EXERCISE 1E

Very-Short-Answer Questions

1. State Euclid's division lemma.

2. State fundamental theorem of arithmetic.
3. Express 360 as product of its prime factors.
4. If a and b are two prime numbers then find HCF(a, b).
5. If a and b are two prime numbers then find LCM(a, b).
6. If the product of two numbers is 1050 and their HCF is 25, find their LCM.
7. What is a composite number?
8. If a and b are relatively prime then what is their HCF?
9. If the rational number $\frac{a}{b}$ has a terminating decimal expansion, what is the condition to be satisfied by b? [CBSE 2008]
10. Simplify: $\frac{(2\sqrt{45}+3\sqrt{20})}{2\sqrt{5}}$. [CBSE 2010]
11. Write the decimal expansion of $\frac{73}{(2^4 \times 5^3)}$. [CBSE 2009]
12. Show that there is no value of n for which $(2^n \times 5^n)$ ends in 5.
13. Is it possible to have two numbers whose HCF is 25 and LCM is 520?
14. Give an example of two irrationals whose sum is rational.
15. Give an example of two irrationals whose product is rational.
16. If a and b are relatively prime, what is their LCM?
17. The LCM of two numbers is 1200. Show that the HCF of these numbers cannot be 500. Why?

Short-Answer Questions

18. Express $0.\overline{4}$ as a rational number in simplest form.
19. Express $0.\overline{23}$ as a rational number in simplest form.
20. Explain why 0.15015001500015 ... is an irrational number.
21. Show that $\frac{\sqrt{2}}{3}$ is irrational.
22. Write a rational number between $\sqrt{3}$ and 2.
23. Explain why $3.\overline{1416}$ is a rational number.

ANSWERS (EXERCISE 1E)

3. $(2^3 \times 3^2 \times 5)$ **4.** 1 **5.** ab **6.** 42 **8.** 1

9. $b = (2^m \times 5^n)$, where m and n are some non-negative integers

10. 6 **11.** 0.0365 **13.** No **16.** ab **17.** since 500 is not a factor of 1

18. $\frac{4}{9}$ **19.** $\frac{23}{99}$ **22.** 1.8

MULTIPLE-CHOICE QUESTIONS (MCQ)

Choose the correct answer in each of the following questions:

1. Which of the following is a pair of co-primes?

(a) (14, 35) (b) (18, 25) (c) (31, 93) (d) (32, 62)

2. If $a = (2^2 \times 3^3 \times 5^4)$ and $b = (2^3 \times 3^2 \times 5)$ then HCF(a, b) = ?

(a) 90 (b) 180 (c) 360 (d) 540

3. HCF of $(2^3 \times 3^2 \times 5)$, $(2^2 \times 3^3 \times 5^2)$ and $(2^4 \times 3 \times 5^3 \times 7)$ is

(a) 30 (b) 48 (c) 60 (d) 105

4. LCM of $(2^3 \times 3 \times 5)$ and $(2^4 \times 5 \times 7)$ is

(a) 40 (b) 560 (c) 1120 (d) 1680

5. The HCF of two numbers is 27 and their LCM is 162. If one of the numbers is 54, what is the other number?

(a) 36 (b) 45 (c) 9 (d) 81

6. The product of two numbers is 1600 and their HCF is 5. The LCM of the numbers is

(a) 8000 (b) 1600 (c) 320 (d) 1605

7. What is the largest number that divides each one of 1152 and 1664 exactly?

(a) 32 (b) 64 (c) 128 (d) 256

. What is the largest number that divides 70 and 125, leaving remainders 5 and 8 respectively?

(a) 13 (b) 9 (c) 3 (d) 585

9. What is the largest number that divides 245 and 1029, leaving remainder 5 in each case?

(a) 15 (b) 16 (c) 9 (d) 5

10. The simplest form of $\frac{1095}{1168}$ is

(a) $\frac{17}{26}$ (b) $\frac{25}{26}$ (c) $\frac{13}{16}$ (d) $\frac{15}{16}$

11. Euclid's division lemma states that for any positive integers a and b, there exist unique integers q and r such that $a = bq + r$, where r must satisfy

(a) $1 < r < b$ (b) $0 < r \leq b$ (c) $0 \leq r < b$ (d) $0 < r < b$

12. A number when divided by 143 leaves 31 as remainder. What will be the remainder when the same number is divided by 13?

(a) 0 (b) 1 (c) 3 (d) 5

13. Which of the following is an irrational number?

(a) $\frac{22}{7}$ (b) 3.1416

(c) $3.\overline{1416}$ (d) 3.141141114 ...,

14. π is

(a) an integer (b) a rational number

(c) an irrational number (d) none of these

15. $2.\overline{35}$ is

(a) an integer (b) a rational number

(c) an irrational number (d) none of these

16. 2.13113111311113 ... is

(a) an integer (b) a rational number

(c) an irrational number (d) none of these

17. The number 3.24636363 ... is

(a) an integer (b) a rational number

(c) an irrational number (d) none of these

18. Which of the following rational numbers is expressible as a terminating decimal?

(a) $\frac{124}{165}$ (b) $\frac{131}{30}$ (c) $\frac{2027}{625}$ (d) $\frac{1625}{462}$

19. The decimal expansion of the rational number $\frac{37}{2^2 \times 5}$ will terminate after
(a) one decimal place (b) two decimal places
(c) three decimal places (d) four decimal places

20. The decimal expansion of the number $\frac{14753}{1250}$ will terminate after
(a) one decimal place (b) two decimal places
(c) three decimal places (d) four decimal places

21. The number 1.732 is
(a) an irrational number (b) a rational number
(c) an integer (d) a whole number

22. a and b are two positive integers such that the least prime factor of a is 3 and the least prime factor of b is 5. Then, the least prime factor of $(a + b)$ is
(a) 2 (b) 3 (c) 5 (d) 8

23. $\sqrt{2}$ is
(a) a rational number
(b) an irrational number
(c) a terminating decimal
(d) a nonterminating repeating decimal

24. $\frac{1}{\sqrt{2}}$ is
(a) a fraction (b) a rational number
(c) an irrational number (d) none of these

25. $(2 + \sqrt{2})$ is
(a) an integer (b) a rational number
(c) an irrational number (d) none of these

26. What is the least number that is divisible by all the natural numbers from 1 to 10 (both inclusive)?
(a) 100 (b) 1260 (c) 2520 (d) 5040

ANSWERS (MCQ)

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

EXERCISE 2A

Find the zeros of the following quadratic polynomials and verify the relationship between the zeros and the coefficients:

1. $x^2 + 7x + 12$
2. $x^2 - 2x - 8$
3. $x^2 + 3x - 10$
4. $4x^2 - 4x - 3$ [CBSE 2008C]
5. $5x^2 - 4 - 8x$ [CBSE 2008]
6. $2\sqrt{3}x^2 - 5x + \sqrt{3}$ [CBSE 2011]
7. $2x^2 - 11x + 15$
8. $4x^2 - 4x + 1$

9. $x^2 - 5$
10. $8x^2 - 4$
11. $5y^2 + 10y$
12. $3x^2 - x - 4$
13. Find the quadratic polynomial whose zeros are 2 and –6. Verify the relation between the coefficients and the zeros of the polynomial.
14. Find the quadratic polynomial whose zeros are $\frac{2}{3}$ and $\frac{-1}{4}$. Verify the relation between the coefficients and the zeros of the polynomial.
15. Find the quadratic polynomial, sum of whose zeros is 8 and their product is 12. Hence, find the zeros of the polynomial. [CBSE 2008]
16. Find the quadratic polynomial, the sum of whose zeros is 0 and their product is –1. Hence, find the zeros of the polynomial.
17. Find the quadratic polynomial, the sum of whose zeros is $\left(\frac{5}{2}\right)$ and their product is 1. Hence, find the zeros of the polynomial.
18. Find the quadratic polynomial, the sum of whose roots is $\sqrt{2}$ and their product is $\frac{1}{3}$.
19. If $x = \frac{2}{3}$ and $x = -3$ are the roots of the quadratic equation $ax^2 + 7x + b = 0$ then find the values of a and b. [CBSE 2011]
20. If $(x + a)$ is a factor of the polynomial $2x^2 + 2ax + 5x + 10$, find the value of a. [CBSE 2009]
21. One zero of the polynomial $3x^3 + 16x^2 + 15x - 18$ is $\frac{2}{3}$. Find the other zeros of the polynomial.

ANSWERS (EXERCISE 2A)

1. –4, –3
2. 4, –2
3. –5, 2
4. $\frac{3}{2}, \frac{-1}{2}$
5. $2, \frac{-2}{5}$
6. $\frac{\sqrt{3}}{2}, \frac{1}{\sqrt{3}}$
7. $3, \frac{5}{2}$
8. $\frac{1}{2}, \frac{1}{2}$
9. $\sqrt{5}, -\sqrt{5}$
10. $\frac{1}{\sqrt{2}}, \frac{-1}{\sqrt{2}}$
11. 0, –2
12. $\frac{4}{3}, -1$
13. $x^2 + 4x - 12$
14. $12x^2 - 5x - 2$
15. $x^2 - 8x + 12, \{6, 2\}$
16. $(x^2 - 1), \{1, -1\}$
17. $(2x^2 - 5x + 2), \left\{2, \frac{1}{2}\right\}$
18. $3x^2 - 3\sqrt{2}x + 1$
19. $a = 3, b = -6$
20. $a = 2$
21. –3, –3

It is clear from the graph that the lines ABC and DEF are parallel and do not meet when produced.

Hence, the given system of equations has no solution and therefore, it is inconsistent.

EXERCISE 3A

Solve each of the following systems of equations graphically:

1. $2x + 3y = 2$, $x - 2y = 8$. [CBSE 2007]
2. $3x + 2y = 4$, $2x - 3y = 7$. [CBSE 2006C]
3. $2x + 3y = 8$, $x - 2y + 3 = 0$. [CBSE 2005]
4. $2x - 5y + 4 = 0$, $2x + y - 8 = 0$. [CBSE 2005]
5. $3x + 2y = 12$, $5x - 2y = 4$. [CBSE 2006]
6. $3x + y + 1 = 0$, $2x - 3y + 8 = 0$. [CBSE 2007C]
7. $2x + 3y + 5 = 0$, $3x - 2y - 12 = 0$.
8. $2x - 3y + 13 = 0$, $3x - 2y + 12 = 0$.
9. $2x + 3y - 4 = 0$, $3x - y + 5 = 0$. [CBSE 2004C]
10. $x + 2y + 2 = 0$, $3x + 2y - 2 = 0$.

Solve each of the following given systems of equations graphically and find the vertices and area of the triangle formed by these lines and the x-axis:

11. $x - y + 3 = 0, 2x + 3y - 4 = 0$.
12. $2x - 3y + 4 = 0, x + 2y - 5 = 0$. [CBSE 2005]
13. $4x - 3y + 4 = 0, 4x + 3y - 20 = 0$. [CBSE 2008]
14. $x - y + 1 = 0, 3x + 2y - 12 = 0$. [CBSE 2002]
15. $x - 2y + 2 = 0, 2x + y - 6 = 0$.

Solve each of the following given systems of equations graphically and find the vertices and area of the triangle formed by these lines and the y-axis:

16. $2x - 3y + 6 = 0, 2x + 3y - 18 = 0$. [CBSE 2004]
17. $4x - y - 4 = 0, 3x + 2y - 14 = 0$. [CBSE 2006C]
18. $x - y - 5 = 0, 3x + 5y - 15 = 0$. [CBSE 2009C]
19. $2x - 5y + 4 = 0, 2x + y - 8 = 0$. [CBSE 2005]
20. $5x - y - 7 = 0, x - y + 1 = 0$.
21. $2x - 3y = 12, x + 3y = 6$. [CBSE 2008]

Show graphically that each of the following given systems of equations has infinitely many solutions:

22. $2x + 3y = 6, 4x + 6y = 12.$ [CBSE 2010]
23. $3x - y = 5, 6x - 2y = 10.$
24. $2x + y = 6, 6x + 3y = 18.$
25. $x - 2y = 5, 3x - 6y = 15.$

Show graphically that each of the following given systems of equations is inconsistent, i.e., has no solution:

26. $x - 2y = 6, 3x - 6y = 0.$
27. $2x + 3y = 4, 4x + 6y = 12.$
28. $2x + y = 6, 6x + 3y = 20.$
29. Draw the graphs of the following equations on the same graph paper:

$$2x + y = 2, 2x + y = 6.$$

Find the coordinates of the vertices of the trapezium formed by these lines. Also, find the area of the trapezium so formed. [HOTS]

HINT The line $2x + y = 2$ cuts the x-axis at $A(1, 0)$ and the y-axis at $B(0, 2)$.

The line $2x + y = 6$ cuts the x-axis at $C(3, 0)$ and the y-axis at $D(0, 6)$.

Area of trap. $ABDC$ = ar($\triangle OCD$) − ar($\triangle OAB$)

$$= \left(\frac{1}{2} \times 3 \times 6\right) - \left(\frac{1}{2} \times 1 \times 2\right) = 8 \text{ sq units.}$$

ANSWERS (EXERCISE 3A)

1. $x = 4, y = -2$ 2. $x = 2, y = -1$ 3. $x = 1, y = 2$ 4. $x = 3, y = 2$
5. $x = 2, y = 3$ 6. $x = -1, y = 2$ 7. $x = 2, y = -3$ 8. $x = -2, y = 3$
9. $x = -1, y = 2$ 10. $x = 2, y = -2$
11. $(x = -1, y = 2)$; $A(-1, 2), B(-3, 0), C(2, 0)$; ar($\triangle ABC$) = 5 sq units
12. $(x = 1, y = 2)$; $A(1, 2), B(-2, 0), C(5, 0)$; ar($\triangle ABC$) = 7 sq units
13. $(x = 2, y = 4)$; $A(2, 4), B(-1, 0), C(5, 0)$; ar($\triangle ABC$) = 12 sq units
14. $(x = 2, y = 3)$; $A(2, 3), B(-1, 0), C(4, 0)$; ar($\triangle ABC$) = 7.5 sq units
15. $(x = 2, y = 2)$; $A(2, 2), B(-2, 0), C(3, 0)$; ar($\triangle ABC$) = 5 sq units
16. $(x = 3, y = 4)$; $A(3, 4), B(0, 2), C(0, 6)$; ar($\triangle ABC$) = 6 sq units
17. $(x = 2, y = 4)$; $A(2, 4), B(0, -4), C(0, 7)$; ar($\triangle ABC$) = 11 sq units
18. $(x = 5, y = 0)$; $A(5, 0), B(0, -5), C(0, 3)$; ar($\triangle ABC$) = 20 sq units
19. $(x = 3, y = 2)$; $A(3, 2), B(0, 0.8), C(0, 8)$; ar($\triangle ABC$) = 10.8 sq units
20. $(x = 2, y = 3)$; $A(2, 3), B(0, -7), C(0, 1)$; ar($\triangle ABC$) = 8 sq units

$\Rightarrow \quad 5y(y-25)-(y-25)=0 \Rightarrow (y-25)(5y-1)=0$

$\Rightarrow \quad y-25=0 \text{ or } 5y-1=0$

$\Rightarrow \quad y=25 \text{ or } y=\frac{1}{5}$

$\Rightarrow \quad 5^x=25=5^2 \text{ or } 5^x=5^{-1}$

$\Rightarrow \quad x=2 \text{ or } x=-1.$

Hence, 2 and –1 are the roots of the given equation.

EXERCISE 4A

1. Which of the following are quadratic equations in x?

(i) $x^2-x+3=0$ (ii) $2x^2+\frac{5}{2}x-\sqrt{3}=0$

(iii) $\sqrt{2}x^2+7x+5\sqrt{2}=0$ (iv) $\frac{1}{3}x^2+\frac{1}{5}x-2=0$

(v) $x^2-3x-\sqrt{x}+4=0$ (vi) $x-\frac{6}{x}=3$

(vii) $x+\frac{2}{x}=x^2$ (viii) $x^2-\frac{1}{x^2}=5$

(ix) $(x+2)^3=x^3-8$ (x) $(2x+3)(3x+2)=6(x-1)(x-2)$

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

2. Which of the following are the roots of $3x^2+2x-1=0$?

(i) –1 (ii) $\frac{1}{3}$ (iii) $-\frac{1}{2}$

3. (i) Find the value of k for which $x=1$ is a root of the equation $x^2+kx+3=0$. Also, find the other root.

(ii) Find the values of a and b for which $x=\frac{3}{4}$ and $x=-2$ are the roots of the equation $ax^2+bx-6=0$.

4. Show that $x=-\frac{bc}{ad}$ is a solution of the quadratic equation $ad^2\left(\frac{ax}{b}+\frac{2c}{d}\right)x+bc^2=0$. [CBSE 2017]

Solve each of the following quadratic equations:

5. $(2x-3)(3x+1)=0$ 6. $4x^2+5x=0$

7. $3x^2-243=0$ 8. $2x^2+x-6=0$

9. $x^2+6x+5=0$ 10. $9x^2-3x-2=0$

11. $x^2+12x+35=0$ 12. $x^2=18x-77$

13. $6x^2+11x+3=0$
14. $6x^2+x-12=0$
15. $3x^2-2x-1=0$
16. $4x^2-9x=100$
17. $15x^2-28=x$
18. $4-11x=3x^2$
19. $48x^2-13x-1=0$
20. $x^2+2\sqrt{2}x-6=0$
21. $\sqrt{3}x^2+10x-8\sqrt{3}=0$ [CBSE 2017]
22. $\sqrt{3}x^2+11x+6\sqrt{3}=0$
23. $3\sqrt{7}x^2+4x-\sqrt{7}=0$
24. $\sqrt{7}x^2-6x-13\sqrt{7}=0$
25. $4\sqrt{6}x^2-13x-2\sqrt{6}=0$
26. $3x^2-2\sqrt{6}x+2=0$ [CBSE 2010, '12]
27. $\sqrt{3}x^2-2\sqrt{2}x-2\sqrt{3}=0$ [CBSE 2011]
28. $x^2-3\sqrt{5}x+10=0$ [CBSE 2011]
29. $x^2-(\sqrt{3}+1)x+\sqrt{3}=0$ [CBSE 2015]
30. $x^2+3\sqrt{3}x-30=0$ [CBSE 2015]
31. $\sqrt{2}x^2+7x+5\sqrt{2}=0$ [CBSE 2013]
32. $5x^2+13x+8=0$ [CBSE 2013C]
33. $x^2-(1+\sqrt{2})x+\sqrt{2}=0$
34. $9x^2+6x+1=0$
35. $100x^2-20x+1=0$
36. $2x^2-x+\frac{1}{8}=0$
37. $10x-\frac{1}{x}=3$
38. $\frac{2}{x^2}-\frac{5}{x}+2=0$
39. $2x^2+ax-a^2=0$ [CBSE 2015]
40. $4x^2+4bx-(a^2-b^2)=0$ [CBSE 2015, '17]
41. $4x^2-4a^2x+(a^4-b^4)=0$ [CBSE 2015]
42. $x^2+5x-(a^2+a-6)=0$ [CBSE 2015]
43. $x^2-2ax-(4b^2-a^2)=0$ [CBSE 2015]
44. $x^2-(2b-1)x+(b^2-b-20)=0$ [CBSE 2015]
45. $x^2+6x-(a^2+2a-8)=0$ [CBSE 2015]
46. $abx^2+(b^2-ac)x-bc=0$ [CBSE 2014]
47. $x^2-4ax-b^2+4a^2=0$ [CBSE 2012]
48. $4x^2-2(a^2+b^2)x+a^2b^2=0$
49. $12abx^2-(9a^2-8b^2)x-6ab=0$ [CBSE 2006]
50. $a^2b^2x^2+b^2x-a^2x-1=0$ [CBSE 2005]
51. $9x^2-9(a+b)x+(2a^2+5ab+2b^2)=0$ [CBSE 2009]
52. $\frac{16}{x}-1=\frac{15}{x+1}$, $x\neq 0,-1$ [CBSE 2014]
53. $\frac{4}{x}-3=\frac{5}{2x+3}$, $x\neq 0,\frac{-3}{2}$ [CBSE 2014]
54. $\frac{3}{x+1}-\frac{1}{2}=\frac{2}{3x-1}$, $x\neq -1,\frac{1}{3}$ [CBSE 2014]

ANSWERS (EXERCISE 4A)

1. (i), (ii), (iii), (iv), (vi), (ix)
2. -1 and $\frac{1}{3}$
3. (i) $k = -4$, other root $= 3$ (ii) $a = 4, b = 5$
5. $x = \frac{3}{2}$ or $x = \frac{-1}{3}$
6. $x = 0$ or $x = \frac{-5}{4}$
7. $x = 9$ or $x = -9$
8. $x = -2$ or $x = \frac{3}{2}$
9. $x = -5$ or $x = -1$
10. $x = \frac{2}{3}$ or $x = \frac{-1}{3}$
11. $x = -7$ or $x = -5$
12. $x = 11$ or $x = 7$
13. $x = \frac{-3}{2}$ or $x = \frac{-1}{3}$
14. $x = \frac{-3}{2}$ or $x = \frac{4}{3}$
15. $x = 1$ or $x = \frac{-1}{3}$
16. $x = \frac{25}{4}$ or $x = -4$
17. $x = \frac{-4}{3}$ or $x = \frac{7}{5}$
18. $x = -4$ or $x = \frac{1}{3}$
19. $x = \frac{1}{3}$ or $x = \frac{-1}{16}$
20. $x = \sqrt{2}$ or $x = -3\sqrt{2}$
21. $x = -4\sqrt{3}$ or $x = \frac{2}{\sqrt{3}}$
22. $x = -3\sqrt{3}$ or $x = \frac{-2}{\sqrt{3}}$
23. $x = \frac{-\sqrt{7}}{3}$ or $x = \frac{1}{\sqrt{7}}$
24. $x = \frac{13}{\sqrt{7}}$ or $x = -\sqrt{7}$
25. $x = \frac{2\sqrt{2}}{\sqrt{3}}$ or $x = \frac{-\sqrt{3}}{4\sqrt{2}}$
26. $x = \frac{\sqrt{2}}{\sqrt{3}}$ or $x = \frac{\sqrt{2}}{\sqrt{3}}$
27. $x = \sqrt{6}$ or $x = \frac{-\sqrt{2}}{\sqrt{3}}$
28. $x = \sqrt{5}$ or $x = 2\sqrt{5}$
29. $x = \sqrt{3}$ or $x = 1$
30. $x = 2\sqrt{3}$ or $x = -5\sqrt{3}$
31. $x = -\sqrt{2}$ or $x = \frac{-5}{\sqrt{2}}$
32. $x = -1$ or $x = \frac{-8}{5}$
33. $x = 1$ or $x = \sqrt{2}$
34. $x = \frac{-1}{3}, x = \frac{-1}{3}$
35. $x = \frac{1}{10}, x = \frac{1}{10}$
36. $x = \frac{1}{4}, x = \frac{1}{4}$
37. $x = \frac{1}{2}$ or $x = \frac{-1}{5}$
38. $x = 2$ or $x = \frac{1}{2}$
39. $x = -a$ or $x = \frac{a}{2}$
40. $x = \frac{-(a+b)}{2}$ or $x = \frac{a-b}{2}$
41. $x = \frac{a^2+b^2}{2}$ or $x = \frac{a^2-b^2}{2}$
42. $x = -(a+3)$ or $x = (a-2)$
43. $x = (a-2b)$ or $x = (a+2b)$
44. $x = (b-5)$ or $x = (b+4)$
45. $x = -(a+4)$ or $x = (a-2)$
46. $x = \frac{-b}{a}$ or $x = \frac{c}{b}$
47. $x = (2a+b)$ or $x = (2a-b)$
48. $x = \frac{a^2}{2}$ or $x = \frac{b^2}{2}$
49. $x = \frac{3a}{4b}$ or $x = \frac{-2b}{3a}$
50. $x = \frac{-1}{a^2}$ or $x = \frac{1}{b^2}$
51. $x = \frac{(a+2b)}{3}$ or $x = \frac{(2a+b)}{3}$
52. $x = 4$ or $x = -4$
53. $x = -2$ or $x = 1$