac{\text{Increase in price}}{\text{Old price}} \times 100$$

$$20 = \frac{\text{Increase in price}}{34000} \times 100$$

$$20 \times 340 = \text{Increase in price}$$

$$= 6800$$

Q5. Let the cost be x

$$x + \frac{20}{100} \times = 600$$

$$\Rightarrow \quad \frac{x}{1} + \frac{x}{5} = 600$$

$$5x + x = 3000$$

$$x = \frac{3000}{5} = 600$$

Q6. Candidates are A and B, Let the votes be = 100

$100 - 46 = 54\%$ votes will be got by B

As $54 - 46 = 8$

So the no of valid votes be

$$= \frac{100}{8} \times 1600$$

$$= 20{,}000 \text{ votes}$$

Q7. Let the expenditure is ₹ 100

So total be $30 + 3 = 33$

$\therefore$ Total salary for the month would be

$$= \frac{2310}{33} \times 100 = ₹\ 7000$$

Q8. Let the cost of sugar be = ₹ 100

Increased cost = ₹ 120

So, consumption a housewife should decrease

$$= \frac{25}{125} \times 100 = 20\%$$

Q9. Let the maximum marks be $= 100x$

First student got $= 25x$ marks

So pass marks $= 25x + 30$ …(i)

Second student got $= 50x$ marks

So, pass marks $= 50x - 20$ …(ii)

Comparing (i) and (ii)

$$25x + 30 = 50x - 20$$

$$25x = 50; \qquad x = 2$$

So, the maximum marks $= 100 \times 2 = 200$ marks

So, minimum pass marks

$$= 25 \times 2 + 30$$

$$= 50 + 30 = 80 \text{ marks}$$

Q10. Let the original salary of the officer be = 100

Increased salary $= 100 + 50 = 150$

So, the salary % to be decreased $= \frac{50}{150} \times 100 = 33\frac{1}{3}\%$

➥ Exercise – 8B

Q1. $C.P.$ of CD player $= ₹\,1500$

$$S.P. = 1750$$

$$\text{Gain} = S.P. - C.P.$$

$$= 1750 - 1500$$

$$= 250$$

$$\text{Gain \%} = \left(\frac{\text{Gain}}{C.P.} \times 100\right)\%$$

$$= \frac{250}{1500} \times 100 = 16\frac{2}{3}\%$$

Q2. $C.P. = ₹\,2200; S.P. = ₹\,1980$

$$\text{Loss} = ₹\,2200 - ₹\,1980$$

$$= ₹\,220$$

$$\text{Loss \%} = \left(\frac{\text{Loss}}{C.P.} \times 100\right)\%$$

$$= \frac{220}{2200} \times 100 = 10\%$$

Q3. Total $C.P. = ₹\,12000 + ₹\,2850$

$$= ₹\,14850$$

$$S.P. = ₹\,13860$$

As $S.P. < C.P.$

$$\text{Loss} = ₹\,14850 - ₹\,13860$$

$$= ₹\,90$$

$$\text{Loss \%} = \frac{990}{14850} \times 100 = 6\frac{2}{3}\%$$

Q4. Let the $C.P.$ of 25 chairs be x

Then $C.P.$ of 1 chair $= \frac{x}{25}$

But, $S.P.$ of 30 chairs $= x$

$$S.P. \text{ of 1 chair} = \frac{x}{30}$$

$$\text{Loss} = \frac{x}{25} - \frac{x}{30} = \frac{x}{150}$$

$$\text{Loss \%} = \frac{x \times 25}{150 \times x} \times 100$$

$$= \frac{50}{3} = 16\frac{2}{3}\%$$

Q5. Dress sold at = ₹ 960

Let the C.P. of dress = x

The gain amount = $\frac{1}{9}x$

$G = S.P. - C.P.$ as,

$$\frac{1}{9}x = 960 - x$$

$$\frac{1 \times x}{9} + x = 960$$

$$10x = 960 \times 9$$

$$x = 864$$

C.P. = ₹ 864

$$\text{Profit \%} = \frac{1 \times x}{9 \times x} \times 100 = 11.11\%$$

Q6. $C.P.$ = ₹ 3,00,000

$S.P.$ of $\frac{1}{3}$ is at loss of 20%

$$C.P. \text{ of } \frac{1}{3} = \frac{1}{3} \times 300000 = 1{,}00{,}000$$

$$\text{Then, 20\% of it} = \frac{20}{100} \times 100000 = 20000$$

$$\text{Loss} = 20000$$

$S.P.$ of $\frac{2}{5}$ is at gain 25%

$$\frac{2}{5}\times 300000 = 120000$$

$$\text{Gain} = \frac{25}{100}\times 120000 = 3000$$

Overall 10% is gain then $= \frac{10}{100}\times 300000 = ₹\ 30000$

And net gain $= 30000 - 2000 = 10000$

So, we should have a gain $= 30000 - 10000 = 20000$

As the land remaining is $= 1 - \frac{1}{3} - \frac{2}{5} = \frac{15-5-6}{15} = \frac{4}{5}$

$C.P.$ of $\frac{4}{15}\times 300000 = 80000$

Q7. Let the $C.P.$ of 1000 gm gold be x

Then $C.P.$ of 1 gm $= \frac{x}{1000}$

The $S.P.$ of 980 gm $= x$

$S.P.$ of 1 gm gold $= \frac{x}{980}$

$$\text{Profit} = \frac{x}{980} - \frac{x}{1000}$$

$$= \frac{20x}{980\times 1000}$$

$$= \frac{x}{49000}$$

$$P\% = \frac{x\times 1000}{49000\times x}\times 100$$

$$= 2\frac{2}{49}\%$$

Q8. $C.P.$ of two fans ₹ 2160

Let the $C.P.$ of 1st fan be x

$C.P.$ of 2nd fan will be $= ₹\,(2160 - x)$

Profit of 1st fan $= 15\%$ of x

$$= \frac{15x}{100}$$

$$S.P. \text{ of 1st fan} = ₹\left(x + \frac{15x}{100}\right)$$

Loss on 2nd fan $= 9\%$ of $₹\,(2160 - x)$

$$= ₹\left(\frac{9}{100} \times (2160 - x)\right)$$

$S.P.$ of 2nd fan $= C.P. -$ Loss

$$= ₹\,(2160 - x) - \frac{9(2160 - x)}{100}$$

$$= (2160 - x)\left(\frac{91}{100}\right)$$

It is given that $S.P.$ of each fan is the same.

$$\frac{x}{1} + \frac{15x}{100} + (2160 - x)\left(\frac{91}{100}\right) = 2160$$

$$\frac{115x}{100} + \frac{91(2160 \times x)}{100} = 2160$$

$$11x + 19650 - 91x = 216000$$

$$24x = 19440$$

$$x = \frac{19440}{24} = 810$$

and cost of 2nd fan $= 2160 - 810$

$= ₹\,1350$

Q9. Cost of 50 chairs = ₹ 50,000

$C.P.$ of 1 chair = ₹ $50000 \div 50$

= ₹ 1000

So, $S.P.$ of one damage chair = ₹ $1000 \times \frac{3}{4}$

S.P. of 20 damage chair = ₹ 750×20 = ₹ 1500

To gain 35% overall profit, we should sell the chairs in

$$\left(50000 + 50000 \times \frac{35}{100}\right) = 67500$$

So, $S.P.$ of 30 chairs = ₹ 67500 – ₹ 15000 = ₹ 52500

So, $S.P.$ of 1 chair = ₹ $\frac{52500}{30}$ = ₹ 1750 each

Q10. Let $C.P.$ be $= 100x$

5% of $100x = 5x$

So, First $S.P. = 105x$

New $C.P. = 95x$

10% of $95x = 9.5x$

New $S.P. = 95x + 9.5x$

$= 104.5x$

According to question

$150x - 104.5x = 2$

$0.5x = 2$

$x = \frac{2}{5} \times 10 = 4$

So, C.P. will be $= 4 \times 100 = 400$

➥ Exercise – 8C

Q1. $M.P. =$ ₹ 18500, $D\% = 12\%$

$$D\% = \frac{\text{Discount}}{M.P.} \times 100$$

$$\frac{12 \times 18500}{100} = \text{Discount}$$

$$2220 = \text{Discount}$$

So, $S.P. = M.P. - \text{Discount}$

$= 18500 - 2220$

$= ₹\,16280$

Q2. Let $M.P. = ₹\,100; D = 12\%$ or ₹ 12

So, $S.P. = ₹\,100 - ₹\,12$

$= ₹\,88$

So, $M.P. = \frac{100}{88} \times \frac{880}{1} = ₹\,1000$

Q3. $C.P. = 3000; D = 10\%; P = 20\%$

$$S.P. = \frac{C.P.(100 + P)}{100}$$

$$= \frac{3000(100 + 20)}{100}$$

$$= \frac{3000 \times 120}{100}$$

$= ₹\,3600$

Let, $M.P. = ₹\,100; D = 10\%$

So, $S.P. = ₹\,100 - ₹\,10 = ₹\,90$

So, Actual $M.P. = \frac{100}{90} \times \frac{3600}{1}$

$= ₹\,4000$

Q4. Let $C.P. = ₹\,100$; Profit % = 20; Profit = ₹ 20

$S.P. = 100 + ₹\,20 = ₹\,120$

Actual profit = ₹ 360

Actual $S.P. = \frac{120}{20} \times 360 = ₹\,2160$

Now, Let $M.P.$ be $= ₹\,100$

$$\text{Discount} = 25\%$$

So, $$S.P. = ₹\ 75$$

$$\text{Actual } M.P. = \frac{100}{75} \times \frac{2160}{1} = ₹\ 2880$$

Q5. Let the $C.P.$ be ₹ 100; The gain required = 20%

The $S.P. = ₹\ (100 + 20) = ₹\ 120$

Discount allowed = 25%

Let the marked price be x

$$\text{Then discount} = 25\% \text{ of } x = ₹\left(\frac{25}{100} \times x\right) = \frac{x}{4}$$

$$S.P. = M.P. - \text{ Discount}$$

$$= ₹\left(x - \frac{x}{4}\right) = \frac{3x}{4}$$

But $$S.P. = ₹\ 120$$

$$\frac{3x}{4} = 120$$

$$x = \frac{120 \times 4}{3}$$

$$x = ₹\ 160$$

Hence the shopkeeper should mark 60% more.

Q6. The $C.P.$ = ₹ 450, The gain required = 20%

$$\frac{20}{100} \times 450 = 90$$

$$S.P. = ₹\ (450 + 90) = 540$$

$$\text{Discount} = 10\%$$

Let $$S.P. \text{ be} = ₹\ x$$

$$\text{Discount} = 10\% \text{ of } x$$

$$= \frac{x}{10}$$

So, $S.P. = x - \frac{x}{10} = \frac{9x}{10} = 540$

$$x = \frac{540 \times 10}{9}$$

$$= ₹\,600$$

Q7. $M.P. = ₹\,18500$

$$\text{Ist Discount} = \frac{20}{100} \times 18500$$

$$= ₹\,3700$$

$$= 18500 - 3700$$

$$= ₹\,14800$$

$$\text{IInd Discount} = 5\% \text{ of } 14800$$

$$= \frac{5}{100} \times 14800 = 740$$

Net Selling price = (14800 – 740)

$$= ₹\,14060$$

Q8. Let the marked price be ₹ 100

Then the Ist discount given on it = ₹ 20

The price after discount = ₹ (100 – 20) = ₹ 80

The next discount = 5% of 80

$$= \frac{5}{100} \times 80 = ₹\,4$$

The price after the second discount = ₹ (80 – 4) = ₹ 76

The net $S.P.$ = ₹ 76

The single discount equivalent to

Discount = (100 – 76) = 24%

Q9. Cost of a pair of skates = ₹ 450

Sales tax percentage = 5%

Sales tax amount = Sales tax percentage × Cost price

$$= 5\% \times 450$$

$$= \frac{5}{100} \times 450$$

$$= \frac{5}{10} \times 45$$

$$= \frac{1}{2} \times 45$$

$$= 22.5$$

$$\text{Bill Amount} = \text{Cost price} + \text{Tax Amount}$$

$$= 450 + 22.5$$

$$= ₹\ 472.5$$

Q10. Let the original price be x

$$x + 8\% \text{ of } x = 5400$$

$$\Rightarrow \quad x + \frac{8}{100} \times x = 5400$$

$$\Rightarrow \quad \frac{108}{100} x = 5400$$

$$x = 5400 \times \frac{100}{108}$$

$$x = 5000$$

So the price was ₹ 5000

➥ Exercise – 8D

Q1. $P = ₹\ 6000; R = 12\%; T = 2$ years

$$\text{Amount} = 6000\left(1 + \frac{12}{100}\right)^2$$

$$= 6000 \times \frac{112}{100} \times \frac{112}{100}$$

$$= ₹\ 7526.40$$

$$\text{Compound Interest} = ₹\ 7526.40 - ₹\ 6000$$

$= ₹\,1526.40$

Q2. Here, $P = ₹\,50000, T = 3$ years; Rate $= 10\%$

$$\text{Amount} = 50000\left(1+\frac{10}{100}\right)^3$$

$$= 50000\times\frac{110}{100}\times\frac{110}{100}\times\frac{110}{100}$$

$$= ₹\,66550$$

Compound interest $= ₹\,66550 - ₹\,50000$

$= ₹\,16550$

Q3. Here, $P = ₹\,20000$; Time $= 3$ years; Rate $= 5\%$

$$\text{Amount} = 20000\left(1+\frac{5}{100}\right)^3$$

$$= 20000\times\frac{105}{100}\times\frac{105}{100}\times\frac{105}{100}$$

$$= ₹\,23150.50$$

Q4. $P = ₹\,25000$; Time $= 1\frac{1}{2}$; years; Rate $= 8\%$ half yearly

As interest compound half yearly

So, Time $= 1\frac{1}{2}\times 2 = 3$ half years

And Rate $= \frac{8}{2} = 4\%$

So, $$\text{Amount} = 25000\left(1+\frac{4}{100}\right)^3$$

$$= 25000\times\frac{26}{25}\times\frac{26}{25}\times\frac{26}{25}$$

$$= ₹\,28121.60$$

So, Compound Interest $= ₹\,28121.60 - ₹\,25000$

$= ₹\,3121.60$

Q5. Here, $P = 2000$, Time $= 1\frac{1}{2}$ years; $R = 10\%$

As interest compounded half yearly

So, Time will be = 3 years and Rate 5%

So, $$\text{Amount} = 2000\left(1+\frac{5}{100}\right)^3$$

$$= 2000\times\frac{21}{20}\times\frac{21}{20}\times\frac{21}{20}$$

$$= ₹\,2315.25$$

So, $$\text{Compound Interest} = ₹\,2315.25 - ₹\,2000$$

$$= ₹\,315.25$$

Q6. Here $P = ₹\,10000$; Time = 6 months; Rate = 12%

As interest compound quarterly

So, Time will be = 2 quarters; Rate $= \frac{12}{4} = 3\%$

So, $$\text{Amount} = 10000\left(1+\frac{3}{100}\right)^2$$

$$= 10000\times\frac{103}{100}\times\frac{103}{100}\times\frac{103}{100}$$

$$= ₹\,10609$$

➥ Exercise – 8E

Q1. $P = ₹\,50000; R = 10\%; T = 2\frac{1}{2}$ years

$$A = 50000\left(1+\frac{10}{100}\right)^2\times\left(1+\frac{10}{100}\times\frac{1}{2}\right)$$

$$= 50000\times\frac{110}{100}\times\frac{110}{100}\times\frac{21}{20}$$

$$= ₹\,635250$$

$$C.I. = ₹\,635250 - ₹\,50000$$

$= ₹\,135250$

Q2. $P = ₹\,4016; T = 18$ months; $R = 12.5\%$

As, $C.I.$ compounded half yearly

So, Time = 3 half years; $R = \frac{12.5}{2} = 6.25\%$

$$A = 4016\left(1+\frac{6.25}{100}\right)^3$$

$$= 4016 \times \frac{160.25}{100} \times \frac{106.25}{100} \times \frac{106.25}{100}$$

$$= ₹\,4817$$

Q3. Let the principal be $= ₹\,100$

According to question,

$$\text{Interest} = \frac{100 \times 3 \times 6.25}{100} = ₹\,18.75$$

$$\text{Actual principal} = \frac{100}{18.75} \times 2400 = ₹\,12800$$

Now, $P = ₹\,12800$, Time = 3 years; Rate = 6.25%

$$A = 12800\left(1+\frac{6.25}{100}\right)^3$$

$$= 12800 \times \frac{106.25}{100} \times \frac{106.25}{100} \times \frac{106.25}{100}$$

$$= ₹\,15353.13$$

$$C.I. = ₹\,(15353.13 - 12800)$$

$$= ₹\,2553.13$$

Q4. $P = ₹\,320000; T = 1$ year; $R = 20\%$

As, $C.I.$ is compound quarterly

So, $T = 4$ quarters, $R = \frac{20}{4} = 5\%$

$$A = 320000\left(1+\frac{5}{100}\right)^4$$

$$= 320000 \times \frac{105}{100} \times \frac{105}{100} \times \frac{105}{100} \times \frac{105}{100}$$

$$= ₹\ 388962$$

So, $C.I. = ₹\ (388962 - 320000) = ₹\ 68962$

Q5. $P = ₹\ 80000$; Time = 3 years; R = 4%, 5%, 10%

$$A = 80000\left(1+\frac{4}{100}\right) \times \left(1+\frac{5}{100}\right) \times \left(1+\frac{10}{100}\right)$$

$$= 80000 \times \frac{104}{100} \times \frac{105}{100} \times \frac{110}{100}$$

$$= ₹\ 96096$$

$$C.I. = ₹\ (96096 - 80000) = ₹\ 16096$$

Q6. $P = ₹\ 8000$; Time = 2 years; Rate = 5%, 15%

$$A = 8000\left(1+\frac{5}{100}\right) \times \left(1+\frac{15}{100}\right)$$

$$= 8000 \times \frac{105}{100} \times \frac{115}{100} = ₹\ 9660$$

Q7. Let the principal be = ₹ 100; Time = 4 years; Rate = 4%

$$\text{Interest} = \frac{100 \times 4 \times 4}{100} = ₹\ 16$$

So, Actual principal $= \frac{100}{16} \times 1600 = ₹\ 10000$

Now, Time = 4 years; Rate = 10%

$$A = 10000\left(1+\frac{10}{100}\right)^4$$

$$= 10000 \times \frac{110}{100} \times \frac{110}{100} \times \frac{110}{100} \times \frac{110}{100}$$

$$= ₹\ 14641$$

So, $C.I. = ₹\,(14641 - 10000) = ₹\,4641$

➥ Exercise – 8F

Q1. Let the principal be = ₹ 100; Rate = 15%, Time = 2 years

$$\text{Amount} = 100\left(1 + \frac{15}{100}\right)^2$$

$$= 100 \times \frac{115}{100} \times \frac{115}{100}$$

$$= ₹\,132.25$$

$$C.I. = ₹\,(132.25 - 100) = ₹\,32.25$$

If compound interest is ₹ 32.25 then principal be = ₹ 100

If compound interest is ₹ 1 than principal be $= \frac{100 \times 100}{3225}$

If compound interest is ₹ 1290 then principal be

$$= \frac{100 \times 100 \times 1290}{3220}$$

$$= ₹\,4000$$

Q2. Time = x years; Rate = 5%, Principal = ₹ 800;

Amount = ₹ 882

$$882 = 800\left(1 + \frac{5}{100}\right)^x$$

$$\frac{882}{800} = \left(\frac{105}{100}\right)^x$$

$$\frac{441}{400} = \left(\frac{21}{20}\right)^x$$

$$\left(\frac{21}{20}\right)^3 = \left(\frac{21}{20}\right)^2$$

$$x = 2$$

Q3. Let the principal be = ₹ 100; Rate = 5%, Time = 3 years

$$\text{Simple interest} = \frac{100 \times 5 \times 3}{100} = ₹\,15$$

$$\text{Amount} = P\left(1 + \frac{R}{100}\right)^{T}$$

$$A = 100\left(1 + \frac{5}{100}\right)^{3}$$

$$= 100 \times \frac{21}{20} \times \frac{21}{20} \times \frac{21}{20}$$

$$= \frac{9261}{80}$$

$$\text{Compound Interest} = \frac{9261}{20} - \frac{100}{1}$$

$$= \frac{9261 - 8000}{80}$$

$$= \frac{1261}{80}$$

Difference between compound interest and simple interest

$$= \frac{1261}{80} - \frac{15}{1}$$

$$= \frac{1261 - 1200}{80}$$

$$= ₹\,\frac{61}{80}$$

$$\text{Actual principal will be} = \frac{100 \times 80 \times 61}{61 \times 1}$$

$$= ₹\,8000$$

Q4. $P = ₹\,4096$

$R = 12\frac{1}{2}\%$ per annum $= \frac{25}{4}\%$ per half year

$n = 18$ months

There will be 3 half years in 18 months

$$A = ₹\left[4096\left(1+\frac{25}{400}\right)^3\right]$$

$$= ₹\left[4096\left(1+\frac{1}{16}\right)^3\right]$$

$$= ₹\left(4096\times\frac{17}{16}\times\frac{17}{16}\times\frac{17}{16}\right)$$

$$= ₹\,4{,}913$$

Thus, the required amount is ₹ 4,913

Q5. Amount after 2 years = ₹ 2205

Amount after 3 years = ₹ 2315.25

Difference = ₹ (2315.25 – 2205) = ₹ 110.25

This difference is interest on ₹ 2205 for 1 year

So, $\text{Rate} = \frac{11025}{100}\times\frac{100}{2205} = 5\%$

Q6. Initial cost of scooter = ₹ 42000

Depriciation rate = 8% p.a.

Time = 1 year $\Rightarrow$ $n = 1$

Using $A = P\left[1+\frac{R}{100}\right]^n$

$$A = ₹\,42000\times\left[1-\frac{8}{100}\right]^1$$

$$= ₹\,42000\times\frac{92}{100}$$

$$= ₹\,420\times92$$

$$= ₹\,38640$$

Thus, the value of scooter after 1 year will be ₹ 38640.

Q7. Present population = 80000; Time = 2 years; Rate = 7.5%

$$\text{Population after 2 years} = 80000\left(1+\frac{7.5}{100}\right)^2$$

$$= 80000\times\frac{107.5}{100}\times\frac{107.5}{100}$$

$$= 92450$$

Q8. Population before 3 years = 160000

Rate of increase = $3\%, 2.5\%, 5\%$

$$\text{Present population} = 16000\left(1+\frac{3}{100}\right)\left(1+\frac{2.5}{100}\right)\left(1+\frac{5}{100}\right)$$

$$= 160000\times\frac{103}{100}\times\frac{102.5}{100}\times\frac{105}{100}$$

$$= 177366$$

Q9. Population before 2 years = 62500;

Rate of decrease = 4%

$$\text{Present population} = 62500\left(1-\frac{4}{100}\right)^2$$

$$= 625000\times\frac{24}{25}\times\frac{24}{25}$$

$$= 57600$$

➥ Multiple Choice Questions

Q1. (a) $C.P. = \dfrac{S.P.\times 100}{(100+P\%)}$

$$C.P. = \frac{420\times 100}{(100+5)}$$

$$= \frac{420\times 100}{105}$$

$$= ₹\ 400$$

Q2. (a) Let $C.P.$ be x

$$S.P. \text{ of article} = \frac{3}{5} \times x$$

$$L = C.P. - S.P.$$

$$L = x - \frac{3}{5} \times x$$

$$= \frac{2x}{5}$$

$$L\% = \frac{2x}{5 \times x} \times 100$$

$$L = 40\%$$

Q3. (d) Let the original number be x

$$\text{as one increased } 20\% = \frac{20}{100} \times x = \frac{x}{5}$$

$$\text{New one is} = x + \frac{x}{5} = \frac{6x}{5}$$

$$\text{Then Increased } 20\% = \frac{20 \times 6x}{100 \times 5} = \frac{6x}{25}$$

$$\text{Newer one will be} = \frac{6x}{25} + \frac{6x}{5}$$

$$= \frac{6x + 30x}{25} = \frac{36x}{25}$$

$$\text{So, total increased} = \frac{36x}{25} - x = \frac{11x}{25}$$

$$\% \text{ increased} = \frac{11x}{25 \times x} \times 100 = 44\%$$

Q4. (c) Do yourself

Q5. (c)

Q6. (b) Do yourself

✧✧✧

Chapter 9 Algebraic Expressions and Identities

Exercise – 9A

Q1. **Polynomials :** An algebraic expression in which the variables involved have only non-negative integral powers is called a **polynomial.**

(a) So, for $5x^2 + 10x - 4$ – Yes

(b) $3x^{1/2} - 5x + 1$ – No

(c) $\frac{2}{3}x^3 + 7x^2 - 16$ – Yes

(d) $6x^3 - 3x^2 + 6\sqrt{x} + 2$ – No

(e) $7x^2y^2 + 3xy^2 + 5x^2y - 7x$ – Yes

(f) $4x^2y^{1/2} - 3xy + 3x^{3/2}y$ – No

Q2. **(a)**

$$\begin{array}{r} 7a - 3b + 5c \\ 2a - 3b - 4c \\ +4a + b + c \\ \hline 13a - 5b + 2c \end{array}$$

(b)

$$\begin{array}{r} -7x^2 - 3xy + 10y^2 \\ 2x^2 + 8xy - 11y^2 \\ -3x^2 + 6xy + 8y^2 \\ \hline -8x^2 + 11xy + 7y^2 \end{array}$$

(c)

$$\begin{array}{r} 3x^2 - 3xy + 5y^2 \\ 7x^2 + 4xy - 2y^2 \\ 5x^2 \qquad\quad + 1y^2 \\ \hline 15x^2 + 1xy + 4y^2 \end{array}$$

(d)

$$\begin{array}{r} 5x^2 - 7xy + 4y^2 - 3x \\ 4x^2 + 2xy - 1y^2 \qquad + 1y \\ 1x^2 + 5xy - 2y^2 + 3x - 1y \\ \hline 10x^2 \qquad + 1y^2 \end{array}$$

Q3. (a)

$$\begin{array}{r} 25x^2 + 16xy - 3b^2 - 2 \\ -6x^2 + 13xy \qquad\quad - 1 + 4a^2 \\ +\quad - \qquad\qquad + \quad - \\ \hline 31x^2 + 3xy - 3b^2 - 1 + 4a^2 \end{array}$$

(b)

$$\begin{array}{r} -x^3 + 2xy^2 - 3x^2y + y^3 \\ x^3 - 1xy^2 - 5x^2y - y^3 \\ -\quad + \quad - \quad + \\ \hline -2x^3 + 3xy^2 - 8x^2y + 2y^3 \end{array}$$

(c)

$$\begin{array}{r} \frac{4}{3}x^2y + 5x^3 - \frac{2}{3}y^3 + 5xy^2 \\ 3x^2y + 4x^3 + 5y^3 - \frac{1}{2}xy^2 \\ -\quad - \quad - \quad + \\ \hline \frac{5}{3}x^2y + 1x^3 - \frac{17}{3}y^3 + \frac{11}{2}xy^2 \end{array}$$

(d)

$$\begin{array}{r} \frac{1}{9}x^3 - \frac{3}{7}x^2 + \frac{2}{5}x + 5 \\ -\frac{8}{9}x^3 + \frac{4}{7}x^2 - \frac{3}{5}x + 1 \\ \hline + \quad - \quad + \quad - \\ \hline x^3 \quad -1x^2 \quad +1x + 4 \end{array}$$

Q4.

$$\begin{array}{r} 2x^3 - 8x^2 + 9x - 10 \\ -7x^3 \quad + 8x - 9 \\ \hline + \quad - \quad + \\ \hline 9x^3 - 8x^2 + 1x \quad -1 \end{array}$$

So, $9x^3 - 8x^2 + 1x - 1$ must be added.

Q5.

$$\begin{array}{r} x^4 - 6x^3 + x^2 - 3x + 1 \\ x^5 \quad - 7x^3 + x^2 - 6x + 8 \\ \hline - \quad + \quad - \quad + \quad - \\ \hline -x^5 + x^4 + x^3 \quad + 3x - 7 \end{array}$$

Q6. (a)

$$\begin{array}{r} 3x^3 \\ \times 4x^3 \\ \hline 12x^7 \end{array}$$

(b)

$$\begin{array}{r} 4a^2b \\ \times -6a^3b^2c \\ \hline -24a^5b^4c \end{array}$$

(c)

$$\begin{array}{r} -\frac{6}{8}x^4yz \\ \times 24x^2y^2z^3 \\ \hline -18x^6y^3z^4 \end{array}$$

(d)

$$\begin{array}{r} -\frac{5}{8}x^2y^3 \\ \times -\frac{16}{15}x^3y \\ \hline \frac{2}{3}x^5y^4 \\ \hline \end{array}$$

Q7. (a)

$$\begin{array}{r} 3x^2-2x+5 \\ \times x-5 \\ \hline -9x^2+6x-15 \\ 3x^3-2x^2+5x \\ \hline 3x^3-11x^2+11x-15 \end{array}$$

(b)

$$\begin{array}{r} x^2+2x+1 \\ \times 2x+3 \\ \hline 3x^2+6x+3 \\ 2x^2+4x^2+2x \\ \hline 2x^3+7x^2+8x+3 \end{array}$$

(c)

$$\begin{array}{r} 2x^2+x-5 \\ \times x^2-2x+3 \\ \hline 6x^2+3x-15 \\ 4x^3-2x^2+10x \\ 2x^4+1x^3-5x^2 \\ \hline 2x^4+5x^3-1x^2+13x-15 \end{array}$$

(d)

$$\begin{array}{r} 3x^5 - 7x^3 + 2x^2 - x + 4 \\ \times x^3 - 2x^2 + 3x - 1 \\ \hline -3x^5 + 7x^3 - 2x^2 + x - 4 \\ 9x^6 + 6x^3 - 3x^2 + 12x - 21x^4 \\ -6x^7 + 14x^5 - 2x^3 - 8x^2 - x^4 \\ 8x^8 - 7x^6 + 2x^5 + 4x - 4x^4 \\ \hline 3x^8 - 6x^7 + 2x^6 + 13x^5 + 15x^3 - 13x^2 + 13x - 4 - 26x^4 \end{array}$$

(e)

$$\begin{array}{r} 5x^2 - 7x + 2 \\ \times\ 2x^2 - 3x - 5 \\ \hline -25x^2 + 35x - 10 \\ -15x^3 + 21x^2 - 6x \\ 10x^4 - 14x^3 + 4x^2 \\ \hline 10x^4 - 29x^3 + 29x - 10 \end{array}$$

(f)

$$\begin{array}{r} (5x - 7) \\ \times (2x + 3) \\ \hline 15x - 21 \\ 10x^2 - 14x \\ \hline 10x^2 + 1x - 21 \end{array}$$

$$\begin{array}{r} (10x^2 + x - 21) \\ \times (7x - 8) \\ \hline -80x^2 - 8x + 168 \\ 70x^3 + 7x^2 - 147x \\ \hline 70x^3 - 73x^2 - 155x + 168 \end{array}$$

Q8. **(a)** $(1.5x - 4y)(1.5x + 4y + 3) - 4.5x + 12y$

$= 1.5x(1.5x + 4y + 3) - 4y(1.5x + 4y + 3)$
$\qquad -4.5x + 12y$

$= 2.25x^2 + 6xy + 4.5x - 6xy - 16y^2 - 12y$
$\qquad -4.5x + 12y$

$= 2.25x^2 + (6xy - 6xy) + (4.5x - 4.5x)$
$\qquad -16y^2 + (12y - 12y)$

$= 2.25x^2 - 16y^2$

(b) $(a+b+c)(a+b-c)$

$= a(a+b-c)+b(a+b-c)+c(a+b-c)$

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

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

$= a^2+b^2-c^2+2ab$

(c) $(t+s^2)(t^2-s)$

$= t(t^2-s)+s^2(t^2-s)$

$= t^3-st+s^2t^2-s^3$

(d) $(x+y)(x^2-xy+y^2)$

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

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

$= x^3+y^3+(xy^2-xy^2)+(x^2y-x^2y)$

$= x^3+y^3$

➥ Exercise – 9B

Q1. **(a)** $(3x+5)^2$

$= (3x)^2+(5)^2+2\times3x\times5$

$= 9x^2+25+30x$

(b) $(5x^2-4y^2)^2$

$= (5x^2)^2+(4y^2)^2-2(5x^2)(4y^2)$

$= 25x^4+16y^4-40x^2y^2$

(c) $\left(7x-\frac{1}{2}y\right)^2$

$= (7x)^2+\left(\frac{1}{2}y\right)^2-2\times\frac{1}{2}y\times7x$

$$= 49x^2 + \frac{1}{4}y^2 - 7xy$$

(d) $\left(\frac{3x}{4} - \frac{4y}{5}\right)^2$

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

$$= \frac{9x^2}{16} + \frac{16y^2}{25} - \frac{6xy}{5}$$

Q2. **(a)** $81a^2 + 9b^2 - 54ab$

$$= (9a)^2 + (3b)^2 - 2 \times 9a \times 3b$$

$$= (9a - 3b)^2; \text{ putting values}$$

$$[9 \times (-1) - 3(-4)]^2$$

$$= [-9 + 12]^2$$

$$= (+3)^2$$

$$= 9$$

(b) $25x^2 + 16y^2 - 40xy$

$$= (5x)^2 + (4y)^2 - 2 \times 5x \times 4y$$

$$= (5x - 4y)^2$$

$$= (5 \times 6 - 4 \times 7)^2$$

$$= (30 - 28)^2$$

$$= 4$$

(c) $4x^2 + \frac{9}{x^2} - 12$

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

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

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

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

$$= \left(\frac{5}{2}\right)^2$$

$$= \frac{25}{4}$$

Q3. $x - \frac{1}{x} = 5$ Squaring both sides

$$x^2 + \left(\frac{1}{x}\right)^2 - 2 \times x \times \frac{1}{x} = 25$$

$$x^2 + \frac{1}{x^2} = 27$$

Squaring both side

$$x^4 + \frac{1}{x^4} + 2 = 729$$

$$x^4 + \frac{1}{x^4} = 727$$

Q4. **(a)** $(103)^2 = (100 + 3)^2$

$$= (100)^2 + (3)^2 = 2(100)(3)$$

$$= 10609$$

(b) $(98)^2 = (100 - 2)^2$

$$= (100)^2 + (2)^2 - 2(100)(2)$$

$$= 9604$$

(c) $(10.3)^2 = (10+0.3)^2$

$= (10)^2 + (0.3)^2 - 2(10)(0.3)$

$= 106.09$

(d) $(99.5)^2 = (100-0.5)^2$

$= (100)^2 + (0.5)^2 - 2(100)(0.5)$

$= 9900.25$

Q5. **(a)** $176 \times 176 - 124 \times 124$

$= (176)^2 - (124)^2$

$= (176+124)(176-124)$

$= 15600$

(b) $0.68 \times 0.68 - 0.32 \times 0.32$

$= (0.68)^2 - (0.32)^2$

$= (0.68+0.32)(0.68-0.32)$

$= 0.36$

(c) $1.06 \times 1.06 - 2 \times 1.06 \times 0.06 + 0.06 \times 0.06$

$= (1.06-0.06)^2$

$= 1$

(d) $\dfrac{23.71 \times 23.74 - 16.29 \times 16.29}{0.742}$

$= \dfrac{(23.71)^2 - (16.29)^2}{0.742}$

$= \dfrac{(23.71+16.29)(23.71-16.29)}{0.742}$

$= 400$

Q6. **(a)** $(3x+2y+4z)^2$

$= (3x)^2 + (2y)^2 + (4z)^2 + 2(3x)(2y)$

$+2(2y)(4z) + 2(4z)(3x)$

$$= 9x^2 + 4y^2 + 16z^2 + 12xy + 16yz + 24xz$$

(b) $(2x - y + 3z)^2$

$$= (2x)^2 + (y)^2 + (3z)^2 - 2(2x)(y) - 2(y)(3z) + 2(3z)(2x)$$

$$= 4x^2 + y^2 + 9z^2 - 4xy - 6yz + 12xz$$

(c) $(x - 2y - 5z)^2$

$$= (x)^2 + (2y)^2 + (5z)^2 - 2(x)(2y) + 2(2y)(5z) - 2(5z)(x)$$

$$= x^2 + 4y^2 + 25z^2 - 4xy + 20yz - 10xz$$

(d) $(5 + 4a - 8b)^2$

$$= (5)^2 + (4a)^2 + (8b)^2 + 2(5)(4a) - 2(4a)(8b) - 2(8b)(5)$$

$$= 25 + 16a^2 + 64b^2 + 40a - 64ab - 80b$$

Q7. $(x + y + z)^2 = x^2 + y^2 + z^2 + 2xy + 2yz + 2zx$

$$x^2 + y^2 + z^2 + 2(xy + yz + zx)$$

as $(x + y + z) = 9$

$xy + yz + zx = 23$

Substituting values

$$(9)^2 = x^2 + y^2 + z^2 + 2(23)$$

$x^2 + y^2 + z^2 = 81 - 46 = 35$

➥ Exercise – 9C

Q1. **(a)** $(5x + 9y)^3$

$$= (5x)^3 + (9y)^3 + 3(5x)(9y)(5x + 9y)$$

$$= 125x^3 + 729y^2 + 675x^2y + 1215xy^2$$

(b) $(x+1)^3$

$$= (x^3) + (1)^3 + 3(x)(1)(x+1)$$

$$= x^3 + 1 + 3x^2 + 3x$$

(c) $\left(\frac{2}{3}a + \frac{5}{3}b\right)^2$

$$= \left(\frac{2}{3}a\right)^3 + \left(\frac{5}{3}b\right)^3 + 3\left(\frac{2}{3}a\right)\left(\frac{5}{3}b\right)\left(\frac{2}{3}a + \frac{5}{3}b\right)$$

$$= \frac{8}{27}a^3 + \frac{125}{27}b^3 + \frac{20a^2b}{9} + \frac{50ab^2}{9}$$

(d) $\left(2x + \frac{1}{4y}\right)^3$

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

$$= 8x^3 + \frac{1}{64y^3} + \frac{3x^2}{y} + \frac{3x}{8y^2}$$

Q2. **(a)** $a^3 + 8b^3, ab = 15, (a+2b) = 10$

$(a+2b) = 10$, cutting both sides

$(a+2b)^3 = 10$

$a^3 + 8b^3 + 6ab(a+2b) = 1000$

$a^3 + 8b^3 + 6 \times 15(10) = 1000$

$a^3 + 8b^3 = 1000 - 900 = 100$

(b) $x^3 - y^3$, if $x - y = \frac{10}{9}$ and $xy = \frac{5}{3}$

$x - y = \frac{10}{9}$

$$x^3 - y^3 - 3 \times \frac{5}{3}\left(\frac{10}{9}\right) = \frac{1000}{729}$$

$$x^3 - y^3 = \frac{1000}{729} + \frac{50}{9} = \frac{5050}{729}$$

(c) $a^3 - \frac{1}{a^3}$; as $a - \frac{1}{a} = 5$

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

$$a^3 - \frac{1}{a^3} = 125 + 15 = 140$$

(d) $a^3 + \frac{1}{a^3}$; if $a + \frac{1}{a} = 6$

$$a^3 + \frac{1}{a^3} + 3a \times \frac{1}{a}\left(a + \frac{1}{a}\right) = 216$$

$$a^3 + \frac{1}{a^3} = 216 - 18 = 198$$

Q3. **(a)** $(1001)^3 = (1000 + 1)^3$

$$= (1000)^3 + (1)^3 + 3(1000)(1000 + 1)$$

$$= 1003003001$$

(b) $(97)^3 = (100 - 3)^3$

$$= (100)^3 - (3)^3 - 3(100)(3)(100 - 3)$$

$$= 912673$$

(c) $(598)^3 = (600 - 2)^3$

$$= (600)^3 - (2)^3 - 3(600)(2)(600 - 2)$$

$$= 213847192$$

(d) $(9.9)^2 = (10 - 0.1)^2$

$$= (10)^3 - (0.1)^3 - 3(10)(0.1)(10 - 0.1)$$

$= 970.299$

Q4. **(a)** $(2x+5)^3-(2x-5)^3$

$= [(2x)^3+(573+3\times 2x\times 5(2x+5)]-[(2x^3$

$-(5)^3-3(2x)(2x-5)]$

$= 120x^2+250$

(b) $(3x)^3+(8y)^3+3\times 3x\times 8y(3x+8y)-[(3x)^3-(8y)^3$

$-3\times 3x\times 8y(3x-8y)]$

$= 27x^3+512y^3+72xy(3xy+8y)-27x^3$

$+512y^3+72xy(3x-8y)$

$= 1024y^3+216xy+576xy^2+216xy-576xy^2$

$= 1024y^3+432xy$

(c) $\left(\frac{x}{2}+\frac{y}{3}\right)^3-\left(\frac{x}{2}-\frac{y}{3}\right)^3$

$= \left(\frac{x}{2}\right)^3+\left(\frac{y}{3}\right)^3+3\left(\frac{x}{2}\right)\left(\frac{y}{3}\right)\left(\frac{x}{2}+\frac{y}{3}\right)$

$-\left[\left(\frac{x}{2}\right)^3-\left(\frac{y}{3}\right)^3-3\left(\frac{x}{2}\right)\left(\frac{y}{3}\right)\left(\frac{x}{2}-\frac{y}{3}\right)\right]$

$= \left(\frac{x}{2}\right)^3+\left(\frac{y}{3}\right)^3+3\left(\frac{x}{2}\right)^2\left(\frac{y}{3}\right)+3\left(\frac{x}{2}\right)\left(\frac{y}{3}\right)^2$

$-\left(\frac{x}{2}\right)^3-\left(\frac{y}{3}\right)^3-3\left(\frac{x}{2}\right)^2\left(\frac{y}{3}\right)+3\left[\frac{x}{2}\right]\left[\frac{y}{3}\right]^2$

$= \frac{2y^3}{27}+\frac{x^2y}{2}$

➥ Exercise – 9D

Q1. **(a)** $(x+5)(x+3)$

$$= x^2 + (5+3)x + 5 \times 3$$

$$= x^2 + 8x + 15$$

(b) $(x-3)(x-5)$

$$= x^2 - (5+3)x + 5 \times 3$$

$$= x^2 - 8x + 15$$

(c) $(x+2)(x-9)$

$$= x^2 + (-9+2)x - 9 \times 2$$

$$= x^2 - 7x - 18$$

(d) $\left(a + \frac{4}{3}\right) + \left(a + \frac{1}{3}\right)$

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

$$= a^2 + \frac{5}{3}a + \frac{4}{9}$$

Q2. **(a)** $(101 \times 103) = (100+1)(100+3)$

$$= (100)^2 + (1+3)100 + (1 \times 3)$$

$$= 10403$$

(b) $97 \times 102 = (100-3)(100+2)$

$$= (100)^2 + (2-3)100 + (2 \times -3)$$

$$= 9894$$

(c) $96 \times 105 = (100-4)(100+5)$

$$= (100)^2 + (-4+5)50(-4 \times 5)$$

$$= 10080$$

(d) $51 \times 53 = (50+1)(50+3)$

$$= (50)^2 + (3+1)50 + (3 \times 1)$$

$$= 2703$$

Q3. **(a)** $(x-4)(x^2+4x+16)$

$= x^3-(4)^3$

$= x^3-64$

(b) $(2x-5y)(4x^2+10xy+25y^2)$

$= (2x)^3-(5y)^3$

$= 8x^3-125y^3$

(c) $(5x+2y)(25x^2-10xy+4y^2)$

$= (5x)^3+(2y)^3$

$= 125x^3+8y^3$

(d) $\left(3x-\frac{y}{2}\right)\left(9x^2+\frac{3}{2}xy+\frac{1}{4}y^2\right)$

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

$= 27x^3-\frac{y^3}{8}$

Q4. **(a)** $(x+5)(x^2-5x+25)-(x+4)(x^2-4x+16)$

$= (x^3)+(5)^3-[(x)^3-(4)^3]+125-(+64)$

$= 125-64=61$

(b) $(x+5)(x-4)+(x-4)(x-3)-(x+3)(x-2)$

$= x^2+(5-4)x-20+x^2-(4+3)x+1^2-x^2$

$-(3-2)x+6$

$= x^2-7x-2$

Q5. $a+b+c=9; ab+bc+ca=26$

Squaring both sides

$a^2+b^2+c^2+2(ab+bc+ac)=81$

$$a^2 + b^2 + c^2 + 2 \times 26 = 81$$

$$a^2 + b^2 + c^2 = 81 - 52 = 29$$

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

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

$$= 9(29 - 26)$$

$$= 9 \times 3$$

$$= 27$$

Q6. **(a)** $(28)^3 - (78)^3 + (50)^3$

$$= 3 \times (28)(-78)(50)$$

$$= -327600$$

(b) $(55)^3 (75)^3 + (20)^3$

$$= 3 \times (55) \times (-75) \times (20)$$

$$= -247500$$

➥ Multiple Choice Questions

Q1. (a) 0

Q2. (a)

$$\begin{array}{r} 3p^2 - 2p + 9 \\ p^2 - 3p + 8 \\ - \quad + \quad - \\ \hline 2p^2 + p + 1 \end{array}$$

Q3. (b) $3xy^2 \times -5x^2 y$

$$= -15x^3 y^3$$

Q4. (a) $(3x - 4y)^2$

$$= (3x)^2 + (4y)^2 - 2(3x)(4y)$$

$$= 9x^2 + 16y^2 - 24xy$$

Q5. (a) $x + 2y = 10$ …(i)

$xy = 6$

$x^2 + 4y^2$

On squaring (i) both sides

$$(x + 2y)^2 = (10)^2$$

$$x^2 + 4y^2 + 4xy = (10)^2$$

$$x^2 + 4y^2 + 4xy = 100$$

$$x^2 + 4y^2 + 4(6) = 100$$

$$x^2 + 4y^2 = 100 - 24$$

$$x^2 + 4y^2 = 76$$

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Chapter 10 Visualising Solid Shapes

➥ Exercise – 10A

Q1. Do yourself

Q2. **(a)** Tetrahedron

(b) Cube, cuboid

(c) Square pyramid and rectangular pyramid

(d) Regular octahedron

Q3. No

Q4. Do yourself

Q5. 8; 6; 30; 4

Q6. **(a)** Square

(b) Circle and rectangle

(c) Triangle and rectangle

(d) Triangle

Q7. **(a)** Triangular pyramid

(b) Hexagonal pyramid

(c) Hexagonal prism

(d) Triangular prism

(e) Triangular prism

(f) Square pyramid

(g) Square pyramid

(h) Cube

Q8. Do yourself

➥Multiple Choice Questions

Q1. (b)

Q2. (d)

Q3. (d)

Q4. (b)

Q5. (d)

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Chapter 11 Mensuration

➥ Exercise – 11A

Q1. Perimeter of square = 4 (side of the square)

$= 4\,(60\text{ m})$

$= 240\text{ m}$

Perimeter of rectangle = 2 (Length + Breadth)

$= 2(80\text{ m} + \text{Breadth})$

$= 160\text{ m} + 2 \times \text{Breadth}$

It is given that perimeter of square and rectangle is same

$160\text{ m} + 2 \times \text{Breadth} = 240\text{ m}$

$$\text{Breadth} = \left(\frac{80}{2}\right)\text{m}$$

$\text{Breadth} = 40\text{ m}$

$\text{Area of square} = (\text{side})^2 = (60\text{ m})^2$

$= 3600\text{ m}^2$

$\text{Area of rectangle} = \text{Length} \times \text{Breadth}$

$= (80 \times 40)\text{ m}^2$

$= 3200\text{ m}^2$

Thus, the area of square field is larger than the area of the rectangle field.

Q2. Length of the rectangle $= [20 - (3.5 + 3.5)]$ m

$= 1.3$ m

Circumference of 1 semi-circular part $= \left(\frac{22}{7} \times 3.5\right)$ m

$= 11$ m

Circumference of both semi-circular parts $= (2 \times 11)$ m

$= 22$ m

Perimeter of the garden = AB + Length of both semi-circular region BC and $DA + CD = 13 \text{ m} + 22 \text{ m} + 13 \text{ m}$

$= 48$ m

Area of the garden = Area of rectangle $+ 2 \times$ Area of two semi-circular regions

$$= \left[(13 \times 7) + 2 \times \frac{1}{2} \times \frac{22}{7} \times (3.5)^2\right] \text{m}^2$$

$$= (91 + 38.5) \text{ m}^2$$

$$= 129.5 \text{ m}^2$$

Q3. Area of parallelogram = Base $\times$ Height

Hence, area of one tile $= 24 \text{ cm} \times 10 \text{ cm}$

$= 240 \text{ cm}^2$

$$\text{Required number of tiles} = \frac{\text{Area of the floor}}{\text{Area of each tile}}$$

$$= \frac{1080 \text{ m}^2}{240 \text{ cm}^2}$$

$$= \frac{(1080 \times 10000) \text{ cm}^2}{240 \text{ cm}^2}$$

$= 45000$ tiles

Thus, 45000 tiles are required to cover a floor of area 1080 m^2.

Q4. **(a)** Radius (r) of semi-circular part $= \left(\frac{2.8}{2}\right)$ cm

$= 1.4$ cm

Perimeter of the given figure

$= 2.8 \text{ cm} + nr$

$= 2.8 \text{ cm} + \left(\frac{22}{7} \times 1.4\right) \text{cm}$

$= 2.8 \text{ cm} + 4.4 \text{ cm}$

$= 7.2 \text{ cm}$

(b) Radius (r) of the semi-circular part $= \left(\frac{2.8}{2}\right)$ cm

$= 1.4$ cm

Perimeter of the given figure

$= 1.5 \text{ cm} + 2.8 \text{ cm} + 1.5 \text{ cm} + n(1.4 \text{ cm})$

$= 5.8 \text{ cm} + \frac{22}{7}(1.4 \text{ cm})$

$= 5.8 \text{ cm} + 4.4 \text{ cm}$

$= 10.2 \text{ cm}$

(c) Radius (r) of semi-circular part $= \left(\frac{2.8}{2}\right)$ cm

$= 1.4$ cm

Perimeter of the figure $(c) = 2 \text{ cm} + nr + 2 \text{ cm}$

$= 4 \text{ cm} + \frac{22}{7} \times (1.4 \text{ cm})$

$= 4 \text{ cm} + 4.4 \text{ cm}$

$= 8.4 \text{ cm}$

Thus, the ant will have to take a longer round for the food-piece (b).

➥ Exercise – 11B

Q1. Area of Trapezium $= \frac{1}{2} \times (15 + 8) \times 10$

$= 23 \times 5$

$= 115 \text{ cm}^2$

Q2. $240 = \frac{1}{2} \times (25 + x) \times 10$

$\frac{2 \times 240}{10} = 25 + x$

$48 - 25 = x$

$x = 23 \text{ cm}$

Q3. $500 = \frac{1}{2} \times (50) \times h$

$\frac{1000}{50} = h$

$h = 20 \text{ cm}$

Q4. $210 = \frac{1}{2} (x + 2x) \times 14$

$\frac{210 \times 2}{14} = 3x$

$x = 10$ and $3x = 30$

Q5. The length of the parallel sides of a trapezium ratio be x as $5x, 6x$

$330 = \frac{1}{2} \times (5x + 6x) \times 12$

$\frac{660}{12 \times 11} = x$

$x = 5$

So, sides are $5 \times 5 = 25$

$6 \times 5 = 30$

Q6. Given $d_1 = 7.5$ cm and $d_2 = 12$ cm

$$\text{Area of rhombus} = \frac{1}{2} \times d_1 \times d_2$$

$$= \frac{1}{2} \times 7.5 \times 12$$

$$= 45 \text{ cm}^2$$

Q7. $d_1 = 45$ cm, $d_2 = 30$ cm

$$\text{Area of tile} = \frac{1}{2} \times d_1 \times d_2$$

$$= \frac{1}{2} \times 45 \times 30 \text{ cm}^2$$

$$= 45 \times 15 \text{ cm}^2$$

$$= 675 \text{ cm}^2$$

Total number of tiles = 3000

$$\text{Area of floor} = 675 \times 3000 \text{ cm}^2$$

$$= 2025000 \text{ cm}^2$$

$$= \frac{2025000}{100 \times 100} \text{ m}^2$$

$$= \frac{2025}{10} \text{ m}^2$$

$$\text{Cost of polishing the floor} = ₹\ 4 \times \frac{2025}{10}$$

$$= ₹\ 2 \times 405$$

$$= ₹\ 810$$

Q8. Let the parallel sides be $3x$ and $5x$

$$\text{Area of trapezium} = \frac{1}{2} (\text{sum of parallel sides}) \times h$$

$$384 \text{ cm}^2 = \frac{1}{2}(3x + 5x) \times 12$$

$$384 = 6 \times 8x$$

$$384 = 48x$$

$$\frac{384}{48} = x$$

$$x = 8$$

So, $3x = 3 \times 8 = 24$ cm

$5x = 5 \times 8 = 40$ cm

Q9. $180\frac{1}{2} \times (x + x + 6) \times 9$

$$\frac{180 \times 2}{9} = 2x + 6$$

$$40 - 6 = 2x$$

$$\frac{34}{2} = 2x$$

$$x = 17$$

$17, 17 + 6 = 23$

Q10. $\text{Area} = \frac{1}{2} \times (10 + 25) \times 15$

$$= \frac{35 \times 1}{2} \times 15$$

$$\text{Cost} = \frac{35 \times 1}{2} \times 15 \times 4$$

$= ₹\,1050$

Q11. Perimeter of Trapezium = 52 cm

Sum of unparallel sides $= 10 + 10 = 20$

Sum of parallel sides $= 52 - 20 = 32$ cm

So, Area of Trapezium $= \frac{1}{2} \times (32) \times 8$

$= 128\ \text{cm}^2$

➥ Exercise –11C

Q1. Area of polygon $A = \frac{1}{2} \times \text{Perimeter} \times \text{in radius}$

$$\text{Perimeter} = na$$

$$\text{radius} = r$$

$$A = \frac{1}{2} nar$$

$$A = \frac{1}{2} \times 5 \times 10 \times 9 \quad \text{(as pentagon so } n = 5\text{)}$$

$$= 225 \text{ cm}^2$$

Q2. $$A = \frac{1}{2} \times na \times \sqrt{R^2 - \frac{a^2}{4}}$$

$$= \frac{1}{2} \times 7 \times 8 \times \sqrt{(6)^2 - \frac{(8)^2}{4}}$$

$$= 28\sqrt{36 - 16}$$

$$= 28 \times \sqrt{20}$$

$$= 125.22 \text{ cm}^2$$

Q3. $$A = \frac{1}{2} \times na \times \sqrt{R^2 - \frac{a^2}{4}}$$

$$= \frac{1}{2} \times 9 \times 6 \times \sqrt{(4)^2 - \frac{(6)^2}{4}}$$

$$= 9 \times 3 \times \sqrt{16 - 9}$$

$$= 27\sqrt{7}$$

$$= 71.435 \text{ cm}^2$$

Q4. Area of regular hexagon

$$= \frac{3\sqrt{3}}{2} (\text{side})^2 \text{ sq unit}$$

$$= \frac{3\sqrt{3}}{2} \times (7)^2$$

$$= \frac{3\sqrt{3}}{2} \times 49$$

$$= 127.302 \text{ cm}^2$$

$$\frac{3\sqrt{3}}{2} \times (9)^2 = \frac{3\sqrt{3}}{2} \times 81 = 210.438 \text{ cm}^2$$

Q5. **(a)** Area of regular octagon $= 2a^2(1+\sqrt{2})$

$$= 2 \times (8)^2(1+\sqrt{2})$$

$$= 2 \times 64(1+\sqrt{2})$$

$$= 308.992$$

(b) $2 \times (5)^2(1+\sqrt{2})$

$$2 \times 25(1+\sqrt{2})$$

$$= 120.7 \text{ cm}^2$$

Q6. **(a)** Area of $\Delta AFB = \left(\frac{1}{2} \times B \times h\right)$

$$= \frac{1}{2} \times 20 \times 10$$

$$= 10 \times 10 = 100 \text{ cm}^2$$

Area of square $= (s)^2$

$$= (20)^2$$

$$= 440 \text{ cm}^2$$

Area of ΔECD

$$OD^2 = (20)^2 - (10)^2$$

$$OD^2 = (400 - 100)$$

$$OD = 10\sqrt{3}$$

$$= \left(\frac{1}{2} \times 20 \times 10\sqrt{3}\right)$$

$$= 100\sqrt{3} \text{ cm}^2$$

$$\text{Total Area} = 100\sqrt{3} + 100 + 400$$

$$= 673.20 \text{ m}^2$$

(b) $PD = \sqrt{(8)^2 - (4)^2}$ $\qquad$ $\sqrt{(12)^2 - (4)^2}$

$= \sqrt{64 - 16}$ $\qquad$ $\sqrt{144 - 16}$

$= \sqrt{48}$ $\qquad$ $\sqrt{128}$

$= 4\sqrt{3}$

$$\text{Area of } FDA = \left(\frac{1}{2} \times 4 \times 4\sqrt{3}\right) + \left(\frac{1}{2} \times 4 \times \sqrt{128}\right)$$

$$= 8\sqrt{3} + 2\sqrt{128}$$

$DQ = \sqrt{(12)^2 - (5)^2}$ $\qquad$ $\sqrt{(12)^2 - (5)^2}$

$= \sqrt{144 - 25} = \sqrt{119}$

$$\text{Area } \nabla AB = \left(\frac{1}{2} \times 5 \times \sqrt{119}\right) \times 2 = 5\sqrt{119}$$

$$DR = \sqrt{(12)^2 - (5)^2} = \sqrt{119}$$

$$= \sqrt{(10)^2 - (5)^2} = \sqrt{100 - 25} = \sqrt{75}$$

$$\text{So, area of } DBC = \left(\frac{1}{2} \times \sqrt{119} \times 5\right) + \left(\frac{1}{2} \times \sqrt{75} \times 5\right)$$

$$= \frac{5\sqrt{119}}{2} + \frac{5\sqrt{75}}{2}$$

$$\text{Total area} = 8\sqrt{3} + 2\sqrt{128} + 5\sqrt{119} + \frac{5\sqrt{119}}{2} + \frac{5\sqrt{7}}{2}$$

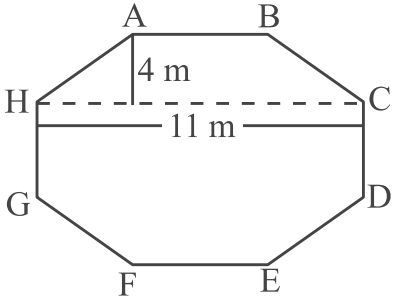
$= 134.29 \text{ cm}^2$

Q7. Side of regular octagon = 5 cm

Area of trapezium $ABCH$ = Area of trapezium $DEFG$

Area of trapezium $ABCH = \left[\frac{1}{2}(4)(11+5)\right] \text{m}^2$

$= \left(\frac{1}{2} \times 4 \times 16\right) \text{m}^2 = 32 \text{ m}^2$



Area of rectangle $HGDC = 11 \times 5 = 55 \text{ m}^2$

Area of octagon = Area of trapezium $ABCH$

+ Area of trapezium $DEFG$

= Area of rectangle $HGDC$

$= 32 \text{ m}^2 + 32\text{m}^2 + 55\text{m}^2 = 119 \text{ m}^2$

Q8. Area of pentagon $ABCDE$

Area of EHD + Area of trapezium $HDCF$ + Area of

ΔCFB + area of ΔAEB

As

$$\frac{1}{2} \times (EH \times HD) + (DH \times CF) \times HF + \frac{1}{2} \times CP \times FB + \frac{1}{2}(EB \times AG)$$

$EH = BE - BH = 120 - 80 = 40$

$$HF = BH - BF = 80 - 20 = 60$$

$$\frac{1}{2} \times (40 \times 25) + \frac{1}{2}(25 \times 30) \times 60 + \frac{1}{2} \times 30 \times 20 + \frac{1}{2}(120 \times 70)$$

$$= 6650 \text{ m}^2$$

➥ Exercise – 11D

Q1. C.S.A. of cylinder $= 2 \times \pi \times r \times h$

$$= 2 \times \frac{22}{7} \times 7 \times 15$$

$$= 660 \text{ cm}^2$$

T.S.A. of cylinder $= 2\pi r\,(h + r)$

$$= 2 \times \frac{22}{7} \times 7\,(15 + 7)$$

$$= 968 \text{ cm}^2$$

Q2. C.S.A. of cylinder $= 2 \times \pi rh$

$$88 = 2 \times \frac{22}{7} \times r \times 14$$

$$\frac{88 \times 7}{22 \times 14} = 2r$$

$$D = 2 \text{ cm} \qquad [\because D = 2r]$$

Q3. Volume $= \pi r^2 h$

$$= \frac{22}{7} \times 3.5 \times 3.5 \times 8$$

$$= 308 \text{ cm}^3$$

Q4. Volume $= \pi r^2 h$

$$3080 = \frac{22}{7} \times r^2 \times 20$$

$$\frac{3080 \times 7}{20 \times 22} = r^2 \qquad r^2 = 49; \qquad \Rightarrow \qquad r = 7 \text{ cm}$$

Q5. Volume $= \pi r^2 h$

Given $D = 14$ m; So radius $= \dfrac{14}{2} = 7$ m

$$2156 = \frac{22}{7} \times (7)^2 \times h$$

$$\frac{2156}{7 \times 22} = h$$

$$h = 14 \text{ m}$$

Q6. C.S. of roller $= 2\pi rh$

$$= 2 \times \frac{22}{7} \times 60 \times 84$$

$$= 31680 \text{ cm}^2$$

1000 revolutions then area

$$= 31680 \times 1000 = 31680000 \text{ cm}^2$$

$$= 3168 \text{ m}^2$$

Q7. Original cylinder volume $= \pi r^2 h$

Reduced cylinder volume $= \pi \times \left(\dfrac{r}{2}\right)^2 h$

$$\text{Ratio} = \frac{\pi \times r^2 \times h}{4(\pi \times r^2 \times h)} \qquad i.e., \quad \frac{\text{reduce}}{\text{original}}$$

$$= 1 : 4 \quad \text{Ans.}$$

Q8. 1 pilar C.S.A. $= 2\pi \times r \times h$

$$= 2 \times \frac{22}{7} \times \frac{0.48}{2} \times 7$$

$$= 22 \times 0.48 \text{ m}^2$$

1 pillar cost of painting $= 22 \times 0.48 \times 5$

12 pillar cost of painting $= 22 \times 0.48 \times 5 \times 12$

i.e., $= ₹ 633.60$

Q9. $h = 22.5\,\text{m}; d = 7\,\text{m or } r = \frac{7}{2}$

$$\text{Inner C.S.A.} = 2\pi \times r \times h$$

$$\text{Area dug} = \text{Volume} = \pi r^2 h$$

$$= \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2} \times 22.5$$

$$= 866.25\ \text{cm}^3$$

$$\text{C.S.A.} = 2 \times \frac{22}{7} \times \frac{7}{2} \times 22.5$$

$$\text{C.S.A. of} = 22 \times 22.5\ \text{m}^2$$

$$= 495\ \text{m}^2$$

$$\text{Cost of plastering} = 3 \times 495 = ₹\,1485$$

Q10. $\text{Volume of 1 coin} = \pi r^2 h$

$$= \frac{22}{7} \times \frac{1.5}{2} \times \frac{1.5}{2} \times 0.2\ \text{cm}^3$$

$$\text{Volume of cylinder} = \pi r^2 h$$

$$= \frac{22}{7} \times \frac{4.5}{2} \times \frac{4.5}{2} \times 10$$

$$\text{No. of Coins} = \frac{\text{Volume of cylinder}}{\text{Volume of cone}}$$

$$= \frac{\frac{22}{7} \times 4.5 \times 4.5 \times 10}{\frac{22}{7} \times 1.5 \times 1.5 \times 0.2}$$

$$= 450 \text{ coins are required}$$

Q11. $\text{Volume of cylinder} = \pi r^2 h$

$$= \frac{22}{7} \times \frac{20}{2} \times \frac{20}{2} \times 9$$

$$= 2828.60\ \text{cm}^3$$

Volume of cube $= (8\text{ cm})^3$

$= 512\text{ cm}^3$

$$\text{height} = \frac{\text{Volume of cylinder}}{\text{Volume of cube}}$$

$$= \frac{2828.6}{512}$$

$= 5.52\text{ cm}$

Q12. C.S.A. of pipe $= 2 \times \frac{22}{7} \times \frac{70}{2} \times 21 \times \frac{1}{100}$

$= 46.2\text{ cm}^2$

$\text{Cost} = 46.2 \times 10$

$= ₹\ 462$

Q13. as height is same

Volume of hollow cylinder = volume of solid cylinder

$$\pi(R^2 - r^2) \times h = \pi \times R_1 \times h$$

$$\frac{\pi(R^2 - r^2) \times h}{\pi \times h} = {R_1}^2$$

$$R^2 = (20)^2 - (15)^2$$

$${R_1}^2 = 175$$

$R_1 = 13.3$ cm approx.

So radius of solid cylinder is 13.3 cm

Q14. **(a)** Volume of roof $= l \times b \times h$

$$= 70 \times 44 \times \frac{1}{10} = 308\text{ cm}^3$$

(b) Volume of tank $= \pi r^2 h$

$$= \frac{22}{7} \times 14 \times 14 \times h$$

$$= 61.6 \text{ hm}^3$$

$$\text{Rise in volume} = \frac{308}{61.6} = 5 \text{ m}$$

Q15. $2\pi r = 22$ or $r = \dfrac{22 \times 7}{22 \times 2}$

$$r = \frac{7}{2}$$

Now volume of cylinder $= \pi r^2 h$

$$= \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2} \times 12$$

$$= 462 \text{ cm}^3$$

Q16. Volume of cuboidal reservoir $= 108 \text{ m}^3$

$$= (108 \times 1000) \text{ L}$$

$$= 108000 \text{ L}$$

It is given that water is being poured at the rate of 60 L per minute.

That is, (60×60) L = 3600 L per hour

$$\text{Required number of hours} = \frac{108000}{3600} = 30 \text{ hours}$$

Thus, it will take 30 hours to fill the reservoir.

➥ Multiple Choice Questions

Q1. (c) $A = \dfrac{1}{2} \times 10 \times 7 = 35 \text{ cm}^2$

Q2. (b) $475 = \dfrac{1}{2} \times (2x + 3x) \times 10$

$$\frac{475 \times 2}{5 \times 10} = x$$

$$x = 19$$

Larger side $= 3 \times 19 = 57$ cm

Q3. (c)

Q4. (b) S.A. = 486

$$6a^2 = 486$$

$$a^2 = 81$$

$$a = 9$$

Q5. (b) S.A. $= 6a^2$

$$= 6 \times (5)^2$$

$$= 150$$

Q6. (a) No. of cubes $= \dfrac{\text{Volume of block}}{\text{Volume of small block}}$

$$= \frac{(8)^3}{(2)^3}$$

$$= (4)^3 = 64$$

Q7. (b) Length $= 4 \times 3 = 12$ m

Breadth $= 4$ cm

S.A. $= 4(12 \times 4) + 2(4 \times 4)$

$192 + 32 = 224 \text{ cm}^2$

Q8. (c) as of $= \dfrac{\pi r^2 \times h}{\pi {R_2}^2 \times H}$

$$= \left(\frac{r}{R}\right)^2 \left(\frac{h}{H}\right)$$

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

$$= \frac{4}{9} \times \frac{5}{3} = \frac{20}{27}$$

✧✧✧

Chapter 12 Exponents and Powers

Exercise – 12A

Q1.

Number	Base	Exponent
(a) 5^7	5	7
(b) 3^{-8}	3	-8
(c) $(-5)^9$	-5	9
(d) $(\sqrt{2})^3$	$\sqrt{2}$	3
(e) 15	15	1
(f) $\left(\frac{-4}{5}\right)^3$	$\frac{-4}{5}$	3
(g) $\left(\frac{-3}{2}\right)^6$	$\frac{-3}{2}$	6
(h) $(\sqrt{2})^0$	$\sqrt{2}$	0

Q2. In exponential form :

(a) $8\times8\times8\times8\times8 = 8^5$

(b) $(-9)\times(-9)\times(-9) = (-9)^3$

(c) $ab\times ab\times ab\times ab\times ab = (ab)^5$

(d) $\sqrt{3}\times\sqrt{3}\times\sqrt{3}\times\sqrt{3} = (\sqrt{3})^4$

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

(f) $\left(\frac{2}{5}\right)^{-2} \times \left(\frac{2}{5}\right)^{-2} \times \left(\frac{2}{5}\right)^{-2} = \left(\frac{2}{5}\right)^{-6}$

Q3. In exponential form (Simplify)

(a) $9^{-3} \times 9^{-2} = 9^{-3-2} = 9^{-5}$

(b) $\frac{(3)^9}{(3)^5} = (3)^{9-5} = 3^4$

(c) $\{(-3)^5 \times 7^5\} = (-3 \times 7)^5 = (-21)^5$

(d) $\frac{x^{-3}}{x^{-5}} = (x)^{-3+5} = (x)^2$

(e) $\left(\frac{-3}{8}\right)^2 \times \left(\frac{-3}{8}\right)^5 \times \left(\frac{-3}{8}\right)^6 = \left(\frac{3}{8}\right)^{2+5+6} = \left(\frac{-3}{8}\right)^{13}$

(f) $(2^4)^{-3} = 2^{-12}$

Q4. Which is greater?

(a) 3^2 or 2^3

$3^2 = 3 \times 3 = 9$

$2^3 = 2 \times 2 \times 2 = 8$

So, $3^2 > 2^3$

(b) 3^4 or 4^3

$3^4 = 3 \times 3 \times 3 \times 3 = 81$

$4^3 = 4 \times 4 \times 4 = 64$

So, $3^3 > 4^3$

(c) 5^3 or 3^7

$5^3 = 5 \times 5 \times 5 = 125$

$3^7 = 3 \times 3 \times 3 \times 3 \times 3 \times 3 \times 3 = 2187$

So, $5^3 < 3^7$

Q5. **(a)** Express 625 as a power of 5

$$625 = 5\times5\times5\times5 = 5^4$$

(b) 343 as power of 7

$$343 = 7\times7\times7 = 7^3$$

(c) 1024 as a power of -2

$$1024 = -2\times-2\times-2\times-2\times-2\times-2\times-2\times-2\times-2\times-2$$

$$= (-2)^{10}$$

Q6. Reciprocol of

(a) $\frac{27}{64} = \frac{64}{27}$ or $\frac{4}{3}\times\frac{4}{3}\times\frac{4}{3} = \left(\frac{4}{3}\right)^3$

(b) $\frac{-16}{125} = \frac{125}{-16}$

(c) $\left(\frac{-3}{8}\right)^3 = \left(\frac{-8}{3}\right)^3$ or $\left(\frac{-3}{8}\right)^{-3}$

(d) $\left(\frac{-7}{3}\right)^2 = \left(\frac{3}{-7}\right)^2$ or $\left(\frac{-7}{3}\right)^{-2}$

Q7. Simplify :

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

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

(b) $\left(\frac{-7}{9}\right)^8\times\left(\frac{-7}{9}\right)^{-11}\times\left(\frac{-7}{9}\right)^1 = \left(\frac{-7}{9}\right)^{8-11+1}$

$$= \left(\frac{-7}{9}\right)^{-2} = \left(\frac{-9}{7}\right)^2$$

(c) $\left(\frac{3}{11}\right)^4\div\left(\frac{3}{11}\right)^{-3} = \left(\frac{3}{11}\right)^{4+3}$

$$= \left(\frac{3}{11}\right)^{7}$$

(d) $\left(\frac{-5}{9}\right)^{-6} \div \left(\frac{-5}{9}\right)^{5} = \left(\frac{-5}{9}\right)^{-6-5}$

$$= \left(\frac{-5}{9}\right)^{-11} \text{ or } \left(\frac{-9}{5}\right)^{11}$$

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

$$= \left(\frac{-4}{7}\right)^{6}$$

Q8. (a) $\left[\left(\frac{2}{5}\right)^{-3}\right]^{4} = \left(\frac{2}{5}\right)^{-12}$

$$= \left(\frac{5}{2}\right)^{12}$$

(b) $\left[\left(\frac{-6}{11}\right)^{-5}\right]^{-3} = \left(\frac{-6}{11}\right)^{15}$

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

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

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

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

$$\left[\frac{3}{4}\right]^{-2} \text{ or } \left[\frac{4}{3}\right]^{2} \text{ or } \frac{16}{9}$$

(e) $(5^{-1} \times 3^{-1}) \div 6^{-1}$

$$= \left(\frac{1}{5} \times \frac{1}{3}\right) \div \frac{1}{6}$$

$$= \frac{1}{15} \times \frac{6}{1} = \frac{2}{5}$$

(f) $\dfrac{4^{-3} \times a^{-5} \times b^{-4}}{4^{-5} \times a^{-8} \times b^{3}}$

$$= 4^{-3+5} \times a^{-5+8} \times b^{-4-3}$$

$$= 4^{2} \times a^{3} \times b^{-7}$$

$$= \frac{16a^{3}}{b^{7}}$$

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

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

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

$$= (a^{5})^{-2} = a^{-10}$$

$$= \frac{1}{a^{10}}$$

Q9. Solve :

(a) $7^{x} = 343$

$7^{x} = 7 \times 7 \times 7 = 7^{3}$

So, $x = 3$

(b) $3^{3x} = \dfrac{1}{27} = \dfrac{1}{3 \times 3 \times 3} = \left(\dfrac{1}{3}\right)^{3}$ or 3^{-3}

$$3x = -3$$

$$x = \frac{-3}{3} = -1$$

(c) $(\sqrt{2})^x = 2^8 = \left(2^{\frac{1}{2}}\right)^x = (2)^8 = (2)^{\frac{x}{2}} = 2^8$

$$\frac{x}{2} = 8 = x = 8 \times 2 = 16$$

➥ Exercise – 12B

Q1. **(a)** 3.5×10^{-5}

(b) 4.050000×10^{6}

(c) 3.186×10^{10}

(d) 8.37×10^{-9}

(e) 6.02×10^{15}

Q2. **(a)** 0.00003

(b) 0.000754

(c) 352000

(d) 1000100000

(e) 36149.20

Q3. **(a)** 7×10^{-2}

(b) 5×10^{-7}

(c) 1.275×10^{-5}

(d) 1×10^{-6}

Q4. Thickness of each book = 20 mm

Hence, thickness of books = (5×20) mm

Thickness of each paper sheet = 0.016 mm

Hence, thickness of 5 paper sheets = (5×0.016) mm

= 0.080 mm

Total thickness of the stack = Thickness of 5 books
+ Thickness of 5 paper sheets

$= (100 + 0.080)$ mm

$= 100.08$ mm

$= 1.0008 \times 10^2$ mm

➥ Multiple Choice Questions

Q1. (b) $11^x = \frac{1}{121} = \left(\frac{1}{11}\right)^2$

$11^x = (11)^{-2}$

$x = -2$

Q2. (d) $(1^3 + 2^3 + 3^3 + 4^3) = ?$

$(1 + 8 + 27 + 64) = 100$

Q3. (c) $27^{\frac{4}{3}} \div 27^{\frac{1}{3}} = ?$

$27^{\frac{4}{3}-\frac{1}{3}} = 27^{\frac{4-1}{3}} = 27^{\frac{3}{3}} = 27^1 = 27$

Q4. (c) $\left[\left(\frac{3}{5}\right)^0\right]^3 = \left(\frac{3}{5}\right)^0 = 1$

Q5. (a) $\left(\frac{1}{3}\right)^0 + \left(\frac{1}{5}\right)^0 + \left(\frac{1}{7}\right)^0 = 1 + 1 + 1 = 3$

Q6. (b) $\left(\frac{a}{b}\right)^0 \times \left(\frac{b}{c}\right)^0 \times \left(\frac{c}{a}\right)^0 = 1 \times 1 \times 1 = 1$

Q7. (a) $3^{-1} \div 4^{-1} = \frac{1}{3} \div \frac{1}{4} = \frac{1}{3} \times \frac{4}{1} = \frac{4}{3}$

Q8. (c)

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Chapter 13 Direct and Inverse Proportions

➥ Exercise – 13A

Q1.

x	3	4	b	25	d
y	a	48	84	c	1860

$$\frac{4}{48} = \frac{1}{12}$$

$$\frac{3}{a} = \frac{1}{12}, a = 36 \qquad \frac{b}{84} = \frac{1}{12}, b = \frac{84}{12} = 7$$

$$\frac{25}{c} = \frac{1}{12}, c = 300 \qquad \frac{d}{1860} = \frac{1}{12}, d = \frac{1860}{12} = 155$$

Q2. If 20 men assemble, 8 machines

Men	20	—
Machine	8	12

$$\frac{20}{8} = \frac{a}{12}$$

$$\frac{20 \times 12}{8} = a$$

$$a = 30$$

So, 30 men are required.

Q3.

Hours	5	20
Tools	120	a

$$\frac{5}{120} = \frac{20}{a}$$

$$a = \frac{20 \times 120}{5}$$

$$a = 480$$

Q4.

Copies	136	c
Self Length	3.4	5.1

$$\frac{136}{3.4} = \frac{c}{5.1}$$

$$c = \frac{5.1 \times 136}{3.4}$$

$c = 204$ copies we required

Q5.

Meter	40	a
Cost	1940	727.50

$$\frac{40}{1940} = \frac{a}{727.50}$$

$$a = \frac{4 \times 7275}{1940}$$

$a = 15$ m

So, 15 m of cloth is required.

Q6.

Charge	520	559
Journey	200	a

$$\frac{520}{200} = \frac{559}{a}$$

$$a = \frac{559 \times 200}{520}$$

$$a = 215 \text{ km}$$

Q7.

Thickness	35	c
Number	12	294

$$\frac{35}{12} = \frac{c}{294}$$

$$\frac{35 \times 294}{12} = c$$

$$c = 857.5 \text{ mm}$$

So, 294 cardboard has 857.5 mm thickness.

Q8.

Weight	150	a
Expansion	2.9	17.4

$$\frac{150}{2.9} = \frac{a}{17.4}$$

$$a = \frac{150 \times 17.4}{1.9}$$

$$a = 900 \text{ gm}$$

Q9. Weight of 12 sheets of thick paper = 40 g

Now,

$$2\frac{1}{2}\text{ kg} = \frac{5}{2}\text{ kg}$$

$$= \frac{5}{2} \times 1000\text{ g}$$

$$= 5 \times 500\text{ g}$$

$$= 2500\text{ g}$$

Let the number of sheets be x

Number of sheets	12	x
Weight (in grams)	40	2500

Now as number of sheets increases,

Weight increases

$$\frac{12}{40} = \frac{x}{2500}$$

$$\frac{12}{40} \times 2500 = x$$

$$\frac{3}{10} \times 2500 = x$$

$$3 \times 250 = x$$

$$750 = x$$

$\therefore$ 750 sheets will weight $2\frac{1}{2}$ kg.

Q10. Given,

Scale of map is 1.30000000

This means that

1 cm on map is actually 3,00,00,000 cm distance.

Let's first convert 3,00,00,000 cm into km

$$3,00,00,000 \text{ cm} = 3,00,00,000 \times \frac{1}{100} \text{ m}$$

$$= 3,00,000 \text{ m}$$

Q11. (a) Let the length of the shadow of the other pole be x m.

$1 \text{ m} = 100 \text{ cm}$

Height of pole (in m)	5.60	10.50
Length of shadow (in m)	3.20	x

$$\frac{5.60}{3.20} = \frac{10.50}{x}$$

$$\Rightarrow \qquad x = \frac{10.50 \times 3.20}{5.60} = 6$$

Hence, the length of the shadow will be 6 m.

(b) Let the height of the pole be y m.

Height of pole (in m)	5.60	y
Length of shadow (in m)	3.20	5

$$\frac{5.60}{3.20} = \frac{y}{5}$$

$$y = \frac{5 \times 5.60}{3.20} = 8.75$$

Q12. Let the number of bottles filled by the machine in five hours be x.

Number of bottles	840	x
Time taken (in hours)	6	5

$$\frac{840}{6} = \frac{x}{5}$$

$$x = \frac{840 \times 5}{6} = 700$$

Thus, 700 bottles will be filled in 5 hours.

➥ Exercise – 13B

Q1.

a	8	2	b	5	1
b	10	a	20	c	80

$8 : 2 = a : 10 \qquad 40 = a$

$2 : b = 20 : 40$

$\frac{2}{b} = \frac{20}{40} \quad \Rightarrow \quad b = 4$

$4 : 5 = c : 20 \quad \Rightarrow \quad c = 16$

Q2. Total expenditure $= 52 \times 1050 = ₹\ 54600$

New cost $= 1050 + 42 = 1092$

Cycle	52	x
Cost	1050	1092

$$\frac{52}{x} = \frac{1092}{1050}$$

$$\frac{52 \times 1050}{1092} = x$$

$$x = 50$$

So, 50 cycle is to be purchased now.

Q3.

Men	56	a
Days	42	14

$$\frac{56}{a} = \frac{14}{42}$$

$$a = 168$$

So, 168 men do work in 14 days.

Q4.

Speed	18	a
Time	30	20

$$\frac{18}{a} = \frac{20}{30}$$

$$\frac{18 \times 30}{20} = a$$

$$a = 27 \text{ km/hour}$$

Q5.

Person	1800	x
Days	40	24

$$\frac{1800}{x} = \frac{24}{40}$$

$$\frac{1800 \times 40}{24} = x$$

$$x = 3000$$

So, 3000 persons required to work in 24 days.

Q6.

Soldiers	1000	a
Days	20	25

$$\frac{1000}{a} = \frac{25}{20}$$

$$\frac{1000 \times 20}{25} = a$$

$$a = 800$$

For 800 soldiers food lasted for 25 days

So, $1000 - 800 = 200$

So, 200 soldiers will transfer.

Q7. 120 men has food provision for 200 days

After 5 days $(200 - 5) = 195$

As 30 died, so $= 120 - 30 = 90$ left

Men	120	90
Days	195	a

$$\frac{120}{90} = \frac{a}{195}$$

$$\frac{120 \times 195}{90} = a$$

$$a = 260$$

So, 260 days.

Q8. 60 days for 500 students

Days left $= 60 - 12 = 48$

as $500 + 300 = 800$ students

Students	500	800
Days	48	a

$$\frac{500}{800} = \frac{a}{48}$$

$$\frac{500 \times 48}{800} = a$$

$$a = 30 \text{ days}$$

Q9. **(a)** $x = 6$ when $y = 16$ find

x	6	8
y	16	?

$$\frac{6}{8} = \frac{y}{16}$$

$$12 = y$$

(b) $x = 10$ when $y = 30$, $y = 24$

x	10	?
y	30	24

$$\frac{10}{y} = \frac{24}{30}$$

$$\frac{300}{24} = a$$

$$y = 12.5$$

Q10.

Number of students	24	20
Number of sweets	5	x

$$24 \times 5 = 20 \times x$$

$$x = \frac{24 \times 5}{20} = 6$$

Hence, each student will get 6 sweets.

Q11.

Duration of each period (in mins)	45	x
Number of periods	8	9

$$45 \times 8 = x \times 9$$

$$x = \frac{45 \times 8}{9} = 40$$

Hence, the duration of each period will be 40 mins.

Q12. (c) is in inverse proportion.

➥ Multiple Choice Questions

Q1. (c)

Books	20	b
Cost	280	700

$$\frac{20}{280} = \frac{b}{700}$$

$$\frac{20 \times 700}{280} = b$$

$$b = 50 \text{ books}$$

Q2. (a)

24 boards = 60 books

40 boards = a

$$a = \frac{60 \times 40}{24} = 100 \text{ books}$$

100 books are required.

Q3. (a)

20 oranges = ₹ 70

x oranges = ₹ 175

$$x = \frac{20 \times 175}{70}$$

$$= 50 \text{ oranges}$$

Q4. (d)

Cost	144	x
Notebook	12	24

$$\frac{144}{12} = \frac{x}{24}$$

$$144 \times 2 = x$$

$$x = ₹\,288$$

Q5. (a)

Student	500	600
Day	30	a

$$\frac{500}{600} = \frac{a}{30}$$

$$\Rightarrow \frac{500 \times 30}{600} = a$$

Q6. (b)

Oxen	6	9
Days	30	a

$$\frac{6}{9} = \frac{a}{30}$$

$$\frac{6 \times 30}{9} = a$$

$$a = 20$$

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Chapter 14 Factorisaton

➥ Exercise – 14A

Q1. **(a)** $2x^2 + 5x$

$= x(2x + 5)$

(b) $3x^2 - 6xy^2$

$= 3x(x - 2y^2)$

(c) $6x^3 + 8x^2y$

$= 2x^2(3 + 4y)$

(d) $12x^3y^4 + 16x^2y^5 - 4x^5y^2$

$= 4x^2y^2(3xy^2 + 4y^3 - x^3)$

(e) $18a^3b^2 + 36ab^4 - 24a^2b^3$

$= 6ab^2(3a^2 + 6b^2 - 4ab)$

Q2. **(a)** $(7 + 3)(2x + 5) = 10(2x + 5)$

(b) $(x + 2)y + (x + 2)x = (x + y)(x + 2)$

(c) $5a(2x + 3y) - 2b(2x + 3y) = (5a - 2b)(2x + 3y)$

(d) $8(5x + 9y)^2 + 12(5x + 9y)$

$= 4(5x + 9y)[2(5x + 9y) + 3]$

Q3. **(a)** $(x + y)(2x + 3y) - (x + y)(x + 1)$

$= x + y(2x + 3y - x - 1)$

$= x + y(x + 3y - 1)$

(b) $x^2 + xy + 8x + 8y$

$= x(x + y) + 8(x + y)$

$= (x + y)(x + 8)$

(c) $15ab + 15 + 9b + 25a$

$= 15ab + 25a + 9b + 15$

$= 5a(3b + 5) + 3(3b + 5)$

$= (5a + 3)(3b + 5)$

(d) $ax^2 + by^2 + bx^2 + ay^2$

$= ax^2 + bx^2 + by^2 + ay^2$

$= x^2(a + b) + y^2(a + b)$

$= (x^2 + y^2)(a + b)$

Q4. **(a)** $80a^2 - 45b^2$

$= 5[16a^2 - 9b^2]$

$= [(4a)^2 - (3b)^2]$

$= 5(4a + 3b)(4a - 3b)$

(b) $(3a - b)^2 - 9c^2$

$= (3a - b)^2 - (3c)^2$

$= (3a - b + 3c)(3a - b - 3c)$

(c) $16a^2b - \dfrac{b}{16a^2}$

$= b\left(16a^2 - \dfrac{1}{16a^2}\right)$

$= b\left(4a + \dfrac{1}{4a}\right)\left(4a - \dfrac{1}{4a}\right)$

(d) $100(x + y)^2 - 81(a + b)^2$

$= \{10(x + y) + 9(a + b)\}\{10(x + y) - 9(a + b)\}$

Q5. **(a)** $x^2 + 8x + 16$

$= x^2 + 4x + 4x + 16$

$= x(x + 4) + 4(x + 4)$

$= (x + 4)(x + 4)$

(b) $x^4 - 10x^2y^2 + 25y^4$

$= x^4 - 5x^2y^2 - 5x^2y^2 + 25y^4$

$= x^2(x^2 - 5y^2) - 5y^2(x^2 - 5y^2)$

$= (x^2 - 5y^2)(x^2 - 5y^2)$

(c) $a^4 - 2a^2b^2 + b^4$

$= a^4 - a^2b^2 - a^2b^2 + b^4$

$= a^2(a^2 - b^2) - b^2(a^2 - b^2)$

$= (a^2 - b^2)(a^2 - b^2)$

$= (a + b)(a - b)(a + b)(a - b)$

(d) $\frac{x^2}{64} + \frac{y^2}{9} + \frac{xy}{12}$

$= \frac{x^2}{64} + \frac{xy}{24} + \frac{xy}{24} + \frac{y^2}{9}$

$= \frac{x}{8}\left(\frac{x}{8} + \frac{y}{3}\right) + \frac{y}{3}\left(\frac{x}{8} + \frac{y}{3}\right)$

$= \left(\frac{x}{8} + \frac{y}{3}\right)\left(\frac{x}{8} + \frac{y}{3}\right)$

Q6. **(a)** $4x^2 + 9y^2 + z^2 + 12xy + 6yz + 4zx$

$= (2x)^2 + (3y)^2 + (z)^2 + 2 \times 2x \times 3y + 2 \times 3y \times z$

$+2 \times z \times 2x$

$= (2x + 3y + z)^2$

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

$$= (-a)^2 + (b)^2 + (c)^2 + 2 \times -a \times b + 2 \times b \times c + 2 \times c \times -a$$

$$= (-a + b + c)^2$$

(c) $8x^3 + 36x^2y + 54xy^2 + 27y^3$

$$= (2x)^3 + (3y)^3 + 3 \times 2x \times 3y(2x + 3y)$$

$$= (2x + 3y)^3$$

(d) same as (c)

➥ Exercise – 14B

Q1. **(a)** $x^2 + 6x + 8$

$$= x^2 + 4x + 2x + 8$$

$$= x(x + 4) + 2(x + 4)$$

$$= (x + 2)(x + 4)$$

(b) $x^2 + 4x - 21$

$$= x^2 + 7x - 3x - 27$$

$$= x(x + 7) - 3(x + 7)$$

$$= (x - 3)(x + 7)$$

(c) $x^2 - 23x + 132$

$$= x^2 - 4x - 3x + 12$$

$$= x(x - 4) - 3(x - 4)$$

$$= (x - 3)(x - 4)$$

(d) $x^2 - 23x + 132$

$$= x^2 - 12x - 11x + 132$$

$$= x(x - 12) - 11(x - 12)$$

$$= (x - 11)(x - 12)$$

(e) $x^2 - 21x + 108$

$$= x^2 - 12x - 9x + 108$$

$= x(x-12)-9(x-12)$

$= (x-9)(x-12)$

(f) $x^2+5x-36$

$= x^2+9x-4x-36$

$= x(x+9)-4(x+9)$

$= (x-4)(x+9)$

(g) $-x^2+3x+40$

$= -x^2+8x-5x+40$

$= -x(x-8)-5(x-8)$

$= (-x-5)(x-8)$

(h) $x^2-11x-42$

$= x^2-14x+3x-42$

$= x(x-14)+3(x-14)$

$= (x+3)(x-14)$

Q2. **(a)** $2x^2+5x+3$

as $2\times 3 = 6, [2,3]$

$= 2x^2+2x+3x+3$

$= 2x(x+1)+3(x+1)$

$= (2x+3)(x+1)$

(b) $6x^2+5x-6$

as $6\times 6 = -36, [-4, 9]$

$= 6x^2+9x-4x-6$

$= 3x(2x+3)-2(2x+3)$

$= (3x-2)(2x+3)$

(c) $6x^2-13x+6$

as $6\times 6 = 36, [-9, -4]$

$= 6x^2-9x+4x+6$

$= 3x(2x-3)-2(2x-3)$

$= (3x-2)(2x-3)$

(d) $-2x^2-3x+2$

as $2\times -2 = -4, [-4, 1]$

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

$= -2x(x+2)+1(x+2)$

$= (1-2x)(x+2)$

(e) $12x^2-23xy+10y^2$

as $12\times 10 = 12, [8, 15]$

$= 12x^2-15xy-8x+10y^2$

$= 3x(4x-5y)-24(x-5y)$

$= (3x-2)(4x-5y)$

(f) $6x^2+35xy-6y^2$

as $6\times -6 = -36,$

$= 6x^2+36xy-xy-6y^2$

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

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

(g) $3x^2-4x-4$

as $4\times 3 = 12, [6, 2]$

$= 3x^2-6x+2x-4$

$= 3x(x-2)+2(x-2)$

$= (3x+2)(x-2)$

(h) $11x^2-54x+63$

as $63\times 11 = 693, [21, 33]$

$= 11x^2-33x-21x+63$

$= 11x(x-3)-21(x-3)$

$= (11x-21)(x-3)$

➥ Exercise – 14C

Q1. **(a)** $3x^3 + 125$

$= (2x)^3 + (5)^3$

$= (2x + 5)(4x^2 - 10x + 25)$

(b) $125a^3 + 34^3 b^3$

$= (5a)^3 + (7b)^3$

$= (5a + 7b)(25a^2 - 35ab + 49b^2)$

(c) $128x^3 + 54y^3$

$= 2(64x^3 + 27y^3)$

$= 2\{(4x)^3 + (3y)^3\}$

$= 2(4x + 3y)(16x^2 - 12xy + 9y^2)$

(d) $54a^6 b + 2a^3 b^4$

$= 2a^3 b(27a^3 + b^3)$

$= 2a^3\{(3a)^3 + (b)^3\}$

$= 2a^3 b(3a + b)(9a^2 - 3ab + b^2)$

Q2. **(a)** $8x^3 - 343$

$= (2x)^3 - (7)^3$

$= (2x - 7)(4x^2 + 49 + 14x)$

(b) $1 - 27x^3$

$= (1)^3 - (3x)^3$

$= (1 - 3x)(1 + 9x^2 + 3x)$

(c) $2x^4 - 128x$

$= 2x\{(x^3 - (64)\}$

$= 2x\{x^3 - (4)^3\}$

$= 2x(x-4)(x^2+16+4x)$

(d) $\frac{x^3}{64} - 8y^3$

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

$= \left(\frac{x}{4} - 2y\right)\left(\frac{x^2}{16} + 4y^2 + \frac{x}{2}y\right)$

Q3. **(a)** $(3x-2y)^3 + (2y-5z)^2 + (5z-3x)^3$

$3x-2y = a, 2y-5z = b, 5z-3x = c$

Clearly $a+b+c = 0, a^3+b^3+c^3 = 3abc$

$3(3x-2y)(2y-5z)(5z-3x)$

$= (3z-2y)^3 + (2y-5z)^3 + (5z-3x)^3$

(b) $p^3(q-r)^3 + q^3(r-p)^3 + r^3(p-q)^3$

$(pq-pr)^3 + (qr-qp)^3 + (rp-rq)^3$

Clearly, $a+b+c = 0, a^3+b^3+c^3 = 3abc$

So, $3(pq-pr)(qr-qp)(rp-rq)$

(c) $x^3 - 8y^3 - 64z^3 - 24xyz$

$= (x)^3 + (-2y)^3 + (-4z)^3 - 3(-2y)(x)(-4z)$

$= (x-2y-4z)(x^2+4y^2+16z^2+2xy-8yz+4zx)$

(d) $125 + 8x^3 - 27y^3 + 90xy$

$= (5)^3 + (2x)^3 - (3y)^3 - 3\times5\times2x\times-3y$

$= (5+2x-3y)(25+4x^2+9y^2-10x+6xy+15y)$

Q4. **(a)** $\frac{73\times73\times73+27\times27\times27}{73\times73-73\times27+27\times27}$

$$= \frac{(73)^3 + (27)^3}{(73)^3 - 73 \times 27 + (27)^2}$$

$$\frac{a^3 + b^3}{a^2 - ab + b^2}, \qquad \text{where } a = 37; b = 27$$

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

$$= (73 + 27) = 100$$

(b) $$\frac{0.87 \times 0.87 \times 0.87 + 0.13 \times 0.13 + 0.13}{0.87 \times 0.87 - 0.87 \times 0.13 + 0.13 \times 0.13}$$

$$\Rightarrow \quad \frac{(0.87)^3 + (0.13)^3}{(0.87)^2 - 0.87 \times 0.13 + (0.13)^2}$$

$$(0.87 + 0.13) = 1$$

(c) $$\frac{27x^3 - 1000}{3x - 10} = \frac{(3x)^3 - (10)^3}{3x - 10}$$

$$= \frac{(3x - 10)(9x^2 + 30x + 100)}{(3x - 10)}$$

$$= 9x^2 + 30x + 100$$

(d) $$\frac{343x^3 - 64}{49x^2 + 36x + 16} = \frac{(7x)^3 - (4)^3}{(7x)^2 + 7x \times 4 + (4)^2}$$

$$= \frac{(7x - 4)(49x^2 + 28x + 16)}{(7x + 4)(7x + 4)}$$

➥ Exercise –14D

Q1. **(a)** $28x^4 \div 56x$

$$28x^4 = 2 \times 2 \times 7 \times x \times x \times x \times x$$

$$56x = 2 \times 2 \times 2 \times 7 \times x$$

$$28x^4 \div 56x = \frac{2 \times 2 \times 7 \times x \times x \times x \times x}{2 \times 2 \times 2 \times 7 \times x}$$

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

(b) $-36y^3 \div 9y^2$

$$36y^3 = 2 \times 2 \times 3 \times 3 \times y \times y \times y$$

$$9y^2 = 3 \times 3 \times y \times y$$

$$-36y^3 \div 9y^2 = \frac{-2 \times 2 \times 3 \times 3 \times y \times y \times y}{3 \times 3 \times y \times y}$$

$$= -4y$$

(c) $12a^8b^8 \div (-6a^6b^4)$

$$6a^6b^4 = 2 \times 3 \times a^6 \times b^4$$

$$12a^8b^8 \div (-6a^6b^4) = \frac{2 \times 2 \times 3 \times a^8 \times b^8}{-2 \times 3 \times a^6 \times b^4}$$

$$= -2a^2b^4$$

Q2. **(a)** $(5x^2 - 6x) \div 3x$

$$5x^2 - 6x = x(5x - 6)$$

$$(5x^2 - 6x) \div 3x = \frac{x(5x-6)}{3x}$$

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

(b) $8(x^3y^2z^2 + x^2y^3z^2 + x^2y^2z^3) \div 4x^2y^2z^2$

$$8(x^3y^2z^2 + x^2y^3z^2 + x^2y^2z^3)$$

$$= 8x^2y^2z^2(x + y + z)$$

$$8(x^3y^2z^2 + x^2y^3z^2 + x^2 + y^2z^3) \div 4x^2y^2z^2$$

$$= \frac{8x^2y^2z^2(x + y + z)}{4x^2y^2z^2}$$

$$= 2(x + y + z)$$

(c) $(p^3q^3 - p^6q^3) \div p^3q^3$

$(p^3q^6 - p^6q^3) = p^3q^3(q^3 - p^3)$

$(p^3q^6 - p^6q^3) \div p^3q^3$

$$= \frac{p^3q^3(q^3 - p^3)}{p^3q^3}$$

$$= q^3 - p^3$$

(d) $(x^3 + 2x^2 + 3x) \div 2x$

$x^3 + 2x^2 + 3x = x(x^2 + 2x + 3)$

$(x^3 + 2x^2 + 3x) \div 2x$

$$= \frac{x(x^2 + 2x + 3)}{2x}$$

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

Q3. **(a)** $10y(6y + 21) \div 5(2y + 7)$

$$= \frac{2 \times 5 \times y[2 \times 3 \times y + 3 \times 7]}{5(2y + 7)}$$

$$= \frac{2 \times 5 \times y \times 3(2y + 7)}{4(2y + 7)} = 6y$$

(b) $9x^2y^2(3z - 24) \div 27xy(z - 8)$

$$= \frac{9x^2y^2[3 \times z - 2 \times 2 \times 2 \times 3]}{27xy(z - 8)}$$

$$= \frac{xy \times 3(z - 8)}{3(z - 8)}$$

$$= xy$$

(c) $26xy(x + 5)(y - 4) \div 13x(y - 4)$

$$= \frac{2 \times 13 \times xy(x+5)(y-4)}{13x(y-4)}$$

$$= 2y(x+5)$$

(d) $52pqr(p+q)(q+r)(r+p) \div 104pq(q+r)(r+p)$

$$= \frac{2 \times 2 \times 13 \times p \times q \times r \times (p+q) \times (q+r) \times (r+p)}{2 \times 2 \times 2 \times 13 \times p \times q \times (q+r) \times (r+p)}$$

$$= \frac{1}{2} r(p+q)$$

(e) $x(x+1)(x+2)(x+3) \div x(x+1)$

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

$$= (x+2)(x+3)$$

Q4. **(a)** $(y^2 + 7y + 10) \div (y+5)$

$$y^2 + 7y + 10 = y^2 + 2y + 5y + 10$$

$$= y(y+2) + 5(y+2)$$

$$= (y+5)(y+2)$$

$$(y^2 + 7y + 10) \div (y+5)$$

$$= \frac{(y+5)(y+2)}{(y+5)}$$

$$= y + 2$$

(b) $4yz(z^2 + 6z - 16) \div 2y(z+8)$

$$4yz(z^2 + 6z - 16) = 4yz[z^2 - 2z + 8z - 16]$$

$$= 4yz[z(z-2) + 8(z-2)]$$

$$= 4yz(z-2)(z+8)$$

$$4yz(z^2 + 6z - 16) \div 2y(z+8)$$

$$= \frac{4yz(z-2)(z+8)}{2y(z+8)}$$

$$= 2z(z-2)$$

(c) $5pq(p^2-q^2) \div 2p(p+q)$

$$5pq(p^2-q^2) = 5pq(p-q)(p+q)$$

$$5pq(p^2-q^2) = \frac{5pq(p-q)(p+q)}{2p(p+q)}$$

$$= \frac{5}{2}q(p-q)$$

Q5. **(a)** $4(x-5) = 4x-5$

L.H.S. $= 4x-20 \neq$ R.H.S.

The correct statement is $4(x-5) = 4x-20$

(b) $(2x)^2 + 5x = 4x + 5x = 9x$

L.H.S. $= (2x)^2 + 5x = 4x^2 + 5x \neq$ R.H.S.

The correct statement $(2x)^2 + 5x = 4x^2 + 5x$

(c) $(y-3)^2 = y^2 - 9$

L.H.S. $= (y-3)^2 = (y)^2 - 2(y)(3) + (3)^2$

$= y^2 - 6y + 9 \neq$ R.H.S.

(d) $\frac{3}{4x+3} = \frac{1}{4x}$

L.H.S. $= \frac{3}{4x+3} \neq$ R.H.S.

The correct statement is $\frac{3}{4x+3} = \frac{3}{4x+3}$

(e) $\frac{4x+5}{4x} = 5$

$$\text{L.H.S.} = \frac{4x+5}{4x}$$

$$= \frac{4x}{4x} + \frac{5}{4x}$$

$$= 1 + \frac{5}{4x} \neq \text{R.H.S.}$$

The correct statement is $\frac{4x+5}{4x} = 1 + \frac{5}{4x}$

➥ Multiple Choice Questions

Q1. (a) $(x-1)(x+1)$

Q2. (a) $4x$

Q3. (b) 27; as, $x - \frac{1}{x} = 5 \qquad \Rightarrow x^2 + \frac{1}{x^2}$

$$= 25 + 2 = 27$$

Q4. (c) 31; as $(a-b)^2 = (5)^2 = a^2 + b^2$

$$= 25 + 2(3) = 31$$

Q5. (b) 110; as $\frac{(72)^2 - (38)^2}{72 - 38}$

$$= \frac{(72+38)(72-38)}{(72-38)}$$

$$= 72 + 38 = 110$$

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Chapter 15 Introduction to Graphs

➥ Exercise – 15A

Q1. Do yourself

Q2. Do yourself

Q3. Do yourself

Q4. Do yourself

Q5. Do yourself

Q6. Do yourself

Q7. (a) 2004

(b) 2010

Q8. **(a)** True

(b) True

(c) True

(d) False

(e) True

Q9. **(a)** different

(b) second

(c) (0, 0)

(d) four

(e) *x*-axis

Q10. Draw graph yourself

(a) 2.5 hours

(b) 105 km

Q11. Yes

➥ Multiple Choice Questions

Q1. (b, c)

Q2. (b)

Q3. (a)

Q4. (c)

Q5. (a)

Chapter 16

Playing with Numbers

➥ Exercise – 16A

Q1. Find Q.

For the given addition to be true, $Q = 8$ is the possible value

$$\begin{array}{r} {\scriptstyle 1\ \ 1\ \ } \\ 3\ 1\ 8 \\ +\,1\ 8\ 3 \\ \hline 5\ 0\ 1 \end{array}$$

Thus, $Q = 8$

Q2. Find A and B

For the given addition to be true, $A = 5$ and $B = 1$ is the possible value.

$$\begin{array}{r} 5 \\ 5 \\ +\ \ 5 \\ \hline 15 \end{array}$$

Thus, $A = 5, B = 1$

Q3. Find A and B

For the given multiplication to be true, $A = 5$ and $B = 2$ is the possible value.

$$\begin{array}{r} {\scriptstyle 1} \\ 2\ 5 \\ \times 2\ 3 \\ \hline {\scriptstyle 1} \\ 7\ 5 \\ 5\ 0\ \times \\ \hline 5\ 7\ 5 \\ \hline \end{array}$$

Thus, $A = 5, B = 2$

Q4. Find the value.

(a) The addition of A and B is giving 9 *i.e.*, a number whose ones digit is 9.

The sum can be 9 only as the sum of two single digit numbers cannot be 19.

Therefore there will not be any carry in this step.

In the next step, $2 + A = 0$

$2 + 8 = 10$ and 1 will be the carry for the next step.

$1 + 1 + 6 = A$

Clearly, A is 8. We know that the addition of A and B is giving 9. As A is 8, thus B is 1.

Therefore, the addition is as follows :

$$\begin{array}{r} 1\ 2\ 8 \\ +\ 6\ 8\ 1 \\ \hline 8\ 0\ 9 \\ \hline \end{array}$$

Hence, $A = 8$ and $B = 1$

(b) The addition of B and 1 is giving 8 *i.e.*, a number whose ones digits is 8.

This is possible only when digit B is 7. In that case, the addition of B and 1 will give 8.

In the next step,

$A + B = 1$

Clearly, A is 4

$4 + 7 = 11$ and 1 will be a carry for the next step. In the next step,

$1 + 2 + A = B$

$1 + 2 + 4 = 7$

Therefore, the addition is as follows :

$$\begin{array}{r} 2\ 4\ 7 \\ +\ 4\ 7\ 1 \\ \hline 7\ 1\ 8 \end{array}$$

Hence, $A = 4$ and $B = 7$

(c) The addition of 1 and B is giving 0 *i.e.*, a number whose ones digits is 0. This is possible only when digit B is 9. In that case, the addition of 1 and B will give 10, and thus, 1 will be the carry for the next step. In the next step,

$1 + A + 1 = B$

Clearly, A is 7 as $1 + 7 + 1 = 9 = B$

Therefore, the addition is as follows

$$\begin{array}{r} 7\ 1 \\ +\ 1\ 9 \\ \hline 9\ 0 \end{array}$$

Hence, $A = 7$ and $B = 9$.

(d) The multiplication of 6 and 8 gives a number whose ones digit is 8 again.

It is possible only when $B = 0, 2, 4, 6$ or 8

If $B = 0$, then the product will be 0.

Therefore, this value of B is not possible.

If $B = 2$, then $B \times 6 = 12$ and 1 will be a ca rry for the next step.

$6A + 1 = BB = 22 \Rightarrow 6A = 21$ and hence, any integer value of A is not possible.

If $B = 6$, then $B \times 6 = 36$ and 3 will be a carry for the next step.

$6A + 3 = BB = 66 \Rightarrow 6A = 63$ and hence, any integer value of A is not possible.

If $B = 8$, then $B \times 6 = 48$ and 4 will be a carry for the next step.

$6A + 4 = BB \Rightarrow 6A = 84$ and hence, $A = 14$.

However, A is a single digit number. Therefore, this value of A is not possible.

If $B = 4$, then $B \times 6 = 24$ and 2 will be a carry for the next step.

$6A + 2 = BB = 44 \Rightarrow 6A = 42$ and hence $A = 7$.

The multiplication is as follows :

$$\begin{array}{r} 7\ \ 4 \\ \times\ \ 6 \\ \hline 4\ \ 4\ \ 4 \\ \hline \end{array}$$

Hence, $A = 7$ and $B = 4$.

(e) The multiplication of B and 5 is giving a number whose ones digit is B again. This is possible when $B = 5$ or $B = 0$ only.

In case of $B = 5$, the product $B \times 5 = 5 \times 5 = 25$

2 will be a carry for the next step

We have, $5 \times A + 2 = CA$ which is possible for $A = 2$ or 7.

The multiplication is as follows :

$$\begin{array}{r} 2\ 5 \\ \times\ 5 \\ \hline 1\ 2\ 5 \\ \hline \end{array} \qquad \begin{array}{r} 7\ 5 \\ \times\ 5 \\ \hline 3\ 7\ 5 \\ \hline \end{array}$$

If $B = 0$

$B \times 5 = B \quad \Rightarrow \quad 0 \times 5 = 0$

There will not be any carry in this step

In the next step $5 \times A = CA$

It can happen only when $A = 5$ or $A = 0$

However A cannot be 0 as AB is a two digit number.

Hence, A can be 5 only, the multiplication is as follows :

$$\begin{array}{r} 5\ 0 \\ \times\ 5 \\ \hline 2\ 5\ 0 \\ \hline \end{array}$$

Hence, there are 3 possible values of A, B and C

(i) 5, 0 and 2 respectively.

(ii) 2, 5 and 1 respectively.

(iii) 7, 5 and 3 respectively.

(f) Do yourself

➥Exercise – 16B

Q1. If a number is a multiple of 9, then the sum of its digit will be divisible by 9.

Sum of digits of $21y5 = 3 + 1 + y + 5 = 8 + y$

Hence, $8 + y$ should be multiple of 9.

This is possible when $8 + y$ is any of these numbers 0, 9, 18, 27 and so on.

Since, y is a single digit number this sum can be 9 only.

Therefore y should be 1 only.

Q2. On checking the sum of digits for each given number, we can see that

Sum of digits of 21436587 is $2 + 1 + 4 + 3 + 6 + 5 + 8 + 7 = 36$. Now, we know that 36 is divisible by 9.

Thus 21436587 is divisible by 9.

Q3. On checking the sum of digits, for each given number, we can see that

Sum of digits of 15287 is $1 + 5 + 2 + 8 + 7 = 23$.

Now, we know that 23 is not divisible by 3. Thus 15287 is not divisible by 3.

Q4. If a three digit number *i.e.*, $24x$ is divisible by 9, that means the sum of its digit is also divisible by 9.

So, $2 + 4 + x = 6 + x$

Now, $6 + x$ is divisible by 9. As we know x is a single digit number.

So, $6 + 3 = 9$ is divisible by 9.

Hence $x = 3$.

Therefore, a three digit number divisible by 9 is 243.

Q5. If $31z5$ is a multiple of 3, the sum of its digit will be a multiple of 3.

This is, $3 + 1 + z + 5 = 9 + z$ is a multiple of 3.

This is possible when $9 + z$ is any one of 0, 3, 6, ….

Since z is a single digit number the value of $9 + z$ can only be 9 or 12 or 15 or 18 and thus value of x comes to 0 or 3 or 6 or 9 respectively.

Thus, z can have its values as any one of the four different values 0, 3, 6 and 9.

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