# MODEL PAPER –3
# Summative Assessment I (2016-17)
# Mathematics
## Blue Print

## CLASS : X

| **Unit/Topic** | **VSA** | **SA(I)** | **SA(II)** | **LA** | **Total** |
|---|---|---|---|---|---|
| Number System<br>Real Numbers | -- | 4(2) | 3(1) | 4(1) | 11(4) |
| Algebra | 1(1) | 4(2) | 6(3) | 12(3) | 23(8) |
| Geometry | 1(1) | 2(1) | 6(2) | 8(2) | 17(6) |
| Trigonometry | 1(1) | --- | 9(3) | 12(3) | 22(70 |
| Statistics | 1(1) | 2(1) | 6(2) | 8(2) | 17(6) |
| **Total** | **4(4)** | **12(6)** | **30(10)** | **44(11)** | **90(31)** |

# MODEL PAPER –3
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Time: 3hrs Max. Marks: 90

General Instruction:-

1. All questions are Compulsory.
2. The question paper consists of **31** questions divided into **4** sections, **A, B , C and D**.
**Section-A** comprises of 4 questions of 1 mark each.
**Section-B** comprises of **6** questions of **2 marks** each,
**Section-C** comprises of 1**0 questions of 3 marks** each and
**Section-D** comprises of **11 questions of 4 marks** each.
3. Use of calculator is not permitted.

## Section - A

Q.1) How many solutions are there if the lines $l_1$and $l_2$ are parallel?

Q.2) If Δ ABC ~ Δ DEF, BC = 3 cm EF =4 cm and area of Δ ABC = 54 $cm^2$ then find the area of Δ DEF .

Q 3) If Sin θ = $\frac{3}{5}$ then find the value of Cos θ

Q.4) Find the median of 30, 5, 2, 22, 14, 26, 10 .

## Section - B

Q.5**)** Find the quadratic polynomial, the sum & the product of whose zeroes are 3 & 2 respectively.

Q.6) At a certain time in a deer park, the number of heads and the number of legs of deer and human visitors were counted and it was found there were 39 heads & 132 legs. Find the number of deer and human visitors in the park.

Q.7) A ladder 10m long reaches a window 8m above the ground. Find the distance of the foot of the ladder from the base of the wall.

Q.8) Show that $\cos 38^o \cos 52^o - \sin 38^o \sin 52^o = 0$.

Q.9) Find the mean of the following data

| $x_i$ | 10 | 15 | 20 | 25 | 30 |
|---|---|---|---|---|---|
| $f_i$ | 5 | 10 | 7 | 8 | 2 |

Q.10) Evaluate $\frac{\tan 65°}{\cot 25°}$

## Section - C

Q.11) The HCF of two numbers is 4 and their LCM is 9696. If one number is 96. Find the other number.

Q.12) If α, β are the zeroes of the polynomial $2x^2 – 4x + 5$ find the value of $\alpha^2 + \beta^2$

Q.13) Find the value of x and y for the pair of linear equations

$7(y + 3) - 2(x + 2) = 14,$

$4 (y - 2) + 3(x - 3) = 2$

Q.14) In an equilateral triangle ABC, D is a point on side BC such that BD = $\frac{1}{3}$ BC.

Prove that $9AD^2 = 7AB^2$

Q.15) ABC is an Isosceles triangle right angled at C. Prove that $AB^2 = 2AC^2$

Q.16) Prove the identity

$$(\text{cosec}\theta - \cot\theta)^2 = \frac{1-\cos\theta}{1+\cos\theta}$$

Q.17) If tanA + sinA = m and tanA - sinA = n, show that $m^2 - n^2 = 4\sqrt{mn}$

Q.18) The following distribution table gives the daily income of 50 workers of a factory

| Daily income in Rs | 100-120 | 120-140 | 140-160 | 160-180 | 180-200 |
|---|---|---|---|---|---|
| No of workers | 12 | 14 | 8 | 6 | 10 |

Convert the distribution above to a less than type cumulative frequency distribution and draw its ogive.

Q.19) A survey conducted on 20 house holds in a locality by a group of students resulted in the following frequency table for the number of family members in a house hold. Find the mode of the data.

| Family size | 1-3 | 3-5 | 5-7 | 7-9 | 9-11 |
|---|---|---|---|---|---|
| No of families | 7 | 8 | 2 | 2 | 1 |

Q.20) Given that if $\sec\theta = \frac{13}{12}$, calculate all other trigonometric ratios.

## Section - D

Q.21). Obtain all other zeroes of $3x^4 + 6x^3 – 2x^2 -10x – 5$, if two of its zeroes are $\sqrt{\frac{5}{3}}$ and $-\sqrt{\frac{5}{3}}$

Q.22) 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.

Q.23) Solve the pair of equation by reducing them to a pair of linear equation

$6x + 3y = 6xy$

$2x + 4y = 5xy$

Q.24) Prove that the ratio of the areas of two similar triangles is equal to the square of the ratio of their corresponding sides.

Q.25) Two poles of heights 6m and 11m stand on a plane ground. If the distance between the feet of the poles is 12m. Find the distance between their tops.

Q.26) If A , B and C are interior angles of a triangle ABC, then show that $\text{Sin}\left(\frac{B+C}{2}\right) = \text{Cos}\frac{A}{2}$

Q.27) Evaluate:

$$\frac{5\cos^2 60^o + 4\,\text{Sec}^2 30^o - \tan 45^o}{\text{Sin}^2 30^o + \text{Cos}^2 30^o}$$

Q.28) If the median of the distribution given below is 28.5, find the value of x & y.

| C.I | 0-10 | 10-20 | 20-30 | 30-40 | 40-50 | 50-60 | Total |
|---|---|---|---|---|---|---|---|
| $f_i$ | 5 | x | 20 | 15 | y | 5 | 60 |

Q.29) The following table gives production field per hectare of wheat of 100 forms of a village

| Production in (kg) | 50-55 | 55-60 | 60-65 | 65-70 | 70-75 | 75-80 |
|---|---|---|---|---|---|---|
| No. of forms | 2 | 8 | 12 | 24 | 38 | 16 |

Change the distribution to a more than type distribution and draw its ogive

Q.30) An army contingent of 616 members is to march behind an army band of 32 members in a parade on the occasion of republic day. The two groups are to march in the same number of column:-

a) What is the maximum number of column in which they can march?
b) Which mathematical concept is used in the above problem?
c) What is the importance of an army for any country?

Q.31) Use Euclid's division lemma to show that the square of any positive integer is either of form 3*m* or 3*m* + 1 for some integer m.

**Group No 2**

Name of the participants.

1.Mr. Satvinder Singh K.V. Jindrah TGT (Maths)
2.Mr. Shri Niket Sharma K. V. Lakhanpur TGT (Maths)
3.Mr.Gulshan Kumar K. V. Kathua TGT (Maths)
4. Mrs. Sujata Verma K. V. Kishtwar TGT (Maths)
5.Miss. Karuna Sharma K.V. Jourian TGT (Maths)

## SOLUTION MODEL PAPER –3 (2016-17) (SA- I)
## Mathematics
## CLASS : X

### Section A

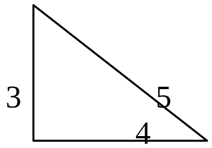
Q.1) No Solution 1 mark

Q.2) $$\frac{ar\ \Delta\ ABC}{ar\ \Delta DEF} = \frac{(BC)^2}{(EF)^2}$$

=> $$\frac{54}{ar\ \Delta\ DEF} = \frac{9}{16}$$

ar$\Delta$ DEF= (54 x 16 )/9 = 96 $cm^2$ 1 mark

Q.3) Option (a) Sin θ = 3/5
BC = 4 ( by Pythagoras thm)
Cos θ = 4/5 1 mark



Q.4) Option (a) Arranging the data in increasing order
2, 5, 10, 14, 22, 26, 30
n = 7 (odd)
Median = $\frac{(n+1)}{2}$ term = 4th term =14 1 mark

### Section B

**Q.5)** Sum of zeros= -3
Product of zeros = 2 1 mark
Quadratic polynomial in x= $x^2$ –(sum of zeros) x+ product of zeros.
= $x^2$ + 3x+ 2. 1mark

Q.6) Let the no. of deers be x
And no. of humans be y

ATQ :

x + y = 39 ---- (1)
4 x + 2 y = 132 ----- (2) 1 mark

Multiply (1) by 4 and subtracting equation (2) from equation (1)

On solving, we get …

$x = 27$ and $y = 12$ 1 mark

Q.7) Let AB be the ladder, CB be distance of foot of the ladder from the wall then in right angled $\Delta ABC$

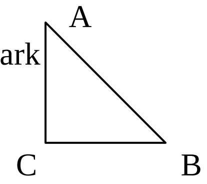
Therefore, By Pythagoras Theorem

$(AB)^2 = (AC)^2 + (BC)^2$ 1 mark

$(10)^2 = AC^2 + 8^2$

$100 = 64 + AC^2$ $AC^2 = 36,$

$AC = 6$



The foot of the ladder is at a distance of 6m from the base of the wall. 1mark

Q.8) $\text{Cos } 38^o \text{ x Cos } (90^o - 52^o) – \text{Sin } 38^o \text{ x Sin } (90^o - 52^o)$ 1mark

$\text{Cos } 38^o \text{ x Sin} 38^o – \text{sin } 38^o \text{ x Cos } 38^o$

$= 0$ 1mark

Q.9)

| $x_i$ | $f_i$ | $f_i\ x_i$ |
|---|---|---|
| 10 | 5 | 50 |
| 15 | 10 | 150 |
| 20 | 7 | 140 |
| 25 | 8 | 200 |
| 30 | 2 | 60 |
| | $\sum fi = 32$ | $\sum fi\ xi = 600$ |

1mark for correct table

$$\text{Mean} = \frac{\sum fi\ xi}{\sum fi} = \frac{600}{32} = 18.75$$ 1 mark

Q.10) We know cot A= tan(90° - A)

So cot 25° = tan (90° - 25°) = tan 65° 1 mark

Therefore tan 65° / cot 25° = tan 65° / tan 65° = 1 1 mark

## Section C

Q.11) One number X second no = LCM X HCF (1)

96 X $2^{nd}$ no. = 9696 X 4 (1)

$2^{nd}$ no = 404 (1)

Q.12)

p (x) = 2 $x^2$ – 4 x + 5

a=2, b= -4 & c=5

$\alpha + \beta = \frac{-b}{a} = 2$

$\alpha\beta = \frac{c}{a} = \frac{5}{2}$ 1 mark

$\alpha^2 + \beta^2 = (\alpha + \beta)^2 - 2\ \alpha\beta$ 1 mark

Substitute then we get, $\alpha^2 + \beta^2 = 2^2 - 2x\frac{5}{2} = 4-5 = -1$ 1 mark

Q.13) 7(y + 3) – 2 (x+ 2) = 14 --------- (1)

4(y– 2) + 3(x – 3) = 2 ----------(2)

From (1) 7y +21 – 2x – 4 = 14

On solving, we will get….

2x – 7y – 3 = 0 ------------- (3)

From (2) 4y – 8 + 3x -9 =2

On solving, we will get….

3x + 4y – 19 =0 ----------------- (4) 1 mark

2x– 7y – 3 =0 ------------- (3)

3x + 4y – 19 =0------------- (4)

Multiplying equations 3 & 4 by 3 & 2 respectively ,we get

6x– 21y – 9 =0 ------------- (5)

6x + 8y – 38 =0------------- (6) 1 mark

Subtracting equation 5 from6,we get

-29y +29=0

-29y = -29

y=1

Putting y=1 in equation 3,we get

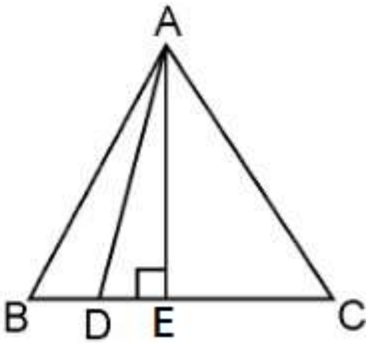
2x-10 =0

x =5

∴ x = 5 and y = 1 1 mark

**Q 14**

**Answer**



1 mark (figure)

Let the side of the equilateral triangle be *a*, and AE be the altitude of ΔABC.

∴ BE = EC = BC/2 = *a*/2

And, AE = *a*√3/2

Given that, BD = 1/3BC

∴ BD = *a*/3

DE = BE - BD = *a*/2 - *a*/3 = *a*/6

Applying Pythagoras theorem in ΔADE, we get

$AD^2 = AE^2 + DE^2$ 1 mark

$$AD^2 = \left(\frac{a\sqrt{3}}{2}\right)^2 + \left(\frac{a}{6}\right)^2$$

$$= \left(\frac{3a^2}{4}\right) + \left(\frac{a^2}{36}\right)$$

$$= \frac{28a^2}{36}$$

$$= \frac{7}{9}AB^2$$

⇒ $9\ AD^2 = 7\ AB^2$ 1 mark

Q.15)

ABC is a isosceles right triangle right angle at C

$(AB)^2 = (BC)^2 + (AC)^2$ 1 mark

$(AB)^2 = (AC)^2 + (AC)^2$ ∙[ BC = AC]

$AB^2 = 2AC^2$ 2 mark

Q.16) LHS

$(\text{Cosec}\,\Theta - \cot\Theta)^2$

$= \left(\frac{1}{\text{Sin}\,\Theta} - \frac{\text{Cos}\,\Theta}{\text{Sin}\,\Theta}\right)^2$ 1mark

$= \frac{(1 - \text{Cos}\,\Theta)^2}{\text{Sin}^2\Theta}$

$= \frac{(1 - \text{Cos}\,\Theta)(1 - \text{Cos}\,\Theta)}{\text{Sin}^2\Theta}$

$= \frac{(1 - \text{Cos}\,\Theta)(1 - \text{Cos}\,\Theta)}{1 - \text{Cos}^2\Theta}$ 1mark

$= \frac{(1 - \text{Cos}\,\Theta)(1 - \text{Cos}\,\Theta)}{(1 - \text{Cos}\,\Theta)(1 + \text{Cos}\,\Theta)}$

$= \frac{(1 - \text{Cos}\,\Theta)}{(1 + \text{Cos}\,\Theta)}$ 1 mark

= RHS

Q.17) Ans: tanA + SinA = m tanA – SinA = n.

$\therefore m^2 - n^2 = (\tan A + \sin A)^2 - (\tan A - \sin A)^2$ 1 mark

$= 4 \tan A \sin A$

$= 4\sqrt{tan^2 A}\sqrt{sin^2 A}$

$= 4\sqrt{tan^2 A}\sqrt{1 - cos^2 A}$ 1 mark

$= \sqrt{\tan^2 A - \tan^2 A.\cos^2 A}$

$= 4\sqrt{\tan^2 A - Sin^2 A}$

$= 4\sqrt{(\tan A + \sin A)(\tan A - \sin A)}$

$\therefore m^2 - n^2 = 4\sqrt{mn}$ 1 mark

Q.18) Converting the given distribution to less than type cumulative frequency distribution, we get,

| **Daily income in RS** | **Cumulative frequency** |
|---|---|
| Less than 120 | 12 |
| Less than 140 | 26 |
| Less than 160 | 34 |
| Less than 180 | 40 |
| Less than 200 | 50 |

1+2(for correct graph) mark

Let us now plot the points corresponding to the ordered pairs (120, 12), ( 140, 26), (160, 34), (180, 4), ( 200, 50) on a graph paper and join them by a free hand smooth curve

Q.19)

Here the maximum class frequency is 8 and the class corresponding to this frequency is 3- 5, so the modal class is 3-5 1mark

Lower limit (l) of modal class = 3

Class size (h) = 2

Frequency ($f_1$) = 8

Frequency ($f_0$) =7

Frequency $f_2$ = 2

Mode = $l + \frac{f_1 - f_0}{2f_1 - f_0 - f_2} \times h$ 1mark

Mode = 3.286 1 mark

Q.20) Given secΘ = 13/12

Finding all trigonometric ratios & value of third side. ½ mark each

## Section D

Q.21) Since two zeros are $\sqrt{\frac{5}{3}}$ and $-\sqrt{\frac{5}{3}}$

So $x - \sqrt{\frac{5}{3}}$ and $x + \sqrt{\frac{5}{3}}$ are the factors of the given polynomial

$x^2 - \frac{5}{3}$ is a factor then

( 3 $x^2$ – 5 ) is a also factor of the given polynomial

Applying the division algorithm to the given polynomial 1mark

$x^2 + 2x \ \ +1$

$3x^2 - 5$ ) $3x^4 + 6x^3 - 2x^2 - 10x - 5$

$-\ 3x^4 \qquad - 5x^2$

$+$

$6x^3 \quad + 3x^2 \ - 10x$

$6x^3 \qquad\quad -10x$

$- \qquad\qquad +$

$3x^2 \ - 5$

$3x^2 \ - 5$

$- \quad +$

0

$3x^4 + 6x^3 - 2x^2 - 10x - 5$

$= (3x^2 - 5)(x^2 + 2x \ \ +1)$

$= x^2 + 2x \ \ +1 \quad = \quad (x+1)(x+1)$ 2 marks for division

So its other zeros are -1 and -1 1mark for correct zeroes

Q.22)

let the fraction be = $\frac{x}{y}$

Then according to the given condition, we have

$\frac{X + 2}{Y + 2} = \frac{9}{11}$ 1 mark

and $\frac{x + 3}{y + 3} = \frac{5}{6}$ 1mark

or $11x + 22 = 9y + 18$ and $6x + 18 = 5y + 15$

$11x - 9y = 18 - 22$ and $6x - 5y = 15 - 18$

$11x - 9y = -4$ --------------I

$6x - 5y = -3$ ---------------II 1 mark

Solve it by any algebraic method and get $x = 7$ and $y = 9$ 1 mark

Fraction $= \frac{7}{9}$

Q.23)

On dividing each one of the given equation by x y we get

$\frac{3}{x} + \frac{6}{y} = 6$ and $\frac{4}{x} + \frac{2}{y} = 5$ ½ mark taking $\frac{1}{x} = u$ and $\frac{1}{y} = v$

3u + 6v = 6---------------I 1 mark

4u + 2v = 5 -------------II

Apply any algebraic method and solve 1 mark

u = 1, v = ½

Put u = 1 in =n I we get 1 mark

3 x 1+6v = 6

6v = 6 – 3

v = ½

now u = 1

$\frac{1}{x} = 1$

x = 1

u = ½ 1 mark

=> y= 2

Hence the given system of equation has one solution x = 1 and y = 2

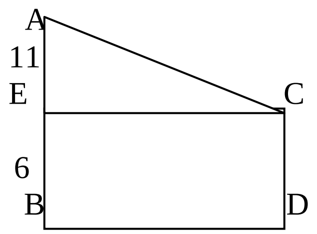
Q.24)

Given , to prove ,construction ----------------1 ½ mark

Proof . ----------------2 ½ mark

Q.25) Let AB = 11 m, CD = 6m 1 mark

be the two poles such that BD = 12 m



Draw CE ⊥ AB and join AC

CE = DB = 12m

AE =AB – BE = AB – CD 1 mark

=11 -6 = 5m

In rt ΔACE, By Pythagoras theorem 1 mark

We have $AC^2 = CE^2 + AE^2$

$AC^2 = (12)^2 + (5)^2$

= 144+25

= 169

AC = 13m 1 mark

Hence the distance between the tops of the two poles is 13 m

Q.26) Since A, B and C are the interior angles of a ΔABC therefore

∠A + ∠B + ∠C = 180 1 mark

Or $\frac{A+B+C}{2} = 90$

-

So, $\frac{B+C}{2} = 90-\frac{A}{2}$ 1mark

$\text{Sin}\left(\frac{B+C}{2}\right) = \text{Sin}\left(90-\frac{A}{2}\right)$ 1 mark

$\text{Sin}\left(\frac{B+C}{2}\right) = \text{Cos}\,\frac{A}{2}$ 1 mark

Q.27) Evaluate

$$\frac{5\cos^2 60^o + 4\,\text{Sec}^2 30^o - \tan 45^o}{\text{Sin}^2 30^o + \text{Cos}^2 30^o}$$

$$= \frac{5\,(\tfrac{1}{2})^2 + 4\,(2/\sqrt{3})^2 - (1)^2}{(\tfrac{1}{2})^2 + (\sqrt{3}/2)^2}$$ 2 mark

$$= \frac{5 \times \frac{1}{4} + 4 \times \frac{4}{3} - 1}{\frac{1}{4} + \frac{3}{4}}$$

$$= \frac{\frac{5}{4} + \frac{16}{3} - 1}{\frac{4}{4}}$$ 1 mark

$$= \frac{15+64-12}{12}$$ 1 mark

$$= \frac{67}{12}$$

Q.28)

| CI | F | Cf |
|---|---|---|
| 0-10 | 5 | 5 |
| 10-20 | x | 5+x |
| 20-30 | 20 | 25 + x |
| 30-40 | 15 | 40+x |
| 40-50 | Y | 40+x+y |
| 50-60 | 5 | 45+x+y |

Here n=60 1 mark

$\Rightarrow \frac{n}{2} = 30$

Median = 28.5

l= 20 , h=10

cf = 5+x

f= 20

$$\text{median} = l + \left( \frac{\frac{n}{2} - cf}{f} \right) \times h$$ 1 mark

$28.5 = 20 + \frac{30-(5+x)}{20} \text{ x } 10$

$28.5 = 20 + \frac{25-x}{2}$

57 = 40 + 25 –x

=> 57 -65 = -x

=> x = 8

Also 45 + x + y = 60 2 mark

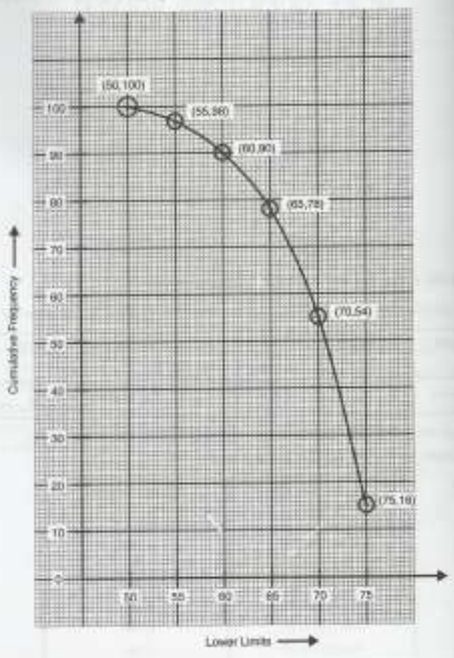
y = 7

Q.29) Converting the given distribution to a more than type distribution, we get

| Production field (Kg) | Cumulative frequency |
|---|---|
| More than or equal to 50 | 100 |
| More than or equal to 55 | 100-2= 98 |
| More than or equal to 60 | 98 – 8 = 90 |
| More than or equal to 65 | 90 -12 = 78 |
| More than or equal to 70 | 78 – 24 = 54 |
| More than or equal to 75 | 54 – 38 = 16 |

Now draw the o give by plotting the points (50, 100) (55,98) (60, 90) (65,78) (70,54) and (75, 16) 1 mark

on the graph paper and join them by a free hand smooth curve. 3 mark



The curve so obtained is the *'more than type ogive'*.

Q.30) Given integers are 32 & 616 clearly 616>32.

Therefore, applying Euclid's division lemma to 616 & 32 we get

616 = 32x19+8

Since the remainder is 8 which is not equal to zero.

So, applying the division lemma again, we get

32 = 8x4+0

Therefore Remainder=0 2 marks

b) Hence the maximum number of column in which they can march =8 1 mark

c) Any importance of army 1 mark

Q.31) Let a be any positive integer and $b = 3$.

Then a = $3q + r$ for some integer $q \geq 0$

And $r = 0, 1, 2$ because $0 \leq r < 3$ 1 mark

Therefore, $a = 3q$ or $3q + 1$ or $3q + 2$ 1 mark

Or,

$a^2 = (3q)^2$ or $(3q + 1)^2$ or $(3q + 2)^2$

$a^2 = (9q)^2$ or $9q^2 + 6q + 1$ or $9q^2 + 12q + 4$
$= 3 \times (3q^2)$ or $3(3q^2 + 2q) + 1$ or $3(3q^2 + 4q + 1) + 1$
$= 3k_1$ or $3k_2 + 1$ or $3k_3 + 1$ 2 marks

Where $k_1$, $k_2$, and $k_3$ are some positive integers
Hence, it can be said that the square of any positive integer is either of the form $3m$ or $3m + 1$.

**Group No 2**
Name of the participants.
1.Mr. Satvinder Singh K.V. Jindrah TGT (Maths)
2.Mr. Shri Niket Sharma K. V. Lakhanpur TGT (Maths)
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