# SIMPLIFICATION

## IMPORTANT CONCEPTS:

### 1. BODMAS rule:

B - Bracket

O - Of

D - Division

M - Multiplication

A - Addition

S – Subtraction

<u>V – BODMAS:</u>

V = Virnaculum

Before applying BODMAS, apply V.

### 2. Types of numbers:

- Natural number – 1,2, 3…...,∞
- Whole number – 0,1,2,3,…. ∞
- Integer - > - ∞,….-3,-2,-1,0,1,2,3,.. ∞
- Even number – 2,4,6,….
- Odd number – 1,3,5,7,...
- Prime number – 1 & itself (2,3,5,7,11,….)
- Composite number - If a number has more than two factors. Eg: 4,6,9,10,...

1 is neither prime nor composite.

### 3. Divisibility rule:

<u>Rule 2:</u> Ended by even number = (20/2) = 10

<u>Rule 3:</u> Add given number, if that is divided by exactly 3 means divided by '3'

Eg: 135 = 1+3+5 = 9/3 = 3

<u>Rule 4:</u> Last two digits divided by four means like your number will be divided by four or lost two numbers or zero means divided by four.

Eg: 200/4 = 50 ; 634/4 = 156.

<u>Rule 5:</u> End with 0 or 5.

Eg: 50/5 = 10 and 65/5 = 13.

<u>Rule 6:</u> check condition of 2 or 3.

Eg: 54= 54/2 = 27 and 5+4 = 9/3 = 3.

<u>Rule 7:</u> Sum is divided by 9.

Eg: 18= 1+8 = 9/9 = 1.

## 4. Square root:

- $1^2 = 1$
- $2^2 = 4$
- $3^2 = 9$
- $4^2 = 16$
- $5^2 = 25$
- $6^2 = 36$
- $7^2 = 49$
- $8^2 = 64$
- $9^2 = 81$
- $10^2 = 100$
- $11^2 = 121$
- $12^2 = 144$
- $13^2 = 169$
- $14^2 = 196$
- $15^2 = 225$
- $16^2 = 256$
- $17^2 = 289$
- $18^2 = 324$
- $19^2 = 361$

- $20^2 = 400$

## Cube root:

- $1^3 = 1$
- $2^3 = 8$
- $3^3 = 27$
- $4^3 = 64$
- $5^3 = 125$
- $6^3 = 216$
- $7^3 = 343$
- $8^3 = 512$
- $9^3 = 729$
- $10^3 = 1000$
- $11^3 = 1331$
- $12^3 = 1728$
- $13^3 = 2197$
- $14^3 = 2744$
- $15^3 = 3375$
- $16^3 = 4096$
- $17^3 = 4913$
- $18^3 = 5832$
- $19^3 = 6859$
- $20^3 = 8000$

**ALGEBRA**

## FORMULA:

1. $(a+b)^2 = a^2+b^2+2ab$

2. $(a-b)^2 = a^2+b^2-2ab$

3. $a^2-b^2 = (a+b)\ (a-b)$

4. $a^2+b^2 = (a+b)^2 - 2ab$

$\qquad = (a-b)^2 + 2ab$

5. $(a+b)^3 = a^3 + 3a^2b + 3ab^2 + b^3$

6. $(a-b)^3 = a^3 - 3a^2b + 3ab^2 - b^3$

7. $a^3 + b^3 = (a + b)(a^2 - ab + b^2)$

8. $a^3 - b^3 = (a - b)(a^2 + ab + b^2)$

9. $(a+b)^2 - (a-b)^2 = 4ab$

10. $(a + b + c)^2 = a2 + b2 + c2 + 2ab + 2bc + 2ac$

11. $a^3 + b^3 + c^3 - 3abc = (a+b+c)(a^2+b^2+c^2-ab-bc-ac)$

12. If $a+b+c= 0$, then $a^3+b^3+c^3=3abc$

13. $a^4 + a^2 +1 = (a^2+a+1)(a^2-a+1)$

14. $(a^4-b^4) = (a^2+b^2)(a+b)(a-b)$

15. $a^8-b^8 = (a^4 + b^4)(a^2+ b^2)(a+b)(a-b)$

16. $a^m \times a^n = a^{m+n}$

17. $\frac{a^m}{a^n} = a^{m-n}$

18. $(a^m)^n = a^{mn}$

19. $(ab) = a^x b^x$

20. $\left(\frac{a}{b}\right)^x = \frac{a^x}{b^x}$

21. $a^{\frac{1}{x}} = x\sqrt{a}$

22. $(a+b)^2 + (a-b)^2 = 2(a^2+b^2)$

23. $(a+b+c)^3 = a^3+b^3+c^3 + 3(a+b)(b+c)(c+a)$

## SHORTCUTS:

1. If $x + \frac{1}{x} = a$, then $x^2 + \frac{1}{x^2} = a^2 - 2$

2. $x^2 + \frac{1}{x^2} = a$, then $x + \frac{1}{x} = \sqrt{(a + 2)}$

3. $x - \frac{1}{x} = a$, then $x^2 - \frac{1}{x^2} = a^2 + 2$

4. $x^2 - \frac{1}{x^2} = a$, then $x + \frac{1}{x} = \sqrt{(a-2)}$

5. $x + \frac{1}{x} = a$, then $x - \frac{1}{x} = \sqrt{(a^2 - 4)}$

6. $x - \frac{1}{x} = a$, then $x + \frac{1}{x} = \sqrt{(a^2 + 4)}$

7. $x^2 + \frac{1}{x^2} = \left(x + \frac{1}{x}\right) X \left(x - \frac{1}{x}\right)$

8. $x + \frac{1}{x} = a$, then $x^3 + \frac{1}{x^3} = a^3 - 3a$

9. $x - \frac{1}{x} = a$, then $x^3 - \frac{1}{x^3} = a^3 + 3a$

10. $x + \frac{1}{x} = a$, then $x^4 + \frac{1}{x^4} = (a^2)^2 - 2$

11. $x - \frac{1}{x} = a$, then $x^4 - \frac{1}{x^4} = (a^2)^2 + 2$

12. $x + \frac{1}{x} = a$, then $x^5 + \frac{1}{x^5} = a^5 - 5a^3 + a(5)$

13. $x - \frac{1}{x} = a$, then $x^5 - \frac{1}{x^5} = a^5 + 5a^3 - a(5)$

14. $x^2 + \frac{1}{x^2} = a$, $x^3 + \frac{1}{x^3} = a^3 - 3a$

E.g: $x^2 + \frac{1}{x^2} = 23$

23+2 = 25

23-2= 21

a³-3a = 5³ – 3(5)

=125-15

=110

15. To find the quadratic equation.

X² - (α+β)x +αβ

16. $\sqrt{\left(5\sqrt{\left(5\sqrt{(5\sqrt{5}\ldots\ldots)}\right)}\right)}\ldots\ldots\infty$

∞ and multiply = so given no is ans.

17. $\sqrt{\left(6 + \sqrt{\left(6 + \sqrt{\left(6 + \sqrt{6 \ldots \ldots}\right)}\right)}\right) \ldots \ldots \infty}$

Consecutive numb is 6 = 2 X 3

(+) is given so bigger numb is ans

(-) is given so small number is ans

18. $x\sqrt{\left(y\sqrt{\left(z\sqrt{a}\right)}\right)} = xyz\sqrt{a}$

19. $(((a)^x)^y)^z = a^{xyz}$

20. $999\frac{995}{999}999$

   995= numerator + 1

   999 = denominator – 1

   AM = 998996

21.

22.

$$999 \left(\frac{5}{4}\right) 296 \longrightarrow \text{If numerator big}$$

$$296\ 000$$

Then $999 \dfrac{5}{4} 296 \div \quad \Rightarrow \quad \dfrac{296}{4} = 74$

so $\quad 296000$
$\quad\quad\quad \underline{+74} \quad$ (numerator big)
$\quad\quad\quad\quad\quad\quad\quad \text{so } (+)$

Ans - $\underline{296074}.$

23.

$$\dfrac{999}{} \times \boxed{\dfrac{40}{47} \times 47} \rightarrow \text{same, so take } 47$$

$$47\underline{000}$$

Difference $\Rightarrow$ numerator & denominator

$999 \times \left(\dfrac{40}{47}\right) \times 47 \quad \Rightarrow \quad 7$

$\hookrightarrow$ Numerator small so $(-)$.

$\Rightarrow \quad 47000$
$\quad\quad\quad \underline{-7}$

Ans $\Rightarrow \underline{47993}.$

24.

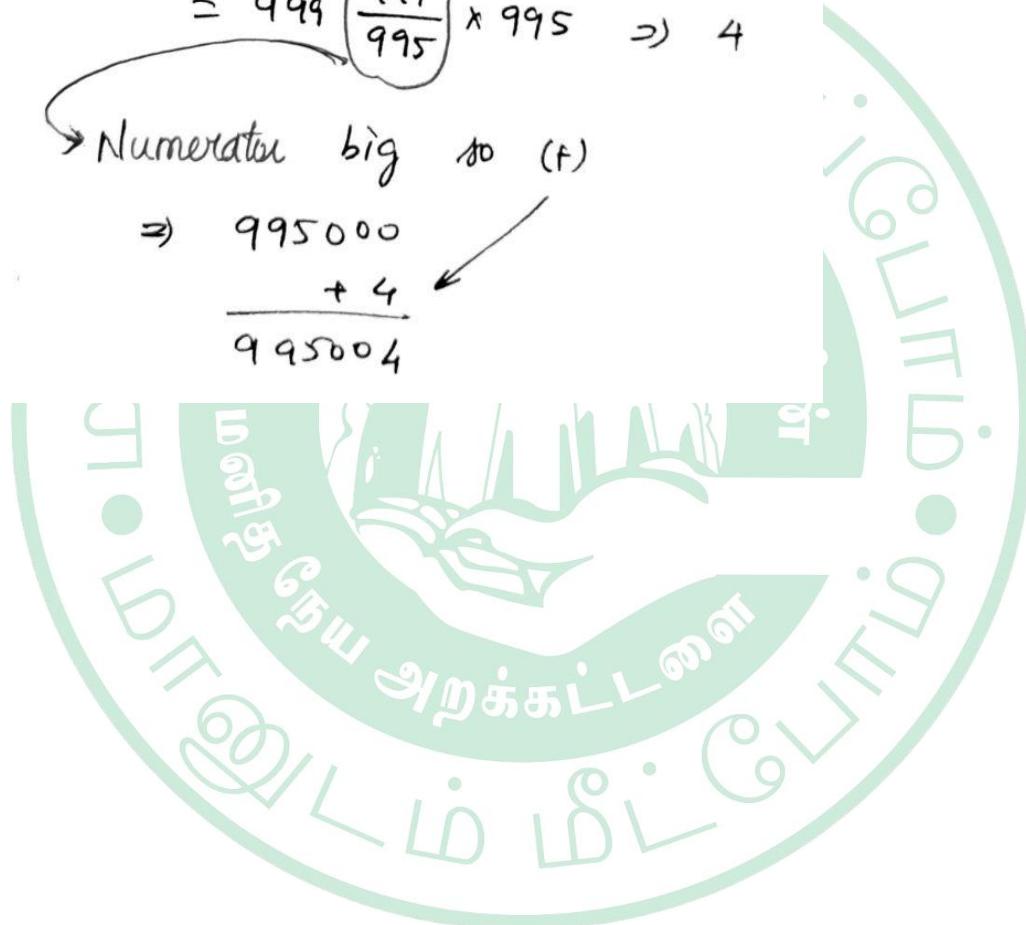$$999 \quad \frac{999}{995} \times 995 \Rightarrow same$$

$$995000$$

Difference $\Rightarrow$ numerators denominator

$$= 999 \boxed{\frac{999}{995}} \times 995 \quad \Rightarrow \quad 4$$

→ Numerator big so (+)

$$\Rightarrow \quad 995000$$
$$\quad + 4$$
$$\overline{995004}$$

**Problems:**

1. **If $\sqrt{y} = 6x$, then $\dfrac{x^2}{y}$ is**

   a. 1/26

   b. 1/36

   c. 1/16

   d. 1/6.

   Ans: b

$$\sqrt{y} = 6x$$
$$y = 36x^2$$
$$\frac{x^2}{y} = \frac{1}{36}$$

2. **If an operation $\Delta$ is defined as follows $a\Delta b = \sqrt{(a^2 + b^2)}$, where $a, b \; \varepsilon \; N$, then the value of $(3\Delta4)\Delta5$ is?**

   a. $2\sqrt{2}$

   b. $5\sqrt{2}$

   c. $2\sqrt{5}$

   d. $5\sqrt{5}$

   **Ans: b**

$$a\Delta b = \sqrt{(a^2 + b^2)}$$
$$\sqrt{(a^2 + b^2)} = \sqrt{(3^2 + 4^2)}$$
$$= \sqrt{(9 + 16)}$$
$$= \sqrt{(25)}$$
$$= 5$$
$$5\Delta 5 = \sqrt{(5^2 + 5^2)}$$

$$= \sqrt{(25 + 25)}$$

$$= \sqrt{(50)}$$

$$= \sqrt{(2 \, X25)}$$

$$= 5\sqrt{2}$$

3. **In an examination a student scores four marks for every correct answer and losses Van Marg for every wrong. Answer if he answers 80 questions in all and gate 150 marks find the number of questions he answered correctly.**

   a. 46

   b. 26

   c. 36

   d. 56

   **Ans: a**

   No. Of correct answers be x.

   No. Of wrong answers be 80-x.

   4x – 1(80 - x) = 150

   4x – 80 + x = 150

   5x =150 + 80

   X = 230/5

   X = 46.

4. **Simplify** $\dfrac{x^3}{(x-3)} + \dfrac{27}{3-x}$

   a. $x^2$-3x+9

   b. $x^2$+3x+9

   c. $x^2$-3x-9

   d. $x^2$+3x-9

**Ans: b**

$$\frac{x^3}{(x-3)} + \frac{27}{3-x}$$

We know that, $a^3 - b^3 = (a - b)(a^2 + ab + b^2)$
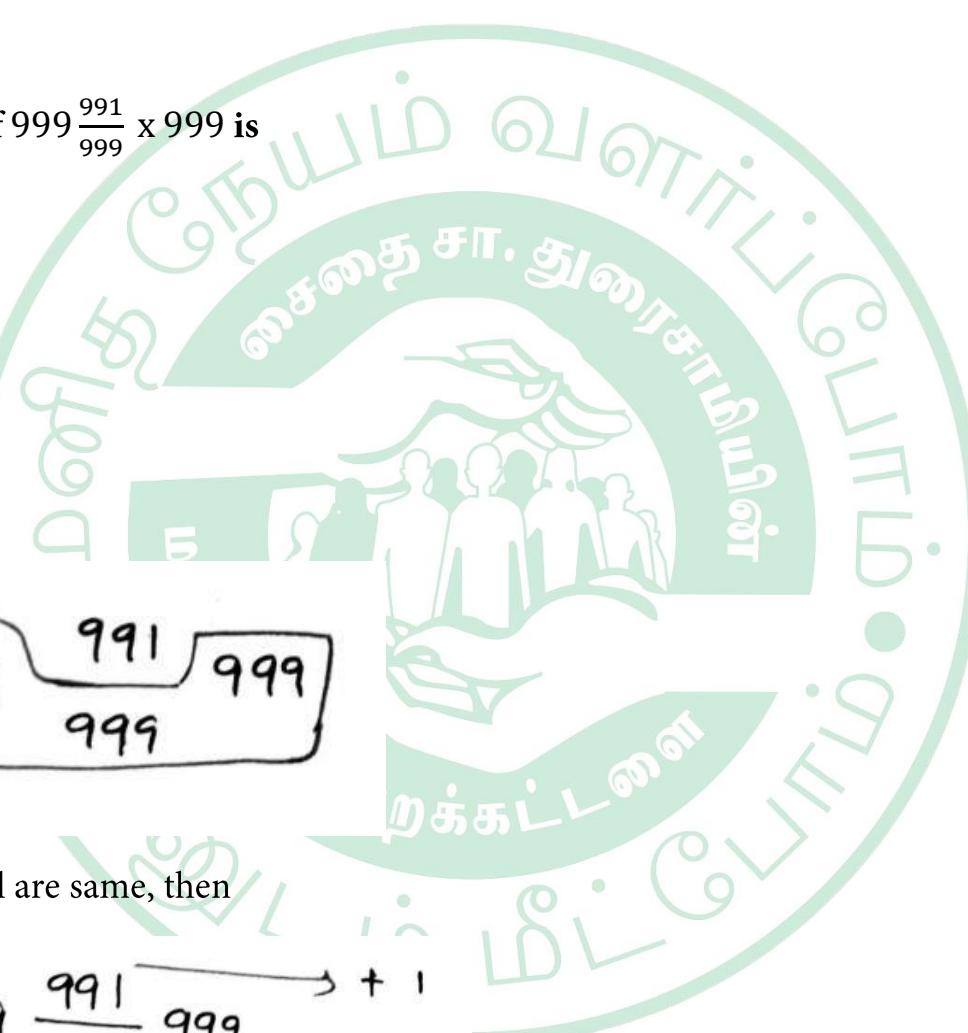
$$\frac{x^3 - 27}{(x-3)} = \frac{(x-3)(x^2 + 3x + 9)}{(x-3)}$$

$= x^2 + 3x + 9$

5. **The value of** $999\frac{991}{999} \times 999$ **is**

   a. 990809

   b. 998990

   c. 999824

   d. 998992

   **Ans: d**



   If all are same, then



   => 998992

6. If $\frac{x}{y} = \frac{12}{13}$, then $\frac{14}{17} + \frac{3y-x}{3y+x}$ is

   a. 69/57

   b. 27/51

   c. 51/69

   d. 58/31

   **Ans: a**

$$\frac{14}{17} + \frac{3(13) - 12}{3(13) + 12}$$

$$\frac{14}{17} + \frac{39 - 12}{39 + 12}$$

$$\frac{14}{17} + \frac{27}{51}$$

$$\frac{42 + 27}{51}$$

$$\frac{69}{51}$$

7. value of $\frac{(9+9+9+9) \div 9}{7+7+7+7 \div 7}$

   a. 11/2

   b. 2/11

   c. 22/4

   d. 12/4

   **Ans: b**

   BODMAS rule

$$\frac{36 \div 9}{7 + 7 + 7 + 7 \div 7}$$

$$\frac{36 \div 9}{7 + 7 + 7 + (7 \div 7)}$$

$$\frac{4}{7+7+7+1}$$

$$= \frac{4}{22}$$

$$= \frac{2}{11}$$

8. **Find the value of** $(6561)^{\frac{5}{4}}$

    a. 56561

    b. 59149

    c. 59049

    d. 59069

    **Ans: c**

$$= \left(\sqrt[4]{(6561)}\right)^5$$

$$= \left(\sqrt[4]{(81 \; X \; 81 \; X \; 81 \; X \; 81)}\right)^5$$

$$= (81)^5$$

$$= 59049$$

9. **If a + b =2x, then value of** $\frac{x}{a-x} + \frac{x}{b-x}$

    a. 2

    b. -1

    c. 0

    d. 1

    **Ans: c**

$$\frac{x}{a-x} + \frac{x}{b-x}$$

LCM

$$\frac{x(b-x) + x(a-x)}{(a-x)(b-x)}$$

$$= \frac{bx - x^2 + ax - x^2}{(a-x)(b-x)}$$

$= \frac{x(b-x+a-x)}{(a-x)(b-x)}$ ----------------**1**

a + b = 2x in equation 1

$$\frac{x(2x - 2x)}{(a-x)(b-x)} = 0$$

10. **Value of** $\sqrt{\left(7\sqrt{7}\left(\sqrt{7}(\sqrt{7})\right)\right)}$

    a. 7

    b. Infinity

    c. 0

    d. $\sqrt{(7)}$

    **Ans: a**

$\sqrt{\left(7\sqrt{7}\left(\sqrt{7}(\sqrt{7})\right)\right)}$ = x

Square on both sides.

$$\left(\sqrt{\left(7\sqrt{7}\left(\sqrt{7}(\sqrt{7})\right)\right)}\right)^2 = x^2$$

$$\left(7\sqrt{7}\left(\sqrt{7}(\sqrt{7})\right)\right) = x^2$$

$$(7x) = x^2$$

$$x = 7$$

**11.If** $\left(\frac{9}{14}\right)^9 X \left(\frac{9}{14}\right)^{3x} = \left(\frac{9}{14}\right)^{12}$**, then the value of x is**

    a. 3

    b. 2

    c. 5

    d. 1

    **Ans: d**

    9 + 3x = 12

    Option d => 12= 12

    LHS = RHS

**12.The value of** $\frac{3.25\ X\ 3.25 + 2\ X\ 3.25\ X\ 1.25 + 1.25\ X\ 1.25}{3.25\ X\ 3.25 - 1.25\ X\ 1.25}$

    a. 1.25

    b. 2.25

    c. 2.50

    d. 3.25

    **Ans: b**

    Let a= 3.25, b= 1.25

$$\frac{a^2 + 2ab + b^2}{a^2 - b^2} = \frac{(a+b)^2}{(a+b)(a-b)}$$

$$= \frac{(a+b)}{(a-b)}$$

$$= \frac{(3.25 + 1.25)}{(3.25 - 1.25)}$$

$$= \frac{4.50}{2} = 2.25$$

13. Simplify $\left(-2\frac{3}{9}\right) + \left(5\frac{7}{9}\right) + \left(-7\frac{11}{9}\right)$

    a. 22/9

    b. 43/9

    c. -43/9

    d. 42/9

    **Ans: c**

$$= \left(\frac{-21}{9}\right) + \left(\frac{52}{9}\right) + \left(\frac{-74}{9}\right)$$

$$= \frac{-21 + 52 - 74}{9}$$

$$= \frac{-43}{9}$$

14. If $a - \frac{1}{a} = 5$ , find $a^3 - \frac{1}{a^3}$

    a. 150

    b. 160

    c. 140

    d. 130

    **Ans: c**

$(a-b)^3 = a^3 - b^3 - 3ab(a-b)$

a=a; b= 1/a

$$\left(a - \frac{1}{a}\right)^3 = a^3 - \left(\frac{1}{a}\right)^3 - 3\left(a \times \frac{1}{a}\right)\left(a - \frac{1}{a}\right)$$

$$5^3 = a^3 - \left(\frac{1}{a^3}\right) - 3 \times 5$$

$$125 = a^3 - \left(\frac{1}{a^3}\right) - 15$$

$$a^3 - \frac{1}{a^3} = 140$$

15. $\dfrac{(3^4)^{-2} \ X \ (2^3)^{-4}}{(2^4)^{-2} \ X \ (3^{-5}) \ X \ 4^{-3}}$ **Is**

   a. 4/27

   b. 27/4

   c. 5/30

   d. 5/27

   **Ans: a**

$$\frac{3^{-8} \ X \ 2^{-12}}{(2^{-8} \ X \ 3^{-5} \ X \ 4^{-3})}$$

$$= 3^{-8} \ X \ 2^{-12} \ X \ 2^8 \ X \ 3^5 \ X \ 2^6$$

$$= 3^{-8+5} \ X \ 2^{-12+8+6}$$

$$= 3^{-3} \ X \ 2^2$$

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

$$= \frac{4}{27}$$

16. **Simplify** $8\sqrt{\left(\sqrt[3]{x^4}\right)}$

   a. $x^{\frac{1}{6}}$

   b. $x^{\frac{1}{4}}$

   c. $x^{\frac{1}{2}}$

   d. $x^{\frac{1}{8}}$

   **Ans: a**

$$\sqrt[3]{x^4} \ = \ (x^4)^{\frac{1}{3}} = \left(x^{\frac{4}{3}}\right)$$

$$8\sqrt{\left(x^{\frac{4}{3}}\right)} = \left(x^{\frac{4}{3}}\right)^{\frac{1}{8}}$$

$$= x^{\frac{4}{3} X \frac{1}{8}}$$

$$= x^{\frac{1}{6}}$$

17. **The value of** $\frac{2x^2-4x}{2x^2+4x} X \frac{4x+8}{x-2}$

   a. 2

   b. 4

   c. 8

   d. 16

   **Ans: b**

   $\frac{2x^2-4x}{2x^2+4x} X \frac{4x+8}{x-2} = 4$

18. $y^{\frac{3}{2}}: 25 = 36: \sqrt{y}$ , **then what is the value of y?**

   a. 10

   b. 30

   c. 25

   d. 50

   **Ans: b**

   a:b = c:d

$$y^{\frac{3}{2}} X y^{\frac{1}{2}} = 25 X 36$$

$$y^{\frac{4}{2}} = 25 X 36$$

$y^2 = 25 X 36$

$$y = \sqrt{(25 X 36)}$$

$$y = 5 X 6 = 30$$

**19.Simplify** $5\frac{3}{4} + \frac{3}{4} of \frac{8}{9}$

    a. 12(5/6)

    b. 6(5/12)

    c. 5(12/6)

    d. 77(5/6)

    **Ans: b**

$$\frac{3}{4} X \frac{8}{9} = \frac{2}{3}$$

$$5\frac{3}{4} + \frac{2}{3} = \frac{23}{4} + \frac{2}{3}$$

$$= \frac{77}{12} = 6\frac{5}{12}$$

**20.Simplify** $\frac{m}{m-1} - \frac{1}{m-1} - \frac{m}{m^2+1}$

    a. $\frac{m^2}{m^2-1}$

    b. $\frac{m^3}{m^2-1}$

    c. $\frac{m^2}{m^2+1}$

    d. $\frac{m^3}{m^2+1}$

    **Ans: c**

$$\frac{m}{m-1} - \frac{1}{m-1} - \frac{m}{m^2+1}$$

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

$$1 - \frac{m}{m^2+1} = \frac{m^2+1-1}{m^2+1}$$

$$= \frac{m^2}{m^2 + 1}$$

21. **Chandra and lekha, each had a number of bangles, Chandra said to Lekha, 'if you give me five of your bangles, my number will be thrice of yours'. Lekha replied 'if you give me 45 my number will be thrice yours'. what are the total bangles together with them?**

a. 70

b. 80

c. 90

d. 100

**Ans: d**

No. Of Chandra bangles = M

No. Of Lekha bangles = L

Total numb of bangles = M+L

(m+5) = 3(L-5)

(m+5) =3L –15

M-3L = -20 ----------**1**

3(M-45) = L + 45

3M-L = 180 ---------**2**

From 1 &2

3m-9L = -60

3m-L = 180

-8L = -240

L = 30

Substituting L in 1
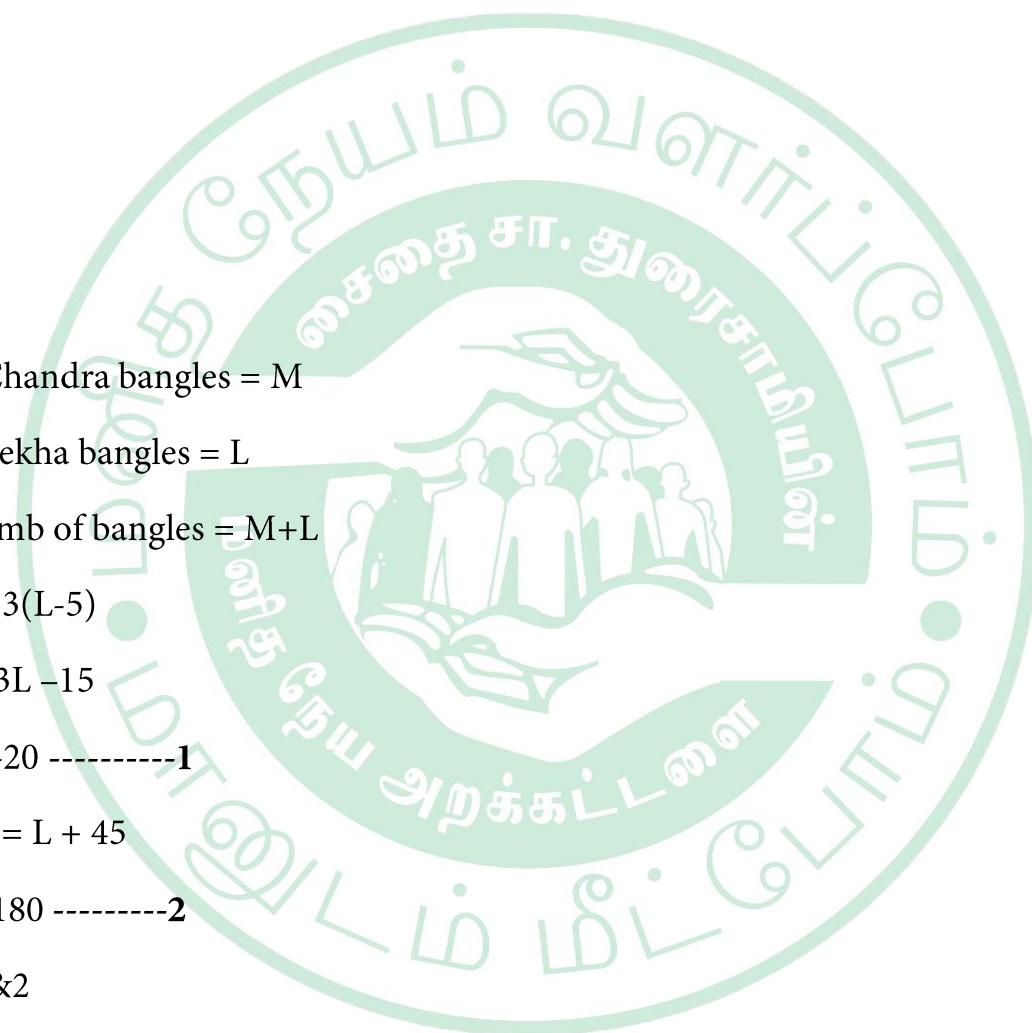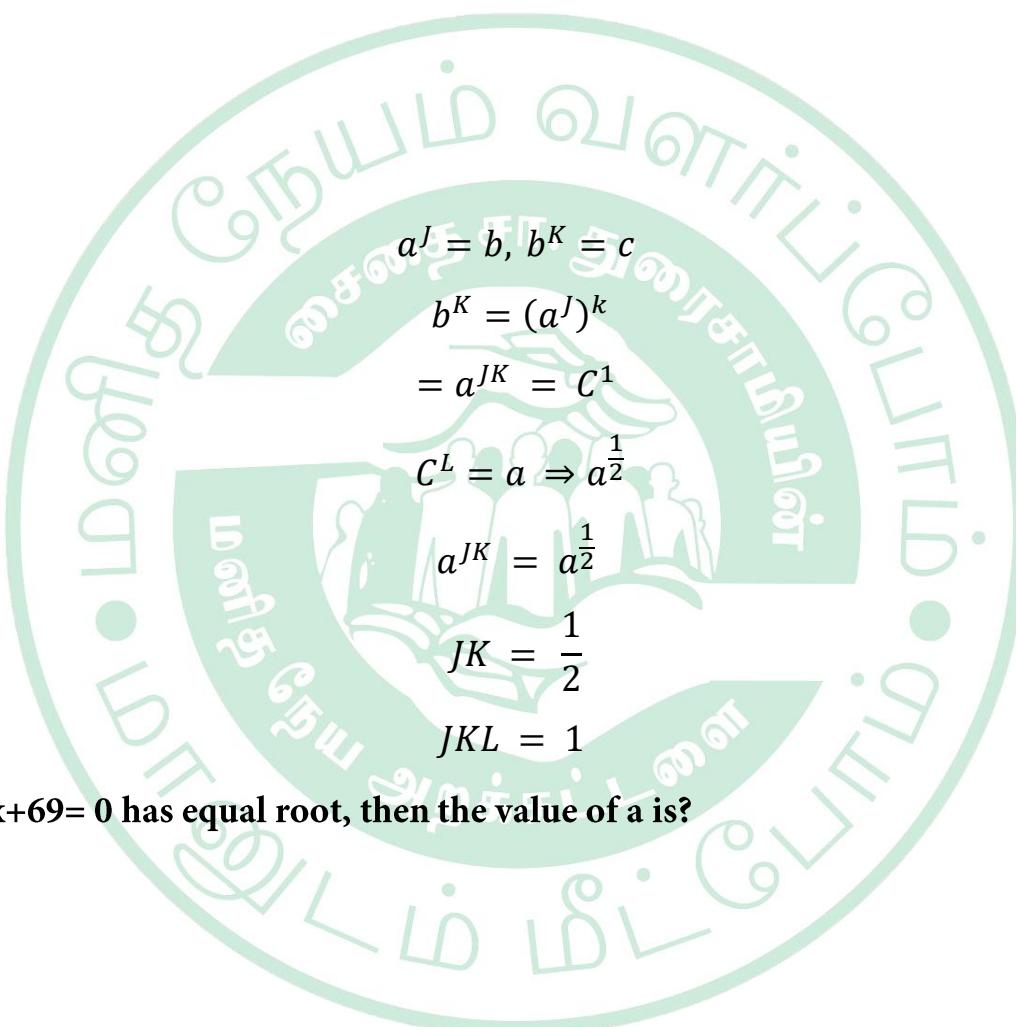
M = 70

L+M= 30 + 70 = 100

**22. If $a^J = b$, $b^K = c$, $c^L = a$, then what is the value of JKL?**

   a. 3

   b. 4

   c. 9

   d. 1

   **Ans: d**

$$a^J = b, \; b^K = c$$
$$b^K = (a^J)^k$$
$$= a^{JK} = C^1$$
$$C^L = a \Rightarrow a^{\frac{1}{2}}$$
$$a^{JK} = a^{\frac{1}{2}}$$
$$JK = \frac{1}{2}$$
$$JKL = 1$$

**23. If $ax^2 - 32x + 69 = 0$ has equal root, then the value of a is?**

   a. 1

   b. 2

   c. 3

   d. 4

   **Ans: d**

a=a: b= -32; c= 64

$b^2 - 4ac = 0$

$(-32)^2-4(a)(64) = 0$

$1024 - 256a = 0$

$1024 = 256a$

$a = 1024/256$

$a = 4$

24. **In a two digit number the digit in the units place is twice of the digit in the 10th place. If the digits are reversed the new number is 36 more than the given number. Find the number.**

a. 84

b. 48

c. 24

d. 42

**Ans: b**

From option, b is 48

Unit place = 4

$10^{th}$ place = 8

84 – 48 = 36

25. **6a+8b = 44, 8a-5b= 4, then $a^2+b^2+2ab$ is?**

a. 36

b. 72

c. 25

d. 49

**Ans: a**

6a+8b = 44 ------------**1**

8a-5b= 4 ---------------**2**

Multiply equ 1 by 8 and 2 by 6, then

48a + 64b = 352

48a – 30b = -24

94b = 376

b = 4

Substitute b in equ 1,

6a +8(4) = 44

6a = 44-32 = 12

a=2

$a^2+b^2+2ab = 4+16+ 2(8)$

$a^2+b^2+2ab = 36$

**26. Simplify $\frac{2}{1.2.3} + \frac{2}{2.3.4} + \frac{2}{3.4.5} + \frac{2}{4.5.6}$ is equal to.**

a. 7/30

b. 11/30

c. 7/15

d. 11/15

**Ans: c**

LCM = 120

$$\frac{2 \, X \, 20}{6 \, X \, 20} + \frac{2 \, X \, 5}{24 \, X \, 5} + \frac{2 \, X \, 2}{60 \, X \, 2} + \frac{2}{120}$$

$$\frac{40}{120} + \frac{10}{120} + \frac{4}{120} + \frac{2}{120}$$

$$\frac{56}{120}$$

$$= \frac{7}{15}$$

**27. Find the value of**

$$\sqrt{\left(58 + \sqrt{\left(31 + \sqrt{\left(21 + \sqrt{\left(11 + \sqrt{\left(21 + \sqrt{\left(31 + \sqrt{(9)}\right)}\right)}\right)}\right)}\right)}\right)}$$

a. 7

b. 8

c. 9

d. 6

**Ans: b**

$\sqrt{9} = 3 \gg \sqrt{(13 + 3)} = \sqrt{16} = 4$

$\sqrt{(21 + 4)} = \sqrt{25} = 5 \gg \sqrt{(11 + 5)} = \sqrt{16} = 4$

$\sqrt{(21 + 4)} = \sqrt{25} = 5 \gg \sqrt{(31 + 5)} = \sqrt{36} = 6$

$\sqrt{(58 + 6)} = \sqrt{64} = 8$

**28. A boy is now twice as old as his sister. Four years ago, he was thrice as old as her. What are their ages now?**

a. 18,9

b. 14,7

c. 16,8

d. 12,6

**Ans: c**

From option c

A boy is now twice as old as his sister i.e., 16 and 8

Four years before he was thrice as old as her i.e., 12 and 4

**29. Simplify** $\left(-\frac{1}{5}\right) - \left\{1 \div \left(\frac{2}{3} X \frac{5}{7}\right) + 8 - \left(5 - \frac{1}{2} - \frac{1}{4}\right)\right\}$

A. -11(5/20)

b. -5(11/20)

c. -20(11/5)

d. -10(11/10)

**Ans: b**

$$\left(-\frac{1}{5}\right) - \left\{1 \div \left(\frac{2}{3} X \frac{5}{7}\right) + 8 - \left(5 - \frac{1}{2} - \frac{1}{4}\right)\right\}$$

$$\left(-\frac{1}{5}\right) - \left\{1 \div \left(\frac{10}{21}\right) + 8 - \left(5 - \frac{1}{4}\right)\right\}$$

$$\left(-\frac{1}{5}\right) - \left\{\left(\frac{10}{21}\right) + 8 - \left(\frac{19}{4}\right)\right\}$$

= (-1/5)-(214/40)

= (-8-214)/40

= (-222)/40

= -5(11/20)

**30. Solve** $\sqrt{\left(1 + \frac{x}{961}\right)} = \frac{32}{31}$

a. 63

b. 32

c. 31

d. 36

**Ans: a**

$$\sqrt{\left(1 + \frac{x}{961}\right)} = \frac{32}{31}$$

If numerator is big (+)

If numerator is small (-)

32 + 31 = 63.

**31.** $\sqrt{\left(30 - \sqrt{\left(30 - \sqrt{\left(30 - \sqrt{(30 \ldots \ldots)}\right)}\right)}\right)} = \infty$

a. 6

b. 5

c. 30

d. 3

**Ans: b**

$$\sqrt{\left(30 - \sqrt{\left(30 - \sqrt{\left(30 - \sqrt{(30 \ldots \ldots)}\right)}\right)}\right)} = \infty$$

Consecutive number multiplication.

6 X 5 = 30

If (-) is given, small number is answer

If (+) is given, big number is answer.

So, Ans is 5.

**32. Solve** $\dfrac{14^{14}}{14^{12}}$

a. 196

b. 14

c. $14^3$

d. 28

**Ans: a**

$$\frac{a^m}{a^n} = a^{m-n}$$

$$= 14^{14-12}$$

$$= 14^2$$

$$= 196$$

**33. If $x + \frac{1}{x} = 7$, then find the value of $x^2 + \frac{1}{x^2}$**

a. 7

b. 17

c. 49

d. 47

**Ans: d**

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

$$\left(x + \frac{1}{x}\right)^2 = 7^2$$

$$x^2 + \frac{1}{x^2} + 2(x)\left(\frac{1}{x}\right) = 49$$

$$x^2 + \frac{1}{x^2} = 49 - 2$$

$$x^2 + \frac{1}{x^2} = 47$$

**34. If $\sqrt{6561} = 81$, then the value of $\sqrt{(6561)} + \sqrt{65.65} + \sqrt{0.006561}$**

a. 81

b. 891.81

c. 89.181

d. 8.9181

**Ans: c**

$$\sqrt{6561} = 81$$

$$\sqrt{65.61} = 8.1$$

$$\sqrt{0.006561} = 0.081$$

$$\sqrt{(6561)} + \sqrt{65.65} + \sqrt{0}.006561 = 89.181$$

**35. 1.6666 expressed as a fraction is**

a. 16/10

b. 16/9

c. 5/3

d. 4/8

**Ans: c**

From option,

(5/3) = 1.66666

(16/9) = 1.7777

(16/10) = 1.6

(4/8) = 0.5

**36. Find quadratic equation whose root are $2 + \sqrt{7}$ & $2 - \sqrt{7}$**

a. $x^2+4x+3$

b. $x^2-4x+3$

c. $x^2-4x-3$

d. $x^2+4x-3$

**Ans: c**

$$\alpha = 2 + \sqrt{7} \, \& \, \beta = 2 - \sqrt{7}$$

$X^2$-(α+β) x + αβ

$$= x^2 - (2 + \sqrt{7} + 2 - \sqrt{7})x + (2 + \sqrt{7})(2 - \sqrt{7})$$

$$= x^2 - 4x + (4 + 2\sqrt{7} - 2\sqrt{7} - 7)$$

$$= x^2 - 4x + (4 - 7)$$

$$= x^2 - 4x - 3$$

**37. Simplify** $\frac{1}{1+\sqrt{2}} + \frac{1}{\sqrt{2} + \sqrt{3}} + \cdots \ldots \ldots + \frac{1}{\sqrt{99} + \sqrt{100}}$

a. 9

b. $\sqrt{9}$

c. 81

d. $\sqrt{99}$

**Ans: a**

If all the signs are (+), then

Last term – first term = $\sqrt{100} - 1 = 10 - 1 = 9$

**38. If** $x + \frac{1}{x} = 3$ **, then find the value of** $x^5 + \frac{1}{x^5}$

a. 3

b. 123

c. 81

d. $3^5$

**Ans: b**

$Z^5$-5(2³) + 5(Z)

$3^5$-5(3³) + 5(3) = 245 – 135 +15

=123

**39. $a^2-b^2=117$, $ab = 54$, then find the value of $\frac{a-b}{a+b}$**

a. 15/3

b. 31/5

c. 3/15

d. 5/31

**Ans: c**

$$\frac{(a-b)^2}{(a+b)^2} = \frac{a^2+b^2-2ab}{a^2+b^2+2ab}$$

$$\frac{(a-b)^2}{(a+b)^2} = \frac{a^2+b^2-2ab}{a^2+b^2+2ab} = \frac{117-2(54)}{117+2(54)}$$

$$= \frac{117-108}{117+108}$$

$$= \frac{9}{225}$$

$$\frac{(a-b)}{(a+b)} = \sqrt{\left(\frac{9}{225}\right)}$$

$$\frac{(a-b)}{(a+b)} = \frac{3}{15}$$

**40. The sum of x, x+3, x+6, x+9, x+12 is 60, then the value of x is**

a. 32

b. 6

c. 8

d. 9

**Ans: b**

From option, x=6

6, 6+3, 6+6, 6+9, 6+12 = 60

6+9+12+15+18 = 60

60 =60

**41. Simplify $(100)^{½}$ X $(0.008)^{1/3}$ - $(0.0016)^{¼}$ X $3°$ -1$(5/4)^{-1}$**

a. 0

b. 1

c. 2

d. 3

**Ans: b**

$(100)^{½}$ X $(0.008)^{1/3}$ - $(0.0016)^{¼}$ X $3°$ -1$(5/4)^{-1}$

= 10 X 0.2 -0.2 X 1 + (4/5)

= 2-0.2 + 0.8

= 2-1 = 1

**42. If $\left\{ 4 - \dfrac{5}{1+\dfrac{1}{3+\dfrac{1}{2+\frac{1}{4}}}} \right\}^{th}$ part of a journey takes 10 minutes, then to complete $(3/4)^{th}$ of that journey , it will take ?**

a. 1hr

b. 1.2hr

c. 55min

d. 57min

**Ans: a**

$$4 - \frac{5}{1 + \dfrac{1}{\dfrac{27 + 4}{9}}} = 4 - \frac{5}{1 + \dfrac{9}{31}}$$

$$= 4 - \frac{\frac{5}{40}}{31}$$

$$= 4 - \left(5 \, X \, \frac{31}{40}\right)$$

$$= 4 - \frac{31}{8}$$

$$= \frac{32 - 31}{8}$$

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

Time taken to complete $(1/8)^{th}$ part = 10min

Time taken to complete $(3/4)^{th}$ part = 10 X 8 X (3/4)

= 20 X 3

= 60min

=1hr

43. **The least number that should be subtracted from the number 32145 to make it a perfect square is?**

a. 103

b. 105

c. 104

d. 108

**Ans: c**

$$\sqrt{32145} > 179$$

179 X 179 = 32041

32145 – 32041 = 104

44. **Each member of a group contributes us much rupees as much paise as the number of members of the group. If their total contribution is Rs.3 636, the number of members of the club is?**

a. 60

b. 36

c. 90

d. 120

**Ans: a**

$$\frac{10x^2 + x^2}{100} = 3636$$

$$101x^2 = 363600$$

$$x^2 = \frac{363600}{101} = 3600$$

$$x^2 = 3600$$

$$x = \sqrt{3600}$$

= 6 X 10

= 60

45. **The product of two positive integers is 4608 and one of them is twice the other, then the smallest number is?**

a. 48

b. 96

c. 42

d. 84

**Ans: a**

Smallest number = x

Larger number = 2x

$x$ x $2x$ = 4096

$2x^2$ = 4096

$X^2$ = 4096/2 = 2304

x = 48

46. **Perfect square numbers between 48 and 1000**

    a. 23

    b. 24

    c. 25

    d. 21

    **Ans: c**

        $7^2$ to $31^2$

        = (31-7) + 1

        = 24 + 1

        = 25

47. **If + means X, X means -, ÷ means +, - means ÷, then what will be the value of the following expression 9+3 ÷4-8X2 =?**

    a. 3/4

    b. 4/3

    c. 25

    d. 52

    **Ans:  c**

        = 9X3 + 4 ÷ 8-2

        = 9X3+(1/2)-2

        = 27 + (1/2)-2

=(54/2)-2

=(54-4)/2

=50/2

=25

**48.If ($n^x$ – pn +1/4) be a perfect square, then the value of p is**

a. ±2

b. 1.2

c. 2.3

d. ±1

**Ans:d**

To be a perfect square, r = 2 , t = ±1

$n^2$-n+(1/4) = $n^2$ –2n - (1/2) + (1/4)

= $(n- (1/2))^2$

$n^2$+n+(1/4) = $n^2$+2n.1/2 + ¼

= $(n+(1/2))^2$

**49.The value of $\left(2 - \frac{1}{n+1}\right) + \left(2 - \frac{2}{n+1}\right) + \left(2 - \frac{3}{n+1}\right) + \cdots \ldots + \left(2 - \frac{n}{n+1}\right)$**

a. (1/2)n

b. (2/3)n

c. 2n

d. (3/2)n

**Ans: d**

$$2n - \left(\frac{1}{n+1} + \frac{2}{n+1} + \frac{3}{n+1} + \cdots + \frac{n}{n+1}\right)$$

$$2n - \frac{1+2+3+\cdots+n}{n+1}$$

$$= 2n - \frac{n(n+1)}{2(n+1)}$$

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

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

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

# PREVIOUS YEAR QUESTIONS

1. **Let** $x = 1 + \cfrac{1}{1 + \cfrac{1}{1 + \cfrac{1}{1 + \cdots \infty}}}$**, which of the following is correct?**

   a. $x^2 + x + 1$

   b. $x^2 - x + 1$

   c. $x^2 + x - 1$

   **d. $x^2 - x - 1$**

2. **7/5 of 58+ 3/8 of 139.2?**

   **a. 133.4**

   b. 137.2

   c. 127.8

   d. 131.6

3. **The value of** $\sqrt{\left(10 + \sqrt{\left(25 + \sqrt{\left(108 + \sqrt{\left(154 + \sqrt{(225)}\right)}\right)}\right)}\right)}$

   **a. 4**

   b. 6

c. 8

d. 10

4. **Find the value of $1000^9 \div 10^{24}$**

    a. 10000

    **b. 1000**

    c. 100

    d. 10

5. $1 \div \left(\frac{5}{7} of 6\frac{3}{10}\right) - \frac{2}{9}$ *is*

    a. 1

    **b. 0**

    c. 2

    d. 1/2

6. **If $\frac{13^3 + 7^3}{169 + 49 - x} = 20$, then the value of x is?**

    a. 6

    b. 20

    **c. 91**

    d. 42

7. **Find the value of $\left(\frac{-1}{216}\right)^{\frac{2}{3}}$**

    **a. 36**

    b. - 36

    c. 1/36

    d. -1/36

8. The simplest form of $\left(\frac{9}{115}\right)$ is

   a. 2/3

   b. 2/5

   c. 3/5

   **d. 4/5**

9. Which is true for the statements?
   1. The degree of the polynomial is the highest power of the variable involved in the term
   2. The GCD of co-prime factor is 1
   3. The LCM of ab, bc, ca is abc
   4. One is a prime number

   **a. 1,2,3**

   b. 1,2,4

   c. 2,3,4

   d. all

10. Simplify 1 hectare : 150m²

    **a. 200: 3**

    b. 2000: 3

    c. 20: 3

    d. 2: 3

11. Simplify $\sqrt{48} - 3\sqrt{108} + 2\sqrt{27} + \sqrt{192}$

    a. $\sqrt{3}$

    **b. 0**

    c. $2\sqrt{3}$

    d. $3\sqrt{3}$

12.Simplify $\left(147 + \frac{1}{42}\right)^2 - \left(147 - \frac{1}{42}\right)^2$

   a. 7

   b. 5

   c. 147

   **d. 14**

13.Simplify $\left(\sqrt{2} + 1\right)^5 + \left(\sqrt{2} - 1\right)^5$

   a. $52\sqrt{2}$

   b. $50\sqrt{2}$

   c. $56\sqrt{2}$

   d. $58\sqrt{2}$

14.Simplify $\sqrt[4]{81} + \sqrt[3]{216} + 5\sqrt{32}$ =?

   a. 10

   **b. 11**

   c. 9

   d. 4

15.$39852 \div \sqrt{?} = 81 X 12$

   a.41

   **b.1681**

   c.1849

   d.43

16. Simplify $\dfrac{(9.8)^3-(6.8)^3}{(9.8)^2+9.8 \, X \, 6.8+(6.8)^2}$

    a. 0

    b. 1

    c. 2

    **d. 3**

17. Which of the following is/are true?

    **1. (-2,-7) is a point in IV quadrant**

    **2. (0,3) is a point on X-axis**

    **3. (-5,2) lies to the left of y axis**

    **4. (5,2) and (-7,2) are the points on line parallel to y axis**

    a. 2 and 3

    **b. 3 only**

    c. 2,3,4

    d. 1 and 2

18. Find the value of $\dfrac{\sqrt[3]{729}-\sqrt[3]{27}}{\sqrt[3]{512}+\sqrt[3]{343}}$

    a. 5/3

    b. 3/5

    c. 5/2

    **d. 2/5**

19. If a and b ar3 two non-zero rational numbers and $\frac{2+\sqrt{3}}{2-\sqrt{3}} = a + b\sqrt{3}$, then the value of b is?

   **a. 4**

   b. 7

   c. 6

   d. 8

20. Which of the following shows the highest percentage?

   a. 384/540

   **b. 425/500**

   c. 570/700

   d. 480/660