KSEEB SSLC MODEL QUETSION PAPER – 04
MATHEMATICS 81 E
QUESTION PAPER & KEY ANSWERS

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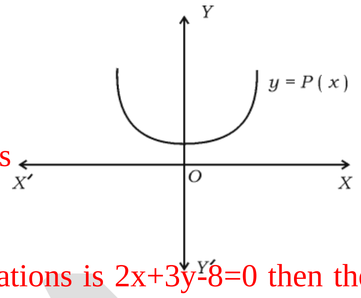
MARKS:80	DATE: 12-02-2025	DURATION: 3 Hours 15min

I. *Four* alternatives are given for each of the following questions / incomplete statements. Choose the correct alternative and write the complete answer along with its letter of alphabet. **1x8=8**

1. The rational number in the following is

   A) $\sqrt{3}$ B) $\sqrt{5}$ C) $\sqrt{4}$ D) $\sqrt{7}$

   Solution: C) $\sqrt{4}$



2. In the figure given below, the number of zeroes of the polynomial p(x) is

   A) 0 B)1 C)2 D) *3*

   Solution: A)0

3. The pair of linear equations represents parallel lines. If one of the equations is 2x+3y-8=0 then the other one is

   A)4x+6y-6=0 B)9x+3y+12=0 C)18x+6y+24=0 D)2x-y+9=0

   Solution: A) 4x+6y-6=0

4. The standard form of a quadratic equations is

   A) $ax^2+bx=0$ B) $ax^2- bx=c$ C) $ax^2+bx+c=0$ D) $ax^3+bx+c=0$

   Solution: **C)** $ax^2+bx+c=0$

5. The distance between the points (x_1, y_1) and (x_2, y_2) is

   Solution: **A) $\sqrt{(x2-x1)^2+(y2-y1)^2}$**

6. The formula to find nth term of an arithmetic progression is

   A) $a_n=a+(n-1)d$ B) $a_n=a-(n-1)d$ C) $a_n=a+(n+1)d$ D) $a_n=a+(n-1)$

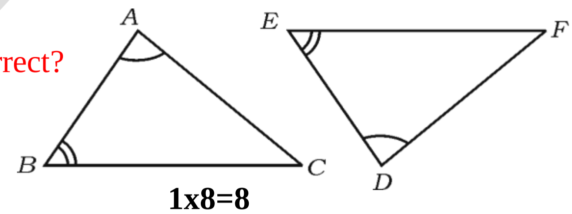
   Solution: A) $a_n=a+(n-1)d$

7. The formula to find mean, by step deviation method is

   Solution: C) mean=a+$\frac{\sum fiui}{fi}$ h

8. ΔABC~DEF, which of the following relation is correct?

   Solution: A) $\frac{AB}{DE}=\frac{BC}{EF}=\frac{AC}{DF}$



II. Answer the following questions **1x8=8**

9. Write the HCF of any two prime numbers.

   Solution: 1

   Explanation:HCF of any prime number is always 1

10. Write the degree of the cubic polynomial.

    Solution: 3

11. Write the number of solutions that the pair of linear equations 2x-5y+4=0 and 2x+y-8=0 have?

    Solution: A unique solution (Only one solution)

12. Write the nature of the roots of the equation $x^2-9=0$.

    Solution: Two equal real roots

13. Find the coordinates of the midpoint of the line segment joining the two points (5, 4) and (1, 4) is

    Solution: (3, 4)

14. Write the value of $\sin^2 90^0$.

Solution: 1

15. If E is an event related to probability, then write the value of $P(E)+P(\overline{\overline{E}})$

Solution: 1

16. In the frequency distribution data, if mean is 25 and median is 40, then calculate the value of mode.

Solution: 70

III. Answer the following questions 2x8=16

17. Calculate the sum of first 20 terms of an A.P 3. 5. 7, ……..

A.P is 3, 5, 7, ………. .

a=3, d=2 and n=20

Then sum of first 20 terms are $\frac{n}{2}\{2a+(n-1)d\}$

$\frac{20}{2}\{2x3+(20-1)x2\}=440$

18. Solve x+y=8 and x-y=2.

Solution: we have x+y=8 --------→(1) and x-y=2-----------→(2)

By elimination method x+y=8

x-y=2

by adding above two we get **x=5**

Put this x value in any one of the above equation we get **y=2**

19. Find the roots of the quadratic equation $x^2+4x-60=0$.

Solution: we have $x^2+4x-60=0$

by factorization method

(x+10) (x-6)

x=-10 and x=6

20. Find the value of *'x'*, if the distance between the points (3, 1) and (0, *x*) is 5 units.

Solution: we have $\sqrt{(0-3)^2+(x-1)^2}=5$

Squaring on both sides

$(x-1)^2=16$

x-1=4

x=5

OR

A circle passes through (-7, 1), if the centre of the circle is (-5, 4) then find the radius.

Solution: by using distance formula, $\sqrt{(-5+7)^2+(4-1)^2}$

$=\sqrt{13}$ units.

21. The coordinates of the point of trisection of the line joining the points A(2, -2), B(-7, 4) is P(x, y). then find the value of x and y.

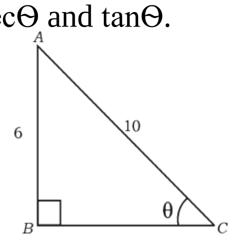
Solution: if line divides in trisection, then (x,y)= $\left[\frac{mx_2+nx_1}{m+n},\frac{my_2+ny_1}{m+n}\right]$ =

Therefore, ratio will become 1: 2 and 2:1

Coordinates of P(x, y)if ratio 1:2=$\frac{1(-7)+2(2)}{1+2},\frac{1(4)+2(-2)}{1+2}=(-1,0)$

Coordinates of P(x, y) if ratio 2:1=$(\frac{2(-7)+1(2)}{2+1},\frac{2(4)+1(-2)}{2+1})=(-4,2)$

22. In the given figure, find the value of cosecϴ and tanϴ.



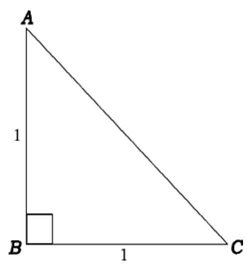
Solution:

In triangle ABC, coseecϴ=$\frac{HYP}{OPP}=\frac{10}{6}$

tanϴ=$\frac{opp}{adj}=\frac{6}{8}$

OR

In the given figure, prove that 2sinA.CosA=1



Solution: sinA= $\frac{1}{\sqrt{2}}$ & CosA=$\frac{1}{\sqrt{2}}$, thus, 2sinA.CosA = 2x$\frac{1}{\sqrt{2}}$x $\frac{1}{\sqrt{2}}$ = 1

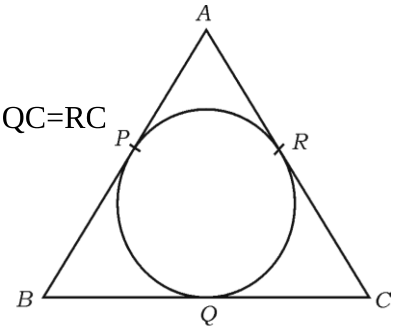
23. A box contains 20 cards numbered from 1 to 20. If a card is drawn randomly from the box, then find the probability of getting perfect squared numbered card.

Solution: total number of outcomes = 20 = n(S)

Possible outcomes,Perfect squared number on top= 1, 4, 9, 16 = 4 = n(E)

Probability, P(E) = $\frac{n(E)}{n(S)} = \frac{1}{5}$ = 0.2 or 20%

24. In the given figure, if $\overline{\overline{AB}} = \overline{\overline{AC}}$, then prove that $\overline{\overline{BQ}} = \overline{\overline{QC}}$.



Solution: Given $\overline{\overline{AB}} = \overline{\overline{AC}}$, in figure, AP=AR, PB=BQ, and QC=RC

AP+PB=AR+RC

AR+BQ=AR+QC

BQ=QC

Hence the proof

IV. Answer the following questions **3x9=27**

25. Find the zeroes of the polynomial x(x-4) and verify the relation between zeroes and coefficients.

Solution: let x(x-4)

x=0 or x=4

α=0 and β=4

above equation can be written as $x^2-4x+0=0$

a=1, b=-4 and c=0

sum of zeroes, $\alpha+\beta = \frac{-b}{a}$ and product $\alpha\beta = \frac{c}{a}$

$0+(4) = \frac{-(-4)}{1}$ $(0)(4) = \frac{0}{1}$

4 = 4 0=0 Hence verified

26. The base of a triangle is 4cm more than twice its height. If the area of the triangle is 48 sq cm then calculate the base and height of the triangle.

Solution: Let height of the triangle is x cm and base of the triangle is (4+2x) cm.

Area of the triangle is given, = 48 sq cm

$\frac{1}{2}$(4+2x)x x = 48

$2x^2+4x=96$

$x^2+2x-48=0$

by factorization method, (x+8) (x-6)

x=-8 or x=6 (by considering the positive height)

height of the triangle is 6cm and base= 4+2x6 = 16cm.

OR

Some students planned a picnic. The budget for the food was Rs.900. As 10 of them failed to join the party, the cost of the food for each member is increased by Rs.15. find how many students went for the picnic.

Solution: let Number of students = x and cost of each contribution = Rs.y

According to question, xy=900 -------------→(1)

$x=\frac{900}{y}$-------------→(2)

If 10 students were failed to join, then x-10 and each student should pay extra 15, 15+y.

Then (x-10)(15+y)=900

15x+xy-10y-150=900

15x+900-10y-150=900

15x-10y=150 ---------------→(3)

Put equation (2) in (1) we get a quadratic equation, $y^2+15y-1350=0$

After solving above we get y=30 or y=-45. (negative value will not consider)

Put y=30 in any one of the above equations we get x=30.

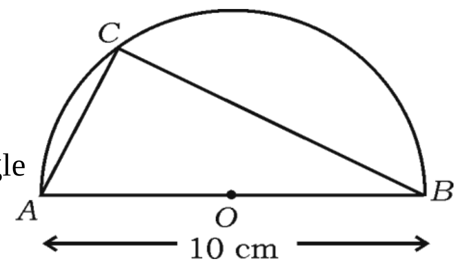
Number of students = 30 and cost of each students should pay before trip is Rs.30.

27. In the given figure ACB is a semicircle. If AB=10cm, & AC=6cm then find the area of the segments in the semicircle.

Solution: Given that AB=10cm and AC=6cm, then radius r=5cm

We have to find area of the semicircle= $\frac{3.142x5x5}{2}$

= 39.285 sq cm.



Then area of the triangle, $\frac{1}{2}$x10x6 = 30 sq cm.

Then area of the two segments= area of semicircle – area of triangle

= 39.285-30

= 9.285

28. A vessel is in the form of inverted cone. Its height is 8 cm and radius of its top, which is open, is 5 cm. It is filled with water upto the brim. When lead shots, each of which is a sphere of radius 0.5 cm are dropped into the vessel, one fourth of the water flows out. Find the number of lead shots dropped in the vessel.

Solution: Radius of cone =5cm

Height of cone =8cm

Radius of sphere=0.5cm

Volume of cone is,

$=\frac{1}{3}\pi r^2 h$

$=\frac{1}{3}\pi\times5^2\times8$

$=\frac{200}{3}\pi cm^3$

Volume of lead shot $=\frac{4}{3}\pi r^3$

$=\frac{4}{3}\pi\times(0.5)^3$

$=\frac{1}{6}\pi cm^3$

∴ number of lead shots $=\frac{\frac{1}{4}}{\frac{1}{6}\pi}$x $\frac{200}{3}\pi$

=100

OR

A hemispherical section is cut out from one face of a cubical wooden block such that the diameter 7 cm of the hemisphere is equal to the edge of the cube. Determine the surface area of the remaining solid.

Solution: Consider the diagram shown below.

It is given that a hemisphere of radius $\frac{7}{2}$ sq is cut out from the top face of the cuboidal wooden block.

Therefore, surface area of the remaining solid

= surface area of the cuboidal box whose each edge is of length (7) − Area of the top of the hemispherical part + curved surface area of the hemispherical part

$=6l^2-\pi r^2+2\pi r^2$

=294-28.875

= 265.125 sq.units

29. Prove that $\sqrt{5}$ is an irrational number.

Solution: Let us assume that is rational.

∴ There exists co-prime integers a and b (b ≠ 0) such that

$\sqrt{5} = a/b \Rightarrow \sqrt{5}b= a$

Squaring on both sides, we get

$5b^2= a^2$…… (i)

$\Rightarrow$ 5 divides a^2 $\Rightarrow$ 5 divides a

So, we can write a = 5c for some integer c.

From (i) and (ii)

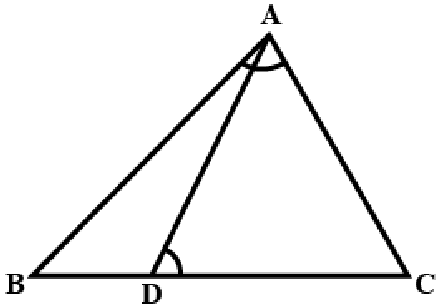
$5b^2 = 25c^2$

$\Rightarrow b^2 = 5c^2$ $\Rightarrow$ 5 divides b^2

$\Rightarrow$ 5 divides b

∴ 5 is a common factor of a and b.
But this contradicts the fact that a and b are co-primes.
This contradiction has arisen because of our incorrect assumption that √5 is rational.
Hence, √5 is irrational.

30. D is a point on the side BC on a triangle ABC such that ∟ADC= ∟BAC. Show that AB.AC=AD.BC.



Solution: Given that ∟ADC= ∟BAC

In triangle ABC & DAC,

∟C= ∟C

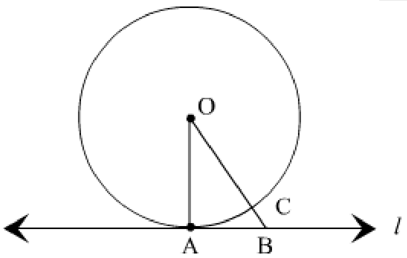
Therefore ΔABC~ΔADC

Thus, $\frac{AB}{AD} = \frac{BC}{AC}$

AB.AC=BC.AD

31. Prove that "the tangent at any point of a circle is perpendicular to the radius through the point of contact".

Solution:



Given: a circle C(0, r) and a tangent l at point A.
To prove: OA ⊥ l
Construction: Take a point B, other than A, on the tangent l.
join OB. Suppose OB meets the circle in C.
Proof: In figure
OA=OC (Radius of the same circle)
Now, OB=OC+BC.
∴ OB>OC
⇒OB>OA
⇒OA<OB
Thus, OA is shorter than any other line segment joining O to any point on l. Here OA ⊥ l.

32. Prove that $\sqrt{\frac{1+sin\Theta}{1-sin\Theta}} + \sqrt{\frac{1-sin\Theta}{1+sin\Theta}} = 2sec\Theta$

Solution: we have $\sqrt{\frac{1+sin\Theta}{1-sin\Theta}} + \sqrt{\frac{1-sin\Theta}{1+sin\Theta}}$

$= \sqrt{\frac{1+sin\Theta}{1-sin\Theta} x \frac{1+sin\Theta}{1+sin\Theta}} + \sqrt{\frac{1-sin\Theta}{1+sin\Theta} x \frac{1-sin\Theta}{1-sin\Theta}}$

$= \frac{(1+sin\Theta)}{cos\Theta} + \frac{(1-sin\Theta)}{cos\Theta}$

$= 2\ sec\Theta$

OR

Prove that $(\sqrt{3}+1)(3-cot30)= tan^3 60-2sin60$.

Solution: we have LHS, $(\sqrt{3}+1)(3-cot30)= 3\sqrt{3} - 3 + 3-\sqrt{3}$

$= 2\sqrt{3}$ -------------→(1)

RHS, $tan^3 60-2sin60 =(\sqrt{3})^2. \sqrt{3} - 2\frac{\sqrt{3}}{2}$

$=2\sqrt{3}$ -------------→(2)

From (1) and (2) LHS= RHS

33. Find the mean for the following grouped data by direct method.

Class interval	Frequency
10-20	4
20-30	6
30-40	5
40-50	4
50-60	1
	N=20

Solution: We have formula by direct method,

mean $\bar{x} = \frac{\sum fx}{n}$

C.I	f	x (midpoint of C.I)	fx
10-20	4	15	60
20-30	6	25	150
30-40	5	35	175
40-50	4	45	180
50-60	1	55	55
	N=20		$\sum fx = 620$

mean $\bar{x} = \frac{\sum fx}{n}$

$= \frac{620}{20}$

Mean= 31.

OR

Find the median for the following grouped data.

Class interval	Frequency	fc
0-20	6	6
20-40	9	15
40-60	10	25
60-80	6	31
80-100	7	38
	n=38	

Solution: Data, h=20, $\frac{n}{2}$= 19, fc=15 and f=10

Mode=l+$\left\{\frac{\frac{n}{2}-fc}{f}\right\}$xh.

= l+$\left\{\frac{\frac{n}{2}-fc}{f}\right\}$xh.

= 40+4

=44

V. Answer the following questions 4x4=16

34. A question paper consists of 15 questions in total. Each questions carries marks equal to the number of questions. If Dhanya answers first four questions correctly, misses the next two questions and answer all the subsequent questions correctly, then find all the total marks got by Dhanya using formula.

Solution: let 1st question as 1 mark

2nd question as 2 marks

3rd question as 3 marks

Thus it is in A.P, 1, 2, 3, …….. 15 & n=15

Sum of all 15 terms, Sn=$\frac{n(n+1)}{2}$ = 15(8) = 120

Out of 120 marks, 5th and 6th question not answered. So 5+6= 11

Hence 120-11 = 109 marks.

Alternative method: sum of first 15 terms – sum of first 6 terms + sum of first 4 terms.

Sn=$\frac{n}{2}$(2a+(n-1)d

Sum of first 4 terms, $S_4=\frac{4}{2}(2x1+3x1) = 2(5) = 10$

Sum of first 6 terms, $S6=\frac{6}{2}(2x1+5x1) = 3(7) = 21$

Sum of first 15 terms, $S15=\frac{15}{2}(2x1+14x1) = 15(8) = 120$

Therefore, 120-21+10= 109

OR

The seventh term of an arithmetic progression is four times the second term. Also the twelfth term is 2 more than thrice of fourth term. Find the arithmetic progression.

Solution: Given, a7=4(a2)　　　a12=2+3(a4)

a+6d= 4(a+d)　　　a+11d= 2+ 3(a+3d)

a+6d= 4a+4d　　　a+11d= 2+3a+9d

2d=3a ------.(1)　　　2a-2d=2

a-d=1

a=1+d ----------→(2)

put equation (2) in (1) we get

2d=3(1+d)

2d=3+3d

d=-3

put d=-3 in equation (2) we get a=-2

then A.P is -2, -5, -8, ……...

35. Find the solution of the pair of linear equations by graphical method.
x-y=8 and 2x+y=7

Solution:

We have x-y=8

For this we should have to find some solutions

If x=0, then y=-8, and y=0, then x=8

Similarly for 2x+y=7, if x=0, then y=5, if y=0 then x=5.

Tables are

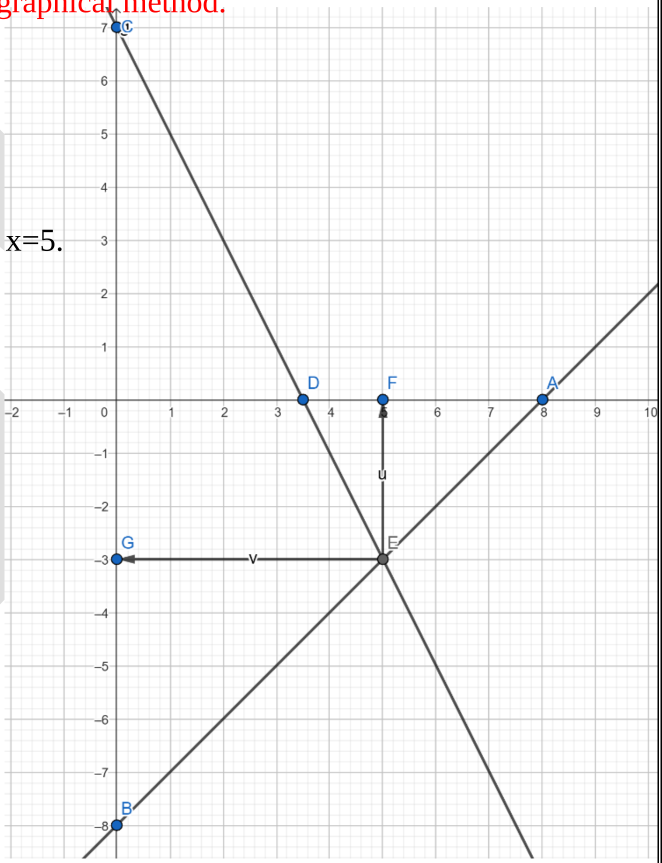
x	0	8
y	-8	0

And

x	0	3.5
y	7	0

Then by graphical method

x=5 and y=-3



36. **The maximum volume of a closed cylindrical tank is 6160 m^3. The diameter of its circular base is 28 m. Find the cost of painting its surface at the rate of Rs. 5 per square metre.**

Solution: Given volume of cylinder, V=6160 cubic m. diameter is 28m and r=14m.

$\Pi r^2 h=6160$

h=10m

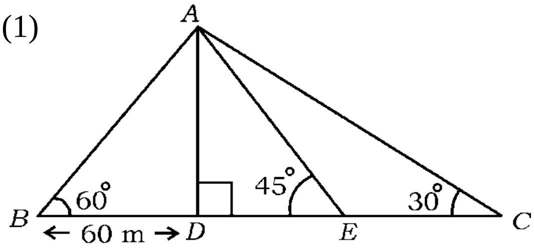
cost of painting = $2\pi rh= 2x\frac{22}{7}x14x10 \quad x\ 5$

$= 44x20x5$

= Rs.4400

37. In the given figure, find the length of DE, EC, AC and AB. Given BD = 60 m.(Use $\sqrt{3}$=1.7)

Solution: let DC=x m and DE=y m and AD=h m



In triangle ADE, tan45=$\frac{h}{y}$ then y=h ---------→(1)

In triangle ADC, tan30=$\frac{h}{x}$

x=$\sqrt{3}$ h------------→(2)

similarly in triangle ABD, tan60= =$\frac{h}{60}$

h=60$\sqrt{3}$

= 60x1.7

= 102m --------------.(3)

Put equation (3) in equation (2), we get x=102$\sqrt{3}$

= 102x1.7

= 173.4m

Put h=102 in equation 1, we get y=102m

Hence the length of DE= y = 102m, EC=x-y= 71.4m, AC=102X2= 204m and AB= 120m.

(**for full explanation, watch my youtube channel given in the link below**)

https://youtu.be/QguiOiJ3TQo?si=WYt2l0z39XXYtjJ3

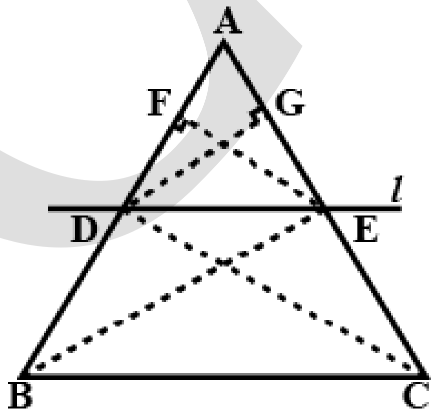
38. State and prove Basic proportionality theorem.

It states that "If a line is drawn parallel to one side of a triangle to intersect the other two sides in distinct points, then other two sides are divided in the same ratio".

Let **ABC** be the triangle.

The line **l** parallel to **BC** intersect **AB** at **D** and **AC** at **E**.

To prove: $\frac{DB}{AD}=\frac{CB}{AE}$



Join **BE,CD**

Draw **EF⊥AB**, **DG⊥CA**

Since **EF⊥AB**,

EF is the height of triangles **ADE** and **DBE**

Area of Δ**ADE=1/2×** base × height=**1/2xAD×EF**

Area of Δ**DBE=1/2×DB×EF**

$\frac{area of \Delta DBE}{area of \Delta ADE}=\frac{1/2\times DB\times EF}{1/2xAD\times EF}\times=\frac{DB}{AD}$ ....(1)

Similarly,

$\frac{area of \Delta DBE}{area of \Delta ADE}=\frac{1/2\times CB\times EF}{1/2xAE\times EF}\times=\frac{CB}{AE}$ ....(2)

But **ΔDBE** and **ΔDCE** are the same base **DE** and between the same parallel straight line **BC** and **DE**.

Area of **ΔDBE**= area of **ΔDCE** ....(3)

From (1), (2) and (3), we have

$\frac{DB}{AD}=\frac{CB}{AE}$

Hence proved.

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Note: This key answers not by board, its prepared by me.

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Link is here: https://youtu.be/yuQXEuAk3uk?si=CIq0jrE8LwdduEN0