



## CREST Mathematics Olympiad (CMO)

# Sample Paper

## Pattern and Marking Scheme

Grade	Topic/Section	No. of Questions	Marks per Question	Total Marks
Grade 8	Practical Mathematics	40	1	40
	Achiever's Section	10	2	20
<b>Grand Total</b>		<b>50</b>		<b>60</b>

The total duration of the exam is 60 minutes.

## Syllabus

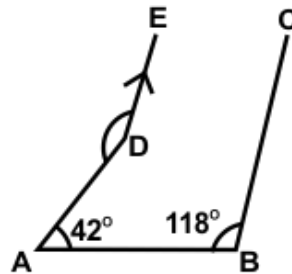
**Section 1:** Rational Numbers, Squares and Square Roots, Cubes and Cube Roots, Exponents and Powers, Comparing Quantities, Algebraic Expressions and Identities, Linear Equations in One Variable, Understanding Quadrilaterals, Constructions, Mensuration, Visualizing Solid Shapes, Data Handling, Direct and Inverse Variations, Factorization, Introduction to Graphs, Playing with Numbers.

**Achievers Section:** Higher Order Thinking Questions - Syllabus as per Section 1

For more details, visit <https://www.crestolympiads.com/maths-olympiad-cmo>

## Practical Mathematics (Each Question is 1 Mark)

- If we divide a positive integer by another positive integer, then what is the resulting number?
  - It is always a natural number
  - It is always an integer
  - It is always a rational number
  - It is an irrational number
- Anne gave 40% of the amount he had to Jey. Jey in turn gave one-fourth of what she received from Anne to Paul. After paying \$200 to the NGO out of the amount he got from Jey, Paul now has \$600 left with him. How much amount did Anne have?
  - \$1,200
  - \$4,000
  - \$8,000
  - \$6,000
- In the given figure,  $DE \parallel BC$ ,  $\angle ABC = 118^\circ$ ,  $\angle DAB = 42^\circ$ , then find the value of  $\angle ADE$ .



- $118^\circ$
  - $42^\circ$
  - $138^\circ$
  - $160^\circ$
- If  $AB = 5$  cm,  $BC = 4$  cm,  $\angle B = 90^\circ$  and opposite sides are equal, then which of the following figures can be constructed?
    - Square
    - Rectangle
    - Trapezium
    - Rhombus
  - The population of four major cities, as of 2011 are shown below:

City	Population
Liverpool	12,442,373
Bristol	11,007,835
Edinburgh	4,666,142
Manchester	4,486,675

The population of Edinburgh is how much per cent more than the population of Manchester?

- 6%
- 5.5%
- 4%
- 2.8%

6. Find the product of  $(3a^2 - 4ax + x^2)$  and  $(5x^2 - 2ax)$ :
- a.  $14a^3x + 23a^2x^2 - 22ax^3 + 5x^4$   
 b.  $14a^2x + 23a^3x^2 - 22ax^3 + 5x^4$   
 c.  $16a^3x + 23a^2x^2 - 22ax^3 + 5x^4$   
 d.  $-6a^3x + 23a^2x^2 - 22ax^3 + 5x^4$
7. A graph that displays data that changes continuously over periods of time is called:
- a. Bar graph  
 b. Pie chart  
 c. Line graph  
 d. Histogram
8. Teo studies for  $6 \frac{1}{4}$  hours daily. He devotes  $1 \frac{3}{4}$  hours of his time to Science and Sanskrit. How much time does he devote to other subjects?
- a. 2 hours  
 b.  $4 \frac{2}{3}$  hours  
 c.  $4 \frac{1}{2}$  hours  
 d.  $3 \frac{1}{4}$  hours
9. Twelve-sided dice are used in adventure games. They are marked with the numbers 1 to 12. The score is the uppermost face. If this type of dice is thrown, then what is the probability that the score is a factor of 12?
- a.  $\frac{1}{2}$   
 b.  $\frac{3}{4}$   
 c.  $\frac{1}{6}$   
 d.  $\frac{1}{4}$
10. Two poles, 18 m and 13 m high, stand upright in a playground. If their feet are 12 m apart, then find the distance between their tops.
- a. 18 m  
 b. 13 m  
 c. 14 m  
 d. 16 m
11. If the angles of a triangle are  $(x - 35)^\circ$ ,  $(x - 25)^\circ$  and  $(\frac{1}{2}x - 10)^\circ$ , then find the value of x.
- a.  $150^\circ$   
 b.  $170^\circ$   
 c.  $110^\circ$   
 d.  $100^\circ$

12. Match the following:

List I		List II	
P.	Add $x^5 + 8x^3 - 7x^2 + 12$ and $-3x^3 + 10x^2 + 8$	1.	$-x^3 - 3x^2 + 3x + 2$
Q.	Subtract $2x^2y + 4x^2y^2 + 3xy^2$ from $5x^2y + 7xy^2$	2.	$-x^3 + x^2 + 3x - 6$
R.	Subtract $2x^3 + 2x^2 - 4x - 4$ from $x^3 - x^2 - x - 2$	3.	$x^5 + 5x^3 + 3x^2 + 20$
S.	Add $x^3 - x^2 - x - 2$ and $2x^2 - 2x^3 + 4x - 4$	4.	$3x^2y + 4xy^2 - 4x^2y^2$

- a. P-3, Q-2, R-1, S-4  
 b. P-3, Q-4, R-1, S-2  
 c. P-2, Q-4, R-3, S-1  
 d. P-2, Q-3, R-4, S-1
13. If  $x/y = (2/3)^3 \div (3/2)^2$ , then find the value of  $(x/y)^3$ .
- a.  $(2/3)^{-3}$   
 b.  $(2/3)^{15}$   
 c.  $(2/3)^3$   
 d. 1

14. Find  $m$ , if  $(\frac{3}{7})^9 \div (\frac{3}{7})^5 = (\frac{3}{7})^{3m + 2/m - 2}$ .
- a. 4  
b. 10  
c. -4  
d. 15
15. Kenster took some loans at 6% per annum simple interest during the first year with an increase of 0.5% for each year. After 4 years she paid \$3,375 as interest. How much was the loan?
- a. \$12,500  
b. \$33,250  
c. \$15,800  
d. \$16580
16. What must be subtracted from  $3x^2 + 4y^2 - 5$  to get  $2x^2 - 3y^2 + 5$ ?
- a.  $x^2 + 3y^2 + 5$   
b.  $x^2 - 4y^2 + 5$   
c.  $x^2 + 7y^2 - 10$   
d.  $x^2 - 7y^2 - 10$
17. Out of the total 390 students studying in a college of Arts and Science, boys and girls are in the ratio of 7:6 respectively and the number of students studying Arts and Science are in the ratio of 3:7 respectively. The boys and girls studying Arts are in the ratio of 4:5 respectively. How many boys are studying Science?
- a. 52  
b. 65  
c. 115  
d. 158
18. A merchant gets \$1160 by selling article A at 30% profit and B at 20% loss. He gets the same amount if he sells A at 20% loss and B at 5% profit. What is the cost price of article B?
- a. \$400  
b. \$800  
c. \$500  
d. \$600
19. If the sum of two integers is negative, then which of the following must be true?
- a. At least one of the integers is positive  
b. Both are positive  
c. At least one of the integers is negative  
d. Both are negative
20. For a positive integer  $x$ , if  $\sqrt{x} + 42/\sqrt{x} = \sqrt{289}$ , then which of the following can be the value of  $x$ ?
- a. 9  
b. 4  
c. 49  
d. 36
21. A single letter is selected at random from the word "PROBABILITY". What will be the probability that the selected letter is a vowel?
- a.  $\frac{2}{11}$   
b.  $\frac{3}{11}$   
c.  $\frac{4}{11}$   
d. 0

22. Which of the following sets of numbers is in descending order?

- a.  $\frac{4}{5}, \frac{3}{8}, \frac{2}{3}, \frac{1}{2}$
- b.  $\frac{4}{5}, \frac{1}{2}, \frac{3}{8}, 2, 3$
- c.  $\frac{2}{3}, \frac{4}{5}, \frac{3}{8}, \frac{1}{2}$
- d.  $\frac{4}{5}, \frac{2}{3}, \frac{1}{2}, \frac{3}{8}$

23. If the rate of interest is 12% per annum compound interest payable half-yearly, then what will be the total compound interest on \$5000 for a year?

- a. \$618
- b. \$1,236
- c. \$600
- d. \$500

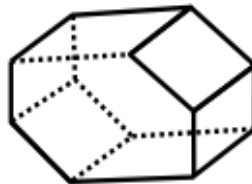
24. The average number of runs scored by a batsman in eight innings is  $x$ . The batsman scored an average of 45 runs in the remaining two innings, thus increasing his average score for ten innings by 4.5 runs. What was his average score for the first eight innings that he played?

- a. 22.5 runs
- b. 40.5 runs
- c. 25 runs
- d. None of these

25. A bag has five red, four black and three blue balls. One ball is drawn at random from the bag. Find the probability that the ball drawn is not red.

- a.  $\frac{5}{12}$
- b.  $\frac{1}{12}$
- c.  $\frac{1}{4}$
- d.  $\frac{7}{12}$

26. Which of the following pictures is the correct for the given net?



- a.
- b.
- c.
- d.

27. In an examination, 42% of students failed in Hindi and 25% failed in English. If 17% failed in both subjects, the percentage of those who passed both subjects is

- a. 23%
- b. 27%
- c. 33%
- d. 50%

28. Multiply  $(3x^3 - 7x + 8 - 2x^2)$  by  $(4x^2 + 6)$ :

a.  $12x^5 + 8x^4 - 10x^3 + 20x^2 - 42x + 48$

b.  $12x^5 - 8x^4 - 10x^3 + 20x^2 - 42x + 48$

c.  $12x^5 - 8x^4 - 10x^3 + 20x^2 - 42x + 8$

d.  $12x^5 + 8x^4 - 10x^3 + 20x^2 - 42x + 8$

29. In a castle there is food for 63 soldiers to last for 27 days. After 7 days, 27 more soldiers joined them. For how many days will the food last now?

a. 12

b. 13

c. 14

d. 15

30. Resolve into factors:

$(a - b)^2 - (a - b)^3$

a.  $(a - b)^2 (1 - a + b)$

b.  $(a - b)^2 (1 - a + b)^2$

c.  $(a - b)^2 (1 - a - b)$

d.  $(a - b) (1 - a + b)$

31. Which of the following points lies on the X-axis?

(i) (4, 0) (ii) (5, 0) (iii) (0, -2) (iv) (0, 0)

a. (i) and (ii)

b. (i), (ii), (iv) and (iii)

c. (i), (ii) and (iv)

d. Only (iv)

32. Which of the following statements is correct?

a. The number 111,111,111,111 is divisible by 9 and 11.

b. The number 111,111,111,111 is divisible by 5 and 11.

c. The number 111,111,111,111 is divisible by 3 and 9.

d. The number 111,111,111,111 is divisible by 3 and 11.

33. A number when divided by the sum of 555 and 445 gives two times their difference as quotient and 30 as remainder. Find the number.

a. 220,030

b. 22,030

c. 1,220

d. 1,250

34. Find the value of the smallest positive integer n for which  $864 \times n$  will be a perfect cube.

a. 1

b. 2

c. 3

d. 4

35. If  $2^{x-1} + 2^{x+1} = 320$ , then find the value of x.

a. 4

b. 5

c. 6

d. 7

36. What will be the factor of the following expression?  
 $625a^{12} - 81b^{12}$
- a.  $(5a^3 + 3b^3)^2 (5a^3 - 3b^3)^2$                       b.  $(25a^6 - 9b^6)^2$   
 c.  $(5a^3 - 3b^3)^4$     d.  $(25a^6 + 9b^6) (5a^3 - 3b^3) (5a^3 + 3b^3)$
37. If Dennis is  $\frac{1}{3}$ <sup>rd</sup> the age of his father Keith now and was  $\frac{1}{4}$ <sup>th</sup> the age of his father 5 years ago, then how old will his father Keith be 5 years from now?
- a. 20 years    b. 45 years  
 c. 40 years    d. 50 years
38. The length of a rectangle is 3 times its breadth. If the length is decreased by 3 cm and the breadth is increased by 5 cm, the area of the rectangle is increased by  $57 \text{ cm}^2$ . The perimeter of the rectangle is:
- a. 18 cm    b. 48 cm  
 c. 24 cm    d. 20 cm
39. The average weight of 120 students in the second-year class of college is 56 kg. If the average weight of boys and girls in the class is 60 kg and 50 kg, respectively, then find the number of boys and girls in the class respectively.
- a. 72, 64    b. 38, 64  
 c. 72, 48    d. 62, 58
40. A sheet is in the form of a rhombus whose diagonals are 10 m and 8 m. Find the cost of painting both of its surfaces at the rate of \$70 per  $\text{m}^2$ .
- a. \$5,600    b. \$4,000  
 c. \$2,800    d. \$2,000

## Achiever's Section (Each Question is 2 Marks)

41. A sum of money amounts to \$9800 after 5 years and \$12005 after 8 years at the same rate of simple interest. Find the rate of interest per annum.
- a. 5%    b. 8%  
 c. 12%    d. 15%
42. A boy is running at a speed of  $p \text{ km/h}$  to cover a distance of 1 km. But, due to slippery ground, his speed is reduced by  $q \text{ km/h}$  ( $p > q$ ). If he takes  $r$  hours to cover the distance, then which of the following is the correct relation between time, speed and distance?
- a.  $\frac{1}{r} = (p - q)$     b.  $r = (p - q)$   
 c.  $\frac{1}{r} = (p + q)$     d.  $r = (p + q)$

43. In the first four papers each of 100 marks, Ronaldo got 95, 72, 73 and 83 marks. If he wants an average of greater than or equal to 75 marks and less than 80 marks, find the range of marks he should score in the fifth paper.

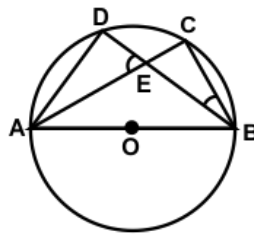
- a.  $52 < x < 77$
- b.  $25 < x < 75$
- c.  $75 < x < 80$
- d.  $73 < x < 100$

44. Match the statements of Column A with those of Column B:

Column A		Column B	
1.	The geometric point of a triangle which always lies inside the triangle	a.	In centre
2.	The geometric point of a triangle which always lies outside the triangle	b.	Orthocentre
3.	The geometric point of a triangle which always lies on two sides of the triangle	c.	Circumcentre
4.	The geometric point of a triangle which lies only on the longest side of the triangle	d.	Excentre

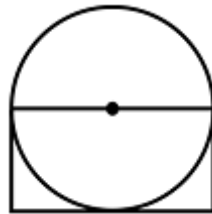
- a. 1 - (a), 2 - (d), 3 - (b), 4 - (c)
- b. 1 - (d), 4 - (c), 3 - (b), 2 - (a)
- c. 1 - (a), 2 - (b), 3 - (c), 4 - (d)
- d. 1 - (d), 2 - (c), 3 - (b), 4 - (a)

45. In the given figure, O is the centre of the circle,  $\angle CBE = 25^\circ$  and  $\angle DEA = 60^\circ$ . Find the measure of  $\angle ADB$ .



- a.  $90^\circ$
- b.  $85^\circ$
- c.  $95^\circ$
- d.  $120^\circ$

46. The area of the circle is  $616 \text{ cm}^2$ . What is the area of the rectangle?



- a.  $784 \text{ cm}^2$
- b.  $196 \text{ cm}^2$
- c.  $392 \text{ cm}^2$
- d. Cannot be determined

47. Select the incorrect match of the given solids with the product of their number of faces and vertices:

- a. Rectangular pyramid - 25
- b. Triangular prism - 30
- c. Octahedron - 48
- d. Triangular pyramid - 18



48. Consider the following statements:

A number  $a_1 a_2 a_3 a_4 a_5 a_6$  is divisible by 11 if

1.  $(a_1 + a_3 + a_5) - (a_2 + a_4 + a_6) = 0$

2.  $(a_1 + a_3 + a_5) - (a_2 + a_4 + a_6)$  is divisible by 11

Which of these statements is/are correct?

a. 1 alone

b. 2 alone

c. Both 1 and 2

d. Neither 1 nor 2

49. A person standing on a railway platform noticed that a train took 21 seconds to completely pass through the platform which was 84 m long and it took 9 seconds to pass him. Find the speed of the train.

a. 25.2 km/hour

b. 32.4 km/hour

c. 50.4 km/hour

d. 75.6 km/hour

50. The sides of a triangle are 5, 12 and 13 units. A rectangle of width 10 units is constructed whose area is equal to the area of the triangle. Find the perimeter of the rectangle.

a. 30 units

b. 26 units

c. 13 units

d. 15 units

## Answer Key

1.	c	2.	c	3.	d	4.	b	5.	c	6.	d	7.	c
8.	c	9.	a	10.	b	11.	d	12.	b	13.	b	14.	b
15.	a	16.	c	17.	d	18.	b	19.	c	20.	a	21.	c
22.	d	23.	a	24.	a	25.	d	26.	d	27.	d	28.	b
29.	c	30.	a	31.	c	32.	d	33.	a	34.	b	35.	d
36.	d	37.	d	38.	b	39.	c	40.	a	41.	c	42.	a
43.	a	44.	a	45.	c	46.	c	47.	d	48.	c	49.	a
50.	b												