

HALF YEARLY EXAMINATION - 2017

SUBJECT - MATHEMATICS (041)

TIME - 3 HOURS

CLASS - X

MAX. MARKS - 80

General Instructions :

1. All questions are compulsory.
2. The question paper consists of 30 questions divided into four sections A, B, C and D. Section-A comprises of 6 questions of 1 mark each; Section-B comprises of 6 questions of 2 marks each; Section-C comprises of 10 questions of 3 marks each and Section-D comprises of 8 questions of 4 marks each.
3. There is no overall choice in this question paper.
4. Use of calculator is not permitted.

SECTION - A

1. For any integer a and 3 , there exist unique integers q and r such that $a = 3q + r$. Find the possible values of r .
2. For which values of p , does the following pair of equations has a unique solution: $4x + py + 8 = 0$ and $2x + 2y + 2 = 0$?
3. A circle has its centre at the origin and a point $P(5, 0)$ lies on it. The point $Q(6, 8)$ lies outside the circle. State true or false. Justify your answer.
4. If α and β are the zeroes of a polynomial, such that $\alpha + \beta = 6$ and $\alpha\beta = 4$, then write the polynomial.
5. If $\Delta ABC \sim \Delta RPQ$, $AB = 3\text{cm}$, $BC = 5\text{cm}$, $AC = 6\text{cm}$, $RP = 6\text{cm}$ and $PQ = 10\text{cm}$, then find QR .
6. Find mode, using the empirical relation, when it is given that the mean and median are 10.5 and 9.6 respectively.

SECTION - B

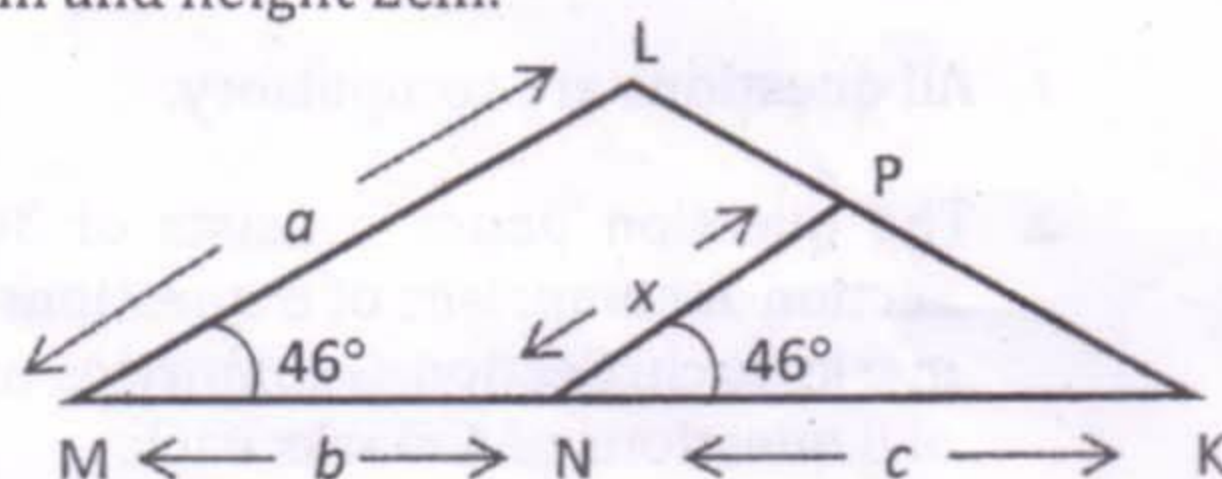
7. 'The product of three consecutive positive integers is divisible by 6.' Is this statement true or false? Justify your answer.
8. 'A' is a point on the y-axis whose ordinate is 5 and B is the point $(-3, 1)$. Calculate the length of AB.
9. Find the HCF of 65 and 117 and find a pair of integral values of m and n such that $\text{HCF} = 65m + 117n$.

10. Determine the missing frequency x , from the following data, when mode is 67.

Class	40 - 50	50 - 60	60 - 70	70 - 80	80 - 90
Frequency	5	x	15	12	7

11. Find the volume of a frustum of base radii 7cm and 3.5cm and height 2cm.

12. In fig. $\angle M = \angle N = 46^\circ$. Express x in terms of a , b and c , where a , b and c are lengths of LM, MN and NK respectively.

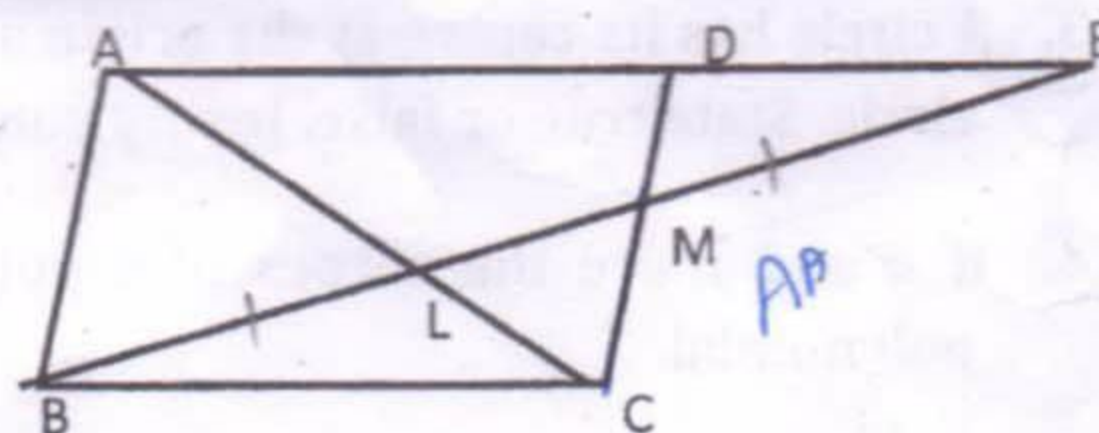


SECTION - C

13. Prove that the sum of squares of the sides of a rhombus is equal to the sum of squares of its diagonals.
14. Prove that $\sqrt{3}$ is irrational.
15. If one zero of the polynomial $(k+1)x^2 - 5x + 5$ is the multiplicative inverse of the other, then find the value of k and the zeroes of the polynomial $kx^2 - 3kx + 9$.

16. Solve for x and y : $\frac{2}{3x+2y} + \frac{3}{3x-2y} = \frac{17}{5}$; $\frac{5}{3x+2y} + \frac{1}{3x-2y} = 2$

17. In the figure, M is the mid-point of side CD of parallelogram ABCD. The line BM is drawn intersecting AC at L and AD produced at E. Prove that $EL = 2BL$.



18. Show that the points $P(0, -2)$, $Q(3, 1)$, $R(0, 4)$ and $S(-3, 1)$ are the vertices of a square.
19. When a polynomial $6x^4 + 8x^3 + 29x^2 + 21x + 7$ is divided by another polynomial $3x^2 + 4x + 1$, the remainder is in the form $ax + b$. Find a and b .
20. A solid wooden toy is in the form of a hemisphere surmounted by a cone of same radius. The radius of hemisphere is 3.5cm and total wood used in making the toy is $166\frac{5}{6}$ cm³. Find the height of the toy. Also, find the cost of painting the hemispherical part of the toy at the rate of ₹10 per cm². [Use $\pi = \frac{22}{7}$]
21. ΔABC is right angled at C. If p is the length of the perpendicular from C to AB and a , b , c are the lengths of the sides opposite $\angle A$, $\angle B$, $\angle C$ respectively then prove that $\frac{1}{p^2} = \frac{1}{a^2} + \frac{1}{b^2}$.

22. In a hospital during the month of October 2013, number of patients admitted for dengue and their ages are as follows :

Age (in years)	0 - 8	8 - 16	16 - 24	24 - 32	32 - 40	40 - 48	48 - 56	56 - 64	64 - 72
No. of patients	10	12	8	25	15	11	21	30	22

Find the mean age of patients by step deviation method.

SECTION - D

23. A solid is in the form of a cylinder with hemispherical ends. The total height of the solid is 19cm and diameter of the cylinder is 7 cm. find the volume and surface area of the solid.
24. Obtain all zeroes of the polynomial $x^4 - 3\sqrt{2}x^3 + 3x^2 + 3\sqrt{2}x - 4$, if two of its zeroes are $\sqrt{2}$ and $2\sqrt{2}$.
25. Solve the following equations graphically : $2x + y = 2$; $2y - x = 4$. What is the area of the triangle formed by these lines and the line $y = 0$?
26. Find the values of k so that the area of the triangle with vertices $(1, -1)$, $(-4, 2k)$, and $(-k, -5)$ is 24 sq. units.
27. In a right angled triangle, the square of hypotenuse is equal to the sum of squares of the other two sides. Prove it.
28. Ved travels 600 km to his home partly by train and partly by car. He takes 8 hours if he travels 120 km by train and the rest by car. He takes 20 min longer if he travels 200km by train and the rest by car. Find the speed of the train and the car.
29. Draw a 'less than type' ogive for the following frequency distribution :

Class	15 - 20	20 - 25	25 - 30	30 - 35	35 - 40	40 - 45
Frequency	13	18	31	25	15	5

Also find the median from the graph.

30. An NGO decided to donate money for books and pencils to the students of a school run by some other NGO. For this they collected some amount from different people. The total amount collected is represented by $4x^4 + 2x^3 - 8x^2 + 3x - 7$. From this fund each student received an equal amount. The number of students, who received the amount from NGO is represented by $x - 2 + 2x^2$. After distribution, amount equal to $5x - 11$ is left with the NGO which they donated to school for their infrastructure. Find the amount received by each student. What value has been depicted here?