



I.C.S.E.

9

MATHEMATICS

WORKSHEETS AND ASSIGNMENTS

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EXERCISE 1: REPRESENTATION OF RATIONAL NUMBER ON A NUMBER LINE

1. Draw the number line and represent the following positive rational numbers on it:

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

(ii) $\frac{2}{3}$

(iii) $\frac{2}{7}$

(iv) $\frac{3}{4}$

(v) $\frac{3}{8}$

(vi) $1\frac{3}{4}$

(vii) $2\frac{2}{5}$

(viii) $3\frac{1}{2}$

(ix) $5\frac{5}{7}$

(x) $4\frac{2}{3}$

2. Represent each of the following negative rational numbers on the number line:

(i) $\frac{-5}{8}$

(ii) $\frac{-3}{16}$

(iii) $\frac{-1}{3}$

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

(v) $\frac{-7}{3}$

(vi) $\frac{22}{-7}$

(vii) $\frac{-31}{3}$

(viii) $-1\frac{2}{3}$

(ix) $-3\frac{1}{7}$

(x) $-4\frac{3}{5}$

(xi) $-2\frac{5}{6}$

(xii) -3

(xiii) $-2\frac{7}{8}$

(xiv) $-5\frac{2}{5}$

EXERCISE 2: RECURRING DECIMALS AS RATIONAL NUMBERS

1. Express each of the following as a rational number.

(i) $4.\dot{1}\dot{2}\dot{5}$

(ii) $-2.0\dot{3}$

(iii) $10.\dot{1}\dot{2}\dot{3}$

(iv) $0.4\dot{6}\dot{7}\dot{2}$

1. Express each of the following as a rational number.

(i) $0.\dot{4}$

(ii) $0.1\dot{6}$

(iii) $0.1\bar{5}$

(iv) $0.74\bar{3}$

EXERCISE 3: FINDING RATIONAL NUMBERS BETWEEN TWO RATIONAL NUMBERS

1. Find out a rational numbers lying between $\frac{1}{4}$ and $\frac{1}{3}$.

2. Find out a rational number lying between 2 and 3.

3. Find out a rational number lying between $-\frac{1}{3}$ and $\frac{1}{2}$.

4. Find out two rational numbers lying between -3 and -2.

5. Find out six rational numbers lying between $-\frac{4}{8}$ and $\frac{3}{8}$.

6. Find out ten rational numbers lying between $\frac{7}{13}$ and $-\frac{4}{13}$.

7. Find out three rational numbers lying between 4 and 5.

8. Find out three rational numbers lying between $\frac{2}{3}$ and $\frac{3}{4}$.

9. State true or false:

(i) Between any two distinct integers there is always an integer.

(ii) Between any two distinct rational numbers there is always a rational number.

(iii) Between any two distinct rational numbers there are infinitely many rational numbers.

EXERCISE 4: RATIONALISATION OF DENOMINATOR

1. Rationalize $\frac{1}{\sqrt{11}}$.
2. Rationalize $\frac{1}{\sqrt{37}}$.
3. Rationalize $\frac{1}{\sqrt{17}}$.
4. Rationalize $\frac{1}{\sqrt{23}}$.
5. Rationalize $\frac{1}{\sqrt{46}}$.
6. Rationalize $\frac{1}{\sqrt{37}}$.
7. Rationalize $\frac{1}{1+\sqrt{3}}$.
8. Rationalize $\frac{1}{1+\sqrt{7}}$.
9. Rationalize $\frac{1}{4+\sqrt{13}}$.
10. Rationalize $\frac{1}{7+\sqrt{29}}$.
11. Rationalize $\frac{1}{11-\sqrt{13}}$.
12. Rationalize $\frac{1}{9-\sqrt{57}}$.
13. Rationalize $\frac{1}{13-\sqrt{15}}$.
14. Rationalize $\frac{1}{\sqrt{13}-\sqrt{11}}$.
15. Rationalize $\frac{1}{\sqrt{21}-\sqrt{29}}$.
16. Rationalize $\frac{1}{\sqrt{31}+\sqrt{41}}$.
17. Rationalize $\frac{1}{\sqrt{21}+\sqrt{37}}$.
18. Rationalize $\frac{2}{\sqrt{5}+\sqrt{7}}$.

ANSWERS

EXERCISE 2

1. (i) $\frac{2042}{495}$

(ii) $-\frac{61}{30}$

(iii) $\frac{3371}{333}$

(iv) $\frac{778}{1665}$

2. (i) $\frac{4}{9}$

(ii) $\frac{1}{6}$

(iii) $\frac{5}{33}$

(iv) $\frac{368}{495}$

EXERCISE 3

1. $7/24$

2. $5/2$

3. $1/12$

4. $-5/2, -9/4$

5. $-3/8, -2/8, -1/8, 0/8, 1/8, 2/8$

6. $-3/13, -2/13, -1/13, 0/13, 1/13, 2/13, 3/13, 4/13, 5/13, 6/13$

7. $17/4, 9/2, 19/4$

8. $33/48, 17/24, 35/48$

9. (i) False

(ii) True

(iii) True

EXERCISE 4

1. $\frac{\sqrt{11}}{11}$

2. $\frac{\sqrt{37}}{37}$

3. $\frac{\sqrt{17}}{17}$

4. $\frac{\sqrt{23}}{23}$

5. $\frac{\sqrt{46}}{46}$

6. $\frac{\sqrt{71}}{71}$

7. $\frac{\sqrt{3}-1}{2}$

8. $\frac{\sqrt{7}-1}{6}$

9. $\frac{4-\sqrt{13}}{3}$

10. $\frac{7-\sqrt{29}}{20}$

11. $\frac{11+\sqrt{13}}{108}$

12. $\frac{9+\sqrt{57}}{24}$

13. $\frac{-13-\sqrt{15}}{2}$

14. $\frac{\sqrt{13}+\sqrt{11}}{2}$

15. $\frac{\sqrt{29}-\sqrt{21}}{8}$

16. $\frac{\sqrt{41}-\sqrt{31}}{10}$

17. $\frac{\sqrt{37}-\sqrt{21}}{16}$

18. $\frac{\sqrt{37}-\sqrt{21}}{16}$

ANSWERS

EXERCISE 5

1. $7/24$
2. $5/2$
3. $1/12$
4. $-5/2, -9/4$
5. $-3/8, -2/8, -1/8, 0/8, 1/8, 2/8$
6. $-3/13, -2/13, -1/13, 0/13, 1/13, 2/13, 3/13, 4/13, 5/13, 6/13$
7. $17/4, 9/2, 19/4$
8. $33/48, 17/24, 35/48$

EXERCISE 6

1. (i) $23/12$
(ii) $25/8$
(iii) $2/3$
(iv) $5/3$
2. (i) $47/12$
(ii) $47/21$
(iii) $-34/5$
(iv) $-177/286$
3. (i) $3/13$
(ii) $-8/7$
(iii) $51/4$
(iv) $-1/49$
4. $4/3$
5. -39
6. $-8/9$
7. (i) $-13/5$
(ii) -9
(iii) $11/19$
8. $\$1\ 61/92$
9. $\$32\ 1/4$
10. $-2/5$
11. $97/33$
12. $9/4$ meters
13. $2/5$
14. $97/33$



COMPOUND INTEREST

EXERCISE 1: COMPOUND INTEREST

1. Find the amount and compound interest for \$2000 lent for 2 years at 2% rate of interest p.a.
2. Find the amount and compound interest for \$8000 lent for 3 years at 5% rate of interest, compounded annually.
3. Find the difference between compound interest and simple interest for a sum of \$5000 lent for 3 years at 5% rate of interest p.a.
4. A sum of \$8000 becomes \$8800 in 1 year at a certain rate of interest per annum.
 - (i) Calculate the compound interest on the sum for 2 years at the same rate of interest.
 - (ii) Calculate the amount after 3 years at the same rate of compound interest.
5. Which one of the following is larger?
 - (i) Compound interest on \$2500 for 2 years at the rate of 10% per annum.
 - (ii) Simple interest on \$2000 for 3 years at the rate of $12\frac{1}{2}\%$ per annum.
6. Ron had borrowed \$15000 for 3 years at 5%p.a., compound interest. Sam borrowed the same amount for the same number of years at the same rate p.a., simple interest. Find the amount paid by both at the end of 3 years. Who has to pay more and by how much?
7. Jack borrowed \$50000 for 3 years at 15% per annum compound interest. Find the interest earned in the second year.
8. Shelly invests \$66000 at 6% per annum compound interest for 3 years.
 - (i) Calculate the interest for the first year.
 - (ii) Calculate the amount at the end of the second year.
 - (iii) Calculate the interest for the third year.
 - (iv) Calculate the total compound interest.
9. A sum of \$ 30000 is invested for 3 years at $7\frac{1}{2}\%$ per annum compound interest.
 - (i) What is the sum at the end of the second year?
 - (ii) What is the sum at the end of the 3 years?
 - (iii) What is the total interest earned in 3 years?
10. Jack borrowed \$400000 from a money lender. He was charged 8% interest half yearly. What amount did he have to return after $1\frac{1}{2}$ year?
11. The price of a piece of land increase 8% annually. If the land cost Davis \$70000, 3 years ago, at what price to the nearest hundred can he sell the land now?
12. The cost price of a bicycle is \$1200. Each year its price decreased by 4%. At what price to the nearest ten will the cycle be sold after 2 years?

EXERCISE 2: COMPOUND INTEREST USING FORMULA

1. A man borrows \$20,000 from a bank at the interest rate of 6% per annum compounded annually. Calculate the amount that he needs to pay back the bank after 3 years. Also find the interest charged by the bank on the man.
2. Rishabh takes a loan of \$25,00,000 from the bank at the interest rate of 10% per annum compounded annually for 5 years. Calculate the amount that he has to pay the bank after this tenure of time. Also, calculate the interest charged by the bank on this sum of money.
3. A man borrows an amount of \$45,000 from a bank at the interest rate of 7% per annum compounded semi annually for 2 years. Calculate the amount that man needs to return to the bank after this period of time. Also, find the interest charged by the bank.
4. A bank lends a sum of \$25,000 to a man at an interest rate of 10% per annum compounded quarterly. Calculate the amount that the man needs to pay to the bank after a tenure of 3 years. Also calculate the interest charged by the bank on this amount.
5. Rajeev took a loan of \$10,00,000 from a bank at an interest of 7% per annum compounded quarterly for 5 years. Calculate the amount he pays to the bank after this period of time. Also, calculate the interest charged by the bank on this sum.
6. Three consecutive rates of interest are applied on a sum of \$25,000. The rates of interest are 5%, 10% and 12% for three years. Calculate the amount one needs to pay to the bank after three years of tenure. Also find the interest charged by the bank.
7. If rates of 6%, 8%, 10% and 15% are rates of interest charged by a bank 4 consecutive years on a sum of Rs2,00,000. Calculate the amount one needs to pay to the bank for the sum. Also, calculate the interest charged by the bank on this sum.

EXERCISE 3: RATE OF GROWTH AND DEPRECIATION

1. The price of a car is \$ 300000. The value of the car depreciates by 20% at the end of the first year and after that it depreciates by 25% every year. What will be the value of the car after 3 years?
2. The value of a machine depreciated for two years at the rate of 10% per year and then in the third year it increased by 15%. Find the original value (initial cost of the machine), if its value at the end of 3 years is \$ 41,917.50.
3. A man bought a flat at \$ 1000000. The price of the flat appreciates by 20% in the first year after purchase. Due to some reason, its price in subsequent years goes on depreciating at the rate of 10% every year. If he sells the flat after 3 years, what will be his profit or loss from it?
4. The population of a town decreased by 12% during 1998 and then increased by 8% during 1999. Find the population of the town, at the beginning of 1998, if at the end of 1990 its population was 2,85,120.
5. A man bought a plot of land for \$ 160000 and a car for \$ 180000 at the same time. The price of the plot of land grows uniformly at the rate of 25% p.a. while the price of the car depreciates by 20% p.a. If the man sells the plot of land as well as the car after 3 years, what will be his profit or loss?

ANSWERS

EXERCISE 1

1. \$2080.80, \$80.80
2. \$9261, \$1261
3. \$38.13
4. (I) \$1680
(ii) \$10648
5. (ii)
6. Ron paid \$17364.38 and Sam paid \$17250.
Ron paid \$114.38 more than Sam
7. \$16125
8. (I) \$3960
(ii) \$74157.60
(iii) \$4449.46
(iv) \$12607.06
9. (I) \$34668.75
(ii) \$37268.90
(iii) \$7268.90
10. \$449945.60
11. \$88200
12. \$1110

EXERCISE 2

- 1) Amount = \$23,820.32
Interest = \$3,820.32
- 2) Amount = \$40,26,275
Interest = \$15,26,275
- 3) Amount = \$51,638.53
Interest = \$6,638.53
- 4) Amount = \$33,622.22
Interest = \$8,622.22
- 5) Amount = \$14,14,778.19
Interest = \$4,14,778.19
- 6) Amount = \$32,340
Interest = \$7,340
- 7) Amount = \$2,89,634.4
Interest = \$89,634.4

EXERCISE 3

1. \$ 1,35,000
2. \$ 45,000
3. Loss of \$ 28,000
4. 3,00,000
5. Profit of \$ 64,660

EXERCISE 1:

1. Expand the following:

(I) $(x + 5)^2$

(ii) $(3p + 4)^2$

(iii) $(\sqrt{5}x + 1)^2$

(iv) $(5x + 7y)^2$

(v) $(x/3 + y/5)^2$

2. Find the square of the following:

(i) $(t/9 + 4/t)$

(ii) $0.3x + 0.4y$

(iii) $c + 6$

3. Use the formula for squaring the binomials and evaluate

(I) $(103)^2$

(ii) $(10.8)^2$

(iii) $(9.2)^2$

4. (i) If $x + y = 10$ and $xy = 15$, find the value of $x^2 + y^2$

(ii) If $x^2 + y^2 = 29$ and $xy = 10$, find the value of $x + y$

5. If $x + 1/x = 5$, find $x^2 + 1/x^2$

6. If $x^2 + 1/x^2 = 14$, find $x + 1/x$

7. If $x + 1/x = 3$, find the value of $x^4 + 1/x^4$

8. What must be added to $49y^2 + 70xy$ to make it a perfect square?

9. What must be subtracted to $4x^2 + 9y^2$ to make it a perfect square?

10. (i) $(2x + 5y)^2$

(ii) $(x + 1/3)^2$

EXERCISE 2:

1. Find the square of the following:

(i) $(x - 7)$

(ii) $(3 - 11y)$

(iii) $(x - 1/x)$

(iv) $(\sqrt{5}x - 1/\sqrt{5}x)$

2. Use the formula for squaring the binomials and evaluate:

(I) $(999)^2$

(ii) $(98)^2$

3. (i) If $x - y = 19$ and $xy = 20$, find the value of $x^2 + y^2$ (ii) If $x^2 + y^2 = 101$ and $xy = 10$, find the value of $x - y$

4. If $x - 1/x = 7$, find $x^2 + 1/x^2$

5. If $x^2 + 1/x^2 = 7$, find $x - 1/x$

6. If $x^2 + 1/x^2 = 11$, find $x - 1/x$

7. What must be added to $16m^2 - 24mn + 6n^2$ to make it a perfect square?

8. What must be subtracted to $25a^2 + 9b^2 - 20ab$ to make it a perfect square?

9. Express each the following expression as perfect square.

(i) $a^2 + 9b^2 - 6ab$

(ii) $1 + 49y^2 - 14y$

EXERCISE 3:

1. Expand each of the following:

(I) $(x + 3y)^3$

(ii) $(px + qy)^3$

(iii) $(x^2 + 9y)^3$

(iv) $(-x + 2y)^3$

(v) $(a + 8y)^3$

(vi) $(1/4 p + 3/4 q)^3$

2. Evaluate by using suitable identity.

(i) $(105)^3$

(ii) $(1002)^3$

(iii) $(303)^3$

(iv) $(10.1)^3$

(v) $(9.04)^3$

3. (i) If $x + 1/x = 7$, find the value of $x^3 + 1/x^3$

(ii) If $x + 1/x = 11$, find the value of $x^3 + 1/x^3$

4. (i) Find the value of $125x^3 + 27y^3$, if $5x + 3y = 8$ and $xy = 2$.

(ii) Find the value of $8x^3 + 64y^3$, if $2x + 4y = 12$ and $xy = 5$.

ANSWERS

EXERCISE 1

1. (i) $x^2 + 10x + 25$

(ii) $9p^2 + 24p + 16$

(iii) $5x^2 + 2\sqrt{5}x + 1$

(iv) $25x^2 + 70xy + 49y^2$

(v) $x^2/9 + 2/15xy + y^2/25$

2. (i) $t^2/81 + 8/9 + 16/t^2$

(ii) $0.09x^2 + 0.24xy + 0.16y^2$

(iii) $c^2 + 12c + 36$

3. (i) 10609

(ii) 116.64

(iii) 84.64

4. (i) 70

(ii) ± 7

5. 23

6. ± 4

7. ± 7

8. $25x^2$

9. $12xy$

10. Express each the following expression as perfect square.

(i) $4x^2 + 25y^2 + 20xy$

(ii) $x^2 + 1/9 + 2x/3$

EXERCISE 2

1. (i) $x^2 - 14x + 49$

(ii) $9 - 66y + 121y^2$

(iii) $x^2 - 2 + 1/x^2$

(iv) $5x^2 - 2 + 1/5x^2$

2. (i) 998001

(ii) 9604

3. (i) 401

(ii) ± 9

4. 51

5. $\pm \sqrt{5}$

6. ± 3

7. $3n^2$

8. $10ab$

9. (i) $(a - 3b)^2$

(ii) $(1 - 7y)^2$

EXERCISE 3

1. (i) $x^3 + 9x^2y + 27xy^2 + 27y^3$

(ii) $p^3x^3 + 3p^2qx^2y + 3pxq^2y^2 + q^3y^3$

(iii) $x^6 + 27x^4y + 243x^2y^2 + 729y^3$

(iv) $-x^3 + 6x^2y - 12xy^2 + 8y^3$

(v) $a^3 + 24a^2y + 192ay^2 + 512y^3$

(vi) $1/64p^3 + 9/64p^2q + 27/64pq^2 + 27/64q^3$

2. (I) 1157625

(ii) 1006012008

(iii) 27818127

(iv) 1030.301

(v) 738.763264

3. (i) 322 (ii) 1298

4. (i) -208 (ii) 288

EXERCISE 1: FACTORISATION BY REGROUPING

1. Factorize each of the following by regrouping:

- (I) $x^2 + xy + 9x + 9y$
- (ii) $6xy - 4y + 6 - 9x$
- (iii) $10ab + 6a + 5b + 3$
- (iv) $x^3 + x^2 + x + 1$
- (v) $a^2 - y + ay - a$
- (vi) $x^3 - x^2y + 5x - 5y$
- (vii) $a(a + 3) - a - 3$
- (viii) $3ax + 3ay - 2bx - 2by$
- (ix) $x(x + y - z) - yz$
- (x) $a^3 - a^2 + ab^2 - a^2b^2$

2. Factor grouping the algebraic expressions:

- (i) $4xy - 7y + 12x - 21$
- (ii) $7ab - 5a - 28b + 20$
- (iii) $5xy - 2x - 5y^2 + 2y$
- (iv) $6x^2 - 15xz - 8yx + 20yz$
- (v) $4ax + 5bx - 12ay - 15by$

3. Factorize by regrouping the terms:

- (i) $7ab - 21bc - 7ax + 21xc$
- (ii) $x^2 + xy(y + 1) + y^3$
- (iii) $ba^2 - 2a(1 - b) - 4$
- (iv) $x^2 - x(a + 4b) + 4ab$
- (v) $x - 9 - (x - 9)^2 + xy - 9y$

4. Factorize by grouping the following expressions:

- (i) $(p - 4) - (p - 4)^2 + 12 - 3p$
- (ii) $q(r - s)^2 - p(s - r) + 3r - 3s$
- (iii) $(x^2 + 2x)^2 - 7(x^2 + 2x) - y(x^2 + 2x) + 7y$
- (iv) $a^4x + a^3(2x - y) - a(2ay + z) - 2z$
- (v) $a^3 - 2a^2b + 3ab^2 - 6b^3$
- (vi) $a^2 + b - ab - a$
- (vii) $5xy - y^2 + 15zx - 3yz$
- (viii) $ab^2 - bc^2 - ab + c^2$

EXERCISE 2: FACTORISATION BY USING IDENTITIES

1. Factor the given expressions using identity:

(I) $m^2 + 8m + 16$

(ii) $4x^2 - 4x + 1$

(iii) $x^4 + 9y^4 + 6x^2y^2$

(iv) $(a^4 - 8a^2b^2 + 16b^4) - 18$

(v) $256 - x^2 - 2xy - y^2$

2. Factorize the expressions:

(i) $4x^2 - 12xy + 9y^2$

(ii) $36x^2 - 84xy + 49y^2$

(iii) $9a^2 + 42ab + 49b^2$

(iv) $(3a - 5b)^2 + 2(3a - 5b)(2b - a) + (2b - a)^2$

(v) $36x^2 + 36x + 8$

(vi) $4a^4 + b^4$

3. Factor the identities:

(i) $4x^2 + 12xy + 9y^2$

(ii) $x^2 + 22x + 121$

(iii) $9x^2 - 24xy + 16y^2$

(iv) $36x^2 - 36x + 9$

(v) $16x^4 - 72x^2y^2 + 81y^4$

(vi) $(a^2 + c^2 + 2ac) - b^2$

4. Factor completely using the formula:

(i) $100 - [121p^2 - 88pq + 16q^2]$

(ii) $36 - a^2 - b^2 - 2ab$

(iii) $25a^2 + 49b^2 - 70ab - 15a + 21b$

(iv) $4x^2 - 4x - 3$

(v) $64 - a^2 - b^2 - 2ab$

(vi) $25x^2 - (3y + 4z)^2$

EXERCISE 3: FACTORISATION OF DIFFERENCE OF SQUARES

Factorise

1. $x^2 - 36$

2. $4a^2 - 9$

3. $81 - 49x^2$

4. $4x^2 - 9y^2$

5. $16x^2 - 225y^2$

6. $9x^2y^2 - 25$

7. $16x^2 - \frac{1}{144}$

8. $(2a + 3b)^2 - 16c^2$

9. $1 - (b - c)^2$

10. $9(x + y)^2 - x^2$

11. $25(a + b)^2 - 16(a - b)^2$

12. $20a^2 - 45b^2$

13. $x^3 - 64x$

14. $12x^2 - 27$

15. $3x^5 - 48x^3$

16. $63a^2b^2 - 7$

17. $a^2 - 2ab + b^2 - c^2$

18. $x^2 - y^2 - 2y - 1$

19. $9x^2 - y^2 + 4y - 4$

20. $x^2 - 2xy + y^2 - z^2$

21. $25 - a^2 - b^2 - 2ab$

22. $16y^3 - 4y$

23. $3x^5 - 48x$

24. $(3x - 4y)^2 - 25z^2$

25. $(2x + 3y)^2 - 1$

26. $16c^2 - (5a + b)^2$

27. $100 - (x - 5)^2$

28. **Evaluate:**

(i) $(405)^2 - (395)^2$

(ii) $(7.8)^2 - (2.2)^2$

EXERCISE 4: FACTORING QUADRATIC TRINOMIALS

1. Factorize the quadratic trinomials:

(i) $x^2 + 5x + 6$

(ii) $x^2 + 10x + 24$

(iii) $x^2 + 12x + 27$

(iv) $x^2 + 15x + 56$

(v) $x^2 + 19x + 60$

(vi) $x^2 + 13x + 40$

(vii) $x^2 - 10x + 24$

(viii) $x^2 - 23x + 42$

(ix) $x^2 - 17x + 16$

(x) $x^2 - 21x + 90$

2. Factorize the expressions completely:

(i) $x^2 - 22x + 117$

(ii) $x^2 - 9x + 20$

(iii) $x^2 + x - 132$

(iv) $x^2 + 5x - 104$

(v) $y^2 + 7y - 144$

(vi) $z^2 + 19z - 150$

(vii) $y^2 + y - 72$

(viii) $x^2 + 6x - 91$

(ix) $x^2 - 4x - 77$

(x) $x^2 - 6x - 135$

3. Factor by splitting middle term:

(I) $x^2 - 11x - 42$

(ii) $x^2 - 12x - 45$

(iii) $x^2 - 7x - 30$

(iv) $x^2 - 5x - 24$

(v) $3x^2 + 10x + 8$

(vi) $3x^2 + 14x + 8$

(vii) $2x^2 + x - 45$

EXERCISE 5:

1. Factorize each of the following expression.

(I) $-5x^2 + 5xy - 52x$

(ii) $p^2qr + pq^2r + pqr^2$

(iii) $-4p^5 - 16p^3q - 20p^2q^2$

(iv) $p^3qr + 4pq^3 + 14p^3$

(v) $-x^2 + 3x + x - a - 2$

(vi) $a^2m + b^2m + c^2m - a^2n - b^2n - c^2n$

2. Factorize using the formula of difference of two squares:

(i) $25x^2 - 36x^2y^2$

(ii) $49m^2 - n^4$

(iii) $81a^4 - b^2$

(iv) $x^3 - 25x$

(v) $32a^2b - 200b^3$

(vi) $4a^2 + 12ab + 9b^2 - 9$

3. Find the values of:

(i) $(64)^2 - (36)^2$

(ii) $(8^2/3)^2 - (3^1/3)^2$

(iii) $(42)^2 - (28)^2$

(iv) $(10003)^2 - (9997)^2$

(v) $(9.2)^2 - (0.8)^2$

4. Factorization of trinomial:

(i) $10p^2q^2 - 11pq + 3$

(ii) $12x^2 + 11x - 5$

(iii) $15a^2b^2 - 21ab + 6$

(iv) $9x^2 - y^2 - 8y - 16$

(v) $x^4 - 10x^2 + 9$

ANSWERS

EXERCISE 1

1. (i) $(x + y)(x + 9)$
(ii) $(2y - 3)(3x - 2)$
(iii) $(2a + 1)(5b + 3)$
(iv) $(x^2 + 1)(x + 1)$
(v) $(a - 1)(a + y)$
(vi) $(x - y)(x^2 + 5)$
(vii) $(a + 3)(a - 1)$
(viii) $(x + y)(3a - 2b)$
(ix) $(x + y)(x - z)$
(x) $a(a - 1)(a - b^2)$
2. (i) $(y + 3)(4x - 7)$
(ii) $(a - 4)(7b - 5)$
(iii) $(x - y)(5y - 2)$
(iv) $(3x - 4y)(2x - 5z)$
(v) $(x - 3y)(4a + 5b)$
3. (i) $7(b - x)(a - 3c)$
(ii) $(x + y^2)(x + y)$
(iii) $(a + 2)(ab - 2)$
(iv) $(x - 4b)(x - a)$
(v) $(x - 9)(10 - x + y)$
4. (i) $(p - 4)(2 - p)$
(ii) $(r - s)(qr - qs + p + 3)$
(iii) $(x^2 + 2x - 7)(x^2 + 2x - y)$
(iv) $(a + 2)(a^3x - a^2y - z)$
(v) $(a - 2)(a^2 + 3b^2)$
(vi) $(a - 1)(a - b)$
(vii) $(y + 3z)(5x - y)$
(viii) $(ab - c^2)(b - 1)$

EXERCISE 2

1. (i) $(m + 4)(m + 4)$
(ii) $(2x - 1)(2x - 1)$
(iii) $(x^2 + 3y^2)(x^2 + 3y^2)$
(iv) $(a^2 - 4b^2 + 9)(a^2 - 4b^2 - 9)$
(v) $(16 + x + y)(16 - x - y)$
2. (i) $(2x - 3y)(2x - 3y)$
(ii) $(6x - 7y)(6x - 7y)$
(iii) $(3a + 7b)(3a + 7b)$
(iv) $(2a - 3b)(2a - 3b)$
(v) $4(3x + 2)(3x + 1)$
(vi) $(2a^2 + b^2 + 2ab)(2a^2 + b^2 - 2ab)$
3. (i) $(2x + 3y)(2x + 3y)$
(ii) $(x + 11)(x + 11)$
(iii) $(3x - 4y)(3x - 4y)$
(iv) $9(2x - 1)(2x - 1)$
(v) $(2x + 3y)(2x - 3y)(2x + 3y)(2x - 3y)$
(vi) $(a + c + b)(a + c - b)$
4. (i) $(10 + 11p - 4q)(10 - 11p + 4q)$
(ii) $(6 + a + b)(6 - a - b)$
(iii) $(5a - 7b)(5a - 7b - 3)$
(iv) $(2x + 1)(2x - 3)$
(v) $(8 + a + b)(8 - a - b)$
(vi) $(5x + 3y + 4z)(5x - 3y - 4z)$

EXERCISE 3

1. $(x + 6)(x - 6)$
2. $(2a + 3)(2a - 3)$
3. $(9 + 7x)(9 - 7x)$
4. $(2x + 3y)(2x - 3y)$
5. $(4x + 15y)(4x - 15y)$
6. $(3xy + 5)(3xy - 5)$
7. $(4x + 1/12)(4x - 1/12)$
8. $(2a + 3b + 4c)(2a + 3b - 4c)$
9. $(1 + b - c)(1 - b + c)$
10. $(4x + 3y)(2x + 3y)$
11. $(9a + b)(a + 9b)$
12. $5(2a + 3b)(2a - 3b)$
13. $x(x + 8)(x - 8)$
14. $3(2x + 3)(2x - 3)$
15. $3x^3(x + 4)(x - 4)$
16. $7(3ab + 1)(3ab - 1)$
17. $(a - b + c)(a - b - c)$
18. $(x + y + 1)(x - y - 1)$
19. $(3x + y - 2)(3x - y + 2)$
20. $(x - y + z)(x - y - z)$
21. $(5 + a + b)(5 - a - b)$
22. $4y(2y + 1)(2y - 1)$
23. $3x(x^2 + 4)(x + 2)(x - 2)$
24. $(3x - 4y + 5z)(3x - 4y - 5z)$
25. $(2x + 3y + 1)(2x + 3y - 1)$
26. $(4c + 5a + b)(4c - 5a - b)$
27. $(5 + x)(15 - x)$
28. (i) 8000 (ii) 56

ANSWERS

EXERCISE 4

1. (i) $(x + 3)(x + 2)$
(ii) $(x + 6)(x + 4)$
(iii) $(x + 9)(x + 3)$
(iv) $(x + 8)(x + 7)$
(v) $(x + 15)(x + 4)$
(vi) $(x + 8)(x + 5)$
(vii) $(x - 6)(x - 4)$
(viii) $(x - 21)(x - 2)$
(ix) $(x - 16)(x - 1)$
(x) $(x - 15)(x - 6)$
2. (i) $(x - 13)(x - 9)$
(ii) $(x - 5)(x - 4)$
(iii) $(x + 12)(x - 11)$
(iv) $(x + 13)(x - 8)$
(v) $(y + 16)(y - 9)$
(vi) $(z + 25)(z - 6)$
(vii) $(y + 9)(y - 8)$
(viii) $(x + 13)(x - 7)$
(ix) $(x - 11)(x + 7)$
(x) $(x - 15)(x + 9)$
3. (i) $(x - 14)(x + 3)$
(ii) $(x - 15)(x + 3)$
(iii) $(x - 10)(x + 3)$
(iv) $(x - 8)(x + 3)$
(v) $(x + 2)(3x + 4)$
(vi) $(x + 4)(3x + 2)$
(vii) $(x + 5)(2x - 9)$

EXERCISE 5

1. (i) $x(-5x + 5y - 52)$
(ii) $pqr(p + q + r)$
(iii) $-4p^2(p^3 + 4pq + 5q^2)$
(iv) $p(p^2qr + 4q^3 + 14p^2)$
(v) $(a - 1)(a - x + 2)$
(vi) $(m - n)(a^2 + b^2 + c^2)$
2. (i) $x^2(5 + 6y)(5 - 6y)$
(ii) $(7m + n^2)(7m - n^2)$
(iii) $(9a^2 + b)(9a^2 - b)$
(iv) $x(x + 5)(x - 5)$
(v) $2b(4a + 10b)(4a - 10b)$
(vi) $(2a + 3b + 3)(2a + 3b - 3)$
3. (i) 2800
(ii) 64
(iii) 980
(iv) 120000
(v) 84
4. (i) $(2pq - 1)(5pq - 3)$
(ii) $(3x - 1)(4x + 5)$
(iii) $3(ab - 1)(5ab - 2)$
(iv) $(3x + y + 4)(3x - y - 4)$
(v) $(x + 1)(x - 1)(x + 3)(x - 3)$



SIMULTANEOUS EQUATIONS

EXERCISE 1:

1. Use the method of substitution to solve each other of the pair of simultaneous equations:

(a) $x + y = 15$ $x - y = 3$

(b) $x + y = 0$ $x - y = 2$

(c) $2x - y = 3$ $4x + y = 3$

(d) $2x - 9y = 9$ $5x + 2y = 27$

(e) $x + 4y = -4$ $3y - 5x = -1$

(f) $2x - 3y = 2$ $x + 2y = 8$

(g) $x + y = 7$ $2x - 3y = 9$

(h) $11y + 15x = -23$ $7y - 2x = 20$

(i) $5x - 6y = 2$ $6x - 5y = 9$

2. Solve each other pair of equation given below using elimination method:

(a) $x + 2y = -4$ $3x - 5y = -1$

(b) $4x + 9y = 5$ $-5x + 3y = 8$

(c) $9x - 6y = 12$ $4x + 6y = 14$

(d) $2y - (3/x) = 12$ $5y + (7/x) = 1$

(e) $(3/x) + (2/y) = (9/xy)$ $(9/x) + (4/y) = (21/xy)$

(f) $(4/y) + (3/x) = 8$ $(6/y) + (5/x) = 13$

(g) $5x + (4/y) = 7$ $4x + (3/y) = 5$

(h) $x + y = 3$ $-3x + 2y = 1$

(i) $-3x + 2y = 5$ $4x + 5y = 2$

3. Solve the following simultaneous equations:

(a) $3a + 4b = 43$ $-2a + 3b = 11$

(b) $4x - 3y = 23$ $3x + 4y = 11$

(c) $5x + (4/y) = 7$ $4x + (3/y) = 5$

(d) $4/(p - 3) + 6/(q - 4) = 5$ $5/(p - 3) - 3/(q - 4) = 1$

(e) $(l/6) - (m/15) = 4$ $(l/3) - (m/12) = 19/4$

(f) $3x + 2y = 8$ $4x + y = 9$

(g) $x - y = -1$ $2y + 3x = 12$

(h) $(3y/2) - (5x/3) = -2$ $(y/3) + (x/3) = 13/6$

(i) $x - y = 3$ $(x/3) + (y/2) = 6$

(j) $(2x/3) + (y/2) = -1$ $(-x/3) + y = 3$

(k) $5x + 8y = 9$ $2x + 3y = 4$

(l) $3 - 2(3a - 4b) = -59$ $(a - 3)/4 - (b - 4)/5 = 2\frac{1}{10}$

EXERCISE 2: WORD PROBLEMS

1. The sum of two numbers is 50 and their difference is 22. Find the numbers.
2. One number is three times the other number. The difference between the two numbers is 12. Find the two numbers.
3. The sum of two numbers is 9. The difference in their squares is also 9. Find the number.
4. The difference between the two numbers is 7. Two times the smaller number added to the larger number gives 22. Find the two numbers.
5. 3 tables and 2 chairs cost Rs. 1900 and 2 tables and 4 chairs cost Rs. 1800. Find the cost of table and a chair.
6. A lady has only Rs. 1 and Rs.2 coin in her purse. If in all she has 50 coins totaling Rs. 70, Find the number of coins of each type.
7. I am three times old as my son. After five years, I will be $2\frac{1}{2}$ times as old as my son. Find my present age and the present age of my son.
8. Ten years ago, mother was 12 times as old as her daughter and ten years, hence she will be twice as old as her daughter will be. Find the present ages.
9. In the triangle, sum of two angles is 90° which is the measure of the third angle. Also, the difference of these 2 angle is 10° , find the measure of these two unknown angles.
10. A fraction becomes $10/7$ if 2 is added to both numerator and denominator. If however 3 is subtracted from both numerator and denominator, the fraction becomes $5/2$. What is the fraction?

EXERCISE 3: WORD PROBLEMS

1. A fraction is such that if numerator is multiply by 3 and the denominator is reduce by 2 we get $\frac{3}{5}$ but if the numerator is increased by 4 and the denominator is doubled we get $\frac{5}{14}$. Find the fraction.
2. The sum of the numerator and denominator of a fraction is 12. If the denominator is increased by 1, the fraction becomes $\frac{7}{6}$. Find the fraction.
3. A number consists of two digits whose sum if 5. When the digits are reversed, the number becomes greater by 9. Find the number.
4. The sum of a two digit number and the number obtained by reversing the digit is 110. The difference between the digits is 4. Find the number.
5. Seven times a 2 – digit number is equal to 4 times the number obtained by reversing the digits. The difference between the digits is 1. Find the number.
6. point A and B are 50 km part on a highway. A car starts from A and another car start from B at the same time. If they travelled in the same direction, they meet in 5 hours but if they move towards each other they meet in 1 hour. Find their speeds.
7. A boat goes 6 km upstream and 57 km downstream in 5 hours. In 9 hours it can go 21 km upstream and 38 km downstream. Determine the speed of stream and that of boat in still water.
8. The distance between two stations is 340 km. two trains starts simultaneously from these stations on parallel tracks to cross each other. If the speed on one of them is greater than the other by 5 km/hr and the distance between the two trains after 2 hours of their start is 30 km, find the speed of each train.
9. The area of a rectangle gets reduced by 10 square units if its length is reduced by 4 units and breadth is increase by 2 units. If we increased the length by 3 units and breadth by 4 units, the area is increased by 96 square units. Find the length and breadth of the rectangle.
10. Raga travel 150 km to his home partly by bus and partly by auto-rickshaw. He takes 2 hours if travels 30 km by bus and rest by auto-rickshaw. He takes 5 minutes longer if he travel 50 km by bus and the rest by auto-rickshaw. Find the speed of bus and the auto-rickshaw.

ANSWERS

EXERCISE 1

1. (a) $x = 9, y = 6$
(b) $x = 1, y = -1$
(c) $x = 1, y = -1$
(d) $x = 261/49, y = 9/49$
(e) $x = -8/23, y = -21/23$
(f) $x = 4, y = 2$
(g) $x = 6, y = 1$
(h) $x = -3, y = 2$
(i) $x = 4, y = 3$
2. (a) $x = -2, y = -1$
(b) $x = -1, y = 1$
(c) $x = 2, y = 1$
(d) $x = -1/2, y = 3$
(e) $x = 3, y = 1$
(f) $x = 1/2, y = 2$
(g) $x = -1, y = 1/3$
(h) $x = 1, y = 2$
(i) $x = -21/23, y = 26/23$

3. (a) $a = 5, b = 7$
(b) $x = 5, y = -1$
(c) $x = -1, y = 1/3$
(d) $p = 5, q = 6$
(e) $l = -2, m = -65$
(f) $x = 2, y = 1$
(g) $x = 2, y = 3$
(h) $x = 141/38, y = 53/19$
(i) $x = 9, y = 6$
(j) $x = -3, y = 2$
(k) $x = 5, y = -2$
(l) $a = 5, b = -4$

EXERCISE 2

1. 36, 14
2. 18, 6
3. 5, 4
4. 12, 5
5. Rs. 500, Rs. 200
6. 30, 20
7. 15 years, 45 years
8. 34 years, 12 years
9. $50^\circ, 40^\circ$
10. $8/5$

EXERCISE 3

1. $1/7$
2. $7/5$
3. 23
4. 37
5. 12
6. 30kmph, 20 kmph
7. Speed of boat 11 kmph, speed of steam 8 kmph
8. 80 kmph, 75 kmph
9. $L = 15, b = 8$
10. Speed of bus = 60 kmph, speed of auto-rickshaw 80 kmph

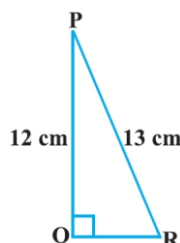
EXERCISE 1: TRIGONOMETRIC RATIOS AND STANDARD ANGLES

1. In $\triangle ABC$, right-angled at B, $AB = 24$ cm, $BC = 7$ cm. Determine :

(i) $\sin A$, $\cos A$

(ii) $\sin C$, $\cos C$

2. In Figure, find $\tan P - \cot R$.



3. If $\sin A = 3/4$, calculate:

(i) $\cos A$

(ii) $\tan A$.

4. Given $15 \cot A = 8$, Find:

(i) $\sin A$

(ii) $\sec A$.

5. Given $\sec \theta = 13/12$, calculate all other trigonometric ratios.

6. If $\angle A$ and $\angle B$ are acute angles such that $\cos A = \cos B$, then show that $\angle A = \angle B$.

7. If $\cot \theta = 7/8$,

Evaluate:

(i) $\frac{(1 + \sin \theta)(1 - \sin \theta)}{(1 \cos \theta)(1 \cos \theta)}$

(ii) $\cot^2 \theta$

8. In triangle ABC, right-angled at B, if $\tan A = 1/\sqrt{3}$

find the value of:

(i) $\sin A \cos C + \cos A \sin C$

(ii) $\cos A \cos C - \sin A \sin C$

9. In $\triangle PQR$, right-angled at Q, $PR + QR = 25$ cm and $PQ = 5$ cm. Determine the values of $\sin P$, $\cos P$ and $\tan P$.

10. State whether the following are true or false. Justify your answer.

(i) The value of $\tan A$ is always less than 1.

(ii) $\sec A = 12/5$ for some value of angle A.

(iii) $\cos A$ is the abbreviation used for the cosecant of angle A.

(iv) $\cot A$ is the product of $\cot$ and A.

(v) $\sin \theta = 4/3$ for some angle θ .

11. Evaluate the following :

(I) $\sin 60^\circ \cos 30^\circ + \sin 30^\circ \cos 60^\circ$

(ii) $2 \tan^2 45^\circ + \cos^2 30^\circ - \sin^2 60^\circ$

EXERCISE 2: COMPLEMENTARY ANGLES

1. If $\sin 3A = \cos (A - 26^\circ)$, where $3A$ is an acute angle, find the value of A .

2. Show that :

(i) $\tan 48^\circ \tan 23^\circ \tan 42^\circ \tan 67^\circ = 1$

(ii) $\cos 38^\circ \cos 52^\circ - \sin 38^\circ \sin 52^\circ = 0$

3. If $\tan 2A = \cot (A - 18^\circ)$, where $2A$ is an acute angle, find the value of A .

4. If $\tan A = \cot B$

Prove that $A + B = 90^\circ$.

5. If $\sec 4A = \operatorname{cosec} (A - 20^\circ)$, where $4A$ is an acute angle, find the value of A .

6. If A , B and C are interior angles of a triangle ABC , then show that

$$\sin ((B + C)/2) = \cos (A/2)$$

7. Express $\sin 67^\circ + \cos 75^\circ$ in terms of trigonometric ratios of angles between 0° and 45° .

ANSWERS

EXERCISE 1

1. (i) $\sin A = 7/25$, $\cos A = 24/25$

(ii) $\sin C = 24/25$, $\cos C = 7/25$

2. 0

3. $\cos A = \sqrt{7}/4$, $\tan A = \sqrt{3}/7$

4. $\sin A = 15/17$, $\sec A = 17/8$

5. $\sin \theta = 5/13$, $\cos \theta = 12/13$, $\tan \theta = 5/12$, $\cot \theta = 12/5$, $\operatorname{cosec} \theta = 13/5$

7. Yes

8. (i) 1 (ii) 0

9. $\sin P = 12/13$, $\cos P = 5/13$, $\tan P = 12/5$

10. (i) False (ii) True (iii) False (iv) False (v) False

11. (I) 1

(ii) 2

EXERCISE 2

3. 29°

3. $\angle A = 36^\circ$

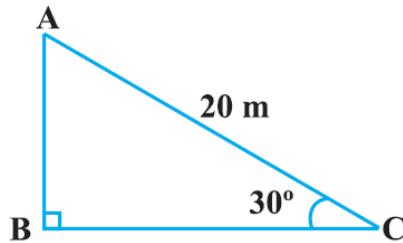
5. $\angle A = 22^\circ$

7. $\cos 23^\circ + \sin 15^\circ$

SOLUTION OF RIGHT TRIANGLES

EXERCISE 1: HEIGHTS AND DISTANCES

1. A circus artist is climbing a 20 m long rope, which is tightly stretched and tied from the top of a vertical pole to the ground. Find the height of the pole, if the angle made by the rope with the ground level is 30° (see figure).



2. A tree breaks due to storm and the broken part bends so that the top of the tree touches the ground making an angle 30° with it. The distance between the foot of the tree to the point where the top touches the ground is 8 m. Find the height of the tree.

3. A contractor plans to install two slides for the children to play in a park. For the children below the age of 5 years, she prefers to have a slide whose top is at a height of 1.5 m, and is inclined at an angle of 30° to the ground, whereas for elder children, she wants to have a steep slide at a height of 3m, and inclined at an angle of 60° to the ground. What should be the length of the slide in each case?

4. The angle of elevation of the top of a tower from a point on the ground, which is 30 m away from the foot of the tower, is 30° . Find the height of the tower.

5. A kite is flying at a height of 60 m above the ground. The string attached to the kite is temporarily tied to a point on the ground. The inclination of the string with the ground is 60° . Find the length of the string, assuming that there is no slack in the string.

6. The shadow of a vertical tower on a level ground increases by 10 m when the altitude of the sun changes from 45° to 30° . Find the height of the tower, correct to two decimal places.

7. Vertical tower is 20 m high. A man standing at some distance from the tower knows that the cosine of the angle of elevation of the top of the tower is 0.53. How far is he standing from the foot of the tower?

8. The length of a string between a kite and a point on the ground is 90 m. If the string is making an angle θ with the level ground such that $\tan \theta = 15/8$, how high will the kite be?

9. A string of a kite is 100 metres long and it makes an angle of 60° with horizontal. Find the height of the kite, assuming that there is no slack in the string.

10. A balloon is connected to a meteorological station by a cable of length 200 m inclined at 60 degree . Find the height of the balloon from the ground. Imagine that there is no slack in the cable.

ANSWERS

EXERCISE 1

1. 10 m
2. $8\sqrt{3}\text{m}$
3. 3m, $2\sqrt{3}\text{m}$
4. $10\sqrt{3}\text{ m}$
5. $40\sqrt{3}\text{m}$
6. 13.66 m
7. 12.5 m
8. 79.41 m
9. $50\sqrt{3}\text{m}$
10. 173.2 m

EXERCISE 1: AREA AND PERIMETER OF RECTANGLES

1. The perimeter of a rectangle is 230 cm. If the length of the rectangle is 70 cm, find its breadth and area.
2. The area of a rectangle is 96 cm^2 . If the breadth of the rectangle is 8 cm, find its length and perimeter.
3. How many tiles whose length and breadth are 13 cm and 7 cm respectively are needed to cover a rectangular region whose length and breadth are 520 cm and 140 cm?
4. Find the cost of tiling a rectangular plot of land 300 m long and 150 m wide at the rate of \$6 per hundred square m.
5. If it costs \$1600 to fence a rectangular park of length 20 m at the rate of \$25 per m^2 , find the breadth of the park and its perimeter. Also, find the area of the field.
6. The length of a rectangular wooden board is thrice its width. If the width of the board is 120 cm, find the cost of framing it at the rate of \$5 for 20 cm.

EXERCISE 2: AREA AND PERIMETER OF SQUARES

1. Find the perimeter of a square whose area is 625 cm^2 .
2. Find the area of the square whose perimeter is 440 cm.
3. The area of a square field is 100 ares. Find its perimeter.
4. How many square tiles of side 9 cm will be needed to fit in a square floor of a bathroom of side 720 cm. Find the cost of tiling at the rate of \$75 per tile.
5. The areas of a square and rectangle are equal. If the side of the square is 20 cm and the breadth of the rectangle 10 cm, find the length of the rectangle and its perimeter.
6. If it costs \$2400 to fence a square field at the rate of \$6 per m, find the length of the side and the area of the field.
$$\text{Perimeter} = (\text{Total cost})/(\text{Cost per } \text{m}^2)$$
7. A wire in the shape of rectangle whose width is 22 cm is bent to form a square of side 31 cm. Find the length of the rectangle. Also, find which shape encloses more area.
8. The area of a square field is 81 hectares. Find the cost of fencing the field with a wire at the rate of \$2.25 per m.
9. Convert the following units:
 - (a) 17 m^2 to cm^2
 - (b) 18000 m^2 to hectares
 - (c) 3000 m^2 to ares
 - (d) 6.3 m^2 to mm^2
 - (e) 3.7 hectares to ares

EXERCISE 3: AREA OF THE PATH

1. A verandah 1.25 m is constructed all along outside of a room 7.5 m long and 5 m wide.
Find:
(a) the area of the verandah.
(b) the cost of cementing the floor of the verandah at the rate of \$15 per m^2 .
2. A floor is 10 m long and 6 m wide. A square carpet of side 5 m is laid on the floor.
Find the area of the floor not carpeted.
3. Four square flowerbeds each of sides 2 m are dug on a piece of land 12 m long and 9 m wide. Find the area of the remaining portion of the land. Find the cost of levelling this land at the rate of \$3 per 100 cm^2 .
4. The side of a square flowerbed is 1 m 60 cm. It is enlarged by digging a path 25 cm wide all around.
Find:
(a) the increase in the area of flowerbed.
(b) the area of the enlarged flowerbed.
5. Two crossroads, each of width 8 m, run at right angles through the centre of a rectangular garden of length 500 m and breadth 250 m and parallel to its sides.
Find:
(a) the area of the garden excluding crossroads.
(b) the area of the crossroads. Convert these areas into hectares and ares.
6. A rectangular field is of dimensions 20 m $\times$ 15 m. Two paths run parallel to the sides of the rectangle through the centre of the field. The width of the longer path is 2 m and that of the shorter path is 1 m.
Find that:
(a) area of the paths
(b) area of the remaining portion of the field.
(c) cost of constructing the roads at the rate of \$10 per m^2 .
7. A square lawn is surrounded by a path 2 m wide. If the area of the path is 240 m^2 , find the area of the lawn.
8. A path 5 m wide runs along inside a rectangular field. The length of the rectangular field is three times the breadth of the field. If the area of the path is 500 m^2 , then find the length and breadth of the field.
9. A strip of width 3 cm is cut out all round from a sheet of paper with dimensions 30 cm $\times$ 20 cm. Find the area of the strip cut out and the area of the remaining sheet.

EXERCISE 4: DIAGONALS OF SQUARES AND RECTANGLES

1. The perimeter of a square is 96 cm. Find the area and the length of the diagonal.
2. The area of a square is 289 cm^2 . Find its perimeter and the length of the diagonal.
3. The diagonal of a square is $9\sqrt{2}$ cm. Find its area and perimeter.
4. The diagonal of a square is 20 cm. Find the side of the square and its perimeter.
5. A square field has the area 8.41 ares. Find the cost of putting the fence around it at the rate of \$8 per m. (Hint: 1 Are = 100 m^2)
6. The cost of cementing a square courtyard at \$2.75 per square m is \$1100. Find the cost of fencing it at the rate of \$5.50 per metre.
7. The area of a square and rectangle are equal. If the side of the square is 35 cm and the length of the rectangle is 45 cm, find the breadth and perimeter of the rectangle.
9. A wire is in shape of a square of side 12 cm. It is again bent into a rectangle of length 15 cm. Find its breadth. Which encloses more area and how much more?

EXERCISE 5: AREA AND PERIMETER OF TRIANGLE

1. Find the area of a triangle having
 - (a) base = 18 cm height = 12 cm
 - (b) base = 6.5 m height = 5 cm
 - (c) base = 7.2 m height = 7 dm
 - (d) base = 10.5 m height = 8 mm

2. Find the height of a triangle whose
 - (a) Area = 420 cm^2 base = 60 cm
 - (b) Area = 1500 mm^2 base = 7.5 cm
 - (c) Area = 64 dm^2 base = 1.6 m

3. Find the base of a triangle whose
 - (a) Area = 300 cm^2 height = 7.5 cm
 - (b) Area = 3.6 dm^2 height = 90 cm
 - (c) Area = 3.6 m^2 height = 1.8 m

4. Find the area of a triangle whose sides are 24 cm, 32 cm and 40 cm.

5. The three sides of a triangle are in the ratio 2 : 3 : 4 and the perimeter 225 m. Find its area.

6. Find the area of a triangle, sides of which are 10 cm and 9 cm and the perimeter 36 cm.

7. The sides of a triangle are in the ratio 14 : 18 : 26, and its perimeter is 580 cm. Find the area. Also, find the altitude corresponding to the smallest side.

8. Find the height of a triangle whose base is 50 cm and whose area is 500 cm^2 .

9. Find the base of a triangle whose altitude is 20 cm and area is 0.8 m^2 .

10. Find the area of an equilateral triangle, the length of whose sides is 12 cm.

11. Find the area of an isosceles right angled triangle of equal sides 15 cm each.

12. The base and height of a triangle are in the ratio 8 : 5 and its area is 320 m^2 . Find the height and base of the triangle.

13. Find the area of a right angled triangle whose hypotenuse is 13 cm and one of its sides containing the right angle is 12 cm. Find the length of the other side.

14. The area of a right triangle is 184 cm^2 and one of its legs is 16 cm long. Find the length of other leg.

15. The length of one of the diagonals of a field in the form of a quadrilateral is 46 m. The perpendicular distance of the other two vertices from the diagonal are 13 m and 10 m, find the area of the field.

16. The area of the triangle is equal to that of square whose each side measures 30 cm. Find the side of the triangle whose corresponding altitude is 36 cm.

EXERCISE 6: AREA AND CIRCUMFERENCE OF CIRCLE

1. Find the circumference of the circle whose radius is
(a) 12 cm
(b) 7.2 cm
(c) 15 mm (Take $\pi = 22/7$)
 2. Find the area of the circle whose diameter is
(a) 28 cm
(b) 10 cm
(c) 6.8 mm (Take $\pi = 22/7$)
 3. If the circumference of a circular sheet is 176 m, find its area.
 4. The area of a circle is 616 cm^2 . Find its circumference.
 5. From a circular sheet of a radius 5 cm, a circle of radius 3 cm is removed. Find the area of the remaining sheet.
 6. Find the perimeter of the adjoining figure which is a semicircle including the diameter. Find the perimeter
-
7. The diameter of a wheel is 70 cm. How many times the wheel will revolve in order to cover a distance of 110 m?
 8. The ratio of the radii of two wheels is 4 : 5. Find the ratio of their circumference.
 9. A well of diameter 150 cm has a stone parapet around it. If the length of the outer edge of the parapet is 616 cm, find the width of the parapet.
 10. A thin wire is in the form of an equilateral triangle of side 11 cm. Find the area of a circle whose circumference is equal to the length of the wire.
 11. Find the area of a circle whose circumference is same as the perimeter of square of side 22 cm.
 12. From a rectangular metal sheet of size 20 cm by 30 cm, a circular sheet as big as possible is cut. Find the area of the remaining sheet.
 13. Two circles have areas in the ratio 36 : 49. Find the ratio of their circumference.
 14. Find the circumference of a wheel whose radius is 35 cm. Find the distance covered in 60 seconds, if it revolves 5 times per second.
 15. The radius of a cycle wheel is 35 cm. Find the number of turns required to cover a distance of 1540 m.
 16. A 3 m wide road runs around a circular park whose circumference is 132 m. Find the cost of fencing the outer boundary of the road at the rate of \$10 per m.
 17. A circular flowerbed is surrounded by a path 2.5 m wide. The diameter of the flower-bed is 40 m. Find the area of the path.
 18. A square metallic frame has a perimeter 208 cm. It is bent in the shape of a circle. Find the area of the circle.
 19. From a circular sheet of radius 18 cm, two circles of radii 4.5 cm and a rectangle of length 4 cm and breadth 1 cm are removed; find the area of the remaining sheet.
-
20. Find the area of a circle inscribed in a square of side 20 cm.

ANSWERS

EXERCISE 1

1. 45 cm, 3150 cm²
2. 12 cm, 40 cm
3. 800 tiles
4. \$2700
5. b = 12 m, P = 64 m, A = 240 m²
6. \$240

EXERCISE 2

1. 100 cm
2. 12100 cm²
3. 400 m
4. \$32000
5. 40 cm, 100 cm
6. 100 m, 10000 m²
7. l = 40 cm, square
8. \$2700
9. (a) 170000 cm²
(b) 1.8 hectares
(c) 30 ares
(d) 6300000 m²
(e) 370 ares

EXERCISE 3

1. (a) 37.5 m²
(b) \$ 562.50
2. 35 m²
3. 92 m², \$ 27600
4. 1.85 m², 4.41 m²
5. (a) 1190.64 ares or 11.9064 hectares
(b) 59.36 ares or 0.5936 hectares
6. a. 53 m²
b. 247 m²
c. \$530
7. 210.25 m²
8. L = 45 m, b = 15 m
9. 264 cm², 336 cm²

EXERCISE 5

1. A = 576 cm², d = 33.936 cm
2. P = 68 cm, d = 24.038 cm
3. A = 81 cm², P = 36 cm
4. Side = 14.14 cm, P = 56.56 cm
5. \$928
6. \$440
7. b = 27.22 cm, P = 144.44 cm
8. b = 9 cm, square, 9 cm²

EXERCISE 5

1. (a) 108 cm²
(b) 0.1625 m²
(c) 2.52 m²
(d) 0.0420 m²
2. (a) 14 cm
(b) 40 mm
(c) 8 dm
3. (a) 80 cm
(b) 0.8 dm
(c) 4 m
4. 384 cm²
5. 1815.0 m² (approx)
6. 36 cm²
7. A = 11981.1 cm²,
height = 171.16 cm
8. 20 cm
9. 8 m
10. 62.352 cm²
11. 112.5 cm²
12. b = 32 cm,
height = 20 cm
13. 5 cm, 30 cm²
14. 23 cm
15. 529 m²
16. 50 cm

EXERCISE 6

1. (a) 75³/₇ cm
(b) 45.25 cm
(c) 94²/₇ cm
2. (a) 616 cm²
(b) 78⁴/₇ cm²
(c) 36.33 mm²
3. 2464 m²
4. 88 cm
5. 50²/₇ cm²
6. 51.42
7. 50
8. 4 : 5
9. 23 cm
10. 86⁵/₈ cm²
11. 616 cm²
12. 285.71 cm²
13. 6 : 7
14. 660 m
15. 700
16. \$1508.57
17. 333.92 m²
18. 3441⁵/₁₁ cm²
19. 887 cm²
20. 314.2 cm².



SURFACE AREAS AND VOLUMES

EXERCISE 1: SURFACE AREA OF CUBES AND CUBOIDS

1. A plastic box 1.5 m long, 1.25 m wide and 65 cm deep is to be made. It is to be open at the top. Ignoring the thickness of the plastic sheet, determine:

(i) The area of the sheet required for making the box.

(ii) The cost of sheet for it, if a sheet measuring 1m^2 costs Rs 20.

2. The length, breadth and height of a room are 5 m, 4 m and 3 m respectively. Find the cost of white washing the walls of the room and the ceiling at the rate of Rs 7.50 per m^2 .

3. The floor of a rectangular hall has a perimeter 250 m. If the cost of painting the four walls at the rate of Rs 10 per m^2 is Rs 15000, find the height of the hall. [Hint : Area of the four walls = Lateral surface area.]

4. The paint in a certain container is sufficient to paint an area equal to 9.375m^2 . How many bricks of dimensions $22.5\text{ cm} \times 10\text{ cm} \times 7.5\text{ cm}$ can be painted out of this container?

5. A cubical box has each edge 10 cm and another cuboidal box is 12.5 cm long, 10 cm wide and 8 cm high.

(i) Which box has the greater lateral surface area and by how much?

(ii) Which box has the smaller total surface area and by how much?

6. A small indoor greenhouse (herbarium) is made entirely of glass panes (including base) held together with tape. It is 30 cm long, 25 cm wide and 25 cm high.

(i) What is the area of the glass?

(ii) How much of tape is needed for all the 12 edges?

7. Shanti Sweets Stall was placing an order for making cardboard boxes for packing their sweets. Two sizes of boxes were required. The bigger of dimensions $25\text{ cm} \times 20\text{ cm} \times 5\text{ cm}$ and the smaller of dimensions $15\text{ cm} \times 12\text{ cm} \times 5\text{ cm}$. For all the overlaps, 5% of the total surface area is required extra.

If the cost of the cardboard is Rs 4 for 1000 cm^2 , find the cost of cardboard required for supplying 250 boxes of each kind.

EXERCISE 2: VOLUME OF CUBES AND CUBOIDS

1. A matchbox measures $4\text{ cm} \times 2.5\text{ cm} \times 1.5\text{ cm}$. What will be the volume of a packet containing 12 such boxes?

2. A cuboidal water tank is 6 m long, 5 m wide and 4.5 m deep. How many litres of water can it hold? ($1\text{ m}^3 = 1000\text{ l}$)

3. A cuboidal vessel is 10 m long and 8 m wide. How high must it be made to hold 380 cubic metres of a liquid?

4. Find the cost of digging a cuboidal pit 8 m long, 6 m broad and 3 m deep at the rate of Rs 30 per m^3 .

5. The capacity of a cuboidal tank is 50000 litres of water. Find the breadth of the tank, if its length and depth are respectively 2.5 m and 10 m.

6. A village, having a population of 4000, requires 150 litres of water per head per day. It has a tank measuring $20\text{ m} \times 15\text{ m} \times 6\text{ m}$. For how many days will the water of this tank last?

7. A godown measures $40\text{ m} \times 25\text{ m} \times 10\text{ m}$. Find the maximum number of wooden crates each measuring $1.5\text{ m} \times 1.25\text{ m} \times 0.5\text{ m}$ that can be stored in the godown.

8. A solid cube of side 12 cm is cut into eight cubes of equal volume. What will be the side of the new cube? Also, find the ratio between their surface areas.

EXERCISE 3: SURFACE AREA OF CYLINDERS

1. The curved surface area of a right circular cylinder of height 14 cm is 88 cm^2 . Find the diameter of the base of the cylinder.
2. It is required to make a closed cylindrical tank of height 1 m and base diameter 140 cm from a metal sheet. How many square metres of the sheet are required for the same?
3. A metal pipe is 77 cm long. The inner diameter of a cross section is 4 cm, the outer diameter being 4.4 cm (see Fig. 13.11). Find its
 - (i) inner curved surface area,
 - (ii) outer curved surface area,
 - (iii) total surface area.
4. The diameter of a roller is 84 cm and its length is 120 cm. It takes 500 complete revolutions to move once over to level a playground. Find the area of the playground in m^2 .
5. A cylindrical pillar is 50 cm in diameter and 3.5 m in height. Find the cost of painting the curved surface of the pillar at the rate of Rs 12.50 per m^2 .
6. Curved surface area of a right circular cylinder is 4.4 m^2 . If the radius of the base of the cylinder is 0.7 m, find its height.
7. The inner diameter of a circular well is 3.5 m. It is 10 m deep. Find
 - (i) its inner curved surface area,
 - (ii) the cost of plastering this curved surface at the rate of Rs 40 per m^2 .
8. In a hot water heating system, there is a cylindrical pipe of length 28 m and diameter 5 cm. Find the total radiating surface in the system.
9. Find
 - (i) the lateral or curved surface area of a closed cylindrical petrol storage tank that is 4.2 m in diameter and 4.5 m high.
 - (ii) how much steel was actually used, if $1/12$ of the steel actually used was wasted in making the tank.

EXERCISE 4: VOLUME OF CYLINDERS

1. The circumference of the base of a cylindrical vessel is 132 cm and its height is 25 cm. How many litres of water can it hold? ($1000 \text{ cm}^3 = 1\text{l}$)
2. The inner diameter of a cylindrical wooden pipe is 24 cm and its outer diameter is 28 cm. The length of the pipe is 35 cm. Find the mass of the pipe, if 1 cm^3 of wood has a mass of 0.6 g.
3. A soft drink is available in two packs – (i) a tin can with a rectangular base of length 5 cm and width 4 cm, having a height of 15 cm and (ii) a plastic cylinder with circular base of diameter 7 cm and height 10 cm. Which container has greater capacity and by how much?
4. If the lateral surface of a cylinder is 94.2 cm^2 and its height is 5 cm, then find (i) radius of its base (ii) its volume. (Use $\pi = 3.14$)
5. It costs Rs 2200 to paint the inner curved surface of a cylindrical vessel 10 m deep. If the cost of painting is at the rate of Rs 20 per m^2 , find
 - (i) inner curved surface area of the vessel,
 - (ii) radius of the base,
 - (iii) capacity of the vessel.
6. The capacity of a closed cylindrical vessel of height 1 m is 15.4 litres. How many square metres of metal sheet would be needed to make it?
7. A lead pencil consists of a cylinder of wood with a solid cylinder of graphite filled in the interior. The diameter of the pencil is 7 mm and the diameter of the graphite is 1 mm. If the length of the pencil is 14 cm, find the volume of the wood and that of the graphite.

EXERCISE 5: SURFACE AREA OF RIGHT CIRCULAR CONES

1. Diameter of the base of a cone is 10.5 cm and its slant height is 10 cm. Find its curved surface area.
2. Find the total surface area of a cone, if its slant height is 21 m and diameter of its base is 24 m.
3. Curved surface area of a cone is 308 cm^2 and its slant height is 14 cm. Find (i) radius of the base and (ii) total surface area of the cone.
4. A conical tent is 10 m high and the radius of its base is 24 m. Find (i) slant height of the tent.
(ii) cost of the canvas required to make the tent, if the cost of 1 m^2 canvas is Rs 70.
5. What length of tarpaulin 3 m wide will be required to make conical tent of height 8 m and base radius 6 m? Assume that the extra length of material that will be required for stitching margins and wastage in cutting is approximately 20 cm (Use $\pi = 3.14$).
6. The slant height and base diameter of a conical tomb are 25 m and 14 m respectively. Find the cost of white-washing its curved surface at the rate of Rs 210 per 100 m^2 .
7. A joker's cap is in the form of a right circular cone of base radius 7 cm and height 24 cm. Find the area of the sheet required to make 10 such caps.

EXERCISE 6: SURFACE AREA OF SPHERES

1. Find the surface area of a sphere of radius:
(i) 10.5 cm (ii) 5.6 cm (iii) 14 cm
2. Find the surface area of a sphere of diameter:
(i) 14 cm (ii) 21 cm (iii) 3.5 m
3. Find the total surface area of a hemisphere of radius 10 cm. (Use $\pi = 3.14$)
4. The radius of a spherical balloon increases from 7 cm to 14 cm as air is being pumped into it. Find the ratio of surface areas of the balloon in the two cases.
5. A hemispherical bowl made of brass has inner diameter 10.5 cm. Find the cost of tin-plating it on the inside at the rate of Rs 16 per 100 cm^2 .
6. Find the radius of a sphere whose surface area is 154 cm^2 .
7. The diameter of the moon is approximately one fourth of the diameter of the earth. Find the ratio of their surface areas.
8. A hemispherical bowl is made of steel, 0.25 cm thick. The inner radius of the bowl is 5 cm. Find the outer curved surface area of the bowl.

EXERCISE 7: VOLUME OF RIGHT CIRCULAR CONES

- Find the volume of the right circular cone with
 - radius 6 cm, height 7 cm
 - radius 3.5 cm, height 12 cm
- Find the capacity in litres of a conical vessel with
 - radius 7 cm, slant height 25 cm
 - height 12 cm, slant height 13 cm
- The height of a cone is 15 cm. If its volume is 1570 cm^3 , find the radius of the base. (Use $\pi = 3.14$)
- If the volume of a right circular cone of height 9 cm is $48 \pi \text{ cm}^3$, find the diameter of its base.
- A conical pit of top diameter 3.5 m is 12 m deep. What is its capacity in kilolitres?
- The volume of a right circular cone is 9856 cm^3 . If the diameter of the base is 28 cm, find
 - height of the cone
 - slant height of the cone
 - curved surface area of the cone
- A right triangle ABC with sides 5 cm, 12 cm and 13 cm is revolved about the side 12 cm. Find the volume of the solid so obtained.
- If the triangle ABC in the Question 7 above is revolved about the side 5 cm, then find the volume of the solid so obtained. Find also the ratio of the volumes of the two solids obtained in Questions 7 and 8.

EXERCISE 8: VOLUME OF SPHERES

- Find the volume of a sphere whose radius is
 - 7 cm
 - 0.63 m
- Find the amount of water displaced by a solid spherical ball of diameter
 - 28 cm
 - 0.21 m
- The diameter of a metallic ball is 4.2 cm. What is the mass of the ball, if the density of the metal is 8.9 g per cm^3 ?
- The diameter of the moon is approximately one-fourth of the diameter of the earth. What fraction of the volume of the earth is the volume of the moon?
- How many litres of milk can a hemispherical bowl of diameter 10.5 cm hold?
- A hemispherical tank is made up of an iron sheet 1 cm thick. If the inner radius is 1 m, then find the volume of the iron used to make the tank.
- Find the volume of a sphere whose surface area is 154 cm^2 .
- A dome of a building is in the form of a hemisphere. From inside, it was white-washed at the cost of Rs 498.96. If the cost of white-washing is Rs 2.00 per square metre, find the
 - inside surface area of the dome,
 - volume of the air inside the dome.
- Twenty seven solid iron spheres, each of radius r and surface area S are melted to form a sphere with surface area S' . Find the
 - radius r' of the new sphere,
 - ratio of S and S' .

ANSWERS

EXERCISE 1

1. (i) 5.45 m^2 (ii) Rs 109
2. Rs 555
3. 6 m
4. 100 bricks.
5. (i) Lateral surface area of cubical box is greater by 40 cm^2 .
(ii) Total surface area of cuboidal box is greater by 10 cm^2 .
6. (i) 4250 cm^2 of glass (ii) 320 cm of tape.
[Calculate the sum of all the edges (The 12 edges consist of 4 lengths, 4 breadths and 4 heights)].
7. Rs 2184

EXERCISE 2

1. 180 cm^3
2. 135000 litres
3. 4.75 m
4. Rs 4320
5. 2 m
6. 3 days
7. 16000
8. 6 cm, 4 : 1

EXERCISE 3

1. 2 cm
2. 7.48 m^2
3. (i) 968 cm^2 (ii) 1064.8 cm^2 (iii) 2038.08 cm^2
[Total surface area of a pipe is (inner curved surface area + outer curved surface area + areas of the two bases). Each base is a ring of area given by $\pi(R^2 - r^2)$, where R = outer radius and r = inner radius].
4. 1584 m^2
5. Rs 68.75
6. 1 m
7. (i) 110 m^2 (ii) Rs 4400
8. 4.4 m^2
9. (i) 59.4 m^2 (ii) 95.04 m^2

EXERCISE 4

1. 34.65 litres
2. 3.432 kg [Volume of a pipe = $\pi h \times (R^2 - r^2)$, where R is the outer radius and r is the inner radius].
3. The cylinder has the greater capacity by 85 cm^3 .
4. (i) 3 cm (ii) 141.3 cm^3
5. (i) 110 m^3 (ii) 1.75 m (iii) 96.25 kl 6. 0.4708 m^2
7. Volume of wood = 5.28 cm^3 , Volume of graphite = 0.11 cm^3 .

EXERCISE 5

1. 165 cm^2
2. 1244.57 m^2
3. (i) 7 cm (ii) 462 cm^2
4. (i) 26 m (ii) Rs 137280
5. 63 m
6. Rs 1155
7. 5500 cm^2

EXERCISE 6

1. (i) 1386 cm^2 (ii) 394.24 cm^2 (iii) 2464 cm^2
2. (i) 616 cm^2 (ii) 1386 cm^2 (iii) 38.5 m^2
3. 942 cm^2
4. 1 : 4
5. Rs 27.72
6. 3.5 cm
7. 1 : 16
8. 173.25 cm^2

EXERCISE 7

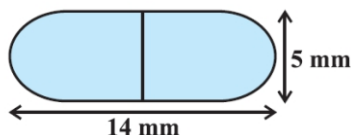
1. (i) 264 cm^3 (ii) 154 cm^3
2. (i) 1.232 l (ii) $11/35 \text{ l}$
3. 10 cm
4. 8 cm
5. 38.5 kl
6. (i) 48 cm (ii) 50 cm (iii) 2200 cm^2
7. $100\pi \text{ cm}^3$
8. $240\pi \text{ cm}^3$; 5 : 12

EXERCISE 8

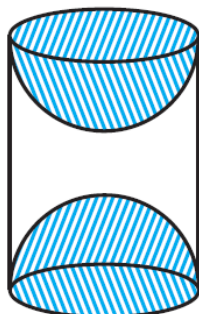
1. (i) 1437.33 cm^3 (ii) 1.05 m^3 (approx.)
2. (i) 11498.67 cm^3 (ii) 0.004851 m^3
3. 345.39 g (approx.)
4. $1/64$
5. 0.303 l (approx.)
6. 0.06348 m^3 (approx.)
7. 179.67 cm^3
8. (i) 249.48 m^2 (ii) 523.9 m^3 (approx.)
9. (i) $3r$ (ii) 1 : 9

EXERCISE 1:

1. 2 cubes each of volume 64 cm^3 are joined end to end. Find the surface area of the resulting cuboid.
2. A vessel is in the form of a hollow hemisphere mounted by a hollow cylinder. The diameter of the hemisphere is 14 cm and the total height of the vessel is 13 cm. Find the inner surface area of the vessel.
3. A toy is in the form of a cone of radius 3.5 cm mounted on a hemisphere of same radius. The total height of the toy is 15.5 cm. Find the total surface area of the toy.
4. A cubical block of side 7 cm is surmounted by a hemisphere. What is the greatest diameter the hemisphere can have? Find the surface area of the solid.
5. A hemispherical depression is cut out from one face of a cubical wooden block such that the diameter of the hemisphere is equal to the edge of the cube. Determine the surface area of the remaining solid.
6. A medicine capsule is in the shape of a cylinder with two hemispheres stuck to each of its ends (see figure). The length of the entire capsule is 14 mm and the diameter of the capsule is 5 mm. Find its surface area.



7. A tent is in the shape of a cylinder surmounted by a conical top. If the height and diameter of the cylindrical part are 2.1 m and 4 m respectively, and the slant height of the top is 2.8 m, find the area of the canvas used for making the tent. Also, find the cost of the canvas of the tent at the rate of Rs 500 per m^2 . (Note that the base of the tent will not be covered with canvas.)
8. From a solid cylinder whose height is 2.4 cm and diameter 1.4 cm, a conical cavity of the same height and same diameter is hollowed out. Find the total surface area of the remaining solid to the nearest cm^2 .
9. A wooden article was made by scooping out a hemisphere from each end of a solid cylinder, as shown in figure. If the height of the cylinder is 10 cm, and its base is of radius 3.5 cm, find the total surface area of the article.

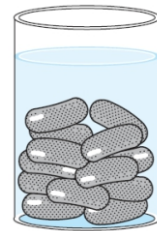


EXERCISE 2: VOLUME OF A COMBINATION OF SOLIDS

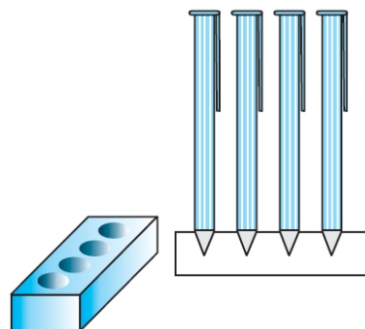
1. A solid is in the shape of a cone standing on a hemisphere with both their radii being equal to 1 cm and the height of the cone is equal to its radius. Find the volume of the solid in terms of π .

2. Rachel, an engineering student, was asked to make a model shaped like a cylinder with two cones attached at its two ends by using a thin aluminium sheet. The diameter of the model is 3 cm and its length is 12 cm. If each cone has a height of 2 cm, find the volume of air contained in the model that Rachel made. (Assume the outer and inner dimensions of the model to be nearly the same.)

3. A gulab jamun, contains sugar syrup up to about 30% of its volume. Find approximately how much syrup would be found in 45 gulab jamuns, each shaped like a cylinder with two hemispherical ends with length 5 cm and diameter 2.8 cm (see figure).



4. A pen stand made of wood is in the shape of a cuboid with four conical depressions to hold pens. The dimensions of the cuboid are 15 cm by 10 cm by 3.5 cm. The radius of each of the depressions is 0.5 cm and the depth is 1.4 cm. Find the volume of wood in the entire stand (see figure).



5. A vessel is in the form of an inverted cone. Its height is 8 cm and the radius of its top, which is open, is 5 cm. It is filled with water up to the brim. When lead shots, each of which is a sphere of radius 0.5 cm are dropped into the vessel, one-fourth of the water flows out. Find the number of lead shots dropped in the vessel.

6. A solid iron pole consists of a cylinder of height 220 cm and base diameter 24 cm, which is surmounted by another cylinder of height 60 cm and radius 8 cm. Find the mass of the pole, given that 1 cm^3 of iron has approximately 8g mass. (Use $\pi = 3.14$)

7. A solid consisting of a right circular cone of height 120 cm and radius 60 cm standing on a hemisphere of radius 60 cm is placed upright in a right circular cylinder full of water such that it touches the bottom. Find the volume of water left in the cylinder, if the radius of the cylinder is 60 cm and its height is 180 cm.

8. A spherical glass vessel has a cylindrical neck 8 cm long, 2 cm in diameter; the diameter of the spherical part is 8.5 cm. By measuring the amount of water it holds, a child finds its volume to be 345 cm^3 . Check whether she is correct, taking the above as the inside measurements, and $\pi = 3.14$.

EXERCISE 3: CONVERSION OF SOLID FROM ONE SHAPE TO ANOTHER

1. A metallic sphere of radius 4.2 cm is melted and recast into the shape of a cylinder of radius 6 cm. Find the height of the cylinder.
2. Metallic spheres of radii 6 cm, 8 cm and 10 cm, respectively, are melted to form a single solid sphere. Find the radius of the resulting sphere.
3. A 20 m deep well with diameter 7 m is dug and the earth from digging is evenly spread out to form a platform 22 m by 14 m. Find the height of the platform.
4. A well of diameter 3 m is dug 14 m deep. The earth taken out of it has been spread evenly all around it in the shape of a circular ring of width 4 m to form an embankment. Find the height of the embankment.
5. A container shaped like a right circular cylinder having diameter 12 cm and height 15 cm is full of ice cream. The ice cream is to be filled into cones of height 12 cm and diameter 6 cm, having a hemispherical shape on the top. Find the number of such cones which can be filled with ice cream.
6. How many silver coins, 1.75 cm in diameter and of thickness 2 mm, must be melted to form a cuboid of dimensions $5.5\text{ cm} \times 10\text{ cm} \times 3.5\text{ cm}$?
7. A cylindrical bucket, 32 cm high and with radius of base 18 cm, is filled with sand. This bucket is emptied on the ground and a conical heap of sand is formed. If the height of the conical heap is 24 cm, find the radius and slant height of the heap.
8. Water in a canal, 6 m wide and 1.5 m deep, is flowing with a speed of 10 km/h. How much area will it irrigate in 30 minutes, if 8 cm of standing water is needed?
9. A farmer connects a pipe of internal diameter 20 cm from a canal into a cylindrical tank in her field, which is 10 m in diameter and 2 m deep. If water flows through the pipe at the rate of 3 km/h, in how much time will the tank be filled?

ANSWERS

EXERCISE 1

1. 160 cm^2
2. 572 cm^2
3. 214.5 cm^2
4. Greatest diameter = 7 cm,
surface area = 332.5 cm^2
5. $\frac{1}{4} l^2 (\pi + 24)$
6. 220 m^2
7. 44 m^2 , Rs 22000
8. 18 cm^2
9. 374 cm^2

EXERCISE 2

1. $\pi \text{ cm}^3$
2. 66 cm^3
3. 338 cm^3
4. 523.53 cm^3
5. 100
6. 892.26 kg
7. 1.131 m^3 (approx.)
8. Not correct. Correct answer is 346.51 cm^3

EXERCISE 3

1. 2.74 cm
2. 12 cm
3. 2.5 m
4. 1.125 m
5. 15
6. 400
7. 36 cm; 43.26 cm
8. 562500 m^2 or 56.25 hectares.
9. 100 minutes



QUEST COACHING CLASSES

ICSE & CBSE: 7th, 8th, 9th, 10th, 11th, 12th

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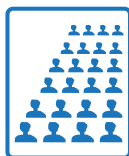
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Regular
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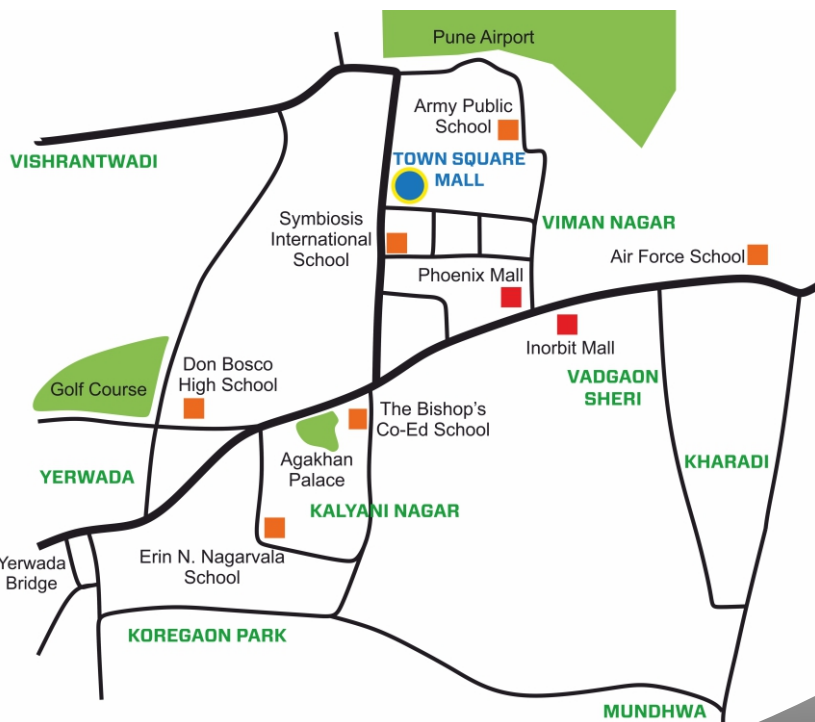
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