UNIQUE STUDY POINT

PA X

Class 10 - Mathematics

1. The HCF of two numbers is 27 and their LCM is 162. If one of the numbers is 54, what is the other number is: **[1]**

   a) 36 b) 45

   c) 81 d) 9

2. If $1080 = 2^x \times 3^y \times 5$, then (x - y) is equal to: **[1]**

   a) 1 b) 0

   c) 6 d) -1

3. If the LCM of a and 18 is 36 and the HCF of a and 18 is 2, then a = **[1]**

   a) 1 b) 3

   c) 2 d) 4

4. The ratio of HCF to LCM of the least composite number and the least prime number is: **[1]**

   a) 2 : 1 b) 1 : 1

   c) 1 : 2 d) 1 : 3

5. If two positive integers m and n can be expressed as $m = x^2y^5$ and $n = x^3y^2$, where x and y are prime numbers, then HCF(m, n) = **[1]**

   a) x^3y^2 b) x^2y^2

   c) x^3y^3 d) x^2y^3

6. If p and q are co-prime numbers, then p^2 and q^2 are **[1]**

   a) not coprime b) odd

   c) coprime d) even

7. LCM of $(2^3 \times 3 \times 5)$ and $(2^4 \times 5 \times 7)$ is **[1]**

   a) 1680 b) 40

   c) 1120 d) 560

8. Two tanks contain 504 and 735 litres of milk respectively. Find the maximum capacity of a container which can measure the milk of either tank in exact number of times. **[1]**

   a) 21 litres b) 7 litres

   c) 6 liters d) 42 litres

9. _____ is neither prime nor composite. **[1]**

   a) 3 b) 2

c) 1 d) 4

10. A charitable trust donates 28 different books of Maths, 16 different books of Science and 12 different books of Social Science to poor students. Each student is given maximum number of books of only one subject of their interest and each student got equal number of books. **[1]**

i. Find the number of books each student got.

ii. Find the total number of students who got books.

a) (i) - (3), (ii) - (10) b) (i) - (4), (ii) - (14)

c) (i) - (4), (ii) - (10) d) (i) - (3), (ii) - (15)

11. 2.35 is **[1]**

a) a rational number b) a natural number

c) an integer d) an irrational number

12. The number $(\sqrt{3}+\sqrt{5})^2$ is **[1]**

a) an integer b) an irrational number

c) not a real number d) a rational number

13. The sum of two irrational numbers is always **[1]**

a) a rational number or an irrational number b) a rational number

c) an integer d) an irrational number

14. If p is a prime number, then $\sqrt{p}$ is **[1]**

a) Integer b) Rational

c) Prime number d) Irrational

15. The number $\frac{\sqrt{5}+\sqrt{2}}{\sqrt{5}-\sqrt{2}}$ is **[1]**

a) an integer b) not a real number

c) a rational number d) an irrational number

16. If a is a non-zero rational and $\sqrt{b}$ is irrational, then $a\sqrt{b}$ is: **[1]**

a) a natural number b) a rational number

c) an integer d) an irrational number

17. $2\sqrt{3}$ is **[1]**

a) a whole number b) an irrational number

c) an integer d) a rational number

18. The number 1.732 is **[1]**

a) an integer b) a whole number

c) a rational number d) an irrational number

19. The number (5 - $3\sqrt{5}$ + $\sqrt{5}$) is: **[1]**

a) a whole number b) a rational number

c) an integer d) an irrational number

20. $(2+\sqrt{2})$ is **[1]**

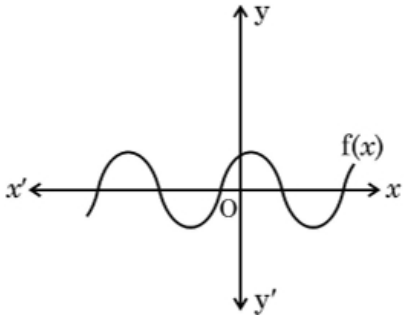
a) an integer

b) a rational number

c) A real number

d) an irrational number

21. The graph of y = f(x) is shown in the figure for some polynomial f(x). **[1]**



The number of zeroes of f(x) is

a) 6

b) 4

c) 8

d) 5

22. The zeros of the polynomial $x^2 - \sqrt{2}x - 12$ are **[1]**

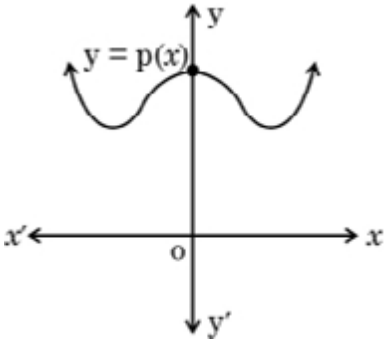
a) 3, -1

b) 3, 1

c) $3\sqrt{2}, -2\sqrt{2}$

d) $\sqrt{2}, -\sqrt{2}$

23. The graph of y = p(x) is shown in the figure for some polynomial p(x). The number of zeroes of p(x) is/are: **[1]**



a) 3

b) 0

c) 1

d) 2

24. A polynomial of the form $ax^5 + bx^3 + cx^2 + dx + e$ has atmost _____ zeroes. **[1]**

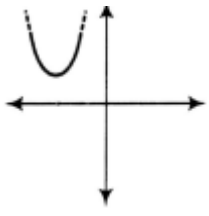
a) 5

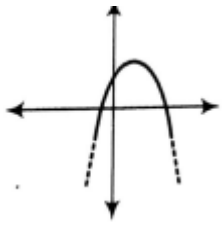
b) 11

c) 3

d) 7

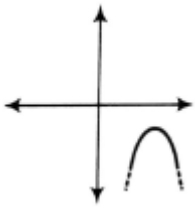
25. Which of the following is not the graph of a quadratic polynomial? **[1]**

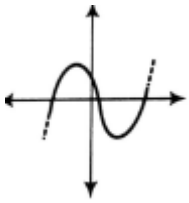
a) 

b) 

c)

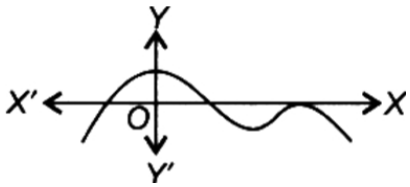
d)



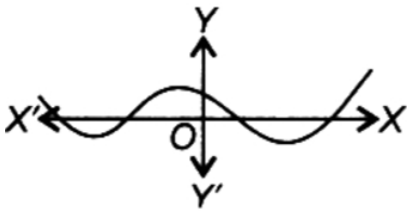


26. Which of the following graph has more than three distinct real roots? **[1]**

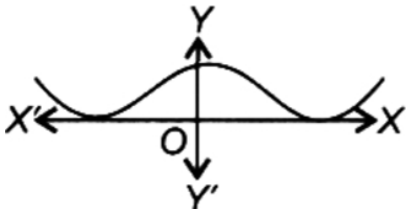
a)



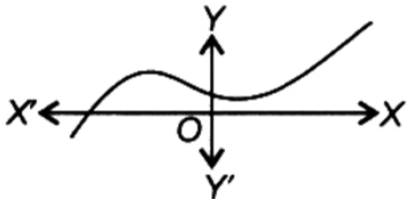
b)



c)



d)



27. The zeroes of the quadratic polynomial $x^2 + 99x + 127$ are **[1]**

a) both positive

b) both equal

c) one positive and one negative

d) both negative

28. If one root of the polynomial $f(x) = 5x^2 + 13x + k$ is reciprocal of the other, then the value of k is **[1]**

a) $\frac{1}{6}$

b) 0

c) 5

d) 6

29. The zeroes of the polynomial $p(x) = 25x^2 - 49$ are: **[1]**

a) $\frac{7}{5}, -\frac{7}{5}$

b) $\frac{7}{5}, \frac{7}{5}$

c) $-\frac{49}{25}, +\frac{49}{25}$

d) $\frac{49}{25}, \frac{49}{25}$

30. For what value of k, the product of zeroes of the polynomial $kx^2 - 4x - 7$ is 2? **[1]**

a) $\frac{7}{2}$

b) $-\frac{2}{7}$

c) $-\frac{1}{14}$

d) $-\frac{7}{2}$

31. If α and β are the zeroes of the polynomial $3x^2 + 4x - 3$, then value of $\alpha\beta$ is **[1]**

a) $-\frac{4}{3}$

b) $\frac{4}{3}$

c) -1

d) 1

32. If one zero of the polynomial $p(x) = (a^2 + 9)x^2 + 45x + 6a$ is reciprocal of the other, then the value of a is **[1]**

a) 1

b) 0

c) 2

d) 3

33. If $p(x) = x^2 + 5x + 6$, then p(-2) is: **[1]**

a) 8

b) 20

c) 0

d) -8

[1]

34. If the sum of the zeroes of the quadratic polynomial $kx^2 + 2x + 3k$ is equal to their product, then k equals.

a) $\frac{2}{3}$ b) $-\frac{2}{3}$

c) $-\frac{1}{3}$ d) $\frac{1}{3}$

35. If am = bl and bn $\neq$ cm, then the system of equations **[1]**

ax + by = c

Ix + my = n

a) Has no solution. b) Has a unique solution.

c) Has infinitely many solutions. d) May or may not have a solution.

36. When L_1 and L_2 are coincident, then the graphical solution of system of linear equation have **[1]**

a) infinite number of solutions b) no solution

c) unique solution d) one solution

37. If a pair of linear equations has infinitely many solutions, then the lines representing them will be **[1]**

a) parallel b) always coincident

c) intersecting or coincident d) always intersecting

38. For what value of k, do the equations **[1]**

3x – y + 8 = 0

and 6x – ky = –16

represent coincident lines?

a) $\frac{1}{2}$ b) –2

c) $-\frac{1}{2}$ d) 2

39. Graphically, the pair of equations 6x - 3y + 10 = 0, 2x - y + 9 = 0 represents two lines which are **[1]**

a) coincident b) Intersect at two points

c) parallel d) intersect at a point

40. The ratio of a 2-digit number to the sum of digits of that number is 4 : 1. If the digit in the units place is 3 more than the digit in the tens place, then what is the number? **[1]**

a) 63 b) 36

c) 24 d) 40

41. Which equation satisfies the data given in the table? **[1]**

x	-1	0	1	2
y	-3	-1	1	3

a) y = 2x - 1 b) y = x - 2

c) y = x + 1 d) y = 3x - 3

42. If $2^{x+y} = 2^{x-y} = \sqrt{8}$ then the value of y is **[1]**

a) $\frac{1}{2}$ b) 0

c) $\frac{3}{2}$ d) 1

43. In a cyclic quadrilateral ABCD, if $\angle A = (2x - 1)^o$, $\angle B = (y + 5)^o$, $\angle C = (2y + 15)^o$ and $\angle D = (4x - 7)^o$, then the value of $\angle C$ is **[1]**

a) 65^o b) 55^o

c) 115^o d) 125^o

44. The sum of the digits of a two-digit number is 15. The number obtained by interchanging the digits exceeds the given number by 9. The number is **[1]**

a) 87 b) 96

c) 69 d) 78

45. In $\triangle ABC$, if $\angle C = 3\angle B = 2(\angle A + \angle B)$, then $\angle C$ = **[1]**

a) 120^o b) 60^o

c) 150^o d) 90^o

46. If $29x + 37y = 103$ and $37x + 29y = 95$ then **[1]**

a) $x = 2, y = 1$ b) $x = 3, y = 2$

c) $x = 1, y = 2$ d) $x = 2, y = 3$

47. The sum of the digits of a two-digit number is 12. The number obtained by interchanging the two digits exceeds the given number by 18. Find the number. **[1]**

a) 58 b) 57

c) 75 d) 85

48. In$\triangle ABC$, if $\angle C = 50°$ and $\angle A$ exceeds $\angle B$ by 44^o, then $\angle A$ = **[1]**

a) 40^o b) 43^o

c) 67^o d) 87^o

49. If $\angle A$ and $\angle B$ are complementary angles and $\angle A$ is x, then which equation can be used to find $\angle B$ which is denoted by y? **[1]**

a) $y = (180° - x)$ b) $y = (90° - x)$

c) $y = (x + 180°)$ d) $y = (90° + x)$

50. 5 years hence, the age of a man shall be 3 times the age of his son while 5 years earlier the age of the man was 7 times the age of his son. The present age of the man is **[1]**

a) 47 years b) 50 years

c) 40 years d) 45 years

51. A and B are friends. A is elder to B by 5 years. B's sister C is half the age of B while A's father D is 8 years older than twice the age of B. If the present age of D is 48 years, then find the present ages of A, B and C respectively. **[1]**

a) 40 years, 20 years, 15 years b) 20 years, 15 years, 10 years

c) 25 years, 20 years, 10 years d) 50 years, 25 years, 20 years

52. The cost of a notebook is twice the cost of a pen. If the cost of a notebook is ₹ x and that of a pen is ₹ y, then a **[1]**

linear equation in two variables to represent the given condition is _____.

a) $x - 2y = 0$ b) $2x - y = 0$

c) $2x + y = 0$ d) $x + 2y = 0$

53. Sum of two numbers is 80 and their difference is 36. Find the numbers. **[1]**

a) 44, 36 b) 40, 40

c) 58, 22 d) 52, 28

54. A part of monthly expenses of a family on milk is fixed which is ₹ 700 and remaining varies with quantity of milk taken extra at the rate of ₹ 25 per litre. Taking quantity of milk required extra as x litres and total expenditure on milk as ₹ y, write a linear equation from the above information. **[1]**

a) $-25x + y = 700$ b) $20x + 10y = 300$

c) $20x + y = 500$ d) $x + 25y = 900$

55. Two numbers whose sum is 12 and the absolute value of whose difference is 4 are the roots of the equation _____. **[1]**

a) $2x^2 - 6x + 7 = 0$ b) $2x^2 - 24x + 43 = 0$

c) $x^2 - 12x + 30 = 0$ d) $x^2 - 12x + 32 = 0$

56. $5x^2 + 8x + 4 = 2x^2 + 4x + 6$ is a **[1]**

a) constant b) cubic equation

c) quadratic equation d) linear equation

57. Value of k for which x = 2 is a solution of the equation $5x^2 - 4x + (2 + k) = 0$, is **[1]**

a) 10 b) -10

c) -14 d) 14

58. If y = 1 is one of the solutions of the quadratic equation $py^2 + py + 3 = 0$, then the value of p is: **[1]**

a) -3 b) -2

c) $-\frac{3}{2}$ d) 2

59. If one root of the equation $2x^2 + ax + 6 = 0$ is 2 then a = ? **[1]**

a) 7 b) $\frac{7}{2}$

c) $\frac{-7}{2}$ d) -7

60. The hypotenuse of a right triangle is 6m more than twice the shortest side. The third side is 2m less than the hypotenuse. The representation of the above situation in the form of a quadratic equation is **[1]**

a) $(2x - 6)^2 = x^2 - (2x - 4)^2$ b) $(2x + 6)^2 = x^2 - (2x + 4)^2$

c) $(2x + 6)^2 + x^2 = (2x + 4)^2$ d) $(2x + 6)^2 = x^2 + (2x + 4)^2$

61. If x = 3 is a solution of the equation $3x^2 + (k - 1)x + 9 = 0$ then k = ? **[1]**

a) 11 b) -11

c) 13 d) -13

62. If one root of the equation $2x^2 + kx + 4 = 0$ is 2, then the other root is **[1]**

a) 1 b) -1

c) 6 d) -6

63. The denominator of a fraction is one more than twice the numerator. If the sum of the fraction and its reciprocal is $2\frac{16}{21}$, find then fraction. **[1]**

a) $\frac{7}{3}$ b) $\frac{3}{7}$

c) $\frac{3}{4}$ d) $\frac{4}{3}$

64. If one root of $5x^2 + 13x + k = 0$ be the reciprocal of the other root then the value of k is **[1]**

a) 2 b) 5

c) 1 d) 0

65. The least positive value of k, for which the quadratic equation $2x^2 + kx - 4 = 0$ has rational roots, is **[1]**

a) $\sqrt{2}$ b) 2

c) ± 2 d) $\pm 2\sqrt{2}$

66. If one root of the equation $a(b - c)x^2 + b(c - a)x + c(a - b) = 0$ is 1, then the other root is _____. **[1]**

a) $\frac{c(a-b)}{a(b-c)}$ b) $\frac{a(b-c)}{b(c-a)}$

c) $\frac{b(c-a)}{a(b-c)}$ d) $\frac{a(b-c)}{c(a-b)}$

67. The equation $x^2 - 8x + k = 0$ has real and distinct roots if **[1]**

a) k = 8 b) k < 16

c) k = 16 d) k > 16

68. If $(a^2 + b^2)\, x^2 + 2(ac + bd)\, x + c^2 + d^2 = 0$ has no real roots, then **[1]**

a) ab = cd b) ac = bd

c) ad $\neq$ bc d) ad = bc

69. The discriminant of the equation $(2a + b)\, x = x^2 + 2ab$ is _____ **[1]**

a) $(2a + b)^2$ b) $(2a - b)^2$

c) $(2a + b^2)$ d) $(2a - b^2)$

70. If 2 is a root of the equation $x^2 + ax + 12 = 0$ and the quadratic equation $x^2 + ax + q = 0$ has equal roots, then q = **[1]**

a) 8 b) 16

c) 20 d) 12

71. A train travels 360km at a uniform speed. If the speed had been 5 km/hr more, it would have taken 1 hour less for the same journey, then the actual speed of the train is **[1]**

a) 45 km/hr b) 48 km/hr

c) 40 km/hr d) 36 km /hr

72. Rohan's mother is 26 years older than him. The product of their ages 3 years from now will be 360, then **[1]**

Rohan’s present age is

a) 8 years
b) 10 years
c) 6 years
d) 7 years

73. If I had walked 1 km per hour faster, I would have taken 10 minutes less to walk 2 km. Then the rate of my walking is **[1]**

a) 6 km /hr
b) 3 km/hr
c) 8 km/hr
d) 4 km/hr

74. A takes 10 days less than the time taken by B to finish a piece of work. If both A and B together can finish the work in 12 days, then the time taken by B to finish the work is **[1]**

a) 20 days
b) 25 days
c) 30 days
d) 28 days

75. The angry Arjun carried some arrows for fighting with Bheeshma. With half the arrows, he cut down the arrows thrown by Bheeshma on him and with six other arrows he killed the rath driver of Bheeshma. With one arrow each, he knocked down respectively the rath, flag and bow of Bheeshma. Finally, with one more than four times the square root of arrows, he laid Bheeshma unconscious on an arrow bed. The total number of arrows that Arjun had, is **[1]**

a) 100
b) 120
c) 80
d) 96

Solution

PA X

Class 10 - Mathematics

1.

(c) 81

Explanation:

Let the two numbers be x and y.

It is given that:

x = 54

HCF = 27

LCM = 162

We know,

x × y = HCF × LCM

⇒ 54 × y = 27 × 162

⇒ 54y = 4374

⇒ $\therefore y = \frac{4374}{54}$ = 81

2.

(b) 0

Explanation:

$1080 = 2^3 \times 3^3 \times 5$

On comparing

x = 3, y = 3

x - y = 3 - 3 = 0

3.

(d) 4

Explanation:

LCM (a, 18) = 36

HCF (a, 18) = 2

We know that the product of numbers is equal to the product of their HCF and LCM.

Therefore,

18a = 2(36)

$a = \frac{2(36)}{18}$

a = 4

4.

(c) 1 : 2

Explanation:

Least composite number is 4 and the least prime number is 2.

LCM (4, 2) = 4

HCF (4, 2) = 2

The ratio of HCF to LCM = 2 : 4 or 1 : 2.

5.

(b) x^2y^2

Explanation:

$x^2y^5 = y^3(x^2y^2)$

$x^3y^3 = x(x^2y^2)$

Therefore HCF (m, n) is x^2y^2

6.

(c) coprime

Explanation:

We know that the co-prime numbers have no factor in common, or, their HCF is 1.

Thus, p^2 and q^2 have the same factor with exponent 2 each. which again will not have any common factor.

Thus we can conclude that p^2 and q^2 are co-prime numbers.

7. **(a)** 1680

Explanation:

LCM = Product of greatest power of each prime factor involved in the numbers

$= 2^4 \times 3 \times 5 \times 7$

$= 16 \times 3 \times 5 \times 7$

$= 1680$

8. **(a)** 21 litres

Explanation:

We have, $504 = 2^3 \times 3^2 \times 7$ and $735 = 3 \times 5 \times 7^2$.

$\therefore$ H.C.F. $(504, 735) = (3 \times 7) = 21$

$\therefore$ Capacity of the container = 21 litres.

9.

(c) 1

Explanation:

1 is neither prime nor composite.

A prime is a natural number greater than 1 that has no positive divisors other than 1 and itself

e.g. 5 is prime because 1 and 5 are its only positive integers factors but 6 is composite because it has divisors 2 and 3 in addition to 1 and 6.

10.

(b) (i) - (4), (ii) - (14)

Explanation:

i. H.C.F. $(28, 16, 12) = 2 \times 2 = 4$

$\therefore$ Number of books each student got = 4

ii. Number of students who got Maths books = $\frac{28}{4} = 7$

Number of students who got Science books = $\frac{16}{4} = 4$

Number of students who got Social Science books = $\frac{12}{4} = 3$

$\therefore$ Total number of students who got books = 7 + 4 + 3 = 14.

11. **(a)** a rational number

Explanation:

It can be expressed in $\frac{p}{q}$ form

$2.35 = \frac{235}{100}$

so, 2.35 is a rational number

12.

(b) an irrational number

Explanation:

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

$= 3 + 5 + 2\sqrt{15}$

$= 8 + 2\sqrt{15}$

Here, $\sqrt{15} = \sqrt{3} \times \sqrt{5}$

Since $\sqrt{3}$ and $\sqrt{5}$ both are an irrational number. Therefore, $\left(\sqrt{3} + \sqrt{5}\right)^2$ is an irrational number.

13. **(a)** a rational number or an irrational number

Explanation:

The sum of two irrational numbers can be either a rational number or an irrational number.

e.g $5\sqrt{3}$ + $3\sqrt{2}$ = $5\sqrt{3}$ + $3\sqrt{2}$ sum is irrational

(2 + $6\sqrt{7}$) + (- $6\sqrt{7}$) = 2 sum is rational

Hence sum can be either rational or irrational

14.

(d) Irrational

Explanation:

$\sqrt{p}$ is an irrational number because the square root of every prime number is an irrational number. (for example $\sqrt{3}$ is an irrational number)

15.

(d) an irrational number

Explanation:

$\frac{\sqrt{5}+\sqrt{2}}{\sqrt{5}-\sqrt{2}}$

= $\frac{\sqrt{5}+\sqrt{2}}{\sqrt{5}-\sqrt{2}} \times \frac{\sqrt{5}+\sqrt{2}}{\sqrt{5}+\sqrt{2}}$

= $\frac{(\sqrt{5}+\sqrt{2})^2}{(\sqrt{5})^2-(\sqrt{2})^2}$

= $\frac{(\sqrt{5})^2+(\sqrt{2})^2+2\times\sqrt{5}\times\sqrt{2}}{5-2}$

= $\frac{5+2+2\sqrt{10}}{3}$

= $\frac{7+2\sqrt{10}}{3}$

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

Since $\sqrt{2}$ and $\sqrt{5}$ both are an irrational number

Therefore, $\frac{\sqrt{5}+\sqrt{2}}{\sqrt{5}-\sqrt{2}}$ is an irrational number.

16.

(d) an irrational number

Explanation:

If possible let $a\sqrt{b}$ be rational.

Then $a\sqrt{b} = \frac{p}{q}$, where p and q are non-zero integers, having no common factor other than 1.

Now, $a\sqrt{b} = \frac{p}{q}$

$\Rightarrow \sqrt{b} = \frac{p}{aq}$ ... (i)

But, p and aq are both rational and aq $\neq$ 0

$\because \frac{p}{aq}$ is rational.

Therefore, from eq. (i), it follows that $\sqrt{b}$ is rational.

The contradiction arises by assuming that $a\sqrt{b}$ is rational.

Hence, $a\sqrt{b}$ is irrational.

17.

(b) an irrational number

Explanation:

an irrational number

18.

(c) a rational number

Explanation:
Clearly, 1.732 is a terminating decimal.
Hence, it is a rational number.

19.

(d) an irrational number
Explanation:
an irrational number

20.

(d) an irrational number
Explanation:
$(2+\sqrt{2})$ is an irrational number.
If it is rational, then the difference of two rational is rational.
$\therefore (2+\sqrt{2})-2=\sqrt{2}$ = irrational, which is a contradiction.
Hence, $(2+\sqrt{2})$, is an irrational number.

21.

(d) 5
Explanation:
Graph of f(x) intersect the x-axis at 5 times.
hence, No. of zeroes of f(x) = 5

22.

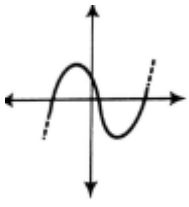
(c) $3\sqrt{2}, -2\sqrt{2}$
Explanation:
$x^2-\sqrt{2}x-12=x^2-3\sqrt{2}x+2\sqrt{2}x-12$
$=x(x-3\sqrt{2})+2\sqrt{2}(x-3\sqrt{2})=(x-3\sqrt{2})(x+2\sqrt{2})$
$\therefore \quad x=3\sqrt{2}$ or $x=-2\sqrt{2}$

23.

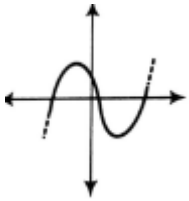
(b) 0
Explanation:
0

24. **(a)** 5
Explanation:
Since, degree of given polynomial is 5,
so $ax^5 + bx^3 + cx^2 + dx + e$ has atmost 5 zeroes.

25.

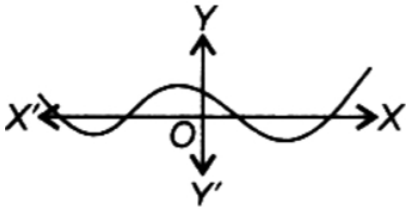
(d) 

Explanation:



The shape of a quadratic polynomial is either upward or downward U - shaped curve i.e., an upward or downward parabola. Also, the graph of the quadratic equation cuts the X - axis at the most at two points, but in fig it cuts the X - axis at three points.
∴ fig is not the graph of a quadratic polynomial.

26.

(b) 

Explanation:
For more than three distinct real roots the graph must cut x-axis at least four times.

27.

(d) both negative
Explanation:
As the Discriminant of the given quadratic polynomial x^2 + 99x + 127 is more than Zero.
∴ Both the zeros are negative.

28.

(c) 5
Explanation:
The Given polynomial is $f(x) = 5x^2 + 13x + k$.
Product of roots = k/5
$1 = \frac{k}{5}$
$\Rightarrow$ k = 5

29. **(a)** $\frac{7}{5}, -\frac{7}{5}$
Explanation:
$p(x) = 25x^2 - 49 = 0$
$= (5x - 7)(5x + 7) = 0$
∴ x = $\frac{7}{5}$ and $\frac{-7}{5}$

30.

(d) $-\frac{7}{2}$
Explanation:
Product of zeros = $\frac{c}{a}$
$2 = \frac{(-7)}{k}$
$k = \left(\frac{-7}{2}\right)$

31.

(c) -1
Explanation:
-1

32.

(d) 3
Explanation:
Let one zero be β then the other zero will be $\frac{1}{\alpha}$
Since $\alpha\beta = \frac{c}{a} \Rightarrow \alpha \times \frac{1}{\alpha} = \frac{6a}{a^2+9}$

$\Rightarrow 1 = \frac{6a}{a^2+9}$

$\Rightarrow 6a = a^2 + 9$

$\Rightarrow a^2 - 6a + 9 = 0$

$\Rightarrow (a - 3)(a - 3) = 0$

a - 3 = 0 and a - 3 = 0

$\Rightarrow$ a = 3 and a = 3

33.

(c) 0

Explanation:

$p(-2) = (-2)^2 + 5(-2) + 6$

p(-2) = 4 - 10 + 6

= 0

34.

(b) $-\frac{2}{3}$

Explanation:

$\alpha + \beta = \alpha\beta \Rightarrow \frac{-2}{k} = \frac{3k}{k} \Rightarrow \frac{-2}{k} = 3 \Rightarrow k = \frac{-2}{3}$

35. **(a)** Has no solution.

Explanation:

We have, ax + by - c and lx + my = n

Now, $\frac{a}{l} = \frac{b}{m} \neq \frac{c}{n}$ (given)

∴The given system of equations has no solution.

36. **(a)** infinite number of solutions

Explanation:

When L_1 & L_2 are co-incident,

$\Rightarrow \frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$

$\Rightarrow$ infinite number solution.

37.

(b) always coincident

Explanation:

equation has infinite many solutions if

$\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$

i.e. always co-incident.

38.

(d) 2

Explanation:

Condition for coincident lines is -

$a_1/a_2 = b_1/b_2 = c_1/c_2$ …(i)

Given lines are,

3x - y + 8 = 0

and 6x - ky + 16 = 0;

Comparing with the standard form, gives

a_1 = 3, b_1 = - 1, c_1 = 8;

a_2 = 6, b_2 = - k, c_2 = 16;

and, from Eq. (i), $\frac{3}{6} = \frac{1}{k} = \frac{8}{16}$

$\frac{1}{k} = \frac{1}{2}$
So, k = 2

39.

(c) parallel
Explanation:
Given: $a_1 = 6$, $a_2 = 2$, $b_1 = -3$, $b_2 = -1$, $c_1 = 10$ and $c_2 = 9$
$a_1 = 6, a_2 = 2, b_1 = -3, b_2 = -1, c_1 = 10$ and $c_2 = 9$
Here $\frac{a_1}{a_2} = \frac{6}{2} = \frac{3}{1}, \frac{b_1}{b_2} = \frac{-3}{-1} = \frac{3}{1}, \frac{c_1}{c_2} = \frac{10}{9}$
but $\frac{c_1}{c_2} = \frac{10}{9}$
$\therefore \frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$
Therefore, the lines are parallel.

40.

(b) 36
Explanation:
Let the digit at units place be x and the digit at tens place e be y, then the number = 10y + x
Now, according to the question, $\frac{10y+x}{y+x} = \frac{4}{1}$
$\Rightarrow$10y + x = 4y + 4x
$\Rightarrow$6y = 3x$\Rightarrow$x = 2y ...(i)
Also, x = 3 + y$\Rightarrow$2y = 3 + y [From (i)]
$\Rightarrow$y = 3 and x = 6
$\therefore$Required number = 36

41. **(a)** y = 2x - 1
Explanation:
y = 2x - 1

42.

(b) 0
Explanation:
$2^{x+y} = 2^{x-y} = 2^{3/2} \Rightarrow$ x + y = $\frac{3}{2}$ and x - y = $\frac{3}{2}$. So, by adding above two equations we get and x= y = 0

43.

(c) 115^o
Explanation:
Since the sum of the opposite angles of a cyclic quadrilateral is 180^o
$\therefore \angle A + \angle C = 180^o$
$\Rightarrow$ 2x - 1 + 2y + 15 = 180^o
$\Rightarrow$ x + y = 83^o ... (i)
And $\angle B + \angle D = 180^o$
$\Rightarrow$ y + 5 + 4x - 7 = 180^o
$\Rightarrow$ 4x + y = 182^o ... (ii)
Subtracting eq. (ii) from eq. (i),
we get -3x = -99^o
$\Rightarrow$ x = 33^o
Putting the value of x in eq. (i),
we get 33^o + y = 83^o

$\Rightarrow y = 50^o$

$\therefore \angle C = (2y + 15)^o = (2 \times 50 + 15)^o = 115^o$

44.

(d) 78

Explanation:

Let us assume the tens and the unit digits of the required number be x and y respectively

$\therefore$ Required number = (10x + y)

According to the given condition in the question,

we have

x + y = 15 .....(i)

By reversing the digits, we obtain the number = (10y + x)

$\therefore$ (10y + x) = (10x + y) + 9

10y + x - 10x - y = 9

9y - 9x = 9

y - x = 1 .....(ii)

Now, on adding (i) and (ii) we get:

2y = 16

$\therefore y = \frac{16}{8} = 8$

Putting the value of y in (i), we get:

x + 8 = 15

x = 15 - 8

x = 7

$\therefore$ Required number = (10x + y) = $10 \times 7 + 8 = 70 + 8 = 78$

45. **(a)** 120^o

Explanation:

Since $\angle A + \angle B + \angle C = 180^o$ ... (i)

$\angle C = 3\angle B = 2(\angle A + \angle B)$

$3\angle B = 2(\angle A + \angle B)$

$3\angle B - 2\angle B = 2\angle A$

$\angle B = 2\angle A$

$\angle A = \angle \frac{B}{2}$

from (i),

$\angle \frac{B}{2} + \angle B + 3\angle B = 180^o$

$9\angle \frac{B}{2} = 180^o$

$\angle B = 40^o$

$\angle C = 3\angle B$

$\angle C = 3 \times 40 = 120^o$

46.

(c) x = 1, y = 2

Explanation:

29x + 37y=103 .....(i)

37x+29y=95 .....(ii)

Adding (i) and (ii), we get 66 (x + y) = 198 $\Rightarrow$ x + y = 3.

Subtracting (ii) from (i), we get 8 (y - x) = 8 $\Rightarrow$ y - x = 1.

Solve above equations we get

x = 1, y = 2

47.

(b) 57

Explanation:

Let the units and tens digits in the number be y and x respectively.

So, the number be 10x + y.

According to the question,

x + y = 12 ...(i)

Also, 10x + y + 18 = 10y + x

$\Rightarrow$ 9x - 9y = -18 $\Rightarrow$ x - y = -2 ...(ii)

Solving (i) and (ii), we get x = 5 and y = 7

$\therefore$ Required number is 57.

48.

(d) 87^o

Explanation:

Let x and y be the measures of $\angle A$ and $\angle B$ respectively.

Now,$\angle A + \angle B + \angle C = 18^o$[By angle sum property]

$\Rightarrow x + y + 50^o = 180^o$[Given,$\angle C = 50^o$]

$\Rightarrow x + y = 130^o$ ...(i)

Also,$\angle A - \angle B = 44^o \Rightarrow x - y = 44^o$ ...(ii)

Adding (i) and (ii), we get

$2x = 174^o \Rightarrow x = 87^o \Rightarrow \angle A = 87^o$

49.

(b) y = (90° - x)

Explanation:

We have given, $\angle A + \angle B = 90°$

$\Rightarrow$ x + y = 90° $\Rightarrow$ y = (90° - x)

50.

(c) 40 years

Explanation:

Let us assume the present age of men be x years

Also, the present age of his son be y years

According to question, after 5 years:

(x + 5) = 3 (y + 5)

x + 5 = 3y + 15

x - 3y = 10 …(i)

Also, five years ago:

(x - 5) = 7 (y - 5)

x - 5 = 7y - 35

x - 7y = - 30 …(ii)

Now, on subtracting (i) from (ii) we get:

- 4y = - 40

y = 10

Putting the value of y in (i), we get

x - 3 $\times$ 10 = 10

x - 30 = 10

x = 10 + 30

x = 40

$\therefore$ The present age of men is 40 years

51.

(c) 25 years, 20 years, 10 years

Explanation:

Let the present ages of A, B, C and D are x, y, z and t respectively.

Since, present age of D = t = 48 years.

According to question,

x = y + 5

$z = \frac{1}{2}y$

f = 2y + 8

From (iii), 48 = 2y + 8

$\Rightarrow$ From (iii), 48 = 2y + 8

From (ii), z = $\frac{1}{2}$ x 20 = 10 years

From (i), x = 20 + 5 = 25 years

So, present ages of A, B and C are 25 years, 20 years and 10 years respectively.

52. **(a)** x - 2y = 0

Explanation:

According to question,

2 x Cost of pen = Cost of notebook

$\Rightarrow$ 2y = x $\Rightarrow$ x - 2y = 0

53.

(c) 58, 22

Explanation:

Let the two numbers be x and y.

Then, x + y = 80 ...(i)

Also, x - y = 36 ...(ii)

or y - x = 36 ...(iii)

a. If x - y = 36, from (i) and (ii), we have 2x = 116
   $\Rightarrow$x = 58 and y = 22

b. If y - x = 36, from (i) and (iii), we have
   2y = 116$\Rightarrow$y = 58 and x = 22
   $\therefore$Numbers are 58 and 22.

54. **(a)** -25x + y = 700

Explanation:

Since, x litres is the extra quantity of milk and y be total expenditure on milk.

$\therefore$ Required linear equation is,

700 + 25x = y $\Rightarrow$ y - 25x = 700

or -25x + y = 700

55.

(d) x^2 - 12x + 32 = 0

Explanation:

Let the two roots be a and b, then

a + b = 12 ...(i)

and a - b = 4 ...(ii)

$\Rightarrow$ a = 8 and b = 4 (from (i) and (ii))

$\therefore$ Required equation is x^2 - 12x + 32 = 0

56.

(c) quadratic equation

Explanation:

Given: $5x^2 + 8x + 4 = 2x^2 + 4x + 6$

$\Rightarrow 5x^2 - 2x^2 + 8x - 4x + 4 - 6$

$\Rightarrow 3x^2 + 4x - 2 = 0$

Here, the degree is 2, therefore it is a quadratic equation.

57.

(c) -14

Explanation:

x = 2 is solution

$p(2) = 5(2)^2 - 4(2) + (2 + k)$

$0 = 20 - 8 + 2 + k$

$k = -14$

58.

(c) $-\frac{3}{2}$

Explanation:

If y = 1 is solution

p(1) = 0

$p(1)^2 + p(1) + 3 = 0$

p + p + 3

2p = -3

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

59.

(d) -7

Explanation:

One root of the equation $2x^2 + ax + 6 = 0$ is 2 i.e. it satisfies the equation

$2(2)^2 + 2a + 6=0$

$8 + 2a + 6=0$

$2a = - 14$

$a = - 7$

60.

(d) $(2x + 6)^2 = x^2 + (2x + 4)^2$

Explanation:

Let the shortest side of a right angled triangle be x meters.

Then according to question, its hypotenuse will be (2x + 6) meters and,

the third side will be (2x + 6 -2) = (2x + 4) meters.

Now, using Pythagoras theorem, $(\text{Hypotenuse})^2 = (\text{Base})^2 + (\text{Perpendicular})^2$

$\Rightarrow (2x + 6)^2 = x^2 + (2x + 4)^2$

61.

(b) -11

Explanation:

$3x^2 + (k - 1)x + 9 = 0$

x = 3 is a solution of the equation means it satisfies the equation

Put x = 3, we get

$3(3)^2 + (k - 1)\ 3 + 9 = 0$

$27 + 3k - 3 + 9 = 0$

27 + 3 k + 6 = 0

3 k = - 33

k = - 11

62. **(a)** 1

Explanation:

Let α and β be the roots of quadratic equation $2x^2 + kx + 4 = 0$ in such a way that $\alpha = 2$

Here, a = 2, b = k and c = 4

Then, according to question sum of the roots

$\alpha + \beta = \frac{-b}{a}$

$2 + \beta = \frac{-k}{2}$

$\beta = \frac{-k}{2} - 2$

$\beta = \frac{-k-4}{2}$

And the product of the roots

$\alpha \cdot \beta = \frac{c}{a}$

$= \frac{4}{2}$

= 2

Putting the value of $\beta = \frac{-k-4}{2}$ in above

$2 \times \frac{-k-4}{2} = 2$

(-k - 4) = 2

k = -4 - 2

= -6

Putting the value of k in $\beta = \frac{-k-4}{2}$

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

$= \frac{6-4}{2}$

$= \frac{2}{2}$

$\beta = 1$

Therefore, value of other root be $\beta = 1$

63.

(b) $\frac{3}{7}$

Explanation:

Let the fraction be $\frac{x}{y}$.

According to the question,

y = 2x + 1 ...(i)

Also, $\frac{x}{y} + \frac{y}{x} = 2\frac{16}{21} = \frac{58}{21}$

$\Rightarrow \frac{x}{2x+1} + \frac{2x+1}{x} = \frac{58}{21}$ [From (i)]

$\Rightarrow \frac{x^2+4x^2+1+4x}{x(2x+1)} = \frac{58}{21}$

$\Rightarrow 105x^2 + 84x + 21 = 116x^2 + 58x$

$\Rightarrow$(x - 3)(11x + 7) = 0

$\Rightarrow$x = 3, or x = $-\frac{7}{11}$ (Not possible)

$\therefore$y = 7

$\therefore$Required fraction = $\frac{3}{7}$

64.

(b) 5

Explanation:

Let the roots of the equation $\left(5x^2 + 13x + k = 0\right)$ be α and $\frac{1}{\alpha}$

Product of the roots = $\frac{c}{a}$

$\Rightarrow \alpha \times \frac{1}{\alpha} = \frac{k}{5}$

$\Rightarrow 1 = \frac{k}{5}$

$\Rightarrow$ k = 5.

65.

(b) 2

Explanation:

Dividing the equation by the coefficient of x^2 i.e., 2 we got

$x^2 + \frac{kx}{2}$ - 2 = 0

$\left(x + \frac{k}{4}\right)^2 - \frac{k^2}{16}$ - 2 = 0

$\left(x + \frac{k}{4}\right)^2 = \frac{k^2+32}{16}$

Hence for rational roots, $\frac{k^2+32}{16}$ has to be a perfect square.

We get a perfect square at k = ± 2 for $\left(\frac{k^2+32}{16}\right)$ i.e., $\frac{36}{16}$ which becomes $\frac{6}{4}$ upon removing the square

We get a perfect square at k = ± 7 for $\left(\frac{k^2+32}{16}\right)$ i.e., $\frac{81}{16}$ which becomes $\frac{9}{4}$ upon removing the square

Hence the least positive value of k is 2.

66. **(a)** $\frac{c(a-b)}{a(b-c)}$

Explanation:

Given equation is

$a(b - c)x^2 + b(c - a)x + c(a - b) = 0$

Let α be the other root, then

Product of roots $= \alpha \times 1 = \frac{c(a-b)}{a(b-c)}$

$\Rightarrow \alpha = \frac{c}{a}\left(\frac{a-b}{b-c}\right)$

67.

(b) k < 16

Explanation:

D > 0

b^2 - 4ac > 0

$(-8)^2$ - 4(1)(k) > 0

64 - 4k > 0

64 > 4k

$(\frac{64}{4})$ > k

16 > k

68.

(c) ad $\neq$ bc

Explanation:

$(a^2 + b^2)\ x^2 + 2(ac + bd)x + c^2 + d^2 = 0$

Here $A = a^2 + b^2$, $B = 2(ac + bd)$, $C = c^2 + d^2$

$D = B^2 - 4AC = [2(ac + bd)]^2 - 4(a^2 + b^2)\ (c^2 + d^2)$

$= 4[a^2c^2 + b^2d^2 + 2abcd] - 4[a^2c^2 + a^2d^2 + b^2c^2 + b^2d^2]$

$= 4a^2c^2 + 4b^2d^2 + 8abcd - 4a^2c^2 - 4a^2d^2 - 4b^2c^2 - 4b^2d^2$

$= -4a^2d^2 - 4b^2c^2 + 8abcd$

$= -4(a^2d^2 + b^2c^2 - 2abcd)$

$= -4(ad - bc)^2$

$\because$ Roots are not real

$\therefore$ D < 0

$\therefore -4(ad - bc)^2 < 0 \Rightarrow (ad - bc)^2 < 0$

$\Rightarrow ad - bc < 0$ or $ad \neq bc$

69.

(b) $(2a - b)^2$

Explanation:

$(2a + b)x = x^2 + 2ab$

$x^2 - (2a + b)x + 2ab = 0$

$D = b^2 - 4ac$

$D = [-(2a + b)]^2 - 4 \times 1 \times 2ab$

$D = 4a^2 + b^2 + 4ab - 8ab$

$D = 4a^2 + b^2 - 4ab$

$D = (2a - b)^2$

70.

(b) 16

Explanation:

2 is root equation $x^2 + ax + 12 = 0$

$\therefore (2)^2 + a \times 2 + 12 = 0 \Rightarrow 4 + 2a + 12 = 0$

$\Rightarrow 2a + 16 = 0$

$\Rightarrow a = \frac{-16}{2} = -8$

and given that roots of $x^2 + ax + q = 0$ are equal.

$\therefore b^2 - 4ac = 0$

$\Rightarrow a^2 - 4q = 0 \Rightarrow (-8)^2 - 4q = 0$

$\Rightarrow 64 - 4q = 0 \Rightarrow 4q = 64$

$\Rightarrow q = \frac{64}{4} = 16$

$\therefore q = 16$

71.

(c) 40 km/hr

Explanation:

Let the actual speed of the train be x km/hr

Time taken to cover 360 km at this speed = $\frac{360}{x}$ hrs.

Time taken to cover 360 km at the increased speed = $\frac{360}{x+5}$ hrs.

According to condition, $\frac{360}{x} - \frac{360}{x+5} = 1$

$\Rightarrow 360\left[\frac{1}{x} - \frac{1}{x+5}\right] = 1$

$\Rightarrow 360\left[\frac{x+5-x}{x(x+5)}\right] = 1$

$\Rightarrow 360\left[\frac{5}{x(x+5)}\right] = 1$

$\Rightarrow x^2 + 5x - 1800 = 0$

$\Rightarrow x^2 + 45x - 40x - 1800$

$\Rightarrow x(x + 45) - 40(x + 45) = 0$

$\Rightarrow (x - 40)(x + 45) = 0$

$\Rightarrow x - 40 = 0$ and $x + 45 = 0$

$\Rightarrow x = 40$ km/hr and $x = -45$ km/hr [But $x = -45$ is not possible]

Therefore, the actual speed of the train is 40 km/hr.

72.

(d) 7 years

Explanation:

Let Rohan's present age be x years.

Then Rohan's mother age will be (x + 26) years.

And after 3 years their ages will be (x + 3) and (x + 29) years. According to question,

(x + 3)(x + 29) = 360

$\Rightarrow x^2 + 29x + 3x + 87 = 360$

$\Rightarrow x^2 + 32x - 273 = 0$

$\Rightarrow x^2 + 39x + 7x - 273 = 0$

$\Rightarrow x(x + 39) -7(x + 39) = 0$

$\Rightarrow (x - 7)(x + 39) = 0$

$\Rightarrow (x - 7) = 0$ and $x + 39 = 0$

$\Rightarrow x = 7$ and $x = -39$ [x = -39 is not possible]

Therefore, Rohan's present is 7 years

73.

(b) 3 km/hr

Explanation:

Let the rate of my walking be x km/h

$\therefore$ Time taken to cover 2 km at the rate of x km/h = $\frac{2}{x}$ hrs

New rate = (x + 1) km/h

$\therefore$ Time taken to cover 2 km at new rate = $\frac{2}{x+1}$ hrs

According to question, $\frac{2}{x} - \frac{2}{x+1} = \frac{10}{60}$

$\Rightarrow \frac{1}{x} - \frac{1}{x+1} = \frac{1}{12}$

$\Rightarrow \frac{x+1-x}{x(x+1)} = \frac{1}{12}$

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

$\Rightarrow x^2 + x - 12 = 0$

$\Rightarrow x^2 + 4x - 3x - 12 = 0$

$\Rightarrow x(x + 4) -3(x + 4) = 0$

$\Rightarrow (x + 4)(x - 3) = 0$

$\Rightarrow (x + 4) = 0$ and $x - 3 = 0$

$\Rightarrow x = -4$ [not possible] and $x = 3$

Therefore, the rate of my walking is 3 km/h.

74.

(c) 30 days

Explanation:

Let B takes x days to do the work,

then A takes (x - 10) days to do it.

$\therefore$ Work done by B in 1 day = $\frac{1}{x}$ and work done by A in $\frac{1}{x-10}$

According to question, $\frac{1}{x} + \frac{1}{x-10} = \frac{1}{12}$

$\Rightarrow \frac{x-10+x}{x(x-10)} = \frac{1}{12}$

$\Rightarrow x^2 - 10x = 24x - 120$

$\Rightarrow x^2 - 34x + 120 = 0$

$\Rightarrow x^2 - 30x - 4x + 120 = 0$

$\Rightarrow x(x - 30) -4(x - 30) = 0$

$\Rightarrow (x - 30)(x - 4) = 0$

$\Rightarrow x - 30 = 0$ and $x - 4 = 0$

$\Rightarrow x = 30$ and $x = 4$ [x = 4 is not possible]

Therefore, B can finish the work in 30 days.

75. **(a)** 100

Explanation:

Let Arjun had x arrows.

According to question,

$\frac{x}{2}$ + 6 + 3 + $4\sqrt{x}$ + 1 = x

$\Rightarrow$ 10 + $4\sqrt{x}$ = $\frac{x}{2}$

$\Rightarrow$ 20 + $8\sqrt{x}$ = x

$\Rightarrow$ $8\sqrt{x}$ = x - 20

$\Rightarrow$ $64x = x^2 - 40x + 400$

$\Rightarrow$ $x^2 - 104x + 400 = 0$

$\Rightarrow$ $x^2 - 100x - 4x + 400 = 0$

$\Rightarrow$ x(x - 100) - 4(x - 100) = 0

$\Rightarrow$ (x - 100)(x - 4) = 0

$\Rightarrow$ x - 100 = 0 and x - 4 = 0

$\Rightarrow$ x = 100 and x = 4 [which is not possible]

Therefore, Arjun had 100 arrows.