



GRADE 10 / MATHEMATICS
JANUARY 2020 / PRE-BOARD / 01

TIME: 3 HRS

MAX MARKS: 80

General Instructions:

- (i) All the questions are compulsory.
- (ii) The question paper consists of 40 questions divided into 4 sections A, B, C, and D.
- (iii) Section A comprises of 20 questions of 1 mark each. Section B comprises of 6 questions of 2 marks each. Section C comprises of 8 questions of 3 marks each. Section D comprises of 6 questions of 4 marks each.
- (iv) There is no overall choice. However, an internal choice has been provided in two questions of 1 mark each, two questions of 2 marks each, three questions of 3 marks each, and three questions of 4 marks each. You have to attempt only one of the alternatives in all such questions.
- (v) Use of calculators is not permitted.

SECTION-A

Q 1- Q 10 are multiple choice questions. Select the most appropriate answer from the given options.

1. The decimal representation of $17/8$ will
a) terminate after 1 decimal place b) terminate after 2 decimal places
c) terminate after 3 decimal places d) not terminate
2. The arithmetic mean of $1, 2, 3, \dots, n$ is
a) $\frac{n+1}{2}$ b) $\frac{n-1}{2}$ c) $\frac{n}{2}$ d) $\frac{n}{2} + 1$
3. The LCM of smallest two digit composite number and smallest composite number is
a) 12 b) 4 c) 20 d) 44
4. The value of k for which the system of equations
$$x + 2y = 5$$
$$3x + ky + 15 = 0$$
has no solution is
a) 6 b) -6 c) $3/2$ d) none of these
5. The value of $(\tan 1^\circ \tan 2^\circ \tan 3^\circ \dots \tan 89^\circ)$ is
a) 0 b) 1 c) 2 d) $\frac{1}{2}$
6. If angles A, B, C of a ΔABC form an increasing AP, then $\sin B =$ _____
a) $\frac{1}{2}$ b) $\frac{\sqrt{3}}{2}$ c) 1 d) $\frac{\sqrt{3}}{2}$
7. If $x = a \cos \theta$ and $y = b \sin \theta$ then $b^2 x^2 + a^2 y^2 =$ _____
a) $a^2 b^2$ b) ab c) $a^4 b^4$ d) $a^2 + b^2$
8. If the points $P(2,1)$ lies on the line segment joining points $A(4,2)$ and $B(8,4)$ then
a) $AP = \frac{1}{3} AB$ b) $AP = PB$ c) $PB = \frac{1}{3} AB$ d) $AP = \frac{1}{2} AB$

9. The perpendicular bisector of the line segment joining the points A (1,5) and B (4,6) cuts the y-axis at
 a) (0, 13) b) (0, -13) c) (0,12) ~~d) (13, 0)~~

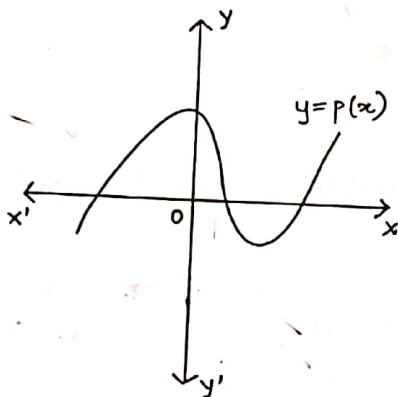
10. If (-2,1) is the centroid of the triangle having its vertices at (x,2), (10,-2), (-8,y), then x, y satisfy the relation
 a) $3x+8y=0$ b) $3x-8y=0$ c) $8x+3y=0$ d) $8x=3y$

(Q 11- Q 15) Fill in the blanks

11. The slant height of the frustum of a cone, whose height is 'h', slant height is 'l' and the radius of the top and bottom is 'R' and 'r' respectively _____
12. If one root of the equation $(k-1)x^2 - 10x + 3 = 0$ is the reciprocal of the other, then the value of 'k' is _____

(OR)

The graph of $y=p(x)$ is a polynomial in variable x, is as follows:



The degree of the polynomial that the graph represents is _____

13. The ratio of perimeters of ΔABC and ΔDEF is 3:2, then the ratio of their areas is _____.
14. If the n th term of an AP is given by $a_n = (-1)^{n-1} \cdot n^3$, its 7th term is _____
15. Sum of first 'n' terms of a series is $5n^2+2n$. The second term of the series is _____

(Q 16- Q 20) Answer the following :

16. For two given positive integers 'p' and 'q' such that $p=m \times q + n$, where m and n are unique integers, write the relation between q and n.

17. If in ΔABC , $AB=6\text{cm}$ and $DE \parallel BC$ such that $AE = \frac{1}{4} AC$, then find the length of AD

18. AB and CD are two common tangents to two circles which touch each other at C. If point D lies on AB such that the tangent $CD=4\text{cm}$, then find the length of AB.

(OR)

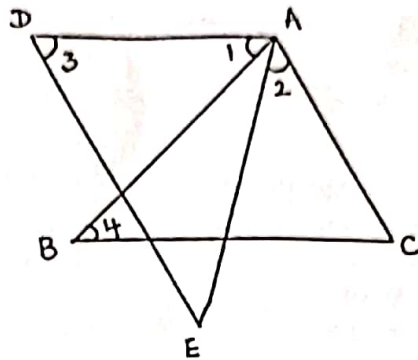
If two tangents inclined at an angle 60° are drawn to a circle of radius 3cm, then find the length of each tangent.

19. In an AP if $a=1$, $a_n=20$ and $S_n = 399$, find the value on n.

20. Write the condition when $px^2+qx+s=0$ has real and distinct roots.

SECTION - B

21. The angles of a quadrilateral are in AP, whose common difference is 10. Find all of its four angles.
22. In a right triangle ABC, a circle with diameter AB is drawn to intersect the hypotenuse AC at P. TP is the tangent to the circle at P. Prove that $\angle OPT = \angle BAC + \angle BCA$
23. In the given figure, $\angle 1 = \angle 2$ and $\angle 3 = \angle 4$. Show that $AE \cdot BC = AC \cdot DE$



(OR)

If one diagonal of a trapezium divides the other diagonal in the ratio 1:3, prove that one of the parallel sides is three times the other.

24. The ratio of the length of the vertically standing rod to its shadow is $\sqrt{3} : 1$. Find the angle of elevation of the sun
25. An integer is chosen between 0 and 100. Find the probability that the number is divisible by 3 and 5 both.

(OR)

If there are two children in a family, find the probability that there is atleast one boy in the family.

26. A biscuit dough is laid in a rectangular tray of length 2.5 m and breadth 1 m. Out of this, 1000 biscuits of radius 2.8 cm each are cut out in the form of a circular disc. How much area of the tray is left with wasted dough ?

SECTION C

27. Given that $\sqrt{2}$ is irrational prove that $7-2\sqrt{2}$ is irrational
28. The houses of a row are numbered consecutively from 1 to 49. Show that there is a value of x such that the sum of the numbers of the houses preceding the house numbered x is equal to the sum of the numbers of the houses following it. Find the value of x .
29. Find the solution of the pair of equations $\frac{x}{10} + \frac{y}{5} - 1 = 0$ and $\frac{x}{8} + \frac{y}{6} = 15$. Hence, find λ , if $y = \lambda x + 5$

(OR)

Seven times a two digit number is equal to four times the number obtained by reversing the order of its digits. If the difference between the digits is 3, find the number.

30. If the zeroes of the polynomial $x^3 - 3x^2 + x + 1$ are $a-b, a, a+b$, find a and b .
31. Find the area of the rhombus ABCD whose vertices are A (3,0), B (4,5), C (-1,4) and D (-2, -1)

32. Prove that $\cot^2 A \left(\frac{\sec A - 1}{1 + \sin A} \right) + \sec^2 A \left(\frac{\sin A - 1}{1 + \sec A} \right) = 0$

(OR)

Evaluate : $\operatorname{cosec} (65^\circ + \theta) - \sec (25^\circ - \theta) - \tan (55^\circ - \theta) + \cot (35^\circ + \theta)$

33. You are required to create a model of a circular wall clock and paste the numbers from 1 to 12 on its dial. What is the angle made at the centre between 3 and 7? Find the area of this region, if the length of the minute hand of the clock is 21cm.

34. The following table shows the ages of the patients admitted in a hospital during a year :

Age (in years)	5-15	15-25	25-35	35-45	45-55	55-65
Number of Patients	6	11	21	23	14	5

Find the mode of the data given above.

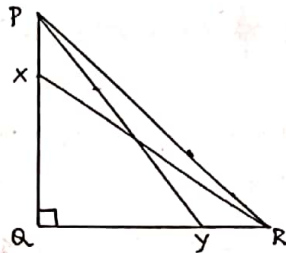
SECTION D

35. Draw a circle of radius 6 cm. From a point 10 cm away from its centre, construct the pair of tangents to the circle and measure its lengths. Justify your construction.

(OR)

Draw an equilateral triangle ABC of side 5 cm. Now construct another triangle that $\frac{5}{7}$ times the corresponding sides of ΔABC

36. In the given figure, PQR is a right triangle, right angled at Q. X and Y are the points on PQ and QR such that $PX : XQ = 1 : 2$ and $QY : YR = 2 : 1$. Prove that $9(PY^2 + XR^2) = 13 PR^2$



37. A takes 3 days longer than B to finish a work. But if they work together, then work is completed in 2 days. How long would each take to do it separately?

(OR)

Solve for x : $9x^2 - 6a^2x + (a^4 - b^4)$

38. The height of a cone is 30cm. A small cone is cut off at the top by a plane parallel to the base. If its volume is $\frac{1}{27}$ th volume of the cone, at what height above the base is the section made?

(OR)

A toy is in the form of a cone of radius 3.5 cm mounted on a hemisphere of same radius. The total height of the toy is 15.5 cm. Find the total surface area of the toy.

39. From the top of a light house, the angles of depression to two ships on the opposite sides of it are observed to be α and β . If the height of the light house be 'h' metres and the line joining the ship passes through the foot of the light house, show that the distance between the ship is $\frac{h(\tan \alpha + \tan \beta)}{\tan \alpha \tan \beta}$ metres.

40. Daily pocket expenses of 80 students of a school are given in the table :

Expenses (in Rs.)	0-5	5-10	10-15	15-20	20-25	25-30	30-35
No. of students	5	15	20	10	10	15	5

- (i) Draw 'less than' and 'more than' ogives on the same graph
- (ii) Hence find the median of the frequency distribution
- (iii) If the mean of distribution is 16, find the mode
