UNICUS OLYMPIADS

#UnicusIsUnique

Sample Paper

Class 10

Unicus Mathematics Olympiad (UMO)

Time: 60 minutes

Pattern and Marking Scheme			
Section	**Total Questions**	**Marks per Question**	**Total Marks**
Classic Section	40	1	40
Scholar Section	10	2	20
Grand Total	**50**		**60**

Classic Section (Each Question is 1 Mark)

1. If an a ΔPQR, ∠P = 35° and ∠Q = 55°, then which of the following option is true?

   a. $RP^2 + QR^2 = PQ^2$
   b. $PQ^2 + RP^2 = QR^2$
   c. $PQ^2 + QR^2 = RP^2$
   d. $RP^2 + QR^2 > PQ^2$

---

2. When $(x^4 - 3x^3 + 2x^2 - 5x + 7)$ is divided by $(x - 2)$, then remainder is:

   a. 3
   b. -3
   c. 2
   d. 0

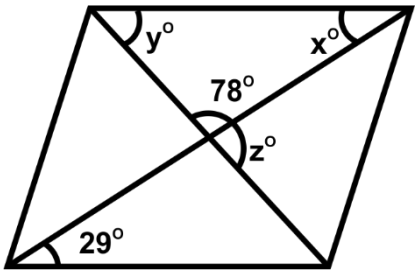
---

3. Which of the following sets of numbers is in ascending order?

   a. 13/15, 11/13, 9/11
   b. 9/11, 11/13, 13/15
   c. 11/13, 9/11, 13/15
   d. 13/15, 9/11, 11/13

---

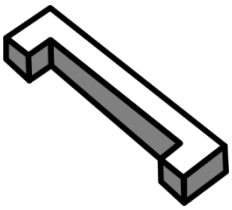
4. The figure given below is a parallelogram. Find the values of x and y:



   a. 29º, 73º
   b. 23º, 78º
   c. 23º, 23º
   d. 29º, 78º

---

5. How many corners does the following solid have?



   a. 12
   b. 16
   c. 14
   d. 18

---

6. A cone of height 7 cm and base radius 1 cm is carved from a cuboidal block of wood 10 cm x 5 cm x 2 cm (Assuming π = 22/7). What is the percentage of wood wasted in the process?

   a. $92\frac{2}{3}$ %
   b. $46\frac{1}{3}$ %
   c. $53\frac{2}{3}$ %
   d. $7\frac{1}{3}$ %

---

7. A coin is tossed 1000 times. Head occurred 625 times. Find the probability of getting a tail:

a. 5/8
b. 7/8
c. 1/8
d. 3/8

---

8. Trader A gives a single discount of 30% and trader B gives two successive discounts of 20% and 10% on an identical article. If the discount given by A is $600 more than the discount given by B, find the marked price of the article:

a. $1,500
b. $3,000
c. $30,000
d. $600

---

9. A sum is split into two equal parts. One of the parts is lent at simple interest at 20% per annum for 6 years. The other part is lent at 40% per annum simple interest for 2 years. The difference in the interest is $72. Find the total sum (in $):

a. $180
b. $360
c. $240
d. $270

---

10. Match the following:

List I		List II	
P.	2/3 of a number is 20 less than the original number, then the number is	1.	30
Q.	Four-fifths of a number is 10 more than two thirds of a number, then the number is	2.	200
R.	A number whose double is 45 greater than its half then the number is	3.	75
S.	A number whose fifth part increased by 5 is equal to its fourth part diminished by 5, then the number is	4.	60

a. P - 3, Q - 4, R - 1, S - 2
b. P - 4, Q - 3, R - 2, S - 1
c. P - 4, Q - 3, R - 1, S - 2
d. P - 1, Q - 2, R - 4, S - 3

---

11. If the price of a book is first decreased by 25% and then increased by 20%, the net change in the price of the book is:

a. 10% decrease
b. 5% decrease
c. No change
d. 5% increase

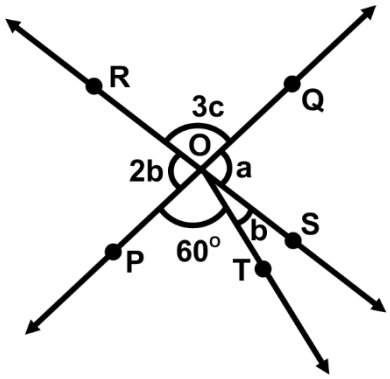
---

12. The value of $[(\sqrt{3} + 1)/(\sqrt{3} - 1) + (\sqrt{3} - 1)/(\sqrt{3} + 1)]$ is:

a. 1
b. 2
c. $2\sqrt{3}$
d. 4

---

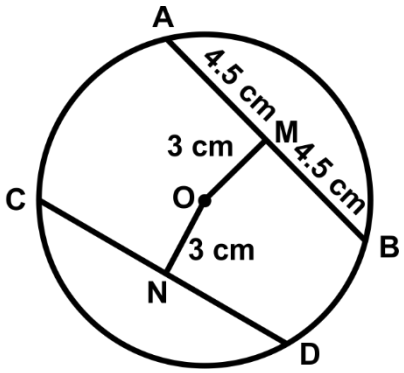
13. In the given figure, two straight lines PQ and RS intersect each other at O. If ∠POT = 60°, then find the values of a, b and c respectively:



a. 80°, 40°, 33.3°
b. 84°, 48°, 21°
c. 22°, 44°, 84°
d. 48°, 24°, 22°

---

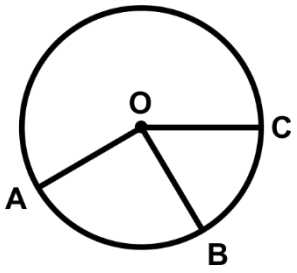
14. O is the centre of the circle. AB and CD are two chords of the circle. OM ⊥ AB and ON ⊥ CD. If OM = ON = 3 cm and AM = BM = 4.5 cm, then the value of CD is equal to:



a. 8 cm
b. 9 cm
c. 10 cm
d. 12 cm

---

15. In the given figure, what would be ∠COB, if the ratio of arc AB and BC is 3: 2 and ∠AOB = 96°?



a. 96°
b. 32°
c. 64°
d. 16°

---

16. If the sum of the p terms of an A. P. is the same as the sum of its q terms (where $p \neq q$), then sum of its first (p + q) terms is:

a. 0
b. 1
c. 2
d. 3

---

17. If $x = [\sqrt{(p + q)} + \sqrt{(p - q)}]/[\sqrt{(p + q)} - \sqrt{(p - q)}]$, then find the value of $qx^2 - 2px + q$:

a. 0
b. 1
c. -1
d. 2

---

18. Factorisation of $a^2 + b^2 + 2 (ab + bc + ca)$ is:

a. (a + b)(a + b + 2c)
b. (b + c)(c + a + 2b)
c. (c + a)(a + b + 2c)
d. (b + a)(b + c + 2a)

---

19. A point whose abscissa and ordinate are 2 and -5 respectively, lies in:

a. First quadrant
b. Second quadrant
c. Third quadrant
d. Fourth quadrant

---

20. A and B are friends. A is elder to B by 5 years. B's sister C is half the age of B while A's father D is 8 years older than twice the age of B. If the present age of D is 48 years, find the present ages of A, B and C (in years):

a. 10, 20, 35
b. 25, 15, 10
c. 25, 20, 10
d. 20, 15, 10

---

21. Fill in the blank:
If the lengths of the sides of a triangle are in proportion 3: 4: 5, then the area of the triangle is _____ sq. units, where the perimeter of the triangle is 144 units.

a. 64
b. 364
c. 564
d. 864

---

22. The radii of two cylinders are in the ratio 2: 3 and their heights are in the ratio 5: 3, then the ratio of their volumes is:

a. 15: 16
b. 14: 17
c. 20: 27
d. 4: 9

---

23. A 9th class English book contains 200 pages. A page is selected at random. What is the probability that the number on the page is divisible by 10?

a. 7/10
b. 9/10
c. 1/10
d. 7/10

---

24. The number $(6n^2 + 6n)$ for natural number n is always divisible by:

a. 6 only
b. 6 and 12
c. 12 only
d. 18 only

---

25. If the side of a cube is increased by 12%, by how much per cent does its volume increase?

a. 40.4928%
b. 50.5240%
c. 60.3292%
d. 30.4928%

---

26. The construction of a ΔLMN in which LM = 8 cm, $\angle L = 45°$ is possible when (MN + LN) is:

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

---

27. A wire bent in the form of a circle of radius 42 cm is cut and again bent in the form of a square. The ratio of the regions enclosed by the circle and the square in the two cases is given by:

a. 11: 12
b. 21: 33
c. 22: 33
d. 14: 11

---

28. The diagonal of a rhombus is 80% of the other diagonal. Then, the area of the rhombus is how many times the square of the length of the longer diagonal?

a. 2/5
b. 4/5
c. 3/4
d. 1/4

---

29. The common quantity that must be added to each term of a^2: b^2 to make it equal to a: b is:

a. ab
b. a + b
c. a - b
d. a/b

---

30. The roots of $x^2 - x + 1 = 0$ are:

a. Real and equal
b. Real and unequal
c. Imaginary
d. Equal

---

31. If a, b are the two roots of a quadratic equation such that a + b =24 and a - b = 8, then the quadratic equation having a and b as its roots is:

a. $x^2 + 2x + 8 = 0$
b. $x^2 - 4x + 8 = 0$
c. $x^2 - 24x + 128 = 0$
d. $2x^2 + 8x + 9 = 0$

---

32. Find the value of sin 120° cos 150° - cos 240° sin 330°:

a. 1
b. -1
c. 2/3
d. $[-\sqrt{(3 + 1)}/4]$

---

33. An amount P is invested at 8% per annum for two years while another value Q is invested at 12% per annum for three years both at simple interest. If the interest earned in the first case is 50% more than that in the second case, find the relation between P and Q:

a. 27P = 8Q
b. 4P = 9Q
c. 8P = 27Q
d. P = 3Q

---

34. A tin of oil was 4/5 full. When 6 bottles of oil were taken out from this tin and 4 bottles of oil were poured into it, it was 3/4 full. How many bottles of oil can the tin contain? (All bottles are of equal volume)

a. 35
b. 40
c. 45
d. 50

---

35. Which one of the following is correct?

a. (x + 2) is a factor of $x^4 - 6x^3 + 12 x^2 - 24x + 32$
b. (x + 2) is a factor of $x^4 - 6x^3 + 12 x^2 + 24x - 32$
c. (x - 2) is a factor of $x^4 - 6x^3 + 12 x^2 - 24x + 32$
d. (x - 2) is a factor of $x^4 + 6x^3 - 12 x^2 + 24x - 32$

---

36. In a trapezium, the two non-parallel sides are equal in length, each being of 5 units. The parallel sides are at a distance of 3 units apart. If the smaller side of the parallel sides is of length 2 units, then the sum of the diagonals of the trapezium is:

a. $10\sqrt{5}$ units
b. $6\sqrt{5}$ units
c. $5\sqrt{5}$ units
d. $3\sqrt{5}$ units

---

37. α and β are the roots of the equation $x^2 - 3kx + k^2 = 0$. Find the value of k if $\alpha^2 + \beta^2 = 7/4$:

a. ± 1/2
b. 1/2
c. - 1/2
d. 1

---

38. The average score of a cricketer for 10 matches is 38.9 runs. If the average for the six matches is 42 runs, then find the average for the last four matches:

a. 33.25 runs
b. 34.25 runs
c. 33.5 runs
d. 35 runs

---

39. The ratio of the age of Parth and Sushma is 3: 5 while the ratio of the age of Parth and Nikhil is 2: 3. If all the values are integers, then which among the following could be a possible value of the sum of their combined age?

a. 24
b. 45
c. 50
d. 60

---

40. If $2x + (1/3x) = 5$, then find the value of $16x^2 + (4/9x^2)$:

a. 284/3
b. 84/3
c. 184/3
d. 3

Scholar Section (Each Question is 2 Marks)

41. A company makes a popular brand of ice cream in a rectangular shaped bar, 6 cm long, 5 cm wide and 2 cm thick. To cut the cost, the company has decided to reduce the volume of the box by 20%. The thickness will remain the same, but the length and width will be decreased by the same percentage amount. Which of the conditions given below will the new length, L satisfy?

a. $5.5 < L < 6$
b. $5 < L < 5.5$
c. $4.5 < L < 5$
d. $4 < L < 4.5$

42. Angelina wanted to distribute a certain amount between his two children George and Anna in the ratio 5: 7. But it was found that due to incorrect calculations George got one-sixth of the total amount more than what he should get. Find the share of Anna in dollars, if George got $560 in all:

a. $300
b. $350
c. $400
d. $450

---

43. A sum of money is divided among A, B, C and D in the ratio 3: 5: 7: 11 respectively. If the share of C is $1668 more than the share of A, then what is the total amount of money of B and D together?

a. $6762
b. $6672
c. $7506
d. $6255

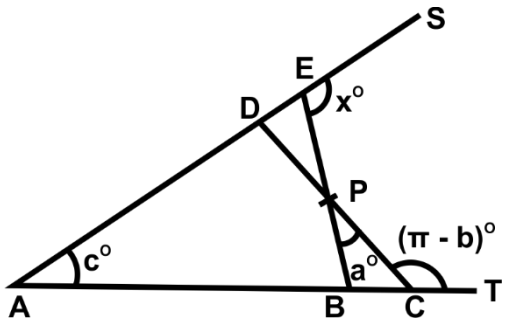
---

44. Study the statements carefully and select the correct option
Statement-I: It is possible to construct a triangle whose sides measure 7 cm, 5 cm, and 12 cm.
Statement-II: It is possible to construct an angle of 22.5° using a ruler and compass only.

a. Statement-I is true but statement-II is false
b. Statement-I is false but statement-II is true
c. Both statement-I and Statement-II are false
d. Both statement-I and Statement-II are true

---

45. The angles x, a, c and $(\pi - b)^o$ are indicated in the figure given below. Which one of the following is correct?



a. $x^o = a^o + c^o - b^o$
b. $x^o = b^o - a^o - c^o$
c. $x^o = a^o + b^o + c^o$
d. $x^o = a^o - b^o + c^o$

---

46. The L.C.M. of two polynomials p(x) and q(x) is $(x + 3)(x - 2)^2(x - 6)$ and their H.C.F. is $(x - 2)$. If $p(x) = (x + 3)(x - 2)^2$, then the value of q(x) is equal to:

a. $(x + 3)(x - 2)$
b. $x^2 - 3x - 18$
c. $x^2 - 8x + 12$
d. $x^2 - 4x + 4$

---

47. The average age of a committee of 11 persons increases by 2 years when 3 men of 32 years, 34 years, and 33 years are replaced by 3 women. What will be the average of those 3 women?

a. 40 years
b. $41\ ^1/_3$ years
c. 41 years
d. $40\ ^1/_3$ years

---

48. A cyclist moves non-stop from A to B, a distance of 14 km, at a certain average speed. If his average speed reduces by 1 km/h, he takes 20 minutes more to cover the same distance. The original average speed of the cyclist is:

a. 5 km/h
b. 6 km/h
c. 7 km/h
d. 9 km/h

---

49. $4x^3 + ax^2 - bx + 3$ divided by $(x - 2)$ leaves remainder 2, divided by $(x + 3)$ leaves remainder 3. Find remainder when it is divided by $(x + 2)$:

a. 26.8
b. 29.2
c. 32.2
d. 35.2

---

50. The relative speed of a train in respect of a car is 90 km/h when train and car are moving opposite to each other. Find the actual speed of train, if car is moving with a speed of 15 km/h:

a. 80 km/h
b. 105 km/h
c. 75 km/h
d. 100 km/h

Answer Key

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