UNICUS OLYMPIADS

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Sample Paper

Class 8

Unicus Global Mathematics Olympiad (UGMO)

Time: 60 minutes

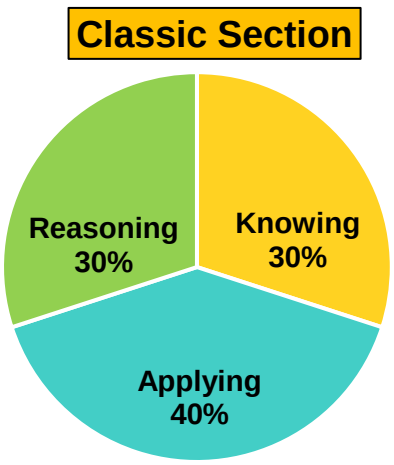
Pattern and Marking Scheme			
Section	**Total Questions**	**Marks per Question**	**Total Marks**
Classic Section	30	1	30
Scholar Section	15	2	30
Grand Total	**45**		60

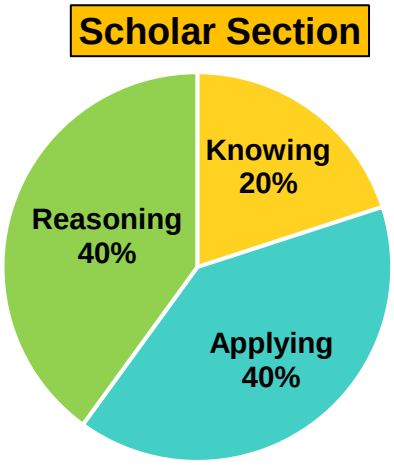
Unicus Global Mathematics Olympiad (UGMO)

The **Unicus Global Olympiad** is organised around two dimensions:

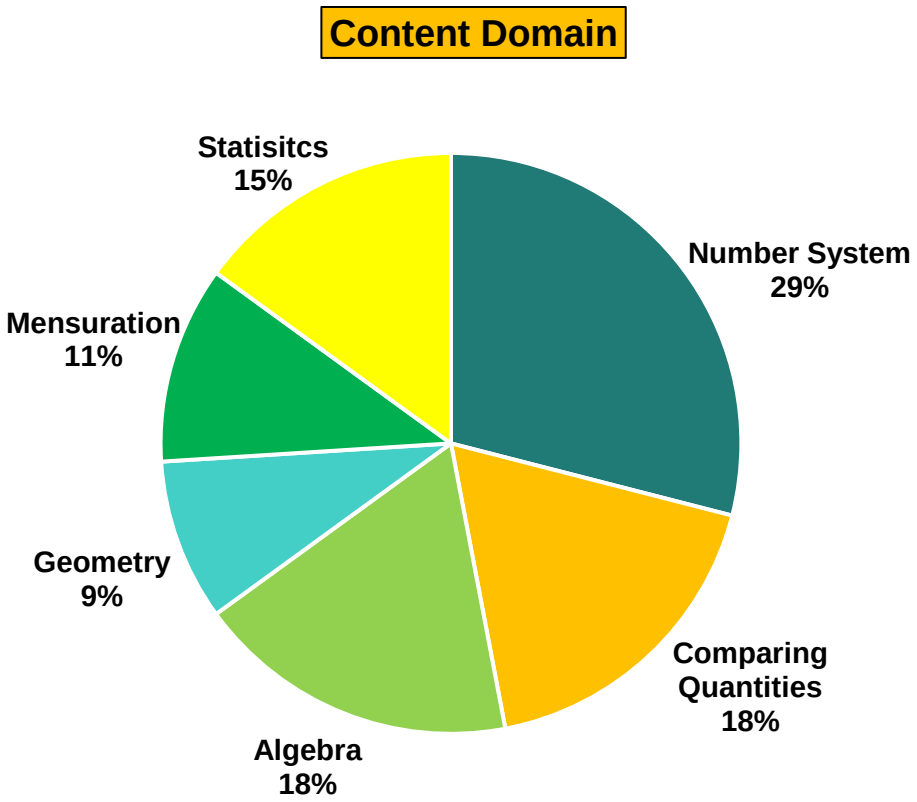
1. Content dimension, specifying the subject matter domains to be assessed
2. Cognitive dimension, specifying the thinking processes to be assessed

Target percentages of the question paper devoted to cognitive domains





Target percentages of the question paper devoted to content domains



For more details, visit https://www.unicusolympiads.com/.

Classic Section (Each Question is 1 Mark)

Cognitive Domain: Knowing	Content Domain: Number System

1. What is the difference between the largest and smallest of the given fractions?
5/11, 5/7, 3/8, 6/13

a. 23/56
b. 17/56
c. 19/56
d. 1/7

Cognitive Domain: Reasoning	Content Domain: Number System

2. Which of the following statements is true?
a. 1/2 + 1/6 + 1/12 + ….....+ 1/110 < 5/6
b. 1/3 + 1/15 + 1/35 + ……+ 1/143 > 7/13

a. Only a
b. Both a and b
c. Only b
d. Neither a nor b

Cognitive Domain: Reasoning	Content Domain: Number System

3. Find is the LCM of 5/12, 6/5, 3/2 and 4/17.

a. 6
b. 120
c. 60
d. 180

Cognitive Domain: Knowing	Content Domain: Number System

4. Simplify:

$$\sqrt{26\frac{1}{4} + 702\frac{1}{4} + \frac{5}{8}}$$

a. 27
b. 37
c. 26
d. 24

Cognitive Domain: Applying	Content Domain: Number System

5. Find the square root of 12⁴⁄₇ and correct it to three places of decimal.

a. 1.252
b. 2.365
c. 3.025
d. 3.545

Cognitive Domain: Reasoning	Content Domain: Comparing quantities

6. A contractor undertakes to build a wall 1000 m long in 50 days. He employs 56 men, but at the end of 27 days, he finds that only 448 m of wall is built. How many extra men must the contractor employ so that the wall is completed in time?

a. 20
b. 25
c. 30
d. 35

Cognitive Domain: Knowing	Content Domain: Number System

7. Find the cube root of 373,248.

a. 64
b. 72
c. 84
d. 96

Cognitive Domain: Applying	Content Domain: Number System

8. Three numbers are in the ratio 1 : 2 : 3. The sum of their cubes is 98784. Find the numbers.

a. 14, 28, 42
b. 12, 24, 36
c. 13, 26, 39
d. 15, 30, 45

Cognitive Domain: Applying	Content Domain: Comparing quantities

9. A, B and C together can complete a work in x, 30 and 45 days, respectively. B and C worked together for 6 days. The remaining work was completed by A alone in 12 days. Find the value of x.

a. 18
b. 20
c. 24
d. 15

Cognitive Domain: Knowing	Content Domain: Number System

10. By what number should $(-24)^{-1}$ be divided so that the quotient may be 3^{-1}?

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

Cognitive Domain: Applying	Content Domain: Number System

11. Select the number that will come in place of the question mark (?) in the mathematical statement.
$(0.064)^{123} \div (0.16)^{47} \times (0.4)^{34} \times (0.4)^{29} = (0.4)^{?}$

a. 341
b. 320
c. 350
d. 338

Cognitive Domain: Reasoning	Content Domain: Number System

12. If 2x = 4y = 8z and xyz = 288, then find the value of 1/2x + 1/4y + 1/8z.

a. 11/24
b. 11/8
c. 11/48
d. 11/96

Cognitive Domain: Knowing	Content Domain: Algebra

13. If $a^2 + b^2 = 117$ and ab = 54, then find the value of (a + b)/(a - b).

a. 5
b. 4
c. 9
d. 6

Cognitive Domain: Applying	Content Domain: Algebra

14. What is the difference between any number of four digits and the number formed by using the digits in the reversed order is exactly divisible?

a. 5
b. 9
c. 11
d. 15

Cognitive Domain: Knowing	Content Domain: Algebra

15. Factorise:
$2x^2$ - (5/6)x + 1/12

a. [(x) - (1/12)](4x - 1)
b. [(x/2) - (1/4)](4x - 1)
c. [(x/2) - (1/12)](4x + 1)
d. [(x/2) - (1/12)](4x - 1)

Cognitive Domain: Applying	Content Domain: Algebra

16. Solve of x:

$$\frac{x+1}{x-1} - \frac{x-1}{x+1} = \frac{5}{6},\ x \neq 1, -1$$

a. 2, -1/2
b. 5, -1/5
c. 1, -1/5
d. -1/2, 2

Cognitive Domain: Knowing	Content Domain: Algebra

17. Factorise:
$17 - 32y - 4y^2$

a. $(17 - 2y)(1- 2y)$
b. $(17 - 2y)(1 + 2y)$
c. $(17 + 2y)(1 - 2y)$
d. $(11 - 2y)(1 + 2y)$

Cognitive Domain: Applying	Content Domain: Algebra

18. A number consists of two digits. The digit in the tens place exceeds the digit in the units place by 4. The sum of the digits is 1/7 of the number. What is the number?

a. 44
b. 64
c. 76
d. 84

Cognitive Domain: Applying	Content Domain: Algebra

19. A man's age is now four times that of his son and it is also three times that of his daughter. In six years it will be three times that of his son. How old was he when his daughter was born?

a. 32 years
b. 36 years
c. 40 years
d. 44 years

Cognitive Domain: Reasoning	Content Domain: Algebra

20. If the numerator of a certain fraction is increased by 2 and the denominator is increased by 1, then the resulting fraction equals 1/2. If however the numerator is increased by 1 and the denominator decreased by 2, then the resulting fraction is equal to 3/5. Find the fraction.

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

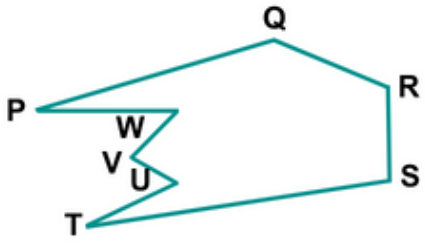
Cognitive Domain: Knowing	Content Domain: Geometry

21. The parallel sides of a trapezium are 20 cm and 10 cm and its non-parallel sides are equal to each other. If its area is 180 cm^2, then what is the length (in cm) of each non-parallel side?

a. 11 cm
b. 12 cm
c. 15 cm
d. 13 cm

Cognitive Domain: Applying	Content Domain: Geometry

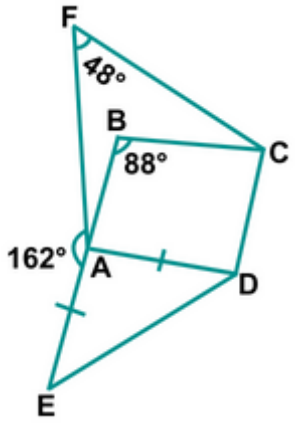
22. Find the sum of the interior angles of the polygon given below:



a. 1080°
b. 1120°
c. 1240°
d. 1360°

Cognitive Domain: Applying	Content Domain: Geometry

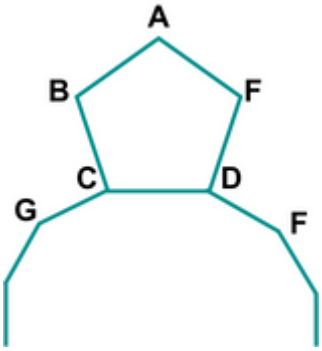
23. In the given figure, ABCD is a parallelogram, AD = AE, BAE is a straight line, ∠ABC = 88°, ∠EAF = 162° and ∠AFC = 48◦. Then find the angle ∠BCF.



a. 22°
b. 28°
c. 32°
d. 36°

Cognitive Domain: Reasoning	Content Domain: Geometry

24. ABCDE is a regular pentagon with sides of length 6 cm. CD is also a side of a regular polygon with n sides. Given that ∠EDF = 90°, find the value of n.



a. 15
b. 20
c. 25
d. 30

Cognitive Domain: Applying	Content Domain: Mensuration

25. Two cubes, each having a total surface area of 150 cm^2 are joined together to form a cuboid. Find the total surface area of the resulting cuboid.

a. 250 cm^2
b. 275 cm^2
c. 300 cm^2
d. 325 cm^2

Cognitive Domain: Reasoning	Content Domain: Mensuration

26. A field is in the shape of a rectangle of length 90 m and breadth 75 m. In one corner of the field, a pit, which is 18 m long, 15 m broad and 6 m deep, has been dug out. The Earth taken out of it is evenly spread over the remaining part of the field. Find the rise in the level of the field.

a. 20 cm
b. 23 cm
c. 25 cm
d. 28 cm

Cognitive Domain: Reasoning	Content Domain: Statistics

27. The median of a set of 11 distinct observations is 15.5. If each of the smallest 5 observations of the set is decreased by 3, then find the median of the new set.

a. Remains the same as that of the original set
b. Is increased by 3
c. Is decreased by 3
d. Is three times the original median

Cognitive Domain: Applying	Content Domain: Statistics

28. A bag contains 27 balls. 10 are red, 2 are green and the rest are white. Annie takes out a ball from the bag at random. What is the probability that she takes

I. A white ball
II. A ball that is red or green?

a. 4/7, 3/8
b. 5/9, 7/6
c. 4/9, 5/9
d. 5/9, 4/9

Cognitive Domain: Knowing	Content Domain: Statistics

29. A die is thrown 24 times. If number 4 comes up 12 times, the probability of number '4' is 1/k, then find the value of k.

a. 1
b. 3
c. 4
d. 2

Cognitive Domain: Reasoning	Content Domain: Comparing Quantities

30. Philip took a certain amount as a loan from a bank at the rate of 8% Simple interest per annum and gave the same amount to Alex as a loan at the rate of 12% per annum on S.I. If at the end of 12 years, he made a profit of $320 in the deal, what was the original amount?

a. $666.67
b. $685.6
c. $695.65
d. $714.63

Scholar Section (Each Question is 2 Marks)

Cognitive Domain: Applying	Content Domain: Number System

31. A man has divided his total money in his will in such a way that half of it goes to his wife, 2/3rd of the remaining among his three sons equally and the rest among his four daughters equally. If each daughter gets $20,000, how much money will each son get?

a. $42333.33
b. $47666.66
c. $51333.33
d. $53333.33

Cognitive Domain: Reasoning	Content Domain: Number System

32. Find the smallest number which when multiplied with 137592 will make the product a perfect cube. Further, find the cube root of the product.

a. 1025, 685
b. 1183, 546
c. 1183, 685
d. 4512, 546

Cognitive Domain: Reasoning	Content Domain: Comparing Quantities

33. At a cost of 60 cents per article, Sophia produces 750 articles. She puts the selling price such that if only 600 articles are sold, she would have made a profit of 40% on the outlay. However, 120 articles got spoilt and she was able to sell 630 articles at this price. Find her actual profit or loss percent as the percentage of total outlay assuming that the unsold articles are useless.

a. 51% profit
b. 36% loss
c. 28% loss
d. 47% profit

Cognitive Domain: Reasoning	Content Domain: Statistics

34. A bag contains x red balls, (x + 5) blue balls and (3x + 10) white balls. If the probability of drawing a blue ball is 2/9, what is the number of white balls?

a. 55
b. 15
c. 50
d. 65

Cognitive Domain: Reasoning	Content Domain: Comparing Quantities

35. Monalisa deposited a total of $10500 with a bank in two different deposit schemes at 10% p.a interest compounded annually. As per the schemes, she gets the same amount after 2 years on the first deposit as she gets after 3 years on the second deposit. How much money did she deposit for 3 years?

a. $4000
b. $4500
c. $5000
d. $5500

Cognitive Domain: Reasoning	Content Domain: Number System

36. Find the square root of $10\frac{2}{3}$.

a. 3.266
b. 3.985
c. 4.125
d. 4.686

Cognitive Domain: Knowing	Content Domain: Comparing quantities

37. A, B and C can do a job in 20 days, 30 days and 60 days, respectively. In how many days will A complete the job if he is assisted by B and C on every third day?

a. 10 days
b. 12 days
c. 15 days
d. 18 days

Cognitive Domain: Knowing	Content Domain: Mensuration

38. Find the number of soaps of size 2 cm × 3 cm × 5 cm, that can be arranged in a cuboidal box of dimensions 6 cm × 3 cm × 15 cm.

a. 5
b. 6
c. 7
d. 9

Cognitive Domain: Applying	Content Domain: Mensuration

39. A milk tank is in the form of a cylinder whose radius is 0.3 x 10 m and length is 0.14 x 10^2 m. Find the quantity of milk in litres that can be stored in the tank.

a. 3.96×10^6 L
b. 3.96×10^4 L
c. 3.96×10^5 L
d. 3.96×10^{-5} L

Cognitive Domain: Reasoning	Content Domain: Mensuration

40. A large solid cube is melted and cast into 'N' small solid spheres, each of radius 3 cm, and 'N + 2' small solid cuboids, each of dimensions 4 cm x 4 cm x 6.5 cm. If the length of each side of the large solid cube is 12 cm, then find the value of 'N'.

a. 7
b. 5
c. 8
d. 6

Directions (41-42): Read the passage carefully and answer the following questions.

A university has four major departments: Engineering, Humanities, Business, and Science. Each department has its own staff, distributed as follows: The Engineering department employs 1200 individuals, which accounts for 30% of the university's total staff. The Humanities department comprises 20% of the total staff. The Business department, known for its smaller size, has 800 staff members. The remaining staff members are employed in the Science department.

Cognitive Domain: Applying	Content Domain: Comparing Quantities

41. What is the ratio of staff members in the Engineering department to those in the Science department?

a. 1 : 2
b. 3 : 4
c. 1 : 1
d. 4 : 3

Cognitive Domain: Knowing	Content Domain: Comparing Quantities

42. If the university plans to increase the staff in the Business department by 25%, how many new staff members will this involve?

a. 120
b. 200
c. 240
d. 300

Directions (43-45): Read the passage carefully and answer the following questions.

Alex surveyed his companies and obtained the following data. Income tax is paid from profit before tax and the remaining amount is apportioned to dividend and retained earnings. The retained earnings were accumulated into reserves. The reserves at the beginning of 2020 were 80 million.

Figure (In Million)	2023	2022	2021	2020
Share Capital	0310	0205	0098	0098
Sales	6435	4725	2620	3270
Profit Before tax	0790	0525	0170	0315
Dividends	0110	0060	0030	0030
Retainer Earnings	0400	0245	0070	0140

Cognitive Domain: Applying	Content Domain: Statistics

43. In which year the profit before tax per dollar of sales was the highest?

a. 2020
b. 2023
c. 2022
d. 2021

Cognitive Domain: Applying	Content Domain: Statistics

44. In which year was the percentage addition to reserves over previous year's reserves the highest?

a. 2020
b. 2021
c. 2022
d. 2023

Cognitive Domain: Applying	Content Domain: Statistics

45. What is the amount of the reserves at the end of 2023?

a. 915 million
b. 935 million
c. 230 million
d. 550 million

Answer Key

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