



UNICUS OLYMPIADS

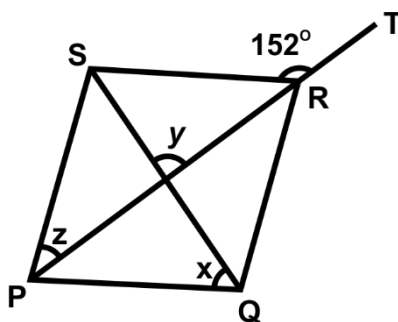
Sample Paper

Class 11

Unicus Mathematics Olympiad (UMO)

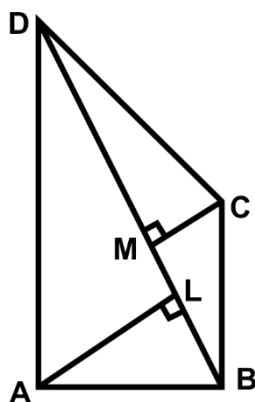


Section	Total Questions	Marks per Questions	Total Marks
Classic Section	40	1	40
Scholar Section	10	2	20
Grand Total	50		60



- a. $x = 60^\circ, y = 90^\circ, z = 28^\circ$ b. $x = 62^\circ, y = 80^\circ, z = 28^\circ$
 c. $x = 62^\circ, y = 90^\circ, z = 28^\circ$ d. $x = 28^\circ, y = 90^\circ, z = 62^\circ$

6. In the adjoining figure, ABCD is a quadrilateral in which diagonal $BD = 14$ cm. If $AL \perp BD$ and $CM \perp BD$ such that $AL = 8$ cm and $CM = 6$ cm, then the area of quadrilateral ABCD is:



- a. 60 cm^2 b. 72 cm^2
 c. 84 cm^2 d. 98 cm^2

7. Molly purchased 23 bracelets for reselling at the rate of \$160 per bracelet. At what rate per bracelet should she sell the bracelets, so that profit earned is 15%?

- a. \$184 b. \$186
 c. \$192 d. \$198

8. Jack has some hens and some goats. If the total number of animal heads is 90 and the total number of animal feet is 248. What is the total number of goats Jack have?

- a. 32 b. 36
 c. 34 d. 56

9. A two-digit number is three times the sum of its digits. If 45 is added to the number, its digits are interchanged. The sum of the digits of the number is:

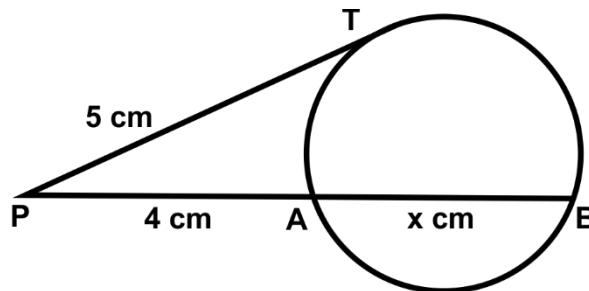
- a. 5 b. 7
 c. 9 d. 11

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10. The solution of $2x + 3y = 2$ and $3x + 2y = 2$ can be represented by a point in the coordinate plane in:
- a. 1st quadrant
b. 2nd quadrant
c. 3rd quadrant
d. 4th quadrant
-

11. If the 10th term of the sequence $a, a - b, a - 2b, a - 3b, \dots$ is 20 and its 20th term is 10, then its x^{th} term is:
- a. $10 - x$
b. $20 - x$
c. $29 - x$
d. $30 - x$
-

12. In the given figure, PAB is secant and PT is a tangent to the circle from P. If $PT = 5$ cm, $PA = 4$ cm and $AB = x$ cm, then what will be the value of x ?



- a. 2.5 cm
b. 2.6 cm
c. 2.25 cm
d. 2.75 cm
-

13. Which of the following is a rational number?

- a. Sum of $2 + \sqrt{3}$ and its inverse
b. Square root of 18
c. Square root of $7 + 4\sqrt{3}$
d. Square root of 9
-

14. If α, β, γ are the zeroes of the polynomial $f(x) = x^3 - 5x^2 - 2x + 24$ such that $\alpha\beta = 12$, then which of the following options is/are true?

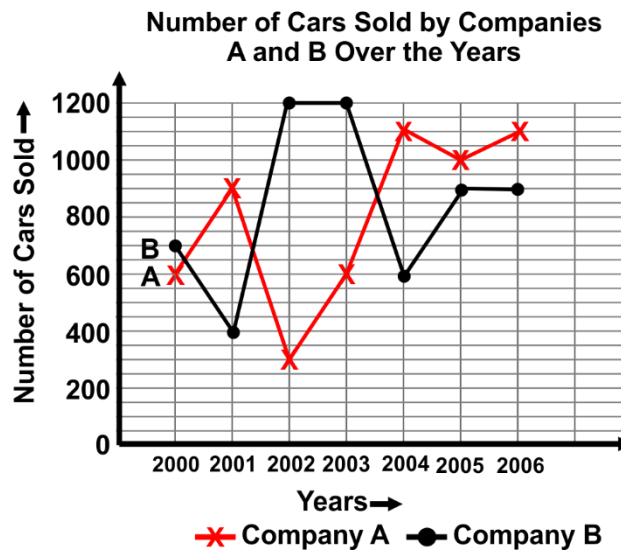
- a. $\alpha + \beta = 7$
b. $\alpha - \beta = +1$
c. $\gamma = -2$
d. All of these
-

15. Peter started cycling along the boundaries of a square field ABCD from corner point A. After half an hour, he reached the corner point C, diagonally opposite to A. If his speed was 8 km/hr, then the area of the field is:

- a. 64 km^2
b. 8 km^2
c. 4 km^2
d. 16 km^2
-

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21. Which of the following combinations of year and percentage rise in sales from the previous year for Company A is correct? (percentage rounded off to two decimal places)



- | | |
|------------------|------------------|
| a. 2003 - 99.85% | b. 2004 - 83.33% |
| c. 2001 - 43.21% | d. 2006 - 7.68% |

22. Express $[x^2 - x - 6/3x^2 + 7x + 2] \div [3x^2 - 9x/3x^2 + 7x + 2]$ as rational expression in its lowest terms:

- | | |
|-----------------|-----------------|
| a. $(x - 2)/3x$ | b. $(x + 2)/2x$ |
| c. $(x + 2)/3x$ | d. $(x - 2)/2x$ |

23. If the L.C.M. of $(x^2 + 3x)$, $(x^2 + 3x + 2)$ and $(x^2 + kx + 8)$, $(x^2 + 5x + 6)$ is $x(x + 1)(x + 2)^2(x + 3)(x + 4)$, then the value of K is:

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

24. If $A = (x + 1)/(2x + 1)$, $B = (2x - 1)/(x + 2)$, and $C = (4x - 7)/(2x^2 + 5x + 2)$, then find the value of $(4A - B - C)$:

- | | |
|-----------------------|-----------------------|
| a. $(x - 2)/(2x + 1)$ | b. $8/(2x - 1)$ |
| c. $8/(2x + 1)$ | d. $(2x - 1)/(x + 2)$ |

25. Sam spends 23% of the amount of money on an insurance policy, 33% on food, 19% on children's education and 16% on recreation. He deposits the remaining amount of \$504 in the bank. How much total amount does he spend on food and insurance policy together?

- | | |
|-----------|-----------|
| a. \$3200 | b. \$3126 |
| c. \$3136 | d. \$3048 |

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26. Sara purchased an item for \$9600 and sold it for a loss of 5%. From that money, she purchased another item and sold it for a gain of 5%. What is her overall gain/loss?
- a. Loss of \$36
b. Profit of \$24
c. Loss of \$24
d. Profit of \$36
-

27. If an electricity bill is paid before the due date, one gets a reduction of 4% on the amount of the bill. By paying the bill before the due date, a person got a reduction of \$13. The amount of his electricity bill was:
- a. \$125
b. \$225
c. \$325
d. \$425
-

28. A student walks from his house at $2\frac{1}{2}$ km/h and reaches his school late by 6 min. The next day, he increases his speed by 1 km/h and reaches 6 min before school time. How far is the school from his house?
- a. $\frac{5}{4}$ km
b. $\frac{7}{4}$ km
c. $\frac{9}{4}$ km
d. $\frac{11}{4}$ km
-

29. Two persons A and B start simultaneously from two places c km apart and walk in the same direction. If A travels at the rate of p km/h and B travels at the rate of q km/h, then A has travelled before he overtakes B a distance of:
- a. $\frac{qc}{p+q}$ km
b. $\frac{pc}{p-q}$ km
c. $\frac{qc}{p-c}$ km
d. $\frac{pc}{p+q}$ km
-

30. Two trains are running 40 km/h and 20 km/h respectively, in the same direction. The fast train completely passes a man sitting in the slow train in 5 s. The length of the fast train is:
- a. $23\frac{2}{9}$ m
b. 27 m
c. $27\frac{7}{9}$ m
d. 23 m
-

31. Find the equation of the line which makes equal intercepts on the axis and passes through the point (4, 5):
- a. $x + y = 9$
b. $x + 2y = 7$
c. $2x + 2y = 7$
d. $2x + y = 7$
-

32. The angles of depression of two ships from the top of a light-house are 60° and 45° towards East. If the ships are 300 m apart, the height of the light-house is:
- a. $200(3 + \sqrt{3})$ m
b. $250(3 + \sqrt{3})$ m
c. $150(3 + \sqrt{3})$ m
d. $160(3 + \sqrt{3})$ m
-

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33. The mean of 20 observations is 17. On checking it was found that the two observations were wrongly copied as 3 and 6. If wrong observations are replaced by correct values 8 and 9, then what is the correct mean?

- a. 17.4
c. 15.8
- b. 16.6
d. 14.2
-

34. If α is in the first quadrant such that $\tan^2\alpha = 8/7$, then the value of $[(1 + \sin \alpha)(1 - \sin \alpha)]/[(1 + \cos \alpha)(1 - \cos \alpha)]$ is:

- a. $7/8$
c. $7/4$
- b. $8/7$
d. $64/49$
-

35. The angles of elevation of the top of a tower from two points A and B lying on the horizontal through the foot of the tower are respectively 15° and 30° . If A and B are on the same side of the tower and $AB = 48$ m, then the height of the tower is: ($\tan 15^\circ = 2 - \sqrt{3}$)

- a. $24\sqrt{3}$ m
c. $28\sqrt{3}$ m
- b. 24 m
d. 96 m
-

36. A conical flask has been radius a cm and height h cm. It was completely filled with milk. The milk is poured into a cylindrical thermos flask whose base radius is p cm. What will be the height of the solution level in the flask?

- a. $a^2h/3p^2$ cm
c. $p^2h/3h^2$ cm
- b. $3hp^2/a^2$ cm
d. $3a^2/hp^2$ cm
-

37. If the sum of the roots of a quadratic equation is 3 and the product is 2, then the equation is:

- a. $2x^2 - x + 3 = 0$
c. $x^2 + 3x + 2 = 0$
- b. $x^2 - 3x + 2 = 0$
d. $x^2 - 3x - 2 = 0$
-

38. The sum of all interior angles of a regular polygon is twice the sum of all its exterior angles. The polygon is:

- a. an octagon
c. a decagon
- b. a nonagon
d. a hexagon
-

39. Two trains start from A and B at the same time and move towards B and A, respectively. They take 8 h and 6 h for their journey, respectively. Two hours after they start, the train from B meets with an accident and thereafter moves at half its normal speed. How many hours after starting will the two trains meet?

- a. $24/7$ hours
c. 4 hours
- b. $25/4$ hours
d. 6 hours
-

Answer Key

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