Half-Yearly Exam
Class – 10
Mathematics (041)

Thanks to Shrawan for Sharing this Real Paper ❤

SET - A

Code No. 01/09

Roll. No. | | | | | | | |

Time allowed- 03 Hours ***Maximum Marks- 80***

General Instructions:

1. This Question Paper has 5 Sections A, B, C, D and E.
2. Section A has 20 MCQs carrying 1 mark each
3. Section B has 5 questions carrying 02 marks each.
4. Section C has 6 questions carrying 03 marks each.
5. Section D has 4 questions carrying 05 marks each.
6. Section E has 3 case based integrated units of assessment (04 marks each) with sub-parts of the values of 1, 1 and 2 marks each respectively.
7. All Questions are compulsory. However, an internal choice in 2 Qs of 5 marks, 2 Qs of 3 marks and 2 Questions of 2 marks has been provided. An internal choice has been provided in the 2marks questions of Section E
8. Draw neat figures wherever required. Take π =22/7 wherever required if not stated.

Section – A

(Section A consists of 20 questions of 1 mark each)

1. If a × b = 1600 and the LCM (a, b) is 320, then the HCF (a, b) is :

   (a) 10 (b) 5 (c) 20 (d) 16

2. If $a = 2^2 \times 3^x, b = 2 \times 3 \times 5, c = 2^2 \times 3 \times 7$ and LCM $(a, b, c) = 1260$, then x is equal to

   (a) 1 (b) 2 (c) 3 (d) 0

3. The parabola representing a quadratic polynomial $f(x) = ax^2 + bx + c$ opens upwards when

   (a) $a < 0$ (b) $a > 0$ (c) $b < 0$ (d) $b > 0$

4. The quadratic equation $2x^2 - \sqrt{5}x - 1 = 0$ has

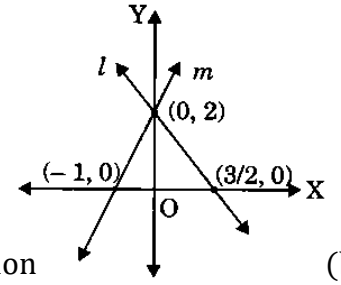
   (a) two distinct real roots (b) two equal real roots

   (c) no real roots (d) more than two real roots

5. If $\Delta ABC \sim \Delta DEF, AB = 6cm, DE = 9cm, EF = 6cm$ and $FD = 12cm$, then the perimeter of ΔABC is

   (a) 28cm (b) 28.5cm (c) 18cm (d) 23cm

6. The system of linear equations represented by the lines l and m is



(a) consistent with unique solution (b) inconsistent

(c) consistent with three solutions (d) consistent with many solutions

7. ABC is a triangle in which AD = 1.6 cm, BD = 4.8, AE = 1.1 cm and EC = 2.2 cm. Then

(a) $DE \parallel BC$ (b) $DE = \frac{1}{2} BC$

(c) $DE = BC$ (d) DE is not parallel to BC

8. If P(–1, 1) is the mid-point of the line segment joining A(–3, b) and B(1, b + 4), then b is equal to

(a) 1 (b) –1 (c) 2 (d) 0

9. The ratio in which the line segment joining points A(3, –4) and B (–2, 7) is divided by $x - axis$ is

(a) 3 : 2 (b) 2 : 3 (c) 4 : 7 (d) 7 : 4

10. If $\sec\theta - \tan\theta = \frac{1}{3}$, then the value of $(\sec\theta + \tan\theta)$ is

(a) $\frac{4}{3}$ (b) $\frac{2}{3}$ (c) $\frac{1}{3}$ (d) 3

11. If $2sin5x = \sqrt{3}, 0^o \leq x \leq 90^o$, then x is equal to

(a) 10^o (b) 12^o (c) 20^o (d) 50^o

12. A ladder 15 m long just reaches the top of a vertical wall. If the ladder makes an angle of 60^o with the wall, then the height of the wall is

(a) $15\sqrt{3}m$ (b) $\frac{15\sqrt{3}}{2}m$ (c) $\frac{15}{2}m$ (d) 15 m

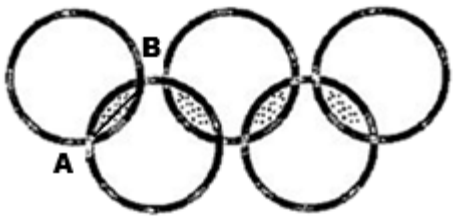
13. Number of tangents to a circle which are parallel to a given secant is

(a) zero (b) one (c) two (d) three

14. Two concentric circles are of radii 10 cm and 6 cm. The length of the chord of larger circle which touches the smaller circle is

(a) 16 cm (b) 8 cm (c) 10 cm (d) 2 cm

15. Given below is the picture of the Olympic rings made by taking five congruent circles of radius 1cm each, intersecting in such a way that the chord formed by joining the point of intersection of two circles is also of length 1cm.Total area of all the dotted regions (assuming the thickness of the rings to be negligible) is



(a) $4\left[\frac{\pi}{12} - \frac{\sqrt{3}}{4}\right] cm^2$ (b) $\left[\frac{\pi}{6} - \frac{\sqrt{3}}{4}\right] cm^2$ (c) $4\left[\frac{\pi}{6} - \frac{\sqrt{3}}{4}\right] cm^2$ (d) $8\left[\frac{\pi}{6} - \frac{\sqrt{3}}{4}\right] cm^2$

16. If an arc of a circle of radius 7 cm subtends an angle of 60^o at the centre, then the length of the arc is

(a) $\frac{7}{22}\ cm$ (b) $\frac{22}{3}\ cm$ (c) $\frac{11}{3}\ cm$ (d) $\frac{3}{11}\ cm$

17. If the probability of the letter chosen at random from the letters of the word "**MATHEMATICS**" to be a vowel is $\frac{2}{2x+1}$, then x is equal to

(a) $\frac{4}{11}$ (b) $\frac{9}{4}$ (c) $\frac{11}{4}$ (d) $\frac{4}{9}$

18. A card is drawn at random from a well shuffled pack of 52 playing cards. The probability of getting a face card is

(a) $\frac{1}{2}$ (b) $\frac{3}{13}$ (c) $\frac{4}{13}$ (d) $\frac{1}{13}$

Direction (19 to 20): - A statement of assertion (A) is followed by a statement of Reason (R). Choose the correct option.

(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).

(b) Both assertion (A) and reason (R) are true and reason (R) is not the correct explanation of assertion (A).

(c) Assertion (A) is true but reason (R) is false.

(d) Assertion (A) is false but reason (R) is true.

19. **Assertion (A) :** The number 5^n cannot end with the digit 0, where n is a natural number.
Reason (R) : A number ends with 0, if its prime factorization contains both 2 and 5.

20. **Assertion (A) :** The 8th term of the A.P. $\frac{1}{m}, \frac{1-2m}{m}, \frac{1-4m}{m}, \ldots is\ \frac{-1+14m}{m}$.
Reason (R) : The nth term of A.P. is given by $a_n = a + (n-1)d$.

Section – B

(Section B consists of 5 questions of 2 marks each)

21. If $\sin(A+B) = 1$ and $\cos(A-B) = \frac{\sqrt{3}}{2}, 0^o < A, B < 90^o$, find the measure of angles A and B.

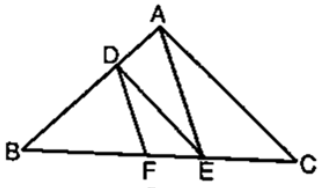
22. For following system of equations determine the value of k for which the system of equations has a unique solution.

$2x - 3y - 5 = 0;$

$kx - 6y - 8 = 0$

23. Find the abscissa of points whose ordinate is 2 and which are at the distance $\sqrt{58}$ units from the point (3, –5).

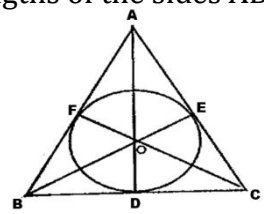
24.(A) In given figure $DE||AC$ and $DF||AE$. Prove that $\frac{BF}{FE} = \frac{BE}{EC}$.



OR

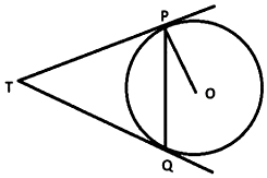
24.(B) In parallelogram ABCD, side AD is produced to a point E and BE intersects CD at F. Prove that $\Delta ABE \sim \Delta CFB$.

25.(A) A ΔABC is drawn to circumscribe a circle of radius 4 cm such that the segments BD and DC are of lengths 10 cm and 8 cm respectively. Find the lengths of the sides AB and AC, if it is given that ar $(\Delta ABC) = 90cm^2$.



OR

25.(B) Two tangents TP and TQ are drawn to a circle with centre O from an external point T. Prove that $\angle PTQ = 2\angle OPQ$.



Section – C

(Section C consists of 6 questions of 3 marks each)

26. Prove that $\sqrt{2}$ is irrational.

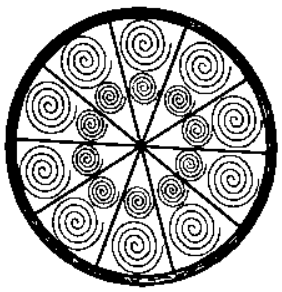
27. Find the zeroes of the quadratic polynomial $3x^2 - x - 4$ and verify the relationship between its zeroes and the coefficients.

28.(A) Prove that $\frac{\sin\theta - \cos\theta + 1}{\sin\theta + cos\theta - 1} = \frac{1}{\sec\theta - \tan\theta}$, using the identity $\sec^2\theta = 1 + \tan^2\theta$.

OR

28.(B) Prove that $\frac{\sin\theta}{1+\cos\theta} + \frac{1+\cos\theta}{\sin\theta} = 2\ cosec\ \theta$

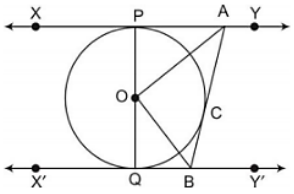
29. A brooch is made with silver wire in the form of a circle with diameter 70 mm. The wire is also used in making 5 diameters which divide the circle into 10 equal sectors as shown. Find



(i) the total length of the silver wire required.

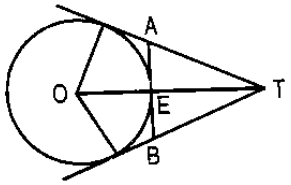
(ii) the area of each sector of the brooch.

30.(A) In Figure, XY and X'Y' are two parallel tangents to a circle with centre O and another tangent AB with point of contact C intersecting XY at A and X'Y' at B. Prove that $\angle AOB = 90^o$.



OR

30.(B) In the adjoining figure, O is the centre of a circle of radius 5 cm. T is a point such that OT = 13 cm and OT intersects the circle at E. If AB is the tangent to the circle at E, find the length of AB.



31. Two dice, one blue and one grey, are thrown at the same time. Find the probability :

(i) of getting doublet.

(ii) The sum of the two numbers appearing on the top of the dice is greater than 10 ?

Section – D

(Section D consists of 4 questions of 5 marks each)

32.(A) The angles of depression of the top and the bottom of an 8 m tall building from the top of a multi-storeyed building are 30^o and 45^o, respectively. Find the height of the multi-storeyed building and the distance between the two buildings.

OR

32.(B) As observed from the top of a 75 m high lighthouse from the sea-level, the angles of depression of two ships are 30^o and 45^o. If one ship is exactly behind the other on the same side of the lighthouse, find the distance between the two ships.

33. State and prove Basic Proportionality Theorem.

34. A fraction becomes $\frac{9}{11}$, if 2 is added to both the numerator and the denominator. If 3 is added to both the numerator and the denominator it becomes $\frac{5}{6}$. Find the fraction.

35.(A) A pole has to be erected at a point on the boundary of a circular park of diameter 13 metres in such a way that the differences of its distances from two diametrically opposite fixed gates A and B on the boundary is 7 metres. Is it possible to do so ? If yes, at what distances from the two gates should the pole be erected ?

OR

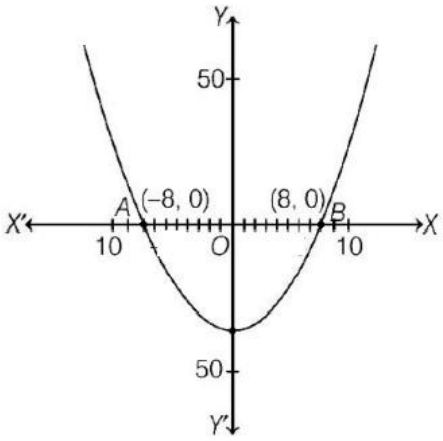
35.(B) If the roots of the equation $(1 + m^2)x^2 + 2mcx + (c^2 - a^2) = 0$ are equal, then prove that $c^2 = a^2(1 + m^2)$.

Section – E

(Case study based questions are compulsory)

36. While playing in garden, Sahiba saw a honeycomb and asked her mother what is that. She replied that it's a honeycomb made by honey bees to store honey. She also told her that the shape of the honeycomb formed is parabolic. The mathematical representation of the honeycomb structure is shown in the graph.





Based on the above figures, answer the following questions :

(i) Write name of shape representated in the graph ? **(1)**

(ii) Write the quadratic polynomial represented by the graph. **(1)**

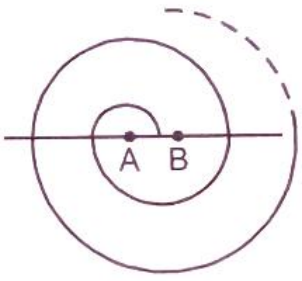
(iii) Find the sum of zeroes and product of zeros of the obtained quadratic polynomial in part (ii). **(2)**

OR

(iii) If the sum of zeroes of polynomial $at^2 + 5t + 3a$ is equal to their product, the find the value of a.

37. Jalebi, one of the most sought after sweet dish in India is in the shape of a spiral. A sweet seller makes a jalebi made up of 10 successive semi-circles with centres alternatively at A and B, starting with centre A of radius 0.5 and the radius of each consecutive semi-circle is increased by 0.5 cm.





Based on the above information, answer the following questions:

(i) What is the circumference of first semi-circle? **(1)**

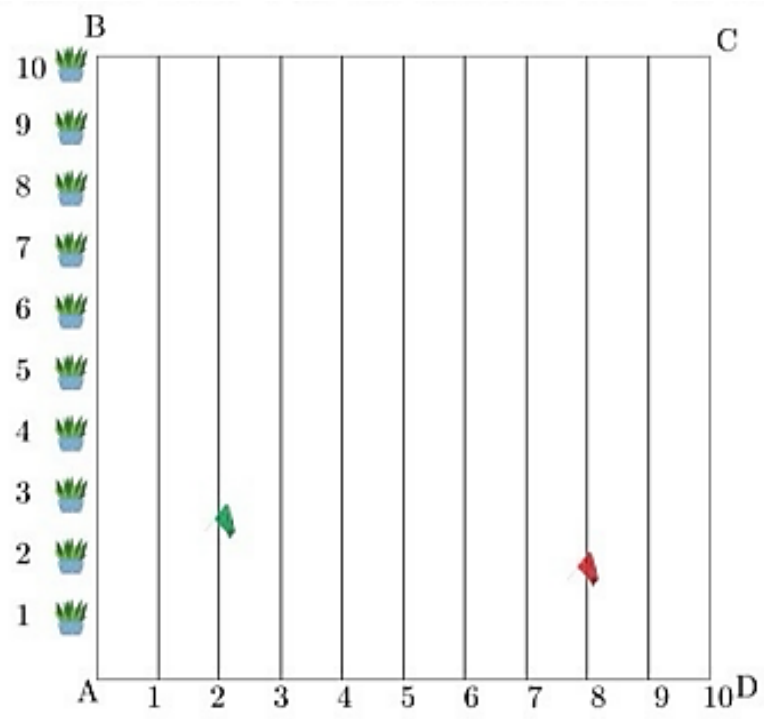
(ii) What is the common difference between the radii of successive semi-circles? **(1)**

(iii) What will be the sum of circumferences of first seven semi-circles? **(2)**

OR

(iii) What is the total length of the jalebi?

38. To conduct sports day activities, in a rectangular shaped school ground ABCD, lines have been drawn with chalk powder at a distance of 1 m each. 100 flower pots have been placed at a distance of 1 m from each other along AB, as shown in figure. Nishtha rins $\frac{1}{4}th$ the distance AB on the 2nd line and posts a green flag. Suman runs $\frac{1}{5}th$ the distance AB on the 8th line and posts a red flag.



(i) What is the position of green flag ? **(1)**

(ii) What is the distance between both the flags ? **(1)**

(iii) What is the coordinate of M if it divides line segment which join both flags in 2 : 1 ? **(2)**

OR

(iii) If Ram runs $\frac{1}{10}$th distance of AB on the 5th line and posts a yellow flag, then find distance between green and yellow flag.