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Dear Students

Take this challenge of solving ancient Indian
MATHEMATICS PROBLEMS



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Dear students, teachers and parents !

Bharatheeya Vidya Vihar is a school started (in 2005) by the Indian Institute of Scientific Heritage, at Mazhuvanchery, Eranellur, in Trissur Guruvayoor Highway. The aim of establishing this academic institute is for demonstrating the method of incorporating the value based education for the students, teachers and parents. The school has undertaken the mission of spreading the values, heritage knowledge on all aspects of human life, spirituality, modern knowledge, etc..... not only within our campus but also in every other schools with the support and cooperation of the management.

1. Developing the future of a student is like constructing a building. The bricks used for the building are like the modern knowledge, the cement used is like the values taught. The cement gives strength, durability and beauty for the building. Similarly the values contribute to the beauty, strength and durability of the life.

2. One should not give values and modern knowledge in separate periods in the class rooms. They are to be given together. The bricks and cement are placed simultaneously during the construction. Cement connects the brick layers. The values give connection of the modern knowledge with the life. Hence the cry for separate periods/hours for teaching values in the class rooms cannot be logically accepted. The values are to be discussed in the class rooms for few minutes when physics/chemistry/English/history/biology/....etc are taught, whenever and wherever possible.

Generally everyone asks the question ; what is meant by values and value based education. We definite it like this : All the information and knowledge disseminated for the (1) psychological and (2) physiological benefits, (3) strengthening family bondage and relations, (4) improving social bondage and (5) national integration are the values in the life. In one line the values are those knowledge given for the psychological, physiological, family relation based, social bondage based and national integration based benefits.

(Contd. in inside back cover)

1. What are the respective remainders obtained when the sums of 1 to 10, each multiplied by 10, terms of the series whose first term and common difference are unity are severally subtracted from the sum of 100 terms of the same series ?
2. Multiply 1296 by 21, 896 by 37, 8065 by 60
3. Tell me the squares of 1 to 9, 25, 36, 63, 432 and 7802
4. Quickly say what are the cubes of 1 to 9, 15, 256 and 203
5. Say the sum of $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{6}$ and $\frac{1}{12}$ and of $2 + \frac{1}{2}$, $3 - \frac{1}{4}$, and 6
6. Friend, if you know the method of calculation, quickly say the sum of $1\frac{1}{2}$ terms, $\frac{1}{2}$ term, and of $\frac{1}{3}$ term of the series whose first term (aadi) and common difference (chaya) are each unity
7. Subtract $\frac{1}{4}$, $\frac{1}{3}$ and $\frac{1}{6}$ from 1 and say what remains. Also subtract $3 - \frac{1}{2}$ and $2 + \frac{1}{3}$ from 5 and say the remainder
8. Say what remains as the remainder when the sum of 2 plus $\frac{1}{2}$ terms is subtracted from the sum of $5 + \frac{1}{2}$ terms of the series whose first term and common difference are unity
9. 2 plus $\frac{1}{2}$ is multiplied by 1 plus $\frac{1}{2}$ and 60 plus $\frac{1}{3}$ is multiplied by $\frac{5}{2}$: what are the products say separately.
10. $6 + \frac{1}{4}$ is divided by $2 + \frac{1}{2}$ and $60 + \frac{1}{4}$ is divided by $3 + \frac{1}{2}$; say the quotients separately
11. Say, friend if you know, the square of $2 + \frac{1}{2}$, of $15 + \frac{1}{4}$, of $\frac{1}{2}$ and of $\frac{1}{3}$.
12. Say, if you know, the cube of $7 + \frac{1}{2}$ of $17 + \frac{1}{4}$, of $\frac{1}{4}$, and of $\frac{1}{3}$.
13. What sum is obtained by adding together the fractions having the integers 2 to 6 for their denominators, and 1 for their numerators, and by adding together the fractions having the integers 3 to 9 for their denominators and the integers 2 etc., for their respective numerators.

14. Tell me the sum of $\frac{1}{4}$ of $\frac{1}{2}$ of $\frac{1}{2}$, $\frac{1}{10}$ of $\frac{1}{6}$ of $\frac{1}{5}$ of $\frac{1}{3}$, and $\frac{1}{7}$ of $\frac{1}{6}$ of $(2 + \frac{1}{2})$
15. It has been severally divided by fractions having the integers 3 to 6 for their denominators and the integers 2 etc for their respective numerators. Say what sum will be obtained when they are added together.
16. Say the amount, when $1 - \frac{1}{2}$, $5 - \frac{1}{4}$ and $8 - \frac{1}{3}$ are added together
17. What is obtained by adding $(3 - \frac{1}{2}) - \frac{1}{4}$ of $(3 - \frac{1}{2}) - \frac{1}{6}$ ($(3 - \frac{1}{2}) - \frac{1}{4}$ of $(3 - \frac{1}{2})$) and $\frac{1}{2} - \frac{1}{2}$ of $\frac{1}{2} - \frac{1}{4}$ of $(\frac{1}{2} - \frac{1}{3}$ of $\frac{1}{2})$?
18. What amount is obtained by reducing 5 puranas, 3 panas, 1 kakini, - 1 varataka, - $\frac{1}{5}$ of that of a varataka to puranas? This is a problem connected with ancient Indian coins/currencies
19. What amount is obtained by adding together $\frac{1}{2}$ $\frac{1}{4}$ of $\frac{1}{4}$, 1 divided by $\frac{1}{3}$, $\frac{1}{2} + \frac{1}{2}$ of $\frac{1}{2}$, and $\frac{1}{3} - \frac{1}{2}$ of $\frac{1}{3}$?
20. If 1 pala and 1 karsha of sandal wood are obtained for ten and a half panas, then for how much will 9 palas and 1 karshas of sandal wood of the same quality be obtained?
21. If $1 \frac{1}{3}$ palas of black pepper are obtained for $1 \frac{1}{4}$ panas, then how much of that will be obtained for $(10 - \frac{1}{3})$ panas?
22. If one and a half dronas and three Kudavas of grain is obtained for 8, say, if you know, for how much will one khari and one drona of that grain be obtained
23. If $60 + \frac{1}{2}$ kharis of grain is obtained for $100 + \frac{1}{3}$ rupas, how much of that grain will be obtained for a quarter of a rupa?
24. Where one suvarana gets $70 + \frac{1}{3}$ rupas, say, friend, what will 1 masha as lessened by $\frac{1}{10}$ of a masha get there.
25. A certain lame person goes to distance of $\frac{1}{8}$ of a yojana in $\frac{1}{3}$ of a day, say in how much time will he go to a distance of 100 yojanas

26. An insect goes to a distance of $\frac{1}{6}$ of an angula in $\frac{1}{4}$ of a day, in how much time will it go to a distance of 10 and half a yojanas
27. The best amongst the elephants goes forward at the rate of $\frac{1}{2}$ $(1 + \frac{1}{4})(1 - \frac{1}{3})(1 + \frac{1}{2})$ of a yojana in $6 \times \frac{1}{5} \times \frac{1}{9} \times \frac{1}{3}$ $(1 + \frac{1}{4})$ of a day and comes back at the rate of $2(1 - \frac{1}{3})$ yojanas in $(1 + \frac{1}{2})$ days. Say, friend, in how much time will he go to a distance of 100 yojanas
28. In how much time will a man, earning at the rate of $(8 - \frac{1}{2})$ rupas in $(1 + \frac{1}{3})$ days and spending on his food at the rate of $\frac{1}{2}$ per day, be a lord of 100 rupas ?
29. When a given quantity of pearls is measured at 8 pearls a necklace, the number of necklaces is twenty; say, mathematician, what the number of necklaces would be (when the same quantity of pearls is measured) at 6 pearls a necklace.
30. Being measured by the masha of 5 raktikas, a quantity of gold amounts to 300 suvarnas, say how much would that quantity of gold, amount to, when measured by the masha of 6 raktikas
31. How much gold of 11 varnas can be had in exchange for 168 suvarnas of 16 varnas ?
32. Quickly say how many blankets of length 6 hastas and breadth 2 hastas can be made of the yarn which yields 200 blankets of length 9 cubits and breadth 3 cubits.
33. How much gold of $10 \frac{1}{4}$ varnas will be obtained in exchange for 100 suvarnas and 8 mashas of gold of $12 \frac{1}{2}$ varnas ?
34. If the interest on 100 for a month be 5, what is the interest on 60 for a year? from the interest say the time, and from them both the unknown principal.
35. If $1 \frac{1}{2}$ be the interest on $100 \frac{1}{2}$ for one third of a month, what will be the interest on $60 \frac{1}{4}$ for $(8 - \frac{1}{2})$ months.

36. When the price of a suvarna of gold of 16 varnas is 60, then say the price of 63 suvarnas of gold of 10 varnas
37. If 8 dronas of rice are carried to a distance of one yojana for 6 panas, say for how much will a khari together with a drona of rice be carried to a distance of 3 yojanas
38. If 3 laborers earn 5 rupas in 2 days, say what will 8 laborers earn in 9 days?
39. If a blanket, whose breadth is 2 cubits and length 8 cubits, gets 10, what will 2 other similar blankets of breadth 3 cubits and length 9 cubits get?
40. If a rectangular piece of stone with length, breadth and thickness equal to 9, 5 and 1 hastas respectively costs 8, what will two other rectangular pieces of stone of dimensions 10, 7 and 2 hastas cost?
41. If the diet of an elephant of diameter 2 hastas, height 6 hastas and length 7 hastas is one drona, what should be diet of an elephant of diameter 3 hastas, height 9 hastas and length 10 hastas
42. If 2 palas of dry ginger are obtained for 6 and one pala of long pepper for 9, how much of long pepper will then be obtained for 6 palas of dry ginger?
43. If 16 mangoes are obtained for 2 panas and 100 wood apples for 3 panas, say then how many wood apples will be obtained for 6 mangoes.
44. If 16 workers of age 16 get 200, say then, o mathematician, how much will 2 workers of 20 years of age get?
45. If 3 camels of 10 years of age get 108 puranas, say then what will 5 camels of 9 years of age get.
46. The rate of interest being 5% per month, a certain sum is seen to amount to 96 in a year. Say, friend what is the capital and what the interest?

47. The interest on $100 \frac{1}{2}$ for one month and a quarter being $1 \frac{1}{2}$, a certain sum amounts to $36 \frac{1}{2}$ in a period of $7 \frac{1}{2}$ months. Find the sum and the interest accrued thereon.
48. The rate of interest being 5% per month, the commission of the surety (bhavyaka) 1 % per month, the fee of the calculator (vrutti) $\frac{1}{2}$ % per month and the charges for the scribe $\frac{1}{4}$ % per month, a certain sum amounts to 905 a year. Find the capital the interest and the shares of the surety, fee for accountant and the scribe.
49. A rich man lent to somebody a sum of 100 rupas at 5% per month and from him took a house bearing a rent of 40 rupas per month. Say learned man, after how much time is the debtor relieved of his debt, and what does the rich man get by the gain of bare accommodation.
50. There are four bonds capitals amounting to 100, 200, 300, and 400 are given to someone on interest at the rates of 2,3,4 and 5 % per month in the respective order; and months amounts to 2,3,5 and 4 multiplied by 2, have passed. Say, how would a single bond (eka patra) be now made out of these.
51. O' Learned man how a single bond be made of the above 4 bonds with the same capitals as previously stated and with rates per cent per month of interest augmented by $\frac{1}{2}$ in each case and months elapsed increased by $\frac{1}{4}$ in each case .
52. A sum of money is put to interest at 5% per month. When will it become twice of itself?
53. And when will another sum of money put to interest at $3 \frac{1}{2}$ percent per month become $1 \frac{1}{4}$ of itself?
54. Two, three, five and four prastas of seeds are contributed by four partners and 210 prasthas of grain is the produce; what are the shares of the partners separately?
55. $\frac{1}{2}$ prasthas is the contribution of one, $\frac{1}{3}$ prastha of another, $\frac{1}{9}$ prastha of still another, and 1700 prasthas is the produce. Say what are their shares in the produce separately.

- 56.- Seven kudava of mudga (green gram) are obtained for 9 panas, and $\frac{1}{2}$ kudava of rice is obtained for one pana, then O' merchant, take 3 panas and a half and quickly give me one part of rice and two parts of mudga.
57. $\frac{1}{2}$ pala of asafetida, 2 palas of long pepper, and 7 palas of dry ginger are each obtained for one rupa. Give me equal quantities of each of them for one rupa.
58. The capitals of three men are 1, 3 and 5 rupas or $\frac{1}{3}$, $\frac{1}{4}$ and $\frac{1}{2}$ rupas respectively. By purchasing and selling certain articles at the same rates and by selling the remnant articles at the rate of 1 for 3 rupas, they become possessed of equal riches. Find the rates of purchase and sale.
59. The capitals of four men are $1\frac{1}{2}$, 2, 3 and 5 rupas. By purchasing and selling certain articles at the same rates and by selling the remnant articles at the rate of 1 for $\frac{1}{2}$ of a rupa, they become possessed of equal riches. Find the rates of purchase and sale.
60. Pigeons are sold at the rate of 5 for 3 rupas, cranes at the rate of 7 for 5 rupas, swans at the rate of 9 for 7 rupas and the peacocks at the rate of 3 for 9 rupas. Knowing the rates as stated above bring 100 birds for 100 rupas for the amusement of the princess.
61. The rate of sales of pomegranates, mangoes and wood apples are respectively 1 for 2 rupas, 5 for 3 rupas and 2 for 1 rupa. Bring 100 fruits for 80 rupas.
62. When a person, traveling at the speed of 8 yojanas per 5 minus $\frac{1}{2}$ days, has already traveled for 6 minus $\frac{1}{4}$ days, another person, who travels at the speed of 3 yojanas a day starts traveling from the same place along the same track. Say after calculating, when the latter traveler would overtake the former.

63. One man travels at the speed of 8 yojanas a day and another at 2 yojanas a day from the same place and after reaching the destination come back by the same track. The length of the track is 100 yojana. Say where is the meeting of the two. One going ahead and the other coming back
64. While a leathern oil bottle (kutapa) filled with 200 palas of oil, was being carried by a porter to a distance of 8 yojanas for 5 panas as wages, a hole happned to occur in the bottom of it through which the oil leaked out on the way continuously. If 20 palas of oil be left in the bottle what wages should be paid to the porter ?
65. One man saw a dance for one quarter of the day, another for two quarters of the day, another for three quarters of the day and yet another till the end of the day. The dancing party has to be paid by them a sum of ninety six rupas in all. If payment is to be made in proportion to the time of seeing the dance, how much of that sum should be paid by each of them separately ?
66. A palanquin is to be carried to a distance of 3 krosas by 10 men for 100 rupas. Of those men, 2, 3 and 5 stop away after going over 1, 2, and 3 krosas respectively. Calculate the wages of each of them separately.
67. Five scholars, enchanters of Vedas were invited by a person to take part in the worship of the five faces of the five faced god Siva on a dakshina of 300 rupas. And they, on the completion of worship of, two, three, four and five faces respectively, went away one by one. Say what are their dakshinas.
68. In what time will the four drains, which severally fill up a cistern in $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{5}$ and $\frac{1}{6}$ of a day, fill up that cistern if they are opened simultaneously, to flow into it ?
69. If for carrying 24 jack fruits over a distance of 5 krosas a porter is to get 9 of those jack fruits, what will he get if he carried them over a distance of 2 krosas ?

70. Twenty four jackfruits were carried to a distance by a man for 4 out of those 24 jack fruits as wages; the remaining jack fruits were carried over the remaining distance by another person for 5 of them as wages. The load was thus carried by the two persons over a distance of 5 krosas. Say how much of that distance was gone over by each of them ?
71. O' friend, a cook prepares varieties of food with the six savours , pungent, bitter, astringent, acid, saline and sweet. Say what is the possible number of varieties ?
72. One fourth, one third, and one sixth of a pillar are respectively buried under the water, mud and sand of a river and three cubits are visible. Give out the measure of the length of that pillar
73. After giving away one half of a quantity, then $\frac{2}{3}$ of what remains, then $\frac{3}{4}$ of what remains there after and then $\frac{4}{5}$ of what remains there after, the residue left is 3. What was the quantity ?
74. Of a herd of cows, one half went away towards the east and one fourth towards the west, the difference of the- two as multiplied by 2 and divided by 5 went away towards the north and three cows are left. What is the numerical strength of the herd ?
75. A number is diminished by its square root, what remains is diminished by its one- sixth, what remains after that is diminished by its square root, what remains after that is diminished by is one fifth and what remains after that is diminished by twice the square root of itself; the residue now left is 8 . Find out the number .
76. One third of a troop of monkeys together with one third of itself has gone to the tank; the square root of the whole troop is afflicted with thirst; and the remaining two monkeys are sitting under the mango tree . what is the number of the monkeys in the troop ?

77. After giving away one, then one sixth of what remains, then one fourth of what remains after that, then one third of what remains after that, and then the square root of the original number, the residue left is 5. what is the original number ?
78. Say what is that number which being multiplied by $\frac{5}{2}$, then divided by 3, then squared, then increased by 9, then reduced to its square root, and then diminished by 1, becomes 4.
79. What is the sum of 5 terms of the series whose first term is 2 and common difference 3 ? and what of one half of a term ? Say the sum of one fifth of a term of the series whose common difference is 5 and first term 2 ?
80. In a leathern oil bottle full of oil there occurs a minute hole, and the oils leaks through it. The bottle has to be carried to a distance of 3 yojanas. If the wages for the first yojana be 10 panas and those for the subsequent yojanas successively less by 2 panas, what are the wages for a krosa ?
81. One man gets 3 rupas and the other men get 2 rupas more in succession; say, what do the first $4\frac{1}{2}$ men get .
82. If a laborer gets $1\frac{1}{2}$ in the first month and $\frac{1}{3}$ more in succession in the following months, what will he get in the first $3\frac{1}{2}$ months.
83. A man taking 3 rupas with him, went out to make profit. If his capital becomes double after every month, what will it become after 3 years ?
84. The first bangle is obtained for 8 panas, and the last bangle for 13 panas. If the total number of the bangles be 24, say what is the price of all of them.
85. One man goes with initial speed 3 yojanas per day and acceleration 1 yojana per day per day and another man goes with the constant speed of 10 yojanas per day. In what time will they cover the same distance ?

86. After one man had traveled for 6 days with some initial speed (adi) and acceleration (uttara) another man went by the same track with an unknown initial speed and acceleration of 2 units per day per day. Say how will they meet each other two times .
87. In a gamble two persons alternately won 30, 10, 100 and 8 casts of dice beginning with 9 and increasing successively by 6. say who is the winner.
88. If the casts of dice (alternatively won by the two persons) be 7, 3, 9, and 12 and the first term and common difference of the series formed by the take money, as stated before, then say after calculation who wins.
89. Say what is the sum of i. The sum of the first five natural numbers, ii. The square of 5 and iii. The cube of 5.
90. Friend, quickly say what is the sum of the cubes of 10 terms of the series whose first term and common difference are each unity; and also the sum of the successive sums of those terms.
91. O' Friend, if you know then say after calculation the sum of i. The sum of successive sums of the first 6 natural numbers, ii. The sum of the squares of the first 6 natural numbers and iii. The sum of the cubes of the first 6 natural numbers.
92. Tell me the sum of the squares of the first six terms of the arithmetic series whose first term is two and the common difference three.
93. Say after adding together the cubes of the four terms which begin with 5 and increase successively by 2.
94. In an equilateral quadrilateral, the face, the base and the altitude are all equal to the flank sides, each being $1\frac{1}{2}$ hastas in length. Say, friend what is the area of the quadrilateral.

95. Give out the area of that rectangular quadrilateral in which the base and face are each $5 \frac{1}{2}$ hastas, and the flank sides and altitude each 3 hastas.
96. In a triangle the flank sides are $4 - \frac{1}{4}$ and $3 \frac{1}{4}$ hastas, the base is $3 \frac{1}{2}$ hastas and the altitude is 3 hastas, what is the area of that triangle?
97. In an equilateral triangle the base is $8 \frac{1}{2}$ hastas and the altitude is 7 hastas and $8 \frac{2}{3}$ angulas. What is the area thereof?
98. If you know the method of finding the area of place figures, say the area of the isosceles triangle, whose flank sides are each 5 hastas, altitude 3 hastas and the base 8 hastas.
99. In a quadrilateral the face is $1 \frac{1}{3}$ hastas, the base is $9 \frac{1}{3}$ hastas, the flank sides are each 5 hastas and the altitude is 3 hastas what is the area?
100. In an in-equilateral quadrilateral with equal altitudes, the base is 10 hastas, the face is $4 \frac{1}{6}$, the flank sides are $9 - \frac{1}{3}$ and $6 + \frac{1}{2}$ hastas and the altitude is $6 \frac{1}{2}$ hastas minus $\frac{1}{60}$ of an angula. what is the area of the figure?
101. What is the area of an elephant's tusk whose base is 2 cubits and altitude cubits; and also of the figure of the shape of a felloe whose base and face are 3 cubits and altitude is 10 cubits?
102. The central length of a crescent moon is 8 cubits and the central width 3 cubits. Treating it as made up of a pair of triangle, quickly say what its arc is?
103. In a thunderbolt, the central length is 10 hastas, the faces are each 5 hastas, and the central width is 2 hastas. What is its area, if it be regarded as made up of two quadrilaterals?

PART II

The mathematical problems given by Bhaskaracharya I in 629 AD in Aryabhateeya Bhashya (Commentary for Aryabhateeya)

104. Tell me separately the cubes of integral numbers beginning with 1 and ending in 9, and also of $(8 \times 8)^2$ and $(25^2)^{25}$
105. If you have clear understanding of cubing a number, say correctly the cubes of 6, 5, 10, and 8 as respectively diminished by $1/6$, $1/5$, $1/10$ and $1/8$
106. Calculate in accordance with the ganitha of Aryabhata, the square root of 6 plus $1/4$ and of 13 plus $4/9$ and state the two results.
107. Correctly state in accordance with the ganitha of Aryabhata the fractional cube root of 13 plus $103/125$
108. Correctly state, in accordance with the rules prescribed in bhatastra (Aryabhateeya) the cube root of 8291469824.
109. Tell me O' friend, the area of the (three) equilateral triangles whose sides are 7, 8 and 9 units respectively, and also the area of the isosceles triangle whose base is 6 units and the lateral sides each 5 units
110. Say what is the area of the scalene triangle in which the base is 51 units and one lateral side is 37 units and the other lateral side is stated to be 20 units.
111. Quickly tell me the more accurate volume and also the measure of the altitude of the solid of the shape of a trapa (triangular pyramid) in which each edge is 12 units
112. The diameter of three circles are correctly seen by me to be 8, 12 and 6 units, respectively. Tell me separately the circumference and area of these circles

113. Calculate and tell me the diameters of the circles whose peripheries are 3299 minus $\frac{8}{25}$ and 21600, respectively.
114. When at an equinox, the Sun is on the meridian, the shadow of a gnomon, divided into 12 units, on level ground is seen to be 5, 9, and $3\frac{1}{2}$ units at three different places. Find the latitudes of these places.
115. Tell me the length of the shadow of the gnomon situated at a distance of 80 angulas from the foot of a lamp post of height 72 angulas; and also that of another gnomon situated at a distance of 20 angulas from a lamp post of height 30 angulas.
116. Give out the hypotenuses of three right angled triangle where the base and uprights are respectively 3 & 4, 6 & 8, and 12 & 9, respectively.
117. In a circle of diameter 10 units, the arrows are seen by me to be 2 and 8 units, in the same circle another set of arrows is 9 and 1 units. Tell me the corresponding R Sines.
118. A hawk is sitting on the top of a rampart whose height is 12 cubits. The hawk sees a rat at a distance of 24 cubits away from the foot of the rampart, the rat, too sees the hawk. Thereupon the rat, out of fear for the hawk, hastens to its own dwelling situated at the foot of the rampart but is killed in between by the hawk which flew along a hypotenuse. I want to know the distance traversed by the rat and also the horizontal motion of the hawk.
119. A bamboo of height 18 units is felled by the wind. It falls at a distance of 6 cubits from the root, thus forming a right angled triangle. Where is the break. ?
120. A full blown lotus of 8 angulas is seen just above the water. Being carried away by the wind it just submerges at a distance of cubit (24 angulas) . Quickly say the height of the lotus plant and the depth of the water.

121. There is a reservoir of water of dimensions 6×12 . At the east north corner thereof there is a fish; and at the west north corner there is a crane. For the fear of the crane, the fish crossing the reservoir, hurriedly went towards the south in an oblique direction but was killed by the crane who came along the sides of the reservoir. Give out the distances traveled by them assuming that their speeds are the same.

122. When the 8 out of 32 of the diameter of the Moon are eclipsed by the shadow of diameter 80, I want to know then what are the arcs of the intercepted arcs of the shadow and the full Moon.

123. In a series of Arithmetic Progression the first term is 8, the common difference is stated to be 5 and the numbers of terms is seen to be 18. Give out the middle term and the sum of the series.

124. In the month of Karkitaka a certain king daily gives away some money in charity starting with 2 on the first day of the month and increasing that by 3 per day. Fifteen days having passed, there arrived a scholar well versed in Vedas. The amount for the next ten days was given to him; that for the remaining five days of the month to someone else. Say, what do the last two persons get.

125. Of the 11 Conch shells which are arranged in the increasing order of their prices which are in AP, the first conch shell is acquired for 5 and the last for 95. Say what is the price of all the 11 conch shells.

126. There are three pyramidal piles of balls having respectively 5, 8 and 14 layers which are triangular. Tell me the number of units of balls in each of them (application of the progression $1 + (1+2) + (1+2+3) + \dots$

127. There are three pyramidal pile on square bases having 7, 8 and 17 layers which are also squares. Say the number of units therein (number of bricks, of unit size used in each of them) (application of $1^2 + 2^2 + 3^2 + \dots + n^2$)
128. There are three pyramidal pile having 5, 4 and 9 cuboidal layers. They are constructed of cuboidal bricks of unit dimensions with one brick in the topmost layer. Find the number of bricks used in each of them (application of $1^3 + 2^3 + 3^3 + \dots + n^3$)
129. The products of two numbers is correctly seen to be as 8 and their difference is 2. Of two other numbers, the product being 18, the difference is 7. Tell me the numbers multiplied in the two cases.
130. I do not know the monthly interest on 100, but I do know that the monthly interest on 100 + interest on that interest accruing in 4 months is 6. Give out the monthly interest on 100.
131. If one bhara (2000 palas) of ginger is sold for $10 + \frac{1}{5}$ rupakas, tell me quickly the price of $100 + \frac{1}{2}$ palas of ginger.
132. A serpent of 20 cubits in length enters into a hole, moving forward at the rate of $\frac{1}{2}$ of an angula per muhurta (one muhurta = 48 minutes) and backward at the rate of $\frac{1}{5}$ of an angula per muhurta. In how many days does the snake get into the hole completely
133. Out of 11 cattle 8 are tamed and 3 to be tamed so are the cattle described. Out of 1001 cattle, then, how many are tamed and how many to be tamed ?
134. Five merchants collaborate in a business; the capitals invested by them are in the ratio of 1 and the same number increasing by one. The profit that accrued on the whole capital amounts to 1000. Say what should be given to whom.

135. The combined profit of three merchants whose investments are in the ratio of $\frac{1}{2}$, $\frac{1}{3}$, and $\frac{1}{8}$, respectively, amount to 70 minus 1. What is whose profit?
136. Given the 100 increases by 5 in a month, say if you are well versed in Aryabhata's Ganitha, by how much will 20 increase in 6 months.
137. A sum of 20 plus $\frac{1}{2}$ rupakas increased by 1 plus $\frac{1}{3}$ rupakas in 1 plus $\frac{1}{5}$ months. Say after carefully understating the method of elimination of divisors from the aphorism of the Bhatta tantra (Aryabhateeya) what will be the increase of 7 minus $\frac{1}{4}$ rupakas in 6 plus $\frac{1}{10}$ months.
138. If 9 kudavas of pure parched and flattened rice are obtained daily for an elephant whose height is 7 cubits, periphery 30 cubits and length 9 cubits say how much of parched and flattened rice will have to be obtained for an elephant whose height is 5 cubits, length and periphery 28 cubits.
139. A number is multiplied by 2; then increased by 1; then divided by 5; then multiplied by 3; then diminished by 2 and then divided by 7: the result thus obtained is 1. Say what is the initial number
140. What is that number which when multiplied by 3, then diminished by 1, then halved, then increased by 2, then divided by 3 and finally diminished by 2 yields 1?
141. A certain person has 8 palas of saffron and money amounting to 90 rupakas. Another person possesses 12 palas of saffron and 30 rupakas and the two persons are equally rich by these items. If the two persons have bought the saffron at the same rate per pala, I want to know the price of one pala of saffron and also the equal wealth with the two.
142. One man goes from Vallabhi at the speed of $1\frac{1}{2}$ yojanas a day; another man comes along the same route from Harukaccha at

the speed of $1 \frac{1}{4}$ yojana a day. The distance between the two places is known to be 18 yojanas. Say, o mathematician, after how much time will they meet each other.

143. One man goes from Vallabhi to Ganga at the speed of $1 \frac{1}{2}$ yojanas a day and at the same time another man proceeds from Sivabhagapura at the speed of $\frac{2}{3}$ yojanas a day. The distance between the two places has been stated by the learned to be 24 yojanas. If they travel along the same route, after how much time will they meet each other ?
144. Calculate what is that number which is said to yield 5 as remainder when divided by 8, 4 when divided by 9 and 1 when divided by 7.
145. Quickly say, O mathematician, what is that number which when divided by the numbers beginning with 2 and ending in 6 in each case leaves 1 as the remainder and is exactly divisible by 7.
146. 8 is multiplied by some number and the product is increased by 6 and that sum is then divided by 13. If the division be exact, what is the unknown multiplier and what is the resulting quotient ?
147. By opening four inlets separately, one pond gets filled respectively with 1, $\frac{1}{2}$, $\frac{1}{3}$ and $\frac{1}{6}$ days. If all the four inlets are opened together, how much time in fraction of the day is required to fill the pond.
148. One third of a troop of monkeys with one third of itself has gone to the tank, the square root of the whole troop is afflicted with thirst, and the remaining 2 monkeys are sitting under the mango tree. What is the total number of monkeys
149. I saw that one half of 7 times the square root of the total number of swans were slowly moving away in the river. Remaining 2 are playing in water. What is the number of the total swans ?

**ASTRONOMICAL PROBLEMS GIVEN BY
BHASKARACHARYA I (AD 629)**

150. The mean position of the Sun has been observed by me at sunrise to be in the sign Leo in the middle of navamamsa Sagitarius. Calculate the number of days elapsed since the beginning of Kalaiyuga (ahargana) when the longitude of the planets was zero according to the Aryabhateeya
151. The mean longitude of the Sun at sunrise on a Wednesday is stated to be 8 signs, 25 degrees, 36 minutes, and 10 seconds. State correctly after how much time will the sun again assume the same position at sunrise on a Thursday, Friday and Wednesday.
152. The Sun and Moon on a Sunday at sunrise are carefully seen by me to be in the sign Libra. The degrees of their longitudes are 12 and 2, respectively. The minutes are 1 and 40, respectively. After how many days will they assume the same longitudes again at sunrise on a Thursday, Friday and Saturday, respectively ?
153. The mean longitude of the Sun for midnight is found to be 9 signs, 32 minutes, and 40 seconds. Quickly say the number of days elapsed since Kaliyuga and the number of revolutions performed by the Earth (Sun)
154. Quickly calculate how many years and how many days of the current yuga had elapsed when the traversed part of the Moon's apogee amounted to three signs.

Sanskrit terms and the measurements used in mathematical books

Sankalitha - addition, vyavakalith - subtraction, pratyutpanna - multiplication, bhagahara - division, varga - square, varga mula - square root, ghana - cube, ghana mula - cube root.

Table of money measurements: one purana = 16 panas; one pana = four kakinis, one kakini = 20 varatakas/ coudies, 12 panas = one dramma, 36 dramma = nishka.

Table of weights: one masha = 5 gunjas, 16 masha = one karsha, one karsha of gold = suvarna, 4 karshas = one pala.

Table of the measurements of capacity: One khari = 16 dronas, one drona = 4 adhakas, one adhaka = 4 prasthas, one prastha = 4 kudavas

Table of linear measurements

24 angula = one hasta, 4 hasta = one danda, 2000 danda = one krosa, 4 krosa = one yojana.

Table of time measurements

60 ghatis = ahoratra (a day and night), 30 ahoratra = one masa, 12 masa = one varsha

How the period of an ancient Indian scientist has been calculated? Calculation of the date of Bhaskaracharya I and his book Aryabhateeya Bhashya written in AD 629 is given below

In the above book 9th stanza of first chapter, 3rd narration gives the period of writing this book in Bhootha Sankhya (number) system as....kha(0) agni(3) adri(7) rama(3) arka(12) rasa(6) vasu(8) randhra(9) indava:(1) - (kha agnyadri rama arka rasa vasu randrendava:) which is 1986123730*. (write the above numbers in the reverse order.

“... Since the beginning of the current kalpa, the number of years elapsed is 1986123730 years (when the book was written).

The number of years elapsed since the beginning of the current kalpa at the commencement of kaliyuga (according to Aryabhata I)

= 6 manwantharaas + $27 \frac{3}{4}$ of mahayugas (one manwanthara = 72 mahayugas and one mahayuga = 4320000 years)

= $(6 \times 72 + 27 \frac{3}{4}) \times 4320000$ years

= 1866240000 + 119880000 = 1986120000 years

Hence the number of years elapsed since the beginning of the kaliyuga at the time of writing this book

= 1986123730* - 1986120000 = 3730 years

The kali era starts from BC 3102 Feb 17th. When year and month corrections are given we get 3730 - 3101 = 629 AD . Our ancestors could calculate the year so accurately (which has been written in their books.)



For the psychological benefit, proper utilization of ears, eyes, tongue and mind for learning and teaching, is advised.

For physiological benefit taking good food (ahaara), following valuable aacharas (customs and good rituals) and also the karma (dharma)

For strengthening the family relation, one should teach the message of *mathru/pitru/putra/putree/bhartru/patnee*.. dharma and also the concept of *maathru devo bhava, pitru devop bhava*. The students should be informed about their dharma towards their parents particularly when they (parents) become old.

Every student should be informed about his / her dharma towards the society, particularly towards the sick, old aged people, orphans, poor, A message should always be given to them that they should spend at least 3% each of their time, energy and monthly income in the course of time for serving the society. They should also learn the culture of India from the heritage knowledge given in epics, poems, stories, and from the great messages given by our ancestors.

Every student should know the past, present and future glory of our motherland and feel proud of being an Indian. The scientific, technological, spiritual, social, literature based,..... heritage of India should be taught with example like Ajanta, Ellora, huge temples, Delhi Iron pillar, etc. The achievements of modern India in the field of atomic energy, green-white - blue revolution and revolutionary improvements taking place in India in the field of the electronics / communication/ transportation /academic/ health / IT fields etc should be taught for making every student proud of our country. How the world is estimating and assessing India as the great future economic/scientific/technological power also should be taught so that every Indian should get thrilled with our capability and should feel proud with self respect and self confidence.

Every student, teacher and parent should collect as many information bits on the above five subjects as possible and learn, teach and practice in their life, which are the values in the value based education. We are sure every school authority will definitely use the above messages for teaching their students.

Indian Institute of Scientific Heritage has been involved in the mission of learning and teaching the Indian scientific and technology heritage in the true spirit of science for the last half a decade. We inform every Indian that they should feel proud of being an Indian. We are the inheritors of a great heritage of our motherland. On the one side millions of people, scientist, scholars and thinkers, world over are accepting our heritage but on the other side, the media and the so called intellectuals (pseudo intellectuals) are tamishing and denigrating our image. It appears that there are a calculated efforts to belittle Indian knowledge in India and abroad. Even some of the reputed institutes and scholars work against Indian heritage and knowledge. It appears that they have some hidden motives behind doing so!

It is the dharma (duty + responsibility + privilege) of every Indian to learn and teach the scientific and technological heritage of our motherland using the Icchasakti, jnaana sakti and kriyaa sakti to counter the negative activities against India and Indian heritage.

Herewith submitted are the true mathematical knowledge existed in India 1250 & 1400 years ago. It is your responsibility too to do your best for your motherland. We submit to you the information and knowledge.. Critically evaluate each point, analyse, understand thoughtly and then teach others in such a way that they feel proud of their heritage (i.e. Indian heritage)

If you want to accept Indian heritage or you want to reject it / denigrate it, you have the freedom. But do it only after understanding/learning Indian heritage