CLATAPULT

MATHEMATICS

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Foreword

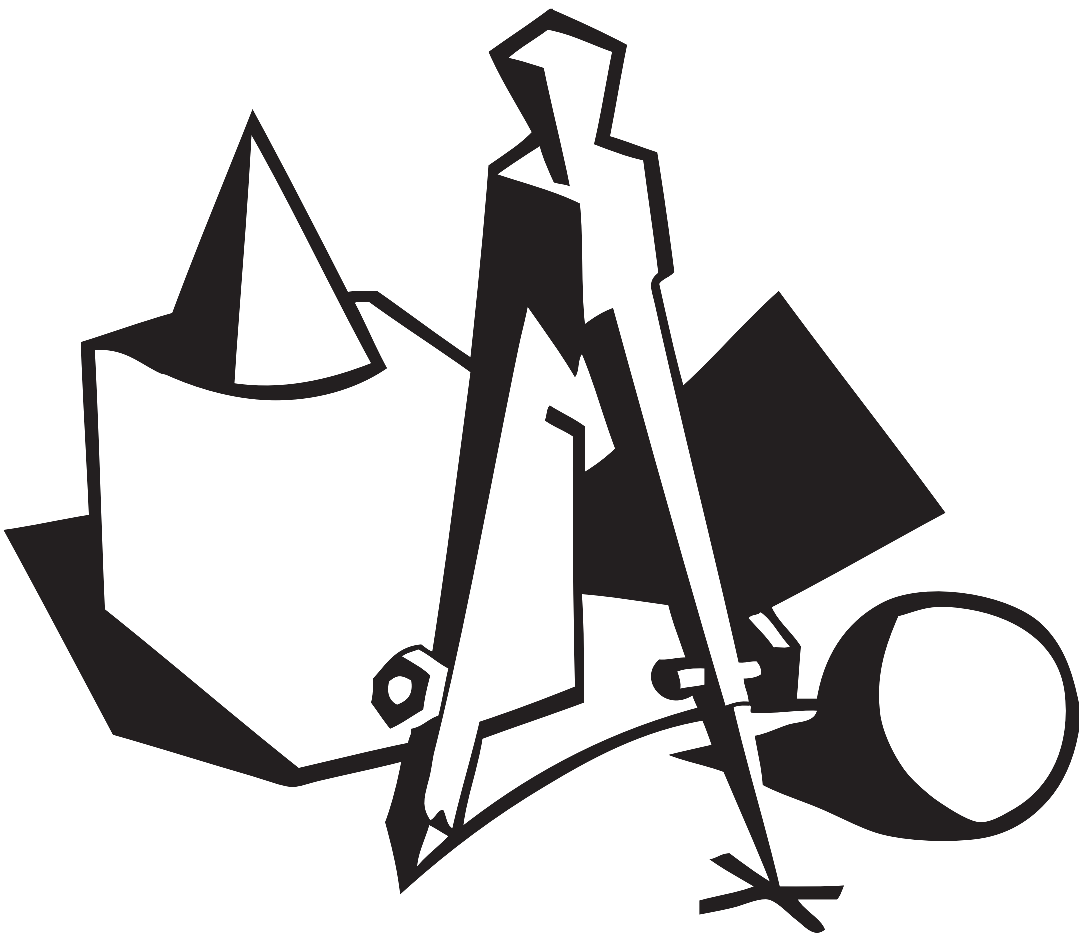
CLAT or the Common Law Admission Test is a multiple choice aptitude test designed to measure the test takers' ability to cope up with the academic brain-stretching that law school entails and thus to predict success in law school. CLAT tests the test takers' aptitude in five areas, namely legal aptitude, general knowledge and current affairs, elementary mathematics, rudimentary English and critical thinking or logical reasoning.

This section tests how proficient the test taker is with elementary mathematics. As the name suggests, the topics required for CLAT math are elementary, i.e. what you learn in high school. Many a test taker would find the inclusion of math in an aptitude test for admissions into law school downright bizarre.

Why would an aspiring lawyer need to be tested in math? Well, to enable you to calculate your billing fee of course! How else would you know if your client is not ripping you off? Just kidding. Jokes apart, the mathematics section is required primarily to test your logic.
Most of the math problems would not be the direct formula application type problems, but would be problems where you would have to solve them by devising your own equations, such as rate of doing labor, rate of tanks filling up etc.

Math after all is the bluntest and most blatantly obvious form of logic. This module aims to provide a summary of all the basic concepts which are most likely to appear in the test, and to provide numerous practice problems as to ensure that even those test takers who are averse to math will find it relatively easy.

CONTENTS



NUMBERS, HCF & LCM

▸ RATIONAL NUMBERS- The numbers of the form p/q, where p and q are integers and q≠0 are rational numbers, e.g., 1/2, 3/7, 0/2, (-2)/3, etc

▸ IRRATIONAL NUMBERS- A number which cannot be expressed in the form p/q where q≠0, is called an irrational number, e.g. √2, which gives an approximate answer in the form of fraction or decimal but the digits after the decimal point are non-ending. Similarly, Π =3.14 is an irrational number. Therefore an infinite non recurring decimal is an irrational number.

▸ RATIONALISATION- Consider a fraction of type 1/(√2) or 1/(√7+√5). Here the denominator is an irrational number. To perform any mathematical operation using such numbers, we need to convert the denominator to a rational number. This process is known as rationalisation.

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

$1/(\sqrt{7}+\sqrt{5}) = 1/(\sqrt{7}+\sqrt{5}) \times (\sqrt{7}-\sqrt{5})/(\sqrt{7}-\sqrt{5}) = (\sqrt{7}-\sqrt{5})/(7-5) = (\sqrt{7}-\sqrt{5})/2$

Note: a) Sum or difference of a rational and an irrational number is always irrational.

b) Product of a rational and an irrational number is always irrational.

▸ REAL NUMBERS- The combination of all rational and irrational numbers forms the set of all real numbers.

► IMAGINARY AND COMPLEX NUMBERS- A number of the form k.i, where k is a real number, $k \neq 0$ and $i = \sqrt{-1}$ is called an imaginary number, e.g. 5i, -2i, $\sqrt{3}i$, etc.

A number of the form a+bi, where a and b are real numbers and $i = \sqrt{-1}$ is called a complex number, e.g. $\sqrt{5}+i\sqrt{2}$, $2+\sqrt{3}i$, etc.

► HIGHEST COMMON FACTOR (HCF)

Highest Common Factor of two or more numbers is the greatest number that divides each of them exactly, i.e the remainder is 0.

e.g., i) If 15 and 18 are two given numbers then their HCF is 3.

ii) If 20 and 50 are two given numbers then they are exactly divisible by 2,5,10. Since the highest of the factors is 10, their HCF is 10.

▪ Method to find HCF of given numbers:-

By Factorisation- Express each given number as the product of primes. Now take the product of the common factors which is HCF.

e.g. , Find HCF of 144, 336, 2016

$144 = 2^4 * 3^2$

$336 = 2^4 * 3 * 7$

$2016 = 2^5 * 3^2 * 7$

therefore, $HCF = 2^4 * 3 = 48$

► LOWEST COMMON MULTIPLE (LCM)

The least number which is exactly divisible by each of the given numbers is called their LCM.

e.g. , i) LCM of 15 and 18 is 90

ii) LCM of 15 and 30 is 30

▪ Methods to find LCM:-

1) By Factorisation- Resolve each of the given numbers into prime factors, then their LCM is the product of highest powers of all factors, of the numbers.

e.g. , Find LCM of 45, 120, 180

45 = 3*3*5 ; 120 = 2*2*2*3*5 ; 180 = 2*2*3*3*5

therefore, LCM = $2^3 * 3^2 * 5^1$ = 360

2. Common Division Method- Arrange the given numbers in a row in any order. Divide a number which divides exactly atleast two of the given numbers and carry forward the numbers which are not divisible. Repeat the above process till no two of the numbers are divisible by the same number except 1. The product of the divisors and the undivided numbers is the required LCM of the given numbers.

- PRODUCT OF TWO NUMBERS = PRODUCT OF THEIR HCF AND LCM
- HCF AND LCM OF FRACTIONS:-

- HCF of Fractions = (HCF of Numerators)/(LCM of Denominators)
- LCM of Fractions = (LCM of Numerators)/(HCF of Denominators)

Solved Examples:-

1) The sum of three prime numbers is 100. If one of them exceeds the another by 36, then one of the numbers is

a)7 **b) 29** **c) 41** **d) 67**

Solution

x + (x+36) + y = 100

or, 2x + y = 64

therefore, y must be even-prime which is 2

or, 2x + 2= 64

therefore, x=31

Ans: d)

2) The largest natural number by which the product of three consecutive even natural numbers is always divisible, is

a)16 **b) 24** **c) 48** **d) 96**

Solution

Required Number = 2 * 4 * 6 = 48

3) Which of the following numbers must be added to 11158 to make it exactly divisible by 77?

a)5 **b) 7** **c) 8** **d) 9**

Solution

On dividing 11158 by 77, we get remainder 70

Therefore, required number to be added = 77-70 = 7

4)A number when divided by the sum of 555 and 445 gives two times their difference as quotient and 30 as the remainder. The number is

a)1220 **b) 1250** **c) 22030** **d) 220030**

Solution

Required number = (555 + 445) * 2 * (555-445) + 30 = 220030

5) Two numbers are in the ratio 15:11. If their HCF is 13, find the numbers.

Solution

Let the two numbers be 15x and 11x, then their HCF is x. So x=13. Therfore, the numbers are 15*13 and 11*13, i.e 195 and 143.

6) Find the greatest possible length which can be used to measure exactly the lengths 4m 95 cm, 9m, 16m 65 cm.

Solution

Required length= HCF of 495cm, 900cm, 1665cm

- $495 = 3^2 * 5 * 11$
- $900 = 2^2 * 3^2 * 52$
- $1665 = 3^2 * 5 * 37$

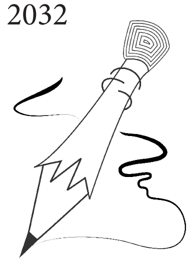
Therefore, HCF = $3^2 * 5 = 45$

Hence, required length = 45cm

7) Find the greatest number which on dividing 1657 and 2037 leaves remainders 6 and 5 respectively.

Solution

Required number = HCF of (1657-6) and (2037-5) = HCF of 1651 and 2032



- Divide 2032 by 1651, remainder =381
- Divide 1651 by 381, remainder = 127
- Divide 381 by 127, remainder = 0

Therefore, required number = 127

8) Find the least number exactly divisible by 12, 15, 20, 27.

Solution

Required number = LCM of 12, 15, 20, 27 = 540

9) Find the least number which when divided by 20, 25, 35, 40 leaves remainders 14, 19, 29, 34 respectively.

Solution

Here,
- 20-14 = 6
- 25-19 = 6
- 35-29 = 6
- 40-34 = 6

Required number = (LCM of 20, 25, 35, 40) – 6

= 1394

10) The traffic lights at 3 different road-crossings change after every 48 sec, 72sec, 108sec respectively. If they all change at 8:20:00 hours, then at what time will they again change simultaneously?

Solution

Time interval = LCM of 48, 72, 108 = 432 sec. So the lights will again change simultaneously after every 432 sec, i.e 7min 12 sec.

Hence, next simultaneous change will happen at 8:27:12 hours.

1)Which of the following fractions is the smallest?

a)13/16 b) 15/19 c) 17/21 d) 7/8 e) 5/21

2) What least number must be subtracted from 2000 to get a number exactly divisible by 17?

a) 11 b) 13 c) 9 d) 14 e) 15

3) On dividing 15968 by a certain number, the quotient is 89 and the remainder is 37. What is the divisor?

a)150 b) 165 c) 179 d)119 e) 121

4)There are four prime numbers in ascending order. The product of first three is 385 and that of the last three is 1001. The last number is:

a)11 b) 13 c) 15 d) 17 e) 19

5) 5A2 is a three digit number where A is the missing digit. If the number is divisible by 6, then the missing digit is:

a)2 b) 3 c) 6 d) 7 e) 5

6)If x and y are the 2 digits of a number 653xy, such that the number is divisible by 80, then x+y= ?

a)2 b) 3 c) 4 d) 6 e) 5

7) When a number is divided by 31, the remainder is 29. When the same number is divided by 16, what is the remainder?

a)11 b) 13 c) 15 d) data inadequate e)16

8) A number when successively divided by 4 and 5, leaves remainders 1 and 4 respectively. If the same number is divided by 5 and 4 successively, then what would be the respective remainders?

a) 1,2 b) 2,3 c) 3,2 d) 4,1 e) 3,4

9) Find a+b, if 3478a9b is divisible by 3 and 11 both.

a)11 b) 13 c) 12 d) 19 e) 16

10) The HCF of two numbers is 11 and their LCM is 693. If one of the numbers is 77, find the other.

a) 78 b) 99 c) 81 d) 66 e) 49

11)Find the largest number which divides 62, 132, 237 to leave the same remainder in each case.

a)27 b) 21 c) 35 d) 39 e) 25

12)Find the least number which when divided by 6, 7, 8, 9, 12 leaves the same remainder 1 in each case.

a) 505 b) 512 c) 572 d) 475 e) 507

13) Find the smallest number of 5 digits which is exactly divisible by 16, 24, 36, 54.

a)10368 b) 10236 c) 10298 d) 10567 e) 10334

14) Find the least number which when divided by 5, 6, 7, 8 leaves a remainder 3, but when divided by 9 leaves no remainder.

a) 1789 b) 1543 c) 1685 d) 1683 e)1765

15) Find the largest number of four digits which is exactly divisible by 12,15,18,27.

a) 9720 b) 9815 c) 9912 d) 9624 e) 9732

16) The sum of two numbers is 528 and their HCF is 33. The number of pairs of numbers satisfying this condition is:

a) 4 b) 6 c) 8 d) 12 e) 15

17) The HCF of two numbers is 12 and their difference is 12. What are the numbers?

a) 66, 78 b) 70, 82 c) 94, 106 d) 84, 96 e) 58, 70

18) The LCM of two numbers is 495 and their HCF is 5. If the sum of the numbers is 10, what is the difference?

a)10 b) 46 c)70 d) 90 e) 85

19)The least number which should be added to 2497 so that the sum is exactly divisible by 5, 6, 4, 3 is:

a) 3 b) 13 c) 23 d) 33 e) 43

20) The least number which when increased by 5 is divisible by each one of 24, 32, 36, 54 is:

a) 427 b) 859 c) 869 d) 4320 e) 510

Answer key:-

1(e)	2(a)	3(c)	4(b)	5(a)	6(d)	7(d)	8(b)	9(a)	10(b)
11(c)	12(a)	13(a)	14(d)	15(a)	16(a)	17(d)	18(a)	19(c)	20(b)