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Q1) Find the factors of $6xy^2 + 9x^2y - 21xy$

Q2) Factorise $x^4 + y^4 - 18x^2y^2$

Q3) Find the factors of $9(x + y)^2 - 24(x^2 - y^2) + 16(x - y)^2$

Q4) Factorise $x^{12} - y^{12}$

Q5) Factorise:

- (i) $64x^3 - 125y^3$
- (ii) $x^2 - 2xy + y^2 - 16$
- (iii) $15x^2 - 17x - 4$
- (iv) $81a^4 - 16b^4$
- (v) $x^3 + 3x^2 - 4x - 12$

Q6) Find the value of $3^{-a} \times 2^b \times 5^{-c} \times 7^d$, if $17640 = 2^a \cdot 3^b \cdot 5^c \cdot 7^d$.

Q7) If $2^x = 3^y = 6^{-z}$, then show that $x^{-1} + y^{-1} + z^{-1} = 0$.

Q8) Evaluate
$$\frac{[3 \times 27^{n+1} + 9 \times 3^{3n-1}]}{[8 \times 3^{3n} - 5 \times 27^n]}$$

Q9) Solve for y, if $(\sqrt[3]{4})^{2y+1} = (\sqrt[3]{8})^5$

Q10) Simplify $(\frac{81}{16})^{-3/4} \times (\frac{25}{9})^{-3/2} \div (\frac{5}{2})^{-3}$

Q11) Simplify $(x^{1/3} - x^{-1/3})(x^{2/3} + 1 + x^{-2/3})$

Q12) Express $a^{-1} + b^{-1} + (a^{-2} - b^{-2})$ in the simplest form.

Q13) Find the value of $3^3 \times (243)^{-2/3} \times 9^{1/3}$

Q14) Simplify
$$\frac{[5 \times (25)^{m+1} - 25 \times (5)^{2m}]}{[5 \times (5)^{2m+3} - (25)^{m+1}]}$$

Q15) Solve for x and y such that $3^x \times 3^{-y} = 9$ and $2^y \times 4^x = 1/8$

Q16) If $5^{2x-1} = 25^{x-1} + 100$, then find the value of x.

Q17) Find the value of x , when

$$3^3(7^0 + 4^{3x}) = 27 \times \frac{27}{64}$$

Q18) Prove that $\frac{1}{(1+x^{m-n}+x^{l-n})} + \frac{1}{(1+x^{n-l}+x^{m-l})} + \frac{1}{1+x^{l-m}+x^{n-m}} = 1$

Q19) Statement I: Factors of $x^2 - 21$ are $(x + 21)$ and $(x - 21)$.

Statement II: Factors of $x^8 - y^8$ are $(x^4 + y^4)$, $(x^2 + y^2)$, $(x + y)$, $(x - y)$ and $(x + y)$.

Which of the following is valid?

- (a) Both the Statements are true.
- (b) Both the Statements are false.
- (c) Statement I is true and Statement II is false.
- (d) Statement I is false and Statement II is true.

Q20) MCQ: Factorise $(3x^2 - 2x - 5)(3x^2 - 2x - 1)$.

- (a) $(3x + 5)(x + 1)(x - 1)(3x + 1)$
- (b) $(3x + 5)(3x - 1)(x + 1)(x - 1)$
- (c) $(3x - 5)(x + 1)(x - 1)(3x + 1)$
- (d) $(3x - 5)(x - 1)(x + 1)(x - 1)$

Q21) Rationalise the denominator of $\frac{1}{1+\sqrt{6}-\sqrt{2}}$

Q22) If $a = \sqrt[3]{28}$, $b = \sqrt[3]{27}$, prove that $a + b - \frac{1}{a^2+ab+b^2} = 2b$

Q23) If $a^2 + b^2 + c^2 = 25$ and $ab + bc + ca = 12$, find the value of $(a + b + c)$.

Q24) Factorise: $m^3 - n^3 - m^2n + mn^2$

Q25) Simplify $\frac{(3\sqrt{2})}{(\sqrt{6}-\sqrt{3})} - \frac{(4\sqrt{3})}{(\sqrt{6}-\sqrt{2})} + \frac{(2\sqrt{3})}{(\sqrt{6}+2)}$

Q26) If $x = \frac{(\sqrt{3}+1)}{2}$ then $x^3 + 1/x^3 = ?$

Q27) If $2^x = 4^y = 8^z$ and $(\frac{1}{2x} + \frac{1}{4y} + \frac{1}{6z}) = \frac{24}{7}$

Then find z

CASE STUDY

One day the teacher wrote laws of exponents on the black board and the sheets containing questions were distributed among the students to conduct an open test. The laws written on the black board are as follows:

$$x^m \div x^n = x^{m-n}$$

$$(x^m)^n = x^{mn}$$

$$x^0 = 1$$

$$x^m/x^n = x^{m-n}$$

$$x^{-n} = 1/x^n, x \neq 0$$

With given conditions of $x > 0$ be real number and m, n be rational numbers.

Q28) The value of $\sqrt[6]{(729^{-1})}$ is

- (a) 3
- (b) $1/3^2$
- (c) $1/3$
- (d) $1/9$

Q29) $3(a^4b^3)^{10} \times 5(a^2b^2)^3$ is equal to

- (a) $15a^{36}b^{36}$
- (b) $15a^{64}b^{46}$
- (c) $15a^{50}b^{46}$
- (d) $15a^{64}b^{36}$

Q30) If $2^{x+1} = 4^{x-3}$, then the value of x is

- (a) 3
- (b) 6
- (c) 5
- (d) 8

Q31) $5^{2/3} \times 5^{2/6}$ is equal to

- (a) $5^{2/9}$
- (b) $5^{1/9}$
- (c) 5
- (d) 1

Q32) The value of expression $[(x^a / x^b)^a \times (x^b / x^c)^c \times (x^c / x^a)^b]$ is

- (a) x^{a+b+c}
- (b) x^{a-b-c}
- (c) $1/x$
- (d) 1

Q33) Simplify $\frac{(0.6)^{-1} - (0.1)^{-1}}{(3/2)^{-1} - (3/2)^2} + \left(\frac{-1}{3}\right)^{-1}$

Q34) If $a = 2 + \sqrt{3} + \sqrt{5}$ and $b = 3 + \sqrt{3} - \sqrt{5}$, then find the value of : $a^2 + b^2 - 4a - 6b - 3$

Q35) $\frac{(3 - \sqrt{3})}{(3 + 2\sqrt{3})} = a + \sqrt{(a + b)}$

where a and b are rational numbers, then the value of $\sqrt{(a + b)}$

Q36) $x = 3\sqrt{5} + 2\sqrt{2}$ and $y = 3\sqrt{5} - 2\sqrt{2}$, then find the value of $(x^2 - y^2)^2$

Q37) Which of the following statements is true?

- (a) Product of two irrational numbers is always irrational
- (b) Product of a rational and irrational number is always irrational
- (c) Sum of two irrational numbers can never be rational
- (d) Sum of an integer and a rational number can never be an integer

Q38) The ascending order of the surds ${}^3\sqrt{2}$, ${}^6\sqrt{3}$, ${}^9\sqrt{4}$ is

- (a) ${}^9\sqrt{4}$, ${}^6\sqrt{3}$, ${}^3\sqrt{2}$
- (b) ${}^9\sqrt{4}$, ${}^3\sqrt{2}$, ${}^6\sqrt{3}$
- (c) ${}^3\sqrt{2}$, ${}^6\sqrt{3}$, ${}^9\sqrt{4}$
- (d) ${}^6\sqrt{3}$, ${}^9\sqrt{4}$, ${}^3\sqrt{2}$

Q39) Set of natural numbers is a subset of

- (a) Set of rational numbers
- (b) Set of odd numbers
- (c) Set of composite numbers
- (d) Set of real numbers

Q40) Which of the following statements is true?

- (a) There can be a real number which is both rational and irrational.
- (b) The sum of any two irrational numbers is not always irrational.
- (c) $x < y \Rightarrow x^2 < y^2$ for every integers x and y .
- (d) Every integer is a rational number.