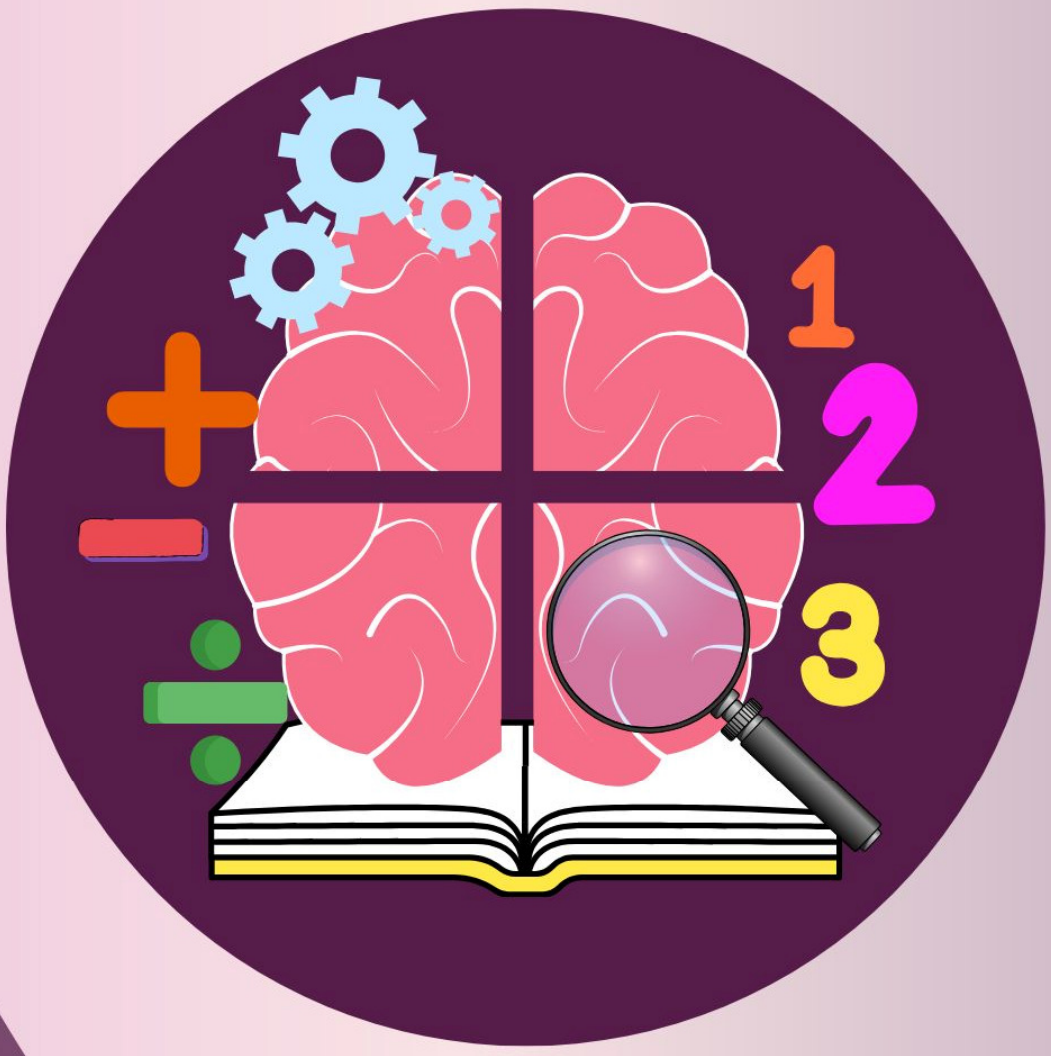
CREST Olympiads

MENTAL MATHS WORKBOOK

8

For the preparation of National & International Competitions



- Chapter-wise practice exercises
- Previous year paper

CREST Mental Maths Olympiad (CMMO)

Mental Maths Competitions

Preparation Book

Grade 8

#CRESTInnovator

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CREST Mental Maths Olympiad (CMMO) Workbook for Grade 8

First Edition

Disclaimer: The information in the Workbook is to give you the path to success but it does not guarantee 100% success as the strategy is completely dependent on its execution.

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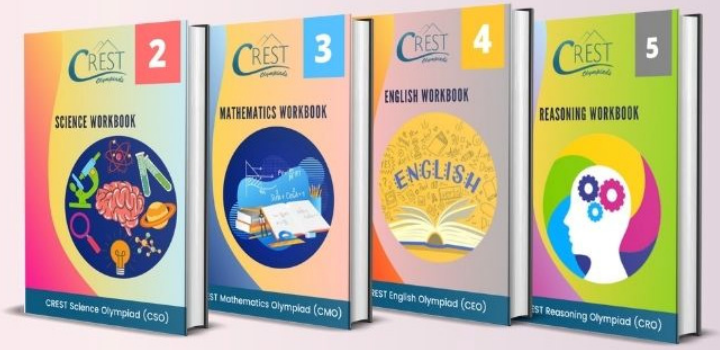

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Preface

We are pleased to launch first edition of this workbook. We welcome feedback from students, teachers, educators and parents. For improvements in the next edition, please send your suggestions at info@crestolympiads.com. Our team will make an effort to work on those suggestions.

CREST Olympiads is one of the largest Olympiad Exams with students from more than 60 countries. The objective of these exams is to build a competitive spirit while evaluating students on conceptual understanding of the concepts.

We strive to provide a superior learning experience, and this workbook is designed to complement the school studies and prepare the students for various competitive exams including the CREST Olympiads. This workbook provides practice questions on the topics. These questions encourage the students to think analytically, to be creative and to come up with solutions of their own. There is a previous year's paper given at the end of this workbook for the students to attempt after completing the syllabus. This paper should be attempted in 1 hour to get an assessment of the student's preparation for the final exam.

Publishers

Chapter 1

Number System

1. Which of the following is false for integers?

a. Positive Integer + Positive Integer = Positive Integer
b. Negative Integer + Negative Integer = Negative Integer
c. Positive Integer × Negative Integer = Positive Integer
d. Negative Integer ÷ Positive Integer = Negative Integer

2. If x and y are integers such that x – y = −15 and x + y = 5, what is the value of xy?

a. 40 b. -50
c. -40 d. 50

3. The sum of three consecutive integers is -21. What is the middle integer?

a. -7 b. 7
c. -8 d. -10

4. Evaluate:
$(-6)^3 + (-4)^2 - (-10)$

a. 240 b. 190
c. -190 d. 200

5. If x = $(-3)^2$ + $(-2)^3$, what is the value of x ÷ (−1)?

a. 1 b. -11
c. 11 d. -1

6. A number is added to its additive inverse and then multiplied by its multiplicative inverse. What is the result?

a. 1 b. Undefined
c. 0 d. -1

7. Arrange the following in ascending order:
A. [(−15) + 10]
B. [(−5) × (−2)]
C. [10 ÷ (−5)],
D. [(−20) ÷ (-4)]

a. A, D, C, B b. A, C, D, B
c. A, C, B, D d. C, D, B, A

8. Find the value of:
(−8) × (−3) + (−12) ÷ (−4)

a. 20 b. 27
c. 30 d. 36

9. If x = −7 and y = 5, what is the value of $x^2 - 2xy + y^2$?

a. 0 b. 12
c. -144 d. 144

10. If $(-5)^2 + (-5)^3 + 2^3$ = x, find the value of (-2x + 6).

a. -190 b. 178
c. 190 d. -178

11. The product of two integers is –76. If one integer is –19, find the other.

a. 4 b. -4
c. 3 d. -3

12. A diver dives in the sea 1170 m down. If the diver's speed is 13 m/sec, how long will it take for the diver to reach the depth?

a. 90 sec b. 180 sec
c. 130 sec d. 80 sec

13. Find the sum of (8 + 9) × 10 and 8 + 9 × 10.

a. 368 b. 370
c. 270 d. 268

14. If a = –5, b = 7 and c = –2 find the value of:
$a \times b + c^2$

a. 37 b. -34
c. -31 d. 35

15. Simplify:
(–20) + (–8) ÷ (–2) × 3

a. 8 b. -22
c. -8 d. 16

16. Evaluate:
(–1) × (–2) × (–3) × (–4) × (–5)

a. -120 b. 20
c. 120 d. 200

17. The temperature in a city was –3℃ in the morning. By afternoon, it rose by 7℃, and by night it dropped by 9℃. What was the temperature at night?

a. 5℃ b. –3℃
c. 3℃ d. –5℃

18. On a number line, A is at –6, and B is at 8. What is the distance between A and B?

a. 14 b. 2
c. 12 d. -14

19. A mountaineer was 120 m above sea level. She climbed 200 m higher, descended 350 m, then climbed 80 m again. What is her final position?

a. 50 m above sea level
b. 50 m below sea level
c. 10 m below sea level
d. 10 m above sea level

20. Find the value of:
[(-16) + (-4)] ÷ [(-2) x (-2)] + (-8)

a. -12 b. -8
c. -13 d. -20

21. Find the value of:
$$\frac{9|3-5|-5|4|\div 10}{-3(5)-2\times 4\div 2}$$

a. 9/10 b. -16/19
c. -20/19 d. 4/9

22. Emma was reading a book at page number -75 when she decided to flip 30 pages forward and then 45 pages backward. At what page number did she end up?

a. -45 b. -70
c. -90 d. -180

23. If the temperature dropped 5 degrees every hour from 10 degrees, and this trend continued for 8 hours, what was the final temperature?

a. -30 degrees b. -40 degrees
c. 25 degrees d. -20 degrees

24. In a game, losing a point means your score is multiplied by -1. If you start with 5 points and lose a point four times, what is your final score?

a. 5 b. -5
c. 0 d. -1

25. A submarine was descending at a rate of 40 m per minute. If it started at sea level and descended for 15 minutes, what was its final depth?

a. 600 m b. 400 m
c. -600 m d. -400 m

26. If the sum of three consecutive integers is -72, what is the smallest integer?

a. -22 b. -25
c. -23 d. -24

27. A debt of $350 is reduced by $50 each month. How many months will it take to clear the debt entirely?

a. 6 months b. 7 months
c. 14 months d. 8 months

28. If you multiply a number by -1, then add -20, and the result is 15, what was the original number?

a. 35 b. -5
c. -35 d. 5

29. During a temperature study, the difference between the highest and lowest temperatures of the day was found to be 25 degrees. If the lowest temperature was -15 degrees, what was the highest?

a. 10 degrees b. 15 degrees
c. 25 degrees d. -40 degrees

30. A hiker starts at sea level and descends into a canyon at 10 m per minute. After 20 minutes, he climbs up at a rate of 15 m per minute for 10 minutes. What is his final altitude?

a. -50 m b. -100 m
c. -150 m d. -200 m

31. Convert $6.\overline{28}$ into rational form.

a. 628/99 b. 622/99
c. 621/99 d. 82/25

32. The sum of two rational numbers is 15/17. If one of the numbers is -1/7. Find the other rational number.

a. 122/119 b. 1/7
c. 15/17 d. 111/119

33. Which of the following false?

a. $\frac{-6}{-5} + 0 = \frac{6}{5}$
b. $\frac{-7}{-6} + \frac{-7}{12} = \frac{-7}{-12} + \frac{-7}{-6}$
c. $\frac{8}{9} + \left(\frac{11}{3} + \frac{-5}{3}\right) = \left(\frac{8}{9} + \frac{11}{3}\right) + \frac{-5}{3}$
d. $\frac{7}{6} - \frac{7}{11} = \frac{7}{11} - \frac{7}{6}$

34. Find the product of 7/9 and the multiplicative inverse of 343/243.

a. 9/8 b. 36/49
c. 6/11 d. 27/49

35. What should be added to (3/4 + 2/5) to get -8/15?

a. -101/60 b. 78/88
c. -87/60 d. 69/60

36. A car is moving at an average speed of $4\frac{1}{8}$ km per hour. How much distance will it cover in $7\frac{1}{3}$ hours?

a. $3\frac{1}{4}$ km b. $30\frac{1}{7}$ km
c. $30\frac{1}{4}$ km d. $28\frac{1}{7}$ km

37. Which of the following rational number lie between $\frac{1}{3}$ and $\frac{1}{2}$?

a. $\frac{2}{5}$ b. $\frac{3}{5}$
c. $\frac{1}{4}$ d. $\frac{5}{6}$

38. Find the resultant if we divide $-\frac{7}{9}$ by the sum of $-\frac{4}{5}$ and $\frac{3}{10}$.

a. $\frac{16}{9}$ b. $\frac{11}{9}$
c. $\frac{7}{9}$ d. $\frac{14}{9}$

39. Find the least fraction that must be added to $1\frac{1}{3} \div 1\frac{1}{4} \div 1\frac{1}{5}$ to make the result an integer?

a. $\frac{9}{8}$ b. $\frac{4}{5}$
c. $\frac{1}{9}$ d. $\frac{3}{5}$

40. Which of the following fractions is the largest?

a. $\frac{5}{12}$ b. $\frac{4}{9}$
c. $\frac{7}{18}$ d. $\frac{3}{8}$

41. Which of the following fractions is less than $\frac{7}{8}$ and greater than $\frac{1}{3}$?

a. $\frac{1}{4}$ b. $\frac{23}{24}$
c. $\frac{11}{12}$ d. $\frac{17}{24}$

42. What fraction of $\frac{7}{10}$ must be added to itself to make the sum $2\frac{1}{5}$?

a. 18/7 b. 2
c. 15/7 d. 3/2

43. If A = $\left(\frac{1}{10}\right)^2$, B = $\frac{1}{8}$ and C = $\sqrt{\left(\frac{1}{100}\right)}$, then which of the statements is correct?

a. A < B < C b. A < C < B
c. B < C < A d. C < A < B

44. The product of two fractions is $\frac{28}{15}$ and their quotient is $\frac{35}{48}$. Find the greater fraction.

a. 7/6 b. 4/5
c. 11/6 d. 14/9

45. What would be the reciprocal of the sum of the reciprocals of the numbers $\frac{4}{5}$ and $\frac{7}{4}$?

a. $\frac{28}{51}$ b. $\frac{29}{51}$
c. $\frac{24}{51}$ d. $\frac{56}{51}$

46. If $\frac{3}{4}$ of an estate is worth \$90000, then what will be the value of $\frac{2}{3}$ of the same?

a. \$70000 b. \$85000
c. \$90000 d. \$80000

47. $\frac{4}{15}$ of $\frac{5}{7}$ of a number is greater than $\frac{4}{9}$ of $\frac{2}{5}$ of the same number by 8. What is $\frac{1}{3}$ of the number?

a. 210 b. 630
c. 315 d. 460

48. What will be the HCF of 3/16, 5/12, 7/20?

a. 1/480 b. 1/180
c. 1/320 d. 1/240

49. Find the value of the given expression: $\frac{1}{20} + \frac{1}{30} + \frac{1}{42} + \frac{1}{56} + \frac{1}{72} + \frac{1}{90} + \frac{1}{110} + \frac{1}{132}$

a. 1/8 b. 1/7
c. 1/6 d. 1/10

50. If $\frac{a}{b} + \frac{b}{a} = 7$, then what is the value of $\frac{a^2+b^2}{ab}$?

a. 14 b. -14
c. -7 d. 7

51. Between which two consecutive rational numbers does -18/5 lie?

a. -2 and -3 b. -4 and -5
c. -3 and -4 d. -5 and -6

52. If a person spends $\frac{3}{5}$ of their money and then earn back $\frac{2}{3}$ of the remaining amount, what fraction of their original money does he have now?

a. 2/3 b. 5/6
c. 13/15 d. 1/3

53. If all the fractions 3/5, 1/8, 8/11, 4/9, 2/7, 5/7 and 5/12 are arranged in descending order of their values, which will be the third fraction?

a. 8/11 b. 3/5
c. 1/8 d. 5/12

54. What will be rational form of $0.\overline{89}$?

a. 89/99 b. 89/10
c. 89/100 d. 89/98

55. Which rational number lies exactly halfway between 3/4 and 5/6?

a. 23/24 b. 21/24
c. 19/24 d. 7/12

56. If the product of two rational numbers is 7/8 and one of them is 7/4, what is the other number?

a. 4/7 b. 8/7
c. 1/2 d. 2/7

57. Which of the following is a non-terminating decimal?

a. 2/5 b. 11/16
c. 8/25 d. 3/7

58. Find a rational number x such that 1/x = 1/4 + 1/6.

a. 10/24 b. 12/5
c. 1/2 d. 5/12

59. The sum of two rational numbers is 1/3, and one of them is -2/9. Find the other.

a. 5/9 b. 7/9
c. 2/9 d. 2/9

60. Which rational number lies between $\frac{5}{6}$ and $\frac{6}{7}$?

a. 71/84 b. 15/21
c. 1/2 d. 71/84

61. If x = $0.\overline{09} \times 7.\overline{3}$, then find the value of x + 2.

a. $1.\overline{6}$ b. 2.6
c. $2.\overline{6}$ d. $0.\overline{6}$

62. What is the reciprocal of the sum of 2/5 and 3/7?

a. 35/29 b. 29/35
c. 17/5 d. 5/17

63. If x = 5/3, which of the following is equal to x/(x-1)?

a. 5/2 b. 3/5
c. 10/3 d. 15/7

64. Simplify:
1/(3/5 - 2/7)

a. 35 b. 11/35
c. 35/11 d. 11

65. Which of these numbers can be expressed as a rational number?

a. √3 b. π
c. 0.3333... d. √2

66. Find a rational number between 1/3 and 3/4 that satisfies $x^2 - 2x + ¼ = 0$.

a. 1/2 b. 2/3
c. 3/4 d. 7/8

67. If a = 7/5 and b = 9/4, which of the following represents 1/a + 1/b?

a. 73/63 b. 45/28
c. 28/45 d. 63/73

68. If x = 5/8, which of the following is equal to x - 1/x?

a. 39/40 b. 3/40
c. -39/40 d. -3/40

69. Which of the following is the largest?

a. 7/8 b. 31/40
c. 13/16 d. 63/80

70. The product of two rational numbers is 6/7 and their sum is 13/7. Find the two numbers.

a. 6/7, 1 b. 3/7, 10/7
c. 2/7, 3/7 d. 1/2, 12/7

71. If 1/4 and 3/4 are the endpoints of a line segment on a number line, which of the following is NOT a rational number between them?

a. $\frac{5}{7}$ b. $\frac{2}{4}$
c. $\frac{5}{8}$ d. $\frac{7}{8}$

72. The sum of two rational numbers is -1/3. If one of the numbers is 11/4, what is the other number?

a. -37/6 b. -38/12
c. -37/12 d. -35/12

73. Identify a rational number that lies halfway between $\frac{3}{5}$ and $\frac{4}{5}$.

a. $\frac{3}{4}$ b. $\frac{7}{10}$
c. $\frac{17}{20}$ d. $\frac{19}{20}$

74. If x is a rational number such that 3x + 5/4 = 3/2, what is the value of x?

a. $\frac{1}{8}$ b. $\frac{1}{6}$
c. $\frac{1}{4}$ d. $\frac{1}{12}$

75. What is the product of the multiplicative inverse of $\frac{3}{4}$ and the additive inverse of $-\frac{1}{8}$?

a. $\frac{1}{5}$ b. $\frac{1}{4}$
c. $\frac{1}{6}$ d. $\frac{1}{8}$

76. What is the result when the additive inverse of $\frac{3}{5}$ is subtracted from the multiplicative inverse of $\frac{5}{3}$?

a. $-\frac{3}{5}$ b. $\frac{5}{6}$
c. $\frac{8}{5}$ d. $\frac{6}{5}$

77. If p/q is a rational number, which of the following must be true?

a. p and q are both even.
b. p and q have no common factors other than 1.
c. q cannot be zero.
d. p must be greater than q.

78. What number must be added to 2/3 to get a sum of 5/6?

a. 3/2 b. 1/2
c. 5/6 d. 1/6

79. A sequence of rational numbers is formed by adding 1/4 to each previous term, starting at 1/2. What is the fifth term in this sequence?

a. $\frac{3}{2}$ b. $\frac{5}{4}$
c. $\frac{7}{4}$ d. $\frac{2}{1}$

80. The product of two rational numbers is $-\frac{1}{216}$. If one of the numbers is $\frac{1}{4}$, what is the other number?

a. 1/44 b. 1/54
c. -1/64 d. -1/54

81. What is the reciprocal of the sum of the reciprocals of 1/3 and 1/6?

a. 1/7 b. 1/9
c. 1/6 d. 1/3

82. Which rational number is exactly halfway between -1/8 and 1/8?

a. 0 b. -1/16
c. 1/8 d. 1/16

83. If x and y are rational numbers such that x < y, and z is the average of x and y, which of the following is always true?

a. z < x b. z > y
c. x < z < y d. z = 2x

84. The product of two rational numbers is -1/2. If one of the numbers is -2/3, what is the other number?

a. 3/4 b. -3/4
c. -4/3 d. 4/3

85. Which of the following properties is not true for rational numbers?

a. Commutativity under multiplication
b. Closure under addition
c. Existence of multiplicative inverse for all numbers
d. Associativity under addition

86. Arrange the following rational numbers in ascending order: -2/3, 1/2, -3/4, 2/5
a. -3/4, -2/3, 2/5, 1/2
b. -2/3, -3/4, 1/2, 2/5
c. -3/4, -2/3, 1/2, 2/5
d. -2/3, -3/4, 2/5, 1/2

87. A recipe calls for 2/3 cup of sugar. If you want to make half the recipe, how much sugar do you need?

a. 1/2 cup b. 4/3 cup
c. 2/7 cup d. 1/3 cup

88. John runs 3/4 of a mile every day. How many miles does he run in a week?

a. 3/28 miles b. 28/3 miles
c. 4/21 miles d. 21/4 miles

89. A rectangular garden is 15/2 metres long and 3/4 metres wide. What is its area?

a. 30 sq m b. 45/8 sq m
c. 49/8 sq m d. 60 sq m

90. A rope is 10 m long. You cut off 2/5 of it. How long is the remaining rope?

a. 4 m b. 8 m
c. 2 m d. 6 m

91. If a car travels 60 km in 3/4 of an hour, what is its average speed?

a. 20 km/h b. 45 km/h
c. 80 km/h d. 75 km/h

92. Sarah has 7/8 of a pizza left. She eats 1/4 of the whole pizza. How much pizza does she have left now?

a. 6/4 b. 5/8
c. 9/8 d. 3/4

93. A shirt costs $2500. It's on sale for 1/4 off. What is the sale price?

a. $1975 b. $1675
c. $1875 d. $1775

94. A movie is $2\frac{1}{2}$ hours long. How long is the movie in minutes?

a. 120 minutes b. 212 minutes
c. 250 minutes d. 150 minutes

95. A building has 12 floors. Each floor is $3\frac{1}{2}$ metres high. What is the total height of the building?

a. 48 m b. 45 m
c. 21 m d. 42 m

96. You have 7/8 of a pizza. You want to share it equally among 3 people. How much pizza does each person get?

a. 7/24 b. 24/7
c. 7/3 d. 3/7

97. A store owner buys 25 kg of apples at $1.20 per kg. He sells 3/5 of the apples at $1.80 per kg and the rest at $1.50 per kg. What is his profit?

a. $18 b. $12
c. $21 d. $15

98. A garden is 12 metres long and 5/2 metres wide. What is the perimeter of the garden?

a. 27 m b. 29 m
c. 58 m d. 54 m

99. A car uses 1/8 of a tank of gas to travel 50 km. How far can the car travel on a full tank of gas?

a. 200 km b. 1200 km
c. 800 km d. 400 km

100. Which rational number, when added to 5/9, yields the same result as when 1/9 is subtracted from it?

a. 4/9 b. -2/9
c. 1/9 d. -1/9