VMC Vidyamandir Classes SINCE 1986
IIT JEE | MEDICAL | FOUNDATION

MOCK MATHEMATICS SUBJECTIVE TEST
CLASS – X (SET – 1)

Maximum Marks: 80 **Duration 3.0 Hours**

Linear Equations in Two Variables, Polynomials, Quadratic Equations, Arithmetic Progression, Real Numbers, Similar Triangles, Application of Trigonometry, Coordinate Geometry, Trigonometry

General Instructions:

1. This question paper consists of **38 questions**. All questions are compulsory.
2. **Paper Pattern and Marking Scheme:**
   There are **Five Sections** in the question paper (Section **A**, **B**, **C**, **D** and **E**).
   - In **Section A** – questions number **1 to 20** are Multiple Choice Questions (MCQs) carrying **1** mark each.
   - In **Section B** – questions number **21 to 25** are Very Short Answer Questions (VSA) type carrying **2** marks each.
   - In **Section C** – questions number **26 to 31** are Short Answer Questions (SA) type carrying **3** marks each.
   - In **Section D** – questions number **32 to 35** are Long Answer Questions (LA) type carrying **5** marks each.
   - In **Section E** – questions number **36 to 38** are 3 source-based/case-based units of assessment carrying 4 marks each with sub-parts.
   - There is no overall choice. However, an internal choice has been provided in some Sections.

(SECTION – A)

1. If n is an odd number, then n^2-1 is always divisible by:

(A) 2 **(B)** 4 **(C)** 6 **(D)** 8

2. The ratio of HCF to LCM of the least composite number and the least prime number is:

(A) 1 : 2 **(B)** 2 : 1 **(C)** 1 : 1 **(D)** 1 : 3

3. If α and β are the zeroes of the polynomial $p(x)=x^2-6x+5$ such that $\alpha>\beta$, then $(\alpha-\beta)$ is equal to:

(A) 5 **(B)** 3 **(C)** 4 **(D)** 2

4. If the polynomial $f(x)=ax^2+bx+c$ have the zeroes α and β, what will be the polynomial $g(x)$ whose zeroes are $\frac{1}{\alpha}$ and $\frac{1}{\beta}$?

(A) bx^2+cx+a **(B)** cx^2+bx+a **(C)** ax^2+cx+b **(D)** cx^2+ax+b

5. Which of the following lines intersect the line $3x+5y+7=0$ at one point only?

(A) $3x+5y+10=0$ **(B)** $4.5x+7.5y=-10.5$

(C) $6x+10y+14=0$ **(D)** $5x+3y+7=0$

6. The pair of linear equations, $x=a$ and $y=b$ are:

(A) Consistent **(B)** Inconsistent

(C) Consistent with one solution **(D)** consistent with many solutions

7. If the equation $x^2+4x+k=0$ has real and distinct roots, then:

(A) $k<4$ **(B)** $k>4$ **(C)** $k\le 4$ **(D)** $k\ge 4$

8. If $y=1$ is a common root of the equations $ay^2+ay+3=0$ and $y^2+y+b=0$, then *ab* equals:

(A) 3 **(B)** $-\frac{7}{2}$ **(C)** 6 **(D)** –3

9. If $\sin\alpha$ and $\cos\alpha$ are the roots of the equation $ax^2+bx+c=0$, then $b^2=$_____.

(A) a^2-2ac **(B)** a^2+2ac **(C)** a^2-ac **(D)** a^2+ac

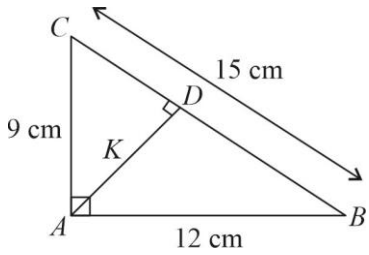
10. If the first, second and last terms of an A.P. are *a*, *b* and 2*a* respectively, its sum is:

(A) $\frac{ab}{2(b-a)}$ **(B)** $\frac{ab}{b-a}$ **(C)** $\frac{3ab}{2(b-a)}$ **(D)** None of these

11. If $\frac{1}{x+2},\frac{1}{x+3},\frac{1}{x+5}$ are in A.P., then $x=$_____.

(A) 5 **(B)** 3 **(C)** 1 **(D)** 2

12. In given figure (not to scale), ΔABC is right triangle right angled at *A*. If $AD\perp BC$, then the value of *K* is_____.



(A) 7.2 cm **(B)** 8.1 cm **(C)** 10.8 cm **(D)** 15.2 cm

13. It is given that $\Delta ABC\sim\Delta DFE$, $\angle A=30°$, $\angle C=40°$, *AB* = 5 cm, *AC* = 8 cm and *DF* = 7.5 cm. Then which of the following is true?

(A) $\angle F=110°,\ DE=12\,cm$ **(B)** $\angle F=40°,\ DE=12\,cm$

(C) $\angle D=110°,\ EF=12\,cm$ **(D)** $\angle D=30°,\ EF=12\,cm$

14. If $P(1,2)$, $Q(0,-1)$, $R(2,-1)$ are the mid-points of sides AB, BC and AC respectively of triangle ABC, what is the value of perimeter of triangle ABC?

(A) $4\left(\sqrt{10}+2\right)$ **(B)** $4\left(\sqrt{12}+2\right)$ **(C)** $4\left(\sqrt{10}+1\right)$ **(D)** $4\left(\sqrt{12}+1\right)$

15. If $P(at^2, 2at)$, $Q\left(\frac{a}{t^2}, \frac{2a}{t}\right)$ and $S(a, 0)$ are points, then what is the value of $\frac{1}{SP}+\frac{1}{SQ}$?

(A) $\frac{1}{a}$ **(B)** $2a$ **(C)** $\frac{2}{a}$ **(D)** $\frac{3}{a}$

16. If $P(x, y)$ is a point on the line joining $A(a,0)$ and $B(0,b)$, then what is the value of $\frac{x}{a}+\frac{y}{b}$?

(A) -1 **(B)** 2 **(C)** -2 **(D)** 1

17. If $\tan\theta = \frac{x}{y}$, then $\cos\theta =$ _____.

(A) $\frac{x}{\sqrt{x^2+y^2}}$ **(B)** $\frac{y}{\sqrt{x^2+y^2}}$ **(C)** $\frac{x}{\sqrt{x^2-y^2}}$ **(D)** $\frac{y}{\sqrt{x^2-y^2}}$

18. $\frac{3}{\text{cosec}^2\theta}+\frac{3}{\sec^2\theta} =$ _____.

(A) 3 **(B)** 2 **(C)** -3 **(D)** $\frac{2}{\sqrt{3}}$

Direction: In question numbers 19 and 20, a statement of Assertion **(A)** is followed by a statement of Reason **(R)**. Choose the correct option:

(A) Both A and R are true and R is the correct explanation for A.

(B) Both A and R are true but R is not the correct explanation for A.

(C) A is true but R is false.

(D) A is false but R is true.

19. **Assertion (A) :** 6^n can end with digit 0 for any natural number 'n'.

Reason (R) : The prime factorization of a natural number is unique, except for the order of its factors.

20. **Assertion (A) :** If the shadow of a vertical pole is $\frac{1}{\sqrt{3}}$ times its height, then the altitude of sun is 60°.

Reason (R) : If the sun's altitude is 45°, then the shadow of the pole is equal to height of the pole.

(SECTION – B)

21. If the sum of the squares of zeroes of the polynomial $4x^2+12x+k$ is $\frac{-3}{8}$, find the value of *k*.

OR

If α and β are zeroes of the polynomial $f(x)=x^2-5x+k$, such that $\alpha-\beta=1$, then find the value of *k*.

22. For what value of k for which the system of equations $x+y-4=0$ and $2x+ky=3$ has no solution?

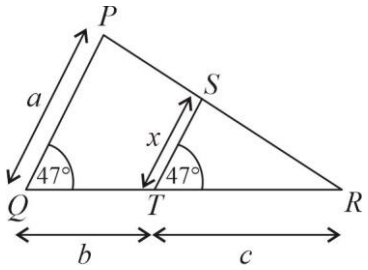
23. Solve the following quadratic equation for *x*:

$4x^2-4a^2x+(a^4-b^4)=0$

OR

Solve for $x:\sqrt{2x+9}+x=13$.

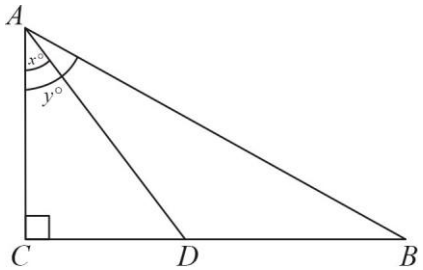
24. Express *x* in terms of *a*, *b* and *c*.



25. The *x*-coordinate of a point *P* is twice its *y*-coordinate. If *P* is equidistant from $Q(2,-5)$ and $R(-3,6)$, find the coordinates of *P*.

(SECTION – C)

26. In the given figure, $\angle ACB=90°$ and *D* is the mid-point of *BC*, find the value of $\frac{\cot y°}{\cot x°}$.



OR

If $\sin\theta+\cos\theta=\sqrt{3}$, then find the value of $\tan\theta+\cot\theta$.

27. Prove that $\sqrt{2}$ is an irrational number.

28. At 't' minutes past 2 pm., the time needed by minute hand of a clock to show 3 pm. was found to be 3 minutes less than $\frac{t^2}{4}$ minutes. What is t ?

29. A geometric shape is formed by the equation $2y + x = 8$ and the coordinate axes. Identify the resulting shape and find its area.

30. If $\sin\theta + \cos\theta = p$ and $\sec\theta + \text{cosec}\,\theta = q,$ then prove that $q(p^2 - 1) = 2p$.

OR

Prove that: $\frac{(1 + \cot\theta + \tan\theta)(\sin\theta - \cos\theta)}{(\sec\theta - \text{cosec}\,\theta)(\sec^2\theta + \sec\theta\,\text{cosec}\,\theta + \text{cosec}^2\theta)} = \sin^2\theta\cos^2\theta$.

31. Solve for x: $1 + 4 + 7 + 10 + ... + x = 287$

(SECTION – D)

32. Point A lies on the line segment PQ joining $P(6, -6)$ and $Q(-4, -1)$ in such a way that $PA = \frac{2}{5}PQ$. Find the coordinates of A. If 'A' lies on the line $3x + k(y + 1) = 0$, then find the value of k.

33. Two poles of height 'p' and 'q' metres are standing vertically on a level ground 'a' metres apart. Prove that the height of the point of intersection of the lines joining the top of each pole to the foot of the opposite pole is given by $\frac{pq}{p+q}$.

34. The angle of elevation of an aeroplane from a point on the ground is 60°. After a flight of 30 seconds, the angle of elevation becomes 30°. If the aeroplane is flying at a constant height of $3000\sqrt{3}\,m,$ find the speed of the aeroplane.

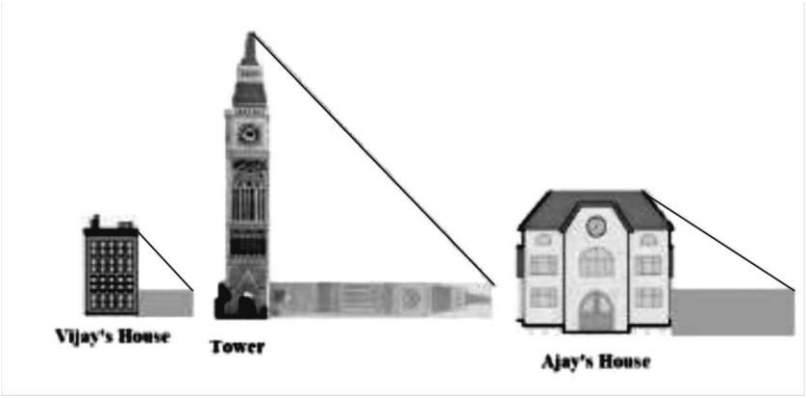
35. The houses in row are numbered consecutively from 1 to 49. Show that there exists a value of x such that sum of numbers of houses preceding the house numbered x is equal to sum of the numbers of houses following x. Find the value of x.

OR

The sum of four consecutive numbers in A.P. is 32 and the ratio of the product of the first and last terms to the product of two middle terms is 7 : 15. Find the numbers?

(SECTION – E)

36. Vijay is trying to find the average height of a tower near his house. He is using the properties of similar triangles. The height of Vijay's house is 20 m. When Vijay's house casts a shadow 10 m long on the ground, at the same time, the tower casts a shadow 50 m long on the ground and the house of Ajay casts 20 m shadow on the ground.



(i) What is the height of the tower? **(1)**

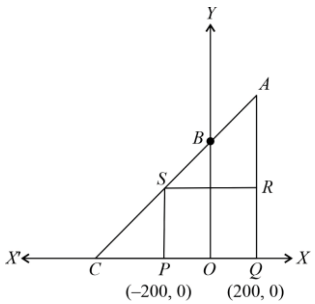
(ii) What is the height of Ajay's house? **(2)**

OR

When the tower casts a shadow of 40 m. At same time what will be the length of the shadow of Ajay's house? **(2)**

(iii) What will be the length of the shadow of the tower when Vijay's house casts a shadow of 12 m? **(1)**

37. Jagdish has a field which is in the shape of a right angled triangle *AQC*. He wants to leave a space in the form of a square *PQRS* inside the field for growing wheat and the remaining for growing vegetables (as shown in the figure).



In the field, there is a pole marked as *O*.

(i) Taking *O* as origin, coordinates of *P* are (–200, 0) and of *Q* are (200, 0). *PQRS* being a square, what are the coordinates of *R* and *S*? **(1)**

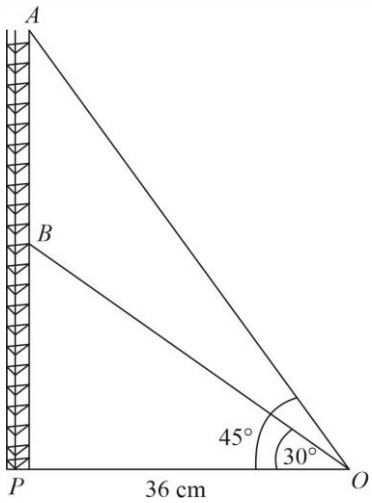
(ii) What is the area of square *PQRS*? **(2)**

OR

What is the length of diagonal *PR* in square *PQRS*? **(2)**

(iii) If *S* divides *CA* in the ratio *K* : 1, what is the value of *K*, where point *A* is (200, 800)? **(1)**

38. Radio towers are used for transmitting a range of communication services including radio and television. The tower will either act as an antenna itself or support one or more antennas on its structure. On a similar concept, a radio station tower was built in two Sections A and B. Tower is supported by wires from a point *O*. Distance between the base of the tower and point *O* is 36 cm. From point *O*, the angle of elevation of the top of the Section B is 30° and the angle of elevation of the top of Section A is 45°.



(i) Find the length of the wire from the point *O* to the top of Section *B*. **(1)**

(ii) Find the distance *AB*. **(2)**

OR

Find the area of ΔOPB. **(2)**

(iii) Find the height of the Section A from the base of the tower. **(1)**