

CA FOUNDATION

QUANTITATIVE APTITUDE



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PREFACE

“Even coal turns into diamond under extreme pressure. Its your time to decide what you wish to become in life – to remain mere coal or become precious diamond.”

I feel great pride in presenting before you the thoroughly updated Third Edition of the book “CA Foundation – Quantitative Aptitude” for New Syllabus. All the previous versions of this book have received great appreciation from my students. Key features of this book are:

1. The book is prepared based on ICAI’s revised module with updated syllabus for those appearing in CA Foundation January 2025 examination under new scheme. It covers extracts from ICAI module, MTP, Student Journal and past examination papers.
2. This book is useful for last-day revision as well – It contains summary of every chapter along with important tips which is helpful for quick and easy reference to students. Space has been provided at the end of the book for students to note additional revision points.
3. Having mentored more than 45 batches of CA Foundation course over years, it becomes easy for me to step in the shoes of students. It is suggested to revise concepts of each chapter atleast 3 times before you appear for examination.

I thank Yesnas Academy and its team members for the valuable support extended while publishing this material. This book is developed in a manner which is student friendly, understandable and helpful.

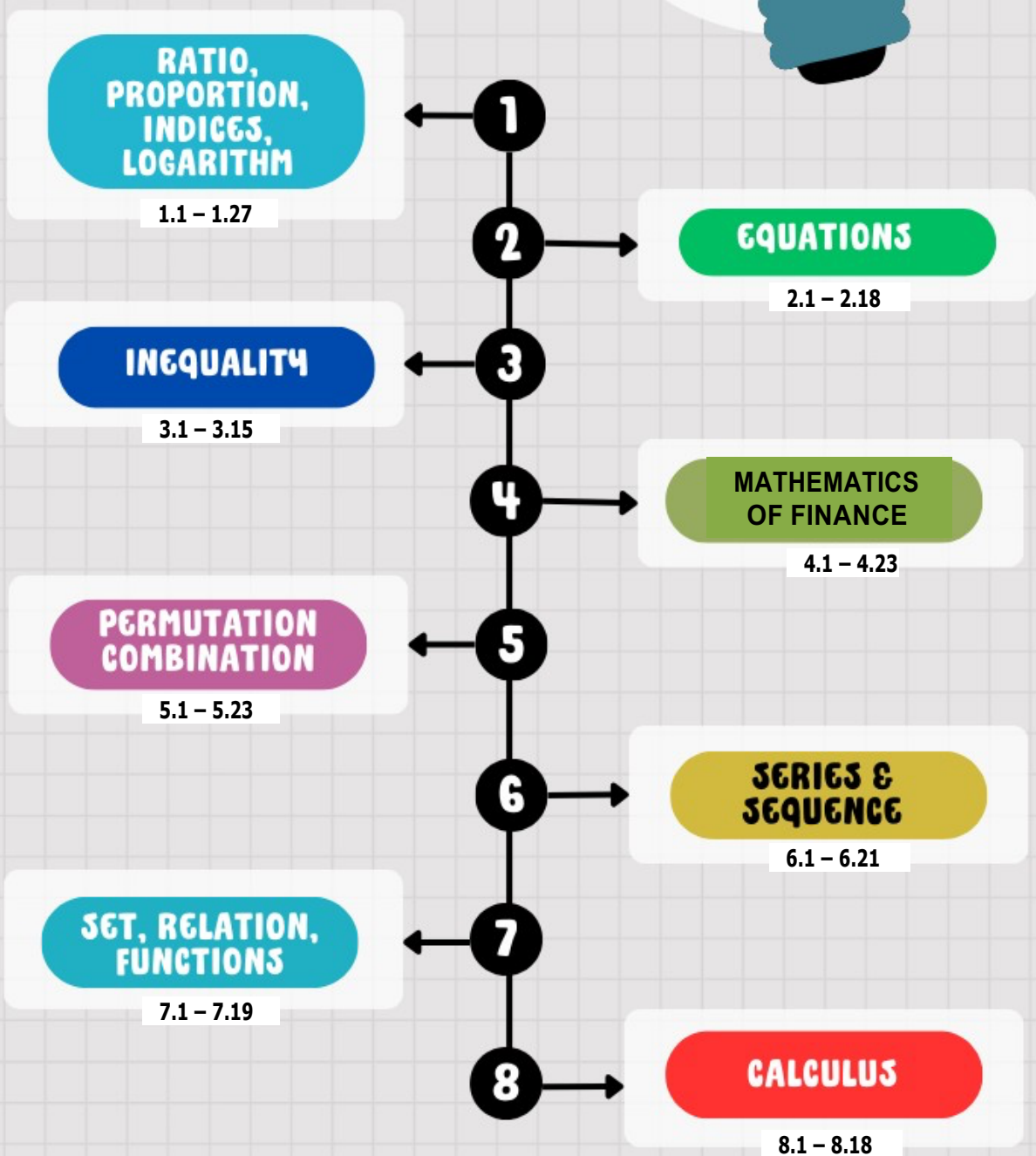
I hope this book will be of great use in your exam preparation. Your valuable suggestions and constructive feedback will be greatly acknowledged.

Warm regards from your friend and mentor,
CA Subhadra Aithal

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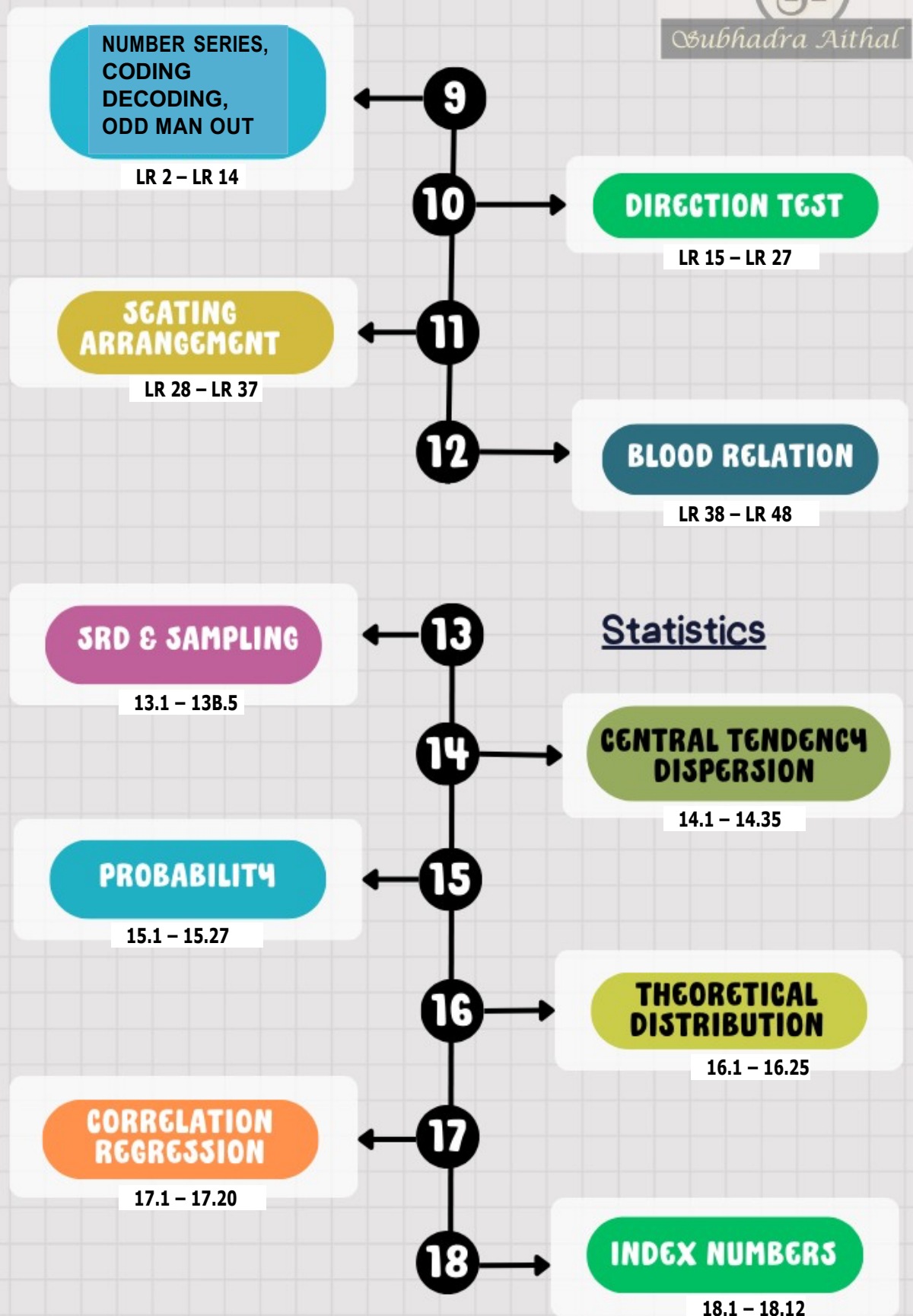
Business Mathematics



Logical Reasoning



Subhadra Aithal



Statistics

REVISION ROADMAP

Sl	CHAPTER	1 st reading	Revise – ICAI material	Unit test preparation	Scanner	Mock test
	Achievement	First attempt pass			60-85	85-100
1	RATIO-PROPORTION, INDICES, LOGARITHMS					
2	EQUATIONS					
3	INEQUALITIES					
4	MATHEMATICS OF FINANCE					
5	PERMUTATIONS COMBINATIONS					
6	SEQUENCE AND SERIES					
7	SETS, RELATIONS AND FUNCTIONS, LIMITS, CONTINUITY					
8	CALCULUS					
9	NUMBER SERIES					
10	DIRECTION TEST					
11	SEATING ARRANGEMENTS					
12	BLOOD RELATIONS					
13	STATISTICAL REPRESENTATION OF DATA AND SAMPLING					
14	CENTRAL TENDENCY - DISPERSION					
15	PROBABILITY					
16	THEORETICAL DISTRIBUTION					
17	CORRELATION REGRESSION					
18	INDEX NUMBERS					

CHAPTER - 1

RATIO, PROPORTION, INDICES & LOGARITHM

UNIT - I : RATIO

- A **ratio** is the comparison of the sizes of two or more quantities of the same kind with the help of fraction. In other words, ratio defines the relationship between two quantities.
- If a and b are two quantities of the same kind (in same units), then the fraction a/b is called the ratio of a to b. The sign used to denote a ratio is ' : '. It is written as **a : b**
- Both terms of a ratio can be multiplied or divided by the same number.
- In the terms of the ratio,
 - a is called the first term or **antecedent**
 - b is called the second term or **consequent**

POINTS TO REMEMBER

- The order of the terms in a ratio is important. 3 : 4 is not same as 4 : 3
- Ratio exists only between quantities of **same kind** - Quantities to be compared (by division) must be in the same units.
- To compare two ratios, convert them into equivalent like fractions. For example, to find which ratio is greater between $2\frac{1}{3} : 3\frac{1}{3}$; 3.6 : 4.8
- If a quantity 'N' increases or decreases in the ratio a : b, then, new quantity = $N * b/a$

TYPES OF RATIO

- | | |
|---------------------------------------|---|
| • $a^2 : b^2$ is the duplicate ratio | • $\sqrt{a} : \sqrt{b}$ is the sub-duplicate ratio |
| • $a^3 : b^3$ is the triplicate ratio | • $\sqrt[3]{a} : \sqrt[3]{b}$ is the sub-triplicate ratio |
- $a > b$ or $a/b > 1$ is ratio of greater inequality

PRACTICE QUESTIONS

1. Write the ratio in simplest form:

a. 12 : 16

b. 150 gm : 2 kg

c. 25 min : 45 sec

d. $1/3 : 1/8 : 1/6$

2. There are 20 girls and 15 boys in a class. What is the ratio of the number of girls to the total number of students in the class?

3. Fill in the blanks: $15 / 18 = \square / 6 = 10 / \square = \square / 30$

4. In a year, Seema earns ₹ 1,50,000 and saves ₹ 50,000. Find the ratio of money that she saves to the money she spends.

5. Cost of a dozen ink pens is ₹ 180, and the cost of 8 ball pens is ₹ 56. Find the ratio of the cost of an ink pen to the cost of a ball pen.

6. Present age of the father is 42 years, and that of his son is 14 years. Find the ratio of age of the father to the age of the son, when the son was 12 years old.

EXERCISE 1 (A)

Choose the most appropriate option (a) (b) (c) or (d)

1.	The inverse ratio of 11 : 15 is
	(a) 15 : 11 (b) $\sqrt{11} : \sqrt{15}$ (c) 121 : 225 (d) none of these
2.	The ratio of two quantities is 3 : 4. If the antecedent is 15, the consequent is
	(a) 16 (b) 60 (c) 22 (d) 20
3.	The ratio of the quantities is 5 : 7. If the consequent of its inverse ratio is 5, the antecedent is
	(a) 5 (b) $\sqrt{5}$ (c) 7 (d) none of these
4.	The ratio compounded of 2 : 3, 9 : 4, 5 : 6 and 8 : 10 is
	(a) 1 : 1 (b) 1 : 5 (c) 3 : 8 (d) none of these
5.	The duplicate ratio of 3 : 4 is
	(a) $\sqrt{3} : 2$ (b) 4 : 3 (c) 9 : 16 (d) none of these
6.	The sub-duplicate ratio of 25 : 36 is
	(a) 6 : 5 (b) 36 : 25 (c) 50 : 72 (d) 5 : 6
7.	The triplicate ratio of 2 : 3 is
	(a) 8 : 27 (b) 6 : 9 (c) 3 : 2 (d) none of these
8.	The sub-triplicate ratio of 8 : 27 is
	(a) 27 : 8 (b) 24 : 81 (c) 2 : 3 (d) none of these
9.	The ratio compounded of 4 : 9 and the duplicate ratio of 3 : 4 is
	(a) 1 : 4 (b) 1 : 3 (c) 3 : 1 (d) none of these
10.	$\frac{3x-2}{5x+6}$ is the duplicate ratio of 2 / 3 then find the value of x :
	(a) 2 (b) 6 (c) 5 (d) 9
11.	The ratio compounded of duplicate ratio of 4 : 5, triplicate ratio of 1 : 3, sub duplicate ratio of 81 : 256 and sub-triplicate ratio of 125 : 512 is

	(a) 4 : 512	(b) 3 : 32	(c) 1 : 12	(d) none of these
12.	The ratio of two numbers is 7 : 10 and their difference is 105. The numbers are			
	(a) (200, 305)	(b) (185, 290)	(c) (245, 350)	(d) none of these
13.	Two numbers are in the ratio 2 : 3. If 4 be subtracted from each, they are in the ratio 3 : 5. The numbers are			
	(a) (16, 24)	(b) (4, 6)	(c) (2, 3)	(d) none of these
14.	The angles of a triangle are in ratio 2 : 7 : 11. The angles are			
	(a) (20, 70, 90)	(b) (30, 70, 80)	(c) (18, 63, 99)	(d) none of these
15.	Division of Rs. 324 between X and Y is in the ratio 11 : 7. X & Y would get Rupees			
	(a) (204, 120)	(b) (200, 124)	(c) (180, 144)	(d) none of these
16.	A person has assets worth Rs. 1,48,200. He wish to divide it amongst his wife, son and daughter in the ratio 3 : 2 : 1 respectively. From these assets, the share of his son will be:			
	(a) 24700	(b) 49400	(c) 74100	(d) none of these
17.	P, Q and R are three cities. The ratio of average temperature between P and Q is 11 : 12 and that between P and R is 9 : 8. The ratio between the average temperature of Q and R is			
	(a) 22 : 27	(b) 27 : 22	(c) 32 : 33	(d) none of these
18.	If $x : y = 3 : 4$, the value of $x^2y + xy^2 : x^3 + y^3$ is			
	(a) 13 : 12	(b) 12 : 13	(c) 21 : 31	(d) none of these
19.	If $a : b = 3 : 4$, the value of $(2a+3b) : (3a+4b)$ is			
	(a) 54 : 25	(b) 8 : 25	(c) 17 : 24	(d) 18 : 25
20.	If $a:b = 2:3$, $b:c = 3:4$ then $a:c =$			
	(a) 2:3	(b) 3:4	(c) 1:2	(d) none of these
21.	If $p : q = 2 : 3$ and $x : y = 4 : 5$, then the value of $5px + 3qy : 10px + 4qy$ is			
	(a) 71 : 82	(b) 27 : 28	(c) 17 : 28	(d) none of these
22.	The number which when subtracted from each of the terms of the ratio 19 : 31 reducing it to 1 : 4 is			
	(a) 15	(b) 5	(c) 1	(d) none of these
23.	Daily earnings of two persons are in the ratio 4:5 and their daily expenses are in the ratio 7 : 9. If each saves Rs 50 per day, their daily earnings in Rs are			

	(a) (40, 50)	(b) (50, 40)	(c) (400, 500)	(d) none of these
24.	The incomes of A and B are in the ratio 3 : 2 and their expenditures in the ratio 5 : 3. If each saves ₹ 1,500, then B's income is:			
	(a) 6000	(b) 4500	(c) 3000	(d) 7500
25.	Monthly incomes of two persons Hrithik and Kangana are in the ratio 5:7 and their monthly expenditures are in the ratio 7:11. If each of them saves Rs.60 per month. Find their monthly income.			
	(a) 280, 440	(b) 200,280	(c) 350, 410	(d) 700,100

UNIT - II : PROPORTIONS

	<u>INTRODUCTION:</u>
•	An equality of two ratios is called a proportion .
•	Four quantities a, b, c, d are said to be in proportion if $a:b = c:d$ OR $a:b :: c:d$ <ul style="list-style-type: none"> • First and fourth terms are called extremes (or extreme terms). • Second and third terms are called means (or middle terms).
•	If $a : b = c : d$ then d is called fourth proportional
•	If $a : b = c : d$ are in proportion then $a/b = c/d$ i.e. $ad = bc$. i.e. product of extremes = product of means. This is called cross product rule .
•	If a, b, c are in continuous proportion, then <ul style="list-style-type: none"> ▪ the middle term b is called the mean proportional - b is mean proportional between a and c, then $b^2 = ac$ i.e. $b = \sqrt{ac}$. ▪ a is the first proportional and ▪ c is the third proportional.
•	In a ratio $a : b$, both quantities must be of the same kind while in a proportion $a : b = c : d$, all four quantities need not be of the same type . The first two quantities should be of the same kind and last two quantities should be of the same kind.
•	$a = b$ or $a/b = 1$ is ratio of equality
Ex. 1	Find the mean proportion between 1.25 and 1.8.
Sol.:	

Ex. 2	If, then what is $\frac{a}{3} = \frac{b}{3} = \frac{c}{7}$ then what is $\frac{a+b+c}{c} =$
Sol.:	

Properties of Proportion

- ✓ Cross – multiplication: If $a : b = c : d$, then $ad = bc$
- ✓ Invertendo: If $a : b = c : d$, then $b : a = d : c$
- ✓ Alternendo: If $a : b = c : d$, then $a : c = b : d$
- ✓ Componendo: If $a : b = c : d$, then $a + b : b = c + d : d$
- ✓ Dividendo: If $a : b = c : d$, then $a - b : b = c - d : d$
- ✓ Componendo and Dividendo: If $a : b = c : d$, then $a + b : a - b = c + d : c - d$
- ✓ Addendo: If $a : b = c : d = e : f = \dots\dots\dots$, then each of these ratios (Addendo) is equal $(a + c + e + \dots\dots\dots) : (b + d + f + \dots\dots\dots)$
- ✓ Subtrahendo: If $a : b = c : d = e : f = \dots\dots\dots$, then each of these ratios (Addendo) is equal $(a - c - e - \dots\dots\dots) : (b - d - f - \dots\dots\dots)$

Ex. 3	If $a : b = c : d = 2.5 : 1.5$, then what are the values of
	a) $ad : bc$
	b) $a + c : b + d$
Ex. 4	Rohith buys some rice at Rs. 10.40 per kg. He mixes it with some rice having price Rs. 8.8 per kg. The final mixture becomes 15kg in weight and with total worth Rs. 146.40. What is the quantity of rice priced at Rs. 8.8 per kg?
Sol.:	

EXERCISE 1 (B)

Choose the most appropriate option (a) (b) (c) or (d)

1.	The fourth proportional to 4, 6, 8 is			
	(a) 12	(b) 32	(c) 48	(d) none of these
2.	The third proportional to 12, 18 is			
	(a) 24	(b) 27	(c) 36	(d) none of these
3.	The mean proportional between 25, 81 is			
	(a) 40	(b) 50	(c) 45	(d) none of these
4.	The number which has the same ratio to 26 that 6 has to 13 is			
	(a) 11	(b) 10	(c) 21	(d) none of these
5.	The fourth proportional to $2a$, a^2, c is			
	(a) $ac/2$	(b) ac	(c) $2/ac$	(d) none of these
6.	If four numbers $1/2$, $1/3$, $1/5$, $1/x$ are proportional then x is			
	(a) $6/5$	(b) $5/6$	(c) $15/2$	(d) none of these
7.	The mean proportional between $12x^2$ and $27y^2$ is			
	(a) $18xy$	(b) $81xy$	(c) $8xy$	(d) none of these
	(Hint: Let z be the mean proportional and $z = \sqrt{12x^2 \text{ and } 27y^2}$)			
8.	The mean proportional between 1.4 gms and 5.6 gms is			
	(a) 28 gms	(b) 2.8 gms	(c) 3.2 gms	(d) none of these
9.	If $A = B/2 = C/5$, then $A : B : C$ is			
	(a) $3 : 5 : 2$	(b) $2 : 5 : 3$	(c) $1 : 2 : 5$	(d) none of these
10.	If $a/3 = b/4 = c/7$, then $a + b + c/c$ is			
	(a) 1	(b) 3	(c) 2	(d) none of these

11.	If $p/q = r/s = 2.5/1.5$, the value of $ps : qr$ is			
	(a) $3/5$	(b) $1:1$	(c) $5/3$	(d) none of these
12	If $x : y = z : w = 2.5 : 1.5$, the value of $(x + z)/(y + w)$ is			
	(a) 1	(b) $3/5$	(c) $5/3$	(d) none of these
13	If $(5x - 3y)/(5y - 3x) = 3/4$, the value of $x : y$ is			
	(a) $2 : 9$	(b) $7 : 2$	(c) $7 : 9$	(d) none of these
14	If $A : B = 3 : 2$ and $B : C = 3 : 5$, then $A : B : C$ is			
	(a) $9 : 6 : 10$	(b) $6 : 9 : 10$	(c) $10 : 9 : 6$	(d) none of these
15	If $x/2 = y/3 = z/7$, then the value of $(2x - 5y + 4z)/2y$ is			
	(a) $6/23$	(b) $23/6$	(c) $3/2$	(d) $17/6$
16	If $x : y = 2 : 3$, $y : z = 4 : 3$ then $x : y : z$ is			
	(a) $2 : 3 : 4$	(b) $4 : 3 : 2$	(c) $3 : 2 : 4$	(d) none of these
17	Division of Rs 750 into 3 parts in the ratio $4 : 5 : 6$ is			
	(a) (200, 250, 300)	(b) (250, 250, 250)	(c) (350, 250, 150)	(d) $8 : 12 : 9$
18	The sum of the ages of 3 persons is 150 years. 10 years ago their ages were in the ratio $7 : 8 : 9$. Their present ages are			
	(a) (45, 50, 55)	(b) (40, 60, 50)	(c) (35, 45, 70)	(d) none of these
19	The numbers 14, 16, 35, 42 are not in proportion. The fourth term for which they will be in proportion is			
	(a) 45	(b) 40	(c) 32	(d) none of these
20	If $x/y = z/w$, implies $y/x = w/z$, then the process is called			
	(a) Dividendo	(b) Componendo	(c) Alternendo	(d) none of these
21	If $p/q = r/s = p - r/q - s$, the process is called			
	(a) Subtrahendo	(b) Addendo	(c) Invertendo	(d) none of these
22.	If $a/b = c/d$, implies $(a + b)/(a - b) = (c + d)/(c - d)$, the process is called			
	(a) Componendo	(b) Dividendo	(c) Componendo and Dividendo	(d) none of these

23	If $u/v = w/p$, then $(u - v)/(u + v) = (w - p)/(w + p)$. The process is called
	(a) Invertendo (b) Alternendo (c) Addendo (d) none of these
24	12, 16, *, 20 are in proportion. Then * is
	(a) 25 (b) 14 (c) 15 (d) none of these
25	4, *, 9, $13\frac{1}{2}$ are in proportion. Then * is
	(a) 6 (b) 8 (c) 9 (d) none of these
26	If $\frac{a}{4} = \frac{b}{5} = \frac{c}{9}$ then $\frac{a+b+c}{c}$ is
	(a) 4 (b) 2 (c) 7 (d) none of these.
27.	Two numbers are in the ratio 3 : 4; if 6 be added to each terms of the ratio, then the new ratio will be 4 : 5, then the numbers are
	(a) 14, 20 (b) 17, 19 (c) 18 and 24 (d) none of these
28	If $\frac{a}{4} = \frac{a}{5}$ then
	(a) $\frac{a+4}{a-4} = \frac{b-5}{b+5}$ (b) $\frac{a+4}{a-4} = \frac{b+5}{b-5}$ (c) $\frac{a-4}{a+4} = \frac{b-5}{b+5}$ (d) none of these
29	If $a : b = 4 : 1$ then $\sqrt{\frac{a}{b}} + \sqrt{\frac{b}{a}}$ is
	(a) $5/2$ (b) 4 (c) 5 (d) none of these

UNIT III: INDICES

INTRODUCTION

If n is a positive integer, and ' a ' is a real number, product of ' a ' for n times (n = factor) is

$$a^n = a \times a \times a \dots \text{upto } n \text{ factors}$$

Here, base is " a " and the index or power is " n ".

For example, in $3 \times 3 \times 3 \times 3 = 3^4$, 3 is the base and 4 is the index or power

Ex. 1

Find x , if $x \sqrt{x} = (x \sqrt{x})^x$.

Sol.:**Laws of Indices**

$$1) a^m \times a^n = a^{m+n} \text{ (Base must be same)}$$

$$2) a^m / a^n = a^{m-n}, \text{ when } m > n.$$

$$3) (a^m)^n = a^{mn}$$

$$4) a^0 = 1$$

$$5) a^{-m} = \frac{1}{a^m}$$

$$1/a^{-m} = a^m$$

$$6) \text{ If } a^x = a^y, \text{ then } x = y$$

$$7) \text{ If } x^a = y^a, \text{ then } x = y$$

$$\sqrt[m]{a} = a^{\frac{1}{m}},$$

$$\sqrt{x} = x^{\frac{1}{2}},$$

$$\sqrt{4} = (2^2)^{1/2} = 2^{1/2 \times 2} = 2$$