QUANTITATIVE APTITUDE

BASIC MATH SHORTCUTS
- SPEED CALCULATION

BASIC MATH SHORTCUT TRICKS

The knowledge on Basic Math Shortcut Tricks and practicing those sincerely shall enable you to minimize time duration for any sort of calculation within a few seconds. This will support you to cover maximum number of questions Quantitative Aptitude subject in any competitive Examination thus resulting high scoring of marks in the paper.

Before going in detail, the students are advised to memorize and ensure of following facts at their end.
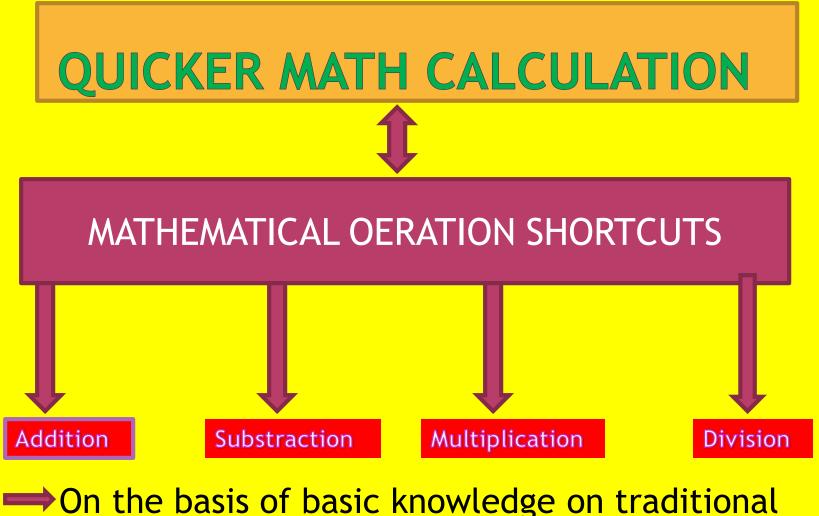
BASIC ACTIVITY

❖ Basic knowledge on different types of numbers such as whole numbers, integers, rational numbers, real numbers, odd numbers, even numbers and prime numbers etc.

❖ Knowledge on all mathematical operations i.e addition, subtraction multiplication and division etc

BASIC MATH TRICKS

❖ Keeping following things always in memory

◉ Multiplication table up to 30

◉ Square of numbers upto 25

◉ Cubes of numbers up to 10

◉ Square root of the numbers up to 10

◉ Cube root upto number 10

◉ All basic formulae on Algebra as follows
$(a+b)^2$, $(a-b)^2$, $(a+b+c)^2$, (a^2-b^2), $(a+b)^3$, $(a-b)^3$, (a^3+b^3) and (a^3-b^3) etc.

QUICKER MATH CALCULATION

MATHEMATICAL OERATION SHORTCUTS

Addition   Substraction   Multiplication   Division

➡ On the basis of basic knowledge on traditional mathematical operation, we may proceed for several math tricks.

ADDITION SHORTCUTS

Types of Addition Shortcuts:
- ✓ Addition of similar digit numbers
- ✓ Addition of similar digit decimal numbers
- ✓ Sum of numbers without decimal in first number
- ✓ Sum of numbers without decimal in second number
- ✓ Addition of common difference in a series of numbers

ADDITION SHORTCUT TRICKS

- ✓ Sum of all consecutive numbers starting from 1
- ✓ Addition of consecutive numbers
- ✓ Sum of all odd numbers starting from 1
- ✓ Addition combination of decimal and whole numbers

EXAMPLES

- 7+77+777+7777+77777+777777=?

Sol:7(1+2+3+4+5+6)=7x123456=864192

- 0.5+0.55+0.555+0.5555=?

Sol:5(0.1+0.11+0.111+0.1111)=5x0.4321=2.1605

- 270+89=?

Sol:270+(89+1)-1=359

- 219+20=?

Sol:(219+1)+20-1=239

- 17+27+37+47+57=?

Sol:(17+57)x5/2=185

EXAMPLES

- 1+2+3+4+5+6+7+8+9+11+12=?

Sol:12x13/2=78

- 23+24+25+26+27+28+29=?

Sol:(23+29)x7/2=182

- Sum of all odd number starting from1 to 60?

Sol:$(60/2)^2=30^2=900$

- 7.7+7.77+7.777+7.7777+7.77777+7.777777=?

Sol:7x6+7X0.654321=42+4.580247=46.580247

MULTIPLICATION SHORTCUTS

* Multiplication of two digit numbers
* Multiplication of three digit number with two digit number
* Multiplication of three digit numbers
* Multiplication of four digit numbers with two digit numbers
* Multiplication of a numbers range below 50
* Multiplication of numbers range above 50 and below 100
* Multiplication of three digit numbers range above 100

MULTIPLICATION SHORTCUTS

- ❖ Multiplication of numbers more than 100
- ❖ Multiplication of any two numbers by tabular method
- ❖ Typical 100,200,1000 etc Base Methods
- ❖ Multiplication of number with certain specific numbers such as 5,25,50,125,9,11,13 and 99
- ❖ Miscellaneous special shortcut methods

EXAPLANATION

- 43x64=?

Step 1:Multiply 3x4=12,Note down 2,carry 1

Step 2:Cross multiply 4x4=16 and 3x6=18

Step 3:Add both the result,16+18=34 and the add 1,34+1=35,note 5 and carry 3

Step 4:Multiply 4x6=24 and add 3,24+3=27,then 27,Hence final answer is 2752

calculate mentally as follows,

6x4/(4x4+3x6)/3x4=24/34/12=2752

EXPLANATION

- 356x47=?

Step1: Multiply 7x6=42,Note 2,carry 4

Step 2:Cross multiply 7x5=35 and 6x4=24

Step 3:Add both results,35+24=59,add carry 4

         59+4=63,note 3,carry 6

Step 4:Cross multiply,7x3=21 and 5x4=20

Step 5:Add both the results,21+20=41 and carry 6,41+6=47,note 7 and carry 4

Step 6:Multiply 3x4=12 and add carry4

         12+4=16,hence result is 16732

EXPLANATION

- 347x658=?

Step 1:Multiply 7x8=56,note 6 and carry 5

Step 2:Cross multiply 4x8=32 and 7x5=35

Step 3:Add the results,32+35=67, add carry 5

      67+5=72,Note 2,carry 7

Step 4:Cross multiply,3x5=15 and 4x6=24

Step 5:Add the results,25+24=39,add carry 7

      39+6=46,note 6 and carry 4

Step 6:Cross multiply,3x8=24 and 7x6=42

Step 7:Add the both results,24+42=66,add 4

EXPLANATION

66+4=70,note 0,carry 7

Step 8:Multiply 3x6=18 and carry 7,18+7=25

Hence, the result is 25026

- 4256x57=?

Step1:Multiply 7x6=42,note 2,carry 4

Step 2:Cross multiply 5x6=30 and 5x7=35

Step 3:Add the above two results,30+35=65 and add carry 4,65+4=69,note 9 and carry 6

Step 4:Cross multiply 2x7=14 and 5x5=25

Step 5:A the above two results,14+25=39 and

EXPLANATION

Add carry 6,39+6=45,note 5 and carry 4

Step 6:Cross multiply,7x4=28 and 5x2=10

Step 7:Add the above two results,28+10=38
    and add carry 4,38+4=42,note 2 and carry 4

Step 8:Multiply 5x4=20 and add carry 4,
        20+4=24

Hence the result is 242592

EXPLANATION

- 36x47=?

Step 1:Multiply 36 with the 1st digit of 2nd number, i.e 4,36x4=144

Step 2:Add 0 to the extreme right of the result,1440

Step 3:Multiply 36 with the 2nd digit of the second number, i.e 7,36x7=252

Step 4:In final step,add the two results,

1440+252=1692

EXPLANATION

- 93x67=?

Step 1:Multiply 93 with the 1st digit of 2nd number, i.e 6,93x6=558

Step 2:Add 0 to the extreme right of the result,5580

Step 3:Multiply 93 with the 2nd digit of the second number, i.e 7,93x7=651

Step 4:In final step,add the two results, 5580+651=6231

EXPLANATION

- 118x116=?

Step 1:Multiply 118 with 1,118x1=118

Step 2:Add 00 to the extreme right of the result,11800

Step 3:Multiply 118 with 1,118x1=118

Step 4:Add 0 to the extreme right of the result,1180

Step 5:Multiply 118 with 6,118x6=708

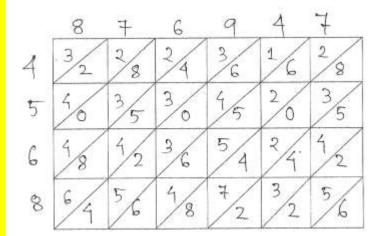Step 6:Add the above results to get the final result,11800+1180+708=13688

EXPLANATION

- 117x109=?

Step 1:First of all substract 100 from both the numbers,117-100=17,109-100=9

Step 2:Mulpiply both the numbers,17x9=153, note 53,carry 1

Step 3:Add the both number with carry 1
17+9+1=27

Step 4:Add 100 with the result,100+27=127

Step 5:Get the final result by writing the noted digit to the right of the result,12753

EXPLANATION

TABULAR METHOD OF MULTIPLICATION SHORTCUT FOR ANY TWO NUMBERS

4568x876947=?

Then, add the numbers in boxes diagonally, with a necessary carryover

Ans. 4005893896

EXPLANATION

MULTIPLICATION BY DIFFERENT BASE METHODS

100 base method:

1)96x95=?

96............-4

95..........-5

96-5=91,4x5=20

Ans.9120

2) 99x98=?

99............-1

98..........-2

99-2=97,1x2=2

Ans:9702

3)88x91=?

88............-12

91............-9

12x9=108

  Carry 1

88-9=79+1=80

Ans.8008

4)104x107=?

104............+4

107............+7

104+7=111,

7x4=28

  Ans.11128

5)96x105=?

96............-4

105......+5

-4x5=-20,100-20=80

96+5=101,101-1=100,

Ans.10080

6)88x109=?

88............-12

109........+9

88+9=97,-108

200-108=92

97-2=95, Ans.9592

EXPLANATION

7)91x103=?   8)109x113=?

91..........x9   109..........x+9

103.......+3   113.........+13

-9x3=27,100-27=73   109+13=122,

91+3=94,94-1=93,   13x9=117

Ans.9373   122+1=123,Ans.12317

200 base method:

9)195x194=?   10)188x191=?

195...........x-5   188.......-12

194...............-6   191.........-9

195-6=189,189x2=378   188-9=179,

-5x-6=30,Ans.37830   179x2=358+1

                       12x9=108,Ans.35908

1000 base Method:

11)992x993=?   12)993x1012=?

992.........-8   993...........-7

993.........-7   1012............+12

992-7=985   993+12=1005,-7x12=84

-8x-7=56,   1000-84=916,1005-1=1004

Ans.98556,   Ans.1004916

EXPLANATION

- Multiplication of number with 5

64x5=?

STEP 1:Multiply the number with 10,64x10=640

Step 2:Divide the result by 2,640/2=320 to get the answer

- Multiplication of the number 25

73x25=?

STEP 1:Multiply the number with 100,73x100=7300

Step 2:Divide the result by 4 to get the answer, 7300/4=1825

EXPLANATION

- Multiplication of the number 50

43x50=?

STEP 1:Multiply the number with 100,43x100=4300

Step 2:Divide the result by 2 to get the answer, 4300/2=2150

Multiplication of the number 125

63x125=?

STEP 1:Multiply the number with 1000

Step 2:Divide the result by 4 to get the answer, 63x000/4=15750

EXPLANATION

- Multiplication of the number 9
- 2137x9=?
- Step 1:Add 0 at end of the number,21370
- Step 2:Sustract number from the above result,21370-2137=19233
- Multiplication of the number 11

1243x11=?

STEP 1:Keep the extreme digits as such.

Step 2:Add sequentially the twin digits from right.

Answer:13673,   85132x11=?   Ans.936452

EXPLANATION

- Multiplication of the number 13

1234x13=?

Step :Put 0 at both sides of the number.012340

Step 2:Multiply with each digit plus succeeding digit, thus begin from left.

4x3+0=12,note 2 carry 1

3x3+4=13+1=14,note 4,carry 1

2x3+3=9+1=10,note 0,carry 1

1x3+2=5+1=6,note 6,

0x3+1=1,note1,Answer:16042

EXPLANATION

- Multiplication of the number 99

78x99=?

Step 1:Multiply the number with 100,78x100=7800

Step 2:Substract the number from the result to get the answer,7800-78=7722

- Multiplication of specific numbers

$84x86=(85-1)(85+1)=85^2-1^2=7225-1=7224$

$81x79=(80+1)(80-1)=80^2-1^2=6400-1=6399$

EXPLANATION

- If two numbers differs by 10 or multiples of 10 and ends with 5

  35x 45=?

Step 1:Add 1 with 1st digit of 2nd number,4+1=5,

Step 2:Multiply the 1st digit of 1st number,5x3=15

Step 3:Extend 75 to the result ,Hence answer is 1575

8+1=9,9x5=45,Ans.4575

- 1st digit of two numbers are same and sum of second digit is 10

EXPLANATION

55x85=?

8+1=9,9x5=45,Ans.4575

- 1st digit of two numbers are same and sum of second digit is 10

81x89=?

Step 1:Increase 1st digit by unity,8+1=9

Step 2:Multiply the result with 1st digit,9x8=72

Step 3:Multiply 2nd digits of numbers,9x1=9

Step 4:Take digit 0,before the single digit result, Answer is 7209

EXPLANATION

- Multiplication of numbers ending with zeros
- 150000x9000=?
- Step 1:Simply multiply non zero digits,15x9=135
- Step 2:Add total zeros to the right of the result,

    Ans.1350000000

DIVISION SHORTCUTS

❖ **DIVISIBILITY TEST SHORTCUT TRICKS**

- Divisibility of a number by 2
- Divisibility of a number by 3
- Divisibility of a number by 4
- Divisibility of a number by 5
- Divisibility of a number by 6
- Divisibility of a number by 8
- Divisibility of a number by 9
- Divisibility of a number by 10
- Divisibility of a number by 11

EXPLANATION

- Divisibility of a number by 13
- Divisibility of a number by 15
- Divisibility of a number by 17
- Divisibility of a number by 19
- Divisibility of a number by 23
- Divisibility of a number by 29
- Divisibility of a number by 31
- Divisibility of a number by 37
- Divisibility of a number by 41
- Divisibility of a number by 43 and 47

EXPLANATION

- A number is divisible by 2 if the last digit of the number is 0 or even number e.g 30,52

- A number is divisible by 3,if the sum digits of the number is divisible by 3,e.g 861,36

- A number is divisible by 4,if the last two digits are 00 or is divisible by 4,e.g 200,728

- A number is divisible by 5,if the last digit is 5 or 0.e.g 860,365

- A number is divisible by 6,if if the number is divisible both by 3 and 2,e.g 984

EXPLANATION

- A number is divisible by 7,if by subtracting 2 times of the last digit from the rest is divisible by 7. e.g 371,1x2=2,37-2=35 which is divisible by 7

- A number is divisible by 8,if the last 3 digits are 000 or is divisible by 8. e.g 21000,24256

In the second no last 3 digits,256/8=32

- A number is divisible by 9,if the sum all digits of the number is divisible by 9,e.g 36,864

6+3=9/9=1,8+6+4=18/9=2

EXPLANATION

- A number is divisible by 10,if the last digit of the number is 0.e.g 860,30

- A number is divisible by 11,if the difference of sum of even places and odd places digit is 0.e.g 1236431460.(1+3+4+1+6)-(2+6+3+4+0)=15-15=0

- A number is divisible by 12,if it divisible by both 3 and 4;e.g 864,(8+6+4)/3 and 4/4=1

- A number is divisible by 13,if by adding 4 times the last digit of remaining leading number is divisible by13.e.g 50661

5066+1x4=5070.→507+4x0=507,50+7x4=78/13

EXPLANATION

- A number is divisible by 15,if the number both divisible by 3 and 5,e.g 870

- A number is divisible by 17,if by subtracting 5 times the last digit from remaining leading truncated number is divisible by 17.e.g.3978

  397-(8x5)=357,35-7x5=0

- A number is divisible by 19,if by adding 2 times the last digit of remaining leading truncated number is divisible by 19.e.g 101156,10115+12=10127,1012+14=1026,

  102+12=114,11+8=19

- A number is divisible by 23,if by adding 7 times the last digit to remaining leading number is divisible by 23.e.g.17043,1704+21=1725,172+35=207,20+49=69

EXPLANATION

- A number is divisible by 29,if by adding 3 times the last digit of remaining leading truncated number is divisible by 29.e.g 15689

  1568+27=1595,159+15=174,17+12=29

- A number is divisible by 31,if by subtracting 3 times the last digit of remaining leading number is divisible by 31.e.g 7998,799-24=775,77-15=62

- A number is divisible by 37,if by subtracting 11 times the last digit of remaining leading number is divisible by 37.e.g 23384,2338-44=2294,229-44=185

EXPLANATION

- A number is divisible by 41,if by subtracting 4 times the last digit of remaining leading number is divisible by 41.e.g 30873,3087-12=3075,307-20=287;28-28=0

- A number is divisible by 43,if by adding 13 times the last digit of remaining leading truncated number is divisible by 43.e.g 3182,318+26=344,34+52=86

- A number is divisible by 47,if by subtracting 14 times the last digit of remaining leading truncated number is divisible by 47.e.g 34827,3482-98=3384,338-56=282,28-28=0

EXPLANATION

❖ **DIVISION OF LARGER NUMBER SHORTCUT TRICKS**: The division may be speedily calculated, whatever complicated it may be.

Let x/y=z, here x is numerator and y is denominator z is a value per unit. Our aim is to find the value of z as quick as possible.

For this purpose, division expression or fraction may be simplified easily if both the numerator and denominator will be increased/decreased proportionately.

EXPLANATION

For this we adopt base number concept to denominator. If it is 2 digit may be multiple of 10,for 3 digits, multiple of 100 etc. To explain we may take different examples.

- 3996/78=?

Step 1:3996+4/78+2=4000/80=50

Step 2:3996+100/80=4096/80=51.2

EXPLANATION

- 79267/21089=?

In case of five digit number, we may keep three digits neglecting remaining digit

792/210=800/200=4

79267/21089=792/210=792-40/210-10

=752/200=3.76

- 67825/3829,here we have neglect 01 digit from denominator, same to be neglected fom numerator also.

  6782/382=7000/400=17.5=17(approx)

  6782/382=6782+18x17/400=7088/400=17.72

SQUARE AND CUBE OF NUMBERS

You have been advised to remember at least square of numbers from 1 to 25.On the basis of this concept, we may apply several shortcut methods.

- Base Method:50,100,200,300,1000 etc. Each base method is applicable within range of 50

- Applying formula $(a+b)^2=a^2+2ab+b^2$

- Squaring of numbers ending with 6

EXPLANATION

50 Base Method:

38^2=?

Step 1:Find the how much less is the number of number from 50 ,50-38=12

Step 2:Take the square of the result,12^2=144,note 44 and carry 1

Step 3:Subtract 12 from 25,25-12=13 and add carry 1,13+1=14

Step 4:Take the result and exend by noted digits,answer is 1444

EXPLANATION

- 53^2=?

Step 1:Find the how much excess is the number over number from 50 ,53-50=3

Step 2:Take the square of the result,3^2=9,note 09 by inserting an extra zero before 9

Step 3:Add 3 with 25,25+3=28

Step 4: Write the answer by writing 09 to the right of the result 28,Thus our answer is 2809

Similarly, by this we find the square of say,56,63,39,36 etc.

EXPLANATION

- 100 Base Method:

96^2=?

Step 1:Find the how much less is the number of number from 100 ,100-96=4

Step 2:Take the square of the result,4^2=16

Step 3:Subtract 4 from 96,96-4=92

Step 4:Write the result,92 and exend the previous result 16,i.e answer is 9216.

97^2=?

100-97=3,3^2=9,write 0 to left of 9,09,97-3=94,Answer is 9409

EXPLANATION

⦿ 88^2=?

100-88=12,12^2=144,note,44,carry1,88-12=76,76+1=77

Answer is 7644

104^2=?

Step 1:Find the how much excess is the number over number from 100 ,104-100=4

Step 2:Take the square of the result,4^2=16

Step 3:Add 4 with 104,104+4=108

Step 4: Write the answer by writing 16 to the right of the previous result 16,Thus our answer is 10816

EXPLANATION

⊙ 112^2=?

112-100=12,12^2=144,note 44,carry 1.Add 12 with 112,112+12=124,add carry 1,124+1=125,

Answer is 12544

▪ Base 200 Method:

175^2=?

200-175=25,25^2=625,note 25 and carry 6 ,

175-25=150,150x2=300,300+6=306,Ans.30625

EXPLANATION

- Base 300 Method:

282^2=?

300-282=18,18^2=324,note 24,carry 3

282-18=264,264x3=792,792+3=795,Ans.79524

312^2=?

312-300=12,12^2=144,note 44,carry 1

EXPLANATION

- 312+12=324,324x3=972,972+1=973,Ans.97344
- Base 1000 Method:

1015^2=?,

1015-1000=15,15^2=225,1015+15=1030,

Ans.1030225

994^2=?

1000-994=6,6^2=36,994-6=988,Ans.988036

Base 10000 Method:

10009^2=? 9^2=81,10018081

9996^2=?,4^2=16,9992016

EXPLANATION

- Square of any number by may be determined by taking the help of specific algebraic formula, $(a+b)^2 = a^2+2ab+b^2$

212^2=?

Step 1:Take a=2,b=12,follow the format $a^2/2ab/b^2$

Step 2:Find $b^2=12^2=144$,keep 44,carry 1

Step 2:Find 2ab=2x2x12=48,add carry 1,48+1=49

Step 3:Find $a^2=2^2=4$

Step 4:Write answer,44944

EXPLANATION

- Square of a number ending with a digit 6

$146^2 = ?$

Step 1:Find the square of the prior to the number in the question.$145^2 = 21025$

Step 2:Add the number to its prior number,

$145 + 146 = 291$

Step 3:Add the result with the previous result,

$21025 + 291 = 21316$

$196^2 = 38416$

CUBES OF NUMBERS

CUBES OF NUMBERS:

   We may find the cubes of any number by the taking the help of the algebraic formula,$(a+b)^3=a^3+3a^2b+3ab^2+b^3$,Further you should keep cubes of 1-10 in the mind

⊙ 12^3=?

Take a=1 and b=2

Step 1:Find b^3=8

Step 2:Find $3ab^2$=12,keep 2,carry 1

Step 3:Find 3 a^2b=6,add carry 1,6+1=7

Step 4:Find a^3=1,Hence answer is,1728

EXPLANATION

26^3=?

Take a=2 and b=6,applying above method,

$2^3/3x2^2x6/3x2x6^2/6^3$=8/72/216/216

=17,576

⊙ 53^3=?

Here a=5 b=3

$5^3/3x5^2x3/3x5x3^2/3^3$=125/225/135/27

=148,877

EXPLANATION

Cube of three digit number:

112^3=?

Start pairing of number from right,a=1,b=12 and applying cube formula

1/36/432/1728,Keep two digit at each place and carry forward the rest to the left places gradually,1404928

SQUARE ROOT AND CUBE ROOT TRICKS

- SQUARE ROOT TRICKS:

On analysis the squares of the numbers from 1-10,

$1^2=1, 2^2=4, 3^2=9, 4^2=16, 5^2=25, 6^2=36, 7^2=49, 8^2=64, 9^2=81, 10^2=100$

It is evident from the above that the numbers

The perfect square number must end with the digit 0,1,4,5,6 and 9

$\sqrt{576}=?$

Step 1:Pair from right,76 and 5

EXPLANATION

- Step 2:The unit digit square root of the above number ending with the digit 6 may be 4 or 6.

- Step 3: Remaining number $2^2<5<3^2$,hence we may take the least number 2 as the tens digit of the square root.

- Step 4:Multiply 2 with next consecutive number,2x3=6,

- Step 5:The first number 5<6,hence we may take least digit 4,as the unit digit of the square root,Hence answer is 24

SQUARE ROOT TRICKS

- $\sqrt{1024}=?$

The unit digit of square root may be 2 or 8

  $3^2<10<4^2$.we may take 3 as the tens digit of square root

3x4=12,10<12,take,2 as the unit digit square root of the number,Hence answer is 32

$\sqrt{11449}=?$

Unit digit may be 3 or 7, $10^2<114<11^{2,}$ 1st part of square root is 10,10x11=110,114>110,so unit digit of square root is 7,Hence answer is 107

CUBE ROOT TRICKS

On memorizing, $1^3=1, 2^3=8, 3^3=27, 4^3=64, 5^3=125,$ $6^3=216, 7^3=343, 8^3=512, 9^3=729, 10^3=1000$

The unit digit of cube root of a number ending with 1 is 1,8 is 2,7 is 3,4 is 4,5 is 5,6 is 6,3 is 7,2 is 8,9 is 9 and 0 is 0.

$1728^{1/3}$ =?

Step 1:Make triplet from right,728 and 1

Step 2:Unit digit is 2 from the part 728

Step 3:Tens digit is 1 for the part 1

Hence ,answer is 12

EXPLANATION

⊙ $17576^{1/3}$=?

Make triplet from right 576 and 17

Here unit digit of cube root is 6,

  $2^3<17<3^3$,so tens digit of cube root is 2

Hence, answer is 26

$438976^{1/3}$ =?

 Making triplet from right 976 and 438

Unit digit of the root is 6, $7^3<438<8^3$ so tens digit is 7,

Hence answer is 76

-xox-