MODEL SSLC EXAMINATION – 2019

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KEY FOR MATHEMATICS

SECTION – I

15 x 1 = 15 marks

Q. No	Key	Answer	Q. No	Key	Answer
1.	(3)	21	9.	(1)	60m
2.	(3)	34			
3.	(3)	$(1+\sec x)(1+\sec^2 x+\sec^4 x)$	10.	(1)	60°
4.	(3)	$k \neq 3$	11.	(3)	-19
5.	(2)	$x^2 - 5x + 6 = 0$	12.	(1)	75 m
6.	(2)	$1 - \alpha^2 - \beta\gamma = 0$	13.	(3)	$\frac{3}{4}$ cm
7.	(2)	$\frac{2}{7}$	14.	(1)	t
8.	(4)	- 2	15.	(4)	$\frac{1}{4}$

SECTION-II

10 x 2 = 20 marks

16. AUB= {a,x,y,r, s, 1,3,5,7, - 10} **- 1 mark**
 B U A= {a, x, y, r, s, 1, 3, 5, 7, -10 } **- 1 mark**
 AUB = BUA

17. Domain = {1, 2, 3, 4, 5} **- 1 mark**
 Range = {1, 3, 5, 7, 9} **- 1 mark**

18. 1 +2 +3 + …….. +12
 $S_{12} = 78$ **- 1 mark**
 Hence the clock strikes in a day = 2 x 78 =156 times. **- 1 mark**

19. $x^2 + 4(x + 2) - 4 = x^2 + 4x + 4$
 $= (x + 2)^2$ **-1 mark**
 $\sqrt{x^2 + 4(x+2) - 4} = |x+2|$ **- 1 mark**

20. $A^2 = \begin{bmatrix} o & c & b \\ c & o & a \\ b & a & o \end{bmatrix} \begin{bmatrix} o & c & b \\ c & o & a \\ b & a & o \end{bmatrix}$ **- 1 mark**

 $= \begin{bmatrix} b^2+c^2 & ab & ac \\ ab & c^2+a^2 & bc \\ ac & bc & a^2+b^2 \end{bmatrix}$ **- 1 mark**

21. $\begin{pmatrix} 3x+2y \\ 4x+5y \end{pmatrix} = \begin{pmatrix} 8 \\ 13 \end{pmatrix}$ **- 1 mark**

 x = 2, y = 1 **- 1 mark**

22. $m = \frac{2}{3}$, $(x_1, y_1) = (5, -4)$

$y - y_1 = m(x - x_1)$ **- 1 mark**

$2x - 3y - 22 = 0$ **- 1 mark**

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23. $m_1 = \frac{3}{5}$, $m_2 = \frac{-5}{3}$ **- 1 mark**

$m_1 \times m_2 = -1$ (or) The straight lines are perpendicular **- 1 mark**

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24. **Pythagoras Theorem:** In a right angled triangle, the square of the hypotenuse is equal to the sum of the squares of the other two sides **- 2 mark**

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25. $sin^6\theta + cos^6\theta = (sin^2\theta)^3 + (cos^2\theta)^3$

$= (sin^2\theta + cos^2\theta)^3 - 3sin^2\theta\, cos^2\theta(sin^2\theta + cos^2\theta)$ **-1 mark**

$= 1 - 3\sin^2\theta \cos^2\theta$ **- 1 mark**

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26. OA = OB= 40cm, $\angle AOB = 60°$

OC is the perpendicular bisector of AB and angle bisector of $\angle AOB$

$\angle AOC = 30°$

In the right ΔCOA, $\sin 30° = \frac{AC}{OA}$

AC = 20 cm **- 1 mark**

Since C is the midpoint of AB

AB = 2AC = 2 x 20 = 40cm **- 1 mark**

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27. Given that $r_1 : r_2 = 3 : 2$ and $h_1 : h = 5 : 3$

The ratio of the CSA = $2\pi r_1h_1 : 2\pi r_2h_2$ **- 1 mark**

= 5: 2 **- 1 mark**

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28. Range = L – S **- 1 mark**

2.26 = 7.44 – S

The smallest value, S= 5.18 **- 1 mark**

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29. n (s) = 13 ,

n(A) = 5

P (A) = $\frac{5}{13}$

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n(B) = 3

P (B) = $\frac{3}{13}$ **- 1 mark**

P(A or B) = P(A) + P(B) = $\frac{8}{13}$ **- 1 mark**

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30. In a cone,

r = 5cm

h =12 cm

Volume of cone = $\frac{1}{3}\pi r^2 h$ **- 1 mark**

$= \frac{2200}{7} (or) 314\frac{2}{7} cm^2$ **- 1 mark**

(b) $\frac{x^3 - 1}{x+3} \div \frac{x^2 + x + 1}{3x+9} = \frac{(x-1)(x^2+x+1)}{(x+3)} \times \frac{3(x+3)}{(x^2+x+1)}$ **- 1 mark**

$= 3(x - 1)$ **- 1 mark**

SECTION-III

31. n(F) = 65 , n(H) = 45, n(C) = 42

n(F∩ H) = 20 , n(F ∩C) = 25, n (H ∩C) =15 and n(F ∩H∩C) = 8 **-1mark**

n(FU H U C) = n(F) + n(H) + n(C) – n (F∩H)

-n(H∩C) – n (F∩C) + n (F∩ H∩C) **- 1 mark**

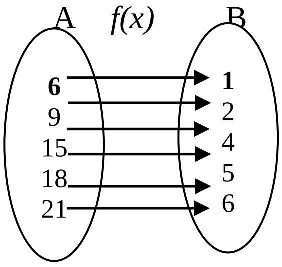
= 65 +45 + 42 – 20 – 25 – 15 +8 **- 2 marks**

= 100 **-1 mark**

Note: This problem can be done by using Venn diagram.

32. *f (6) = 1*, *f(9)* = 2, *f*(15) = 4 *f*(18) = 5, *f(21*) = 6 **-1 mark**

(i) an arrow diagram



-1 mark

(ii) Set of ordered pairs

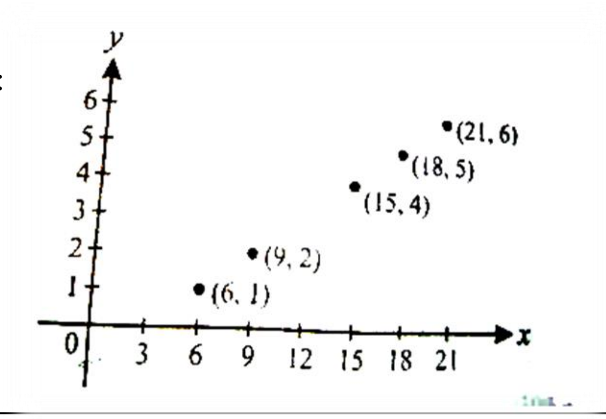
f= {(6, 1), (9, 2) ,(15,4), (18,5), (21,6)} **-1 mark**

(iii) Table:

x	6	9	15	18	21
f(x)	1	2	4	5	6

-1 mark

(iv) Graph:



-1 mark

33. $S_n = 8 + 88 + 888 + \ldots$ to n terms

$S_n = \frac{8}{9}(9+99+999+\ldots$ to n terms) **-1 mark**

$= \frac{8}{9}\left[(10-1)+(100-1)+(1000-1)+\ldots\right.$ to n terms) **-1 mark**

$= \frac{8}{9}\left[10+10^2+10^3+\ldots\right.$ n terms – n) **- 1 mark**

$= \frac{8}{9}\left[\frac{10(10^n-1)}{9} - n\right]$ **-1 mark**

$= \frac{80}{81}(10^n - 1) - \frac{8n}{9}$ **-1 mark**

34. $$\begin{array}{r|rrrr} 1 & 1 & -23 & 142 & -120 \\ & 0 & 1 & -22 & 120 \\ \hline & 1 & -22 & 120 & \boxed{0} \end{array}$$ **-2 marks**

(x-1) is a factor **-1 mark**

$x^2 - 22x + 120 = (x - 12)(x - 10)$ **-1 mark**

$x^3 - 23x^2 + 142x - 120 = (x - 1)(x - 12)(x - 10)$ **-1 mark**

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35. $(a^2 + b^2)x^2 - 2(ac + bd)x + c^2 + d^2 = 0$

This is of the form $Ax^2 + Bx + C = 0$ given roots are equal, $B^2 - 4AC = 0$ **-1 mark**

$[-2(ac + bd)]^2 - 4(a^2 + b^2)(c^2 + d^2) = 0$

$a^2d^2 - 2abcd + b^2c^2 = 0$ **-1mark**

$(ad - bc)^2 = 0$ **-1 mark**

$ad = bc$ **-1 mark**

$\frac{a}{b} = \frac{c}{d}$ **WWW.MATHSTIMES.COM** **-1 mark**

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36. $A^2 = \begin{pmatrix} -1 & -4 \\ 8 & 7 \end{pmatrix}$ **-2 mark**

$A^2 - 4A + 5I_2 = \begin{pmatrix} -1 & 4 \\ 8 & 7 \end{pmatrix} - 4\begin{pmatrix} 1 & -1 \\ 2 & 3 \end{pmatrix} + 5\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$ **-2 mark**

$= \begin{pmatrix} 0 & 0 \\ 0 & 0 \end{pmatrix}$

$A^2 - 4A + 5I_2 = 0$ **-1 mark**

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37. Midpoint , M $\left(-\frac{1}{2}, 6\right)$ **-1 mark**

Midpoint, N $\left(\frac{9}{2}, \frac{3}{2}\right)$ **-1 mark**

Slope of MN, $m_1 = \frac{-9}{10}$ **-1 mark**

Slope of BC, $m_2 = \frac{-9}{10}$ **-1 mark**

$m_1 = m_2$ **-1 mark**

The straight lines BC and MN are parallel.

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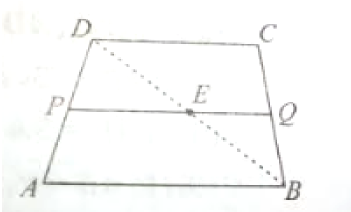
38. Construction: Join BD and let it meet PQ at E.



In ΔDAB, $PE \parallel AB$, By Thales theorem, (BPT), **-2 marks**

We have $\frac{AP}{PD} = \frac{BE}{ED}$ (1)

In ΔBCD, EQ ∥ DC, By Thales theorem (BPT), **-1 mark**

we have $\frac{BE}{ED} = \frac{BQ}{QC}$ (2) **- 1 mark**

From (1) and (2), we get $\frac{AP}{PD} = \frac{BQ}{QC}$ **-1 mark**

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39. LHS = $\frac{\sin\theta - \cos\theta + 1}{\sin\theta + \cos\theta - 1}$ (Divide each term of both numerator and denominator by cosθ)

$= \frac{\tan\theta - 1 + \sec\theta}{\tan\theta + 1 - \sec\theta}$ **-1 mark**

$= \frac{\tan\theta + \sec\theta - (\sec^2\theta - \tan^2\theta)}{\tan\theta + 1 - \sec\theta}$ **- 1 mark**

$= \frac{(\tan\theta + \sec\theta) - (\sec\theta + \tan\theta)(\sec\theta - \tan\theta)}{(\tan\theta + 1 - \sec\theta)}$

$= \frac{(\tan\theta + \sec\theta)(1 - \sec\theta + \tan\theta)}{(\tan\theta + 1 - \sec\theta)}$ **-1 mark**

= (tanθ + secθ) **-1 mark**

$= \frac{1}{\sec\theta - \tan\theta}$ **WWW.MATHSTIMES.COM** **-1 mark**

= RHS.

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40. OB = 6cm, $\angle OBC = 60°$

Cos 60° = $\frac{OB}{BC}$ **-1 mark**

BC = 12 cm, l = 12 cm **-1 mark**

In the right Δ OBC,

$\tan 60° = \frac{OC}{OB}$

OC = $6\sqrt{3}$ **-1 mark**

CSA of cone = πrl **-1 mark**

= 72π cm² **- 1 mark**

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41. Let P be the foot of the perpendicular OP on the line 3x +2y =13

Thus, the equation of straight line OP is the form 2x – 3y + k = 0 **-1 mark**

It passes (0,0), Thus k =0 **-1 mark**

The equation of OP is 2x – 3y = 0 **-1 mark**

Now, P is the point of intersection of the straight lines.

3x + 2y = 13 and 2x – 3y = 0 **-1 mark**

We get, x =3 ,y =2

The foot of the perpendicular is P (3, 2) **-1 mark**

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42. In a cone r =11 cm , h = 44 cm,
To find sphere r = 2

Volume of the sphere = volume of the cone

$$\frac{4}{3}\pi r^3 = \frac{1}{3}\pi r^2 h$$ **-1mark**

$$r^3 = \frac{1}{3}\times\frac{\pi\times 11\times 11\times 44}{\pi}\times\frac{3}{4}$$ **-2 marks**

$r^3 = 11^3$ **-1 mark**

r = 11 cm. **WWW.MATHSTIMES.COM** **-1 mark**

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43. $$\bar{x} = \frac{\sum x}{n} = \frac{n+1}{2}$$

$$\sum x^2 = \frac{n(n+1)(2n+1)}{6}$$

$$\sigma = \sqrt{\frac{\sum x^2}{n} - \left(\frac{\sum x}{n}\right)^2}$$ **-1 mark**

$$= \sqrt{\frac{n(n+1)(2n+1)}{6n} - \left(\frac{n+1}{2}\right)^2}$$ **-1 mark**

$$= \sqrt{\left(\frac{n+1}{2}\right)\left[\frac{(2n+1)}{3} - \frac{(n+1)}{2}\right]}$$ **-1 mark**

$$= \sqrt{\left(\frac{n+1}{2}\right)\left(\frac{n-1}{6}\right)}$$ **-1 mark**

$$= \sigma = \sqrt{\frac{n^2-1}{12}}$$ **-1 mark**

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44. Given that n(s) = 100, $n(S_1) = 30$, n (M) = 40, $n(M\cap S_1) = 10$ **-1 mark**

$P(M) = \frac{40}{100}$, $P(S_1) = \frac{30}{100}$, $P(M\cap S_1) = \frac{10}{100}$ **-1 mark**

$P(MUS_1) = P(MUS_1) = P(m) + P(S_1) - P(M\cap S_1)$ **-1 mark**

$$= \frac{40}{100} + \frac{30}{100} - \frac{10}{100}$$ **-1 mark**

$$= \frac{60}{100} = \frac{3}{5}$$ **WWW.MATHSTIMES.COM** **-1 mark**

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45. (a) $a^2 x^2 - 3abx + 2b^2 = 0$

$$x^2 - \frac{3b}{a} + \frac{2b^2}{a^2} = 0$$ **-1 mark**

$$x^2 - 2\left(\frac{3b}{2a}\right)x = \frac{-2b^2}{a^2}$$ **-1 mark**

$$x^2 - 2\left(\frac{3b}{2a}\right)x + \frac{9b^2}{4a^2} = \frac{9b^2}{4a^2} - \frac{2b^2}{a^2}$$ **-1 mark**

$$\left(x - \frac{3b}{2a}\right)^2 = \frac{9b^2 - 8b^2}{4a^2}$$ **-1 mark**

$$\left(x - \frac{3b}{2a}\right)^2 = \frac{b^2}{4a^2}$$

$$x - \frac{3b}{2a} = \pm \frac{b}{2a}$$

$$x = \left\{\frac{b}{a}, \frac{2b}{a}\right\}$$ **WWW.MATHSTIMES.COM** **-1 mark**

45.(b) a = 2, r =2 , S_n = 1022

$S_n = \dfrac{a[r^n - 1]}{r-1}, r \neq 1$ **-1 mark**

S_n = 2 (2^n – 1) **-1 mark**

2(2^n – 1) = 1022 **-1 mark**

2^n – 1 = 511

2^n = 512 = 2^9 **-1 mark**

n= 9 **-1 mark**

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SECTION – IV

46. (a) Rough diagram **-1 mark**

First Circle **- 3 marks**

Line Segment OP **-1 mark**

Perpendicular bisector **-1 mark**

Second circle **-2 marks**

Two tangents lines **-1 mark**

Measuring the length **-1 mark**

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46. (b) Rough diagram **-1 mark**

Draw a line segment PQ **-1mark**

Draw arcs with radii 7 cm and 5.5 cm. Join PR and QR **-1mark**

Draw perpendicular bisectors of PQ and QR **-3 marks**

Draw a circumcircle **-3 marks**

Join PS and RS **-1mark**

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47. (a) $y = 2x^2 + x - 6$

x	–3	–2	–1	0	1	2	3
$2x^2$	18	8	2	0	2	8	18
x	–3	–2	–1	0	1	2	3
−6	–6	–6	–6	–6	–6	–6	–6
y	9	0	–5	–6	–3	4	15

Plot the points (–3, 9), (–2, 0), (–1, –5), (0, –6), (1, –3), (2, 4), (3, 15) **-3 marks**

Join the points by a smooth curve **-4 marks**

Scale and drawing x and y axis **-2 marks**

Solution set is { –2.5, 2} **-1 mark**

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(b) $y \propto x \Rightarrow y = kx \Rightarrow \frac{y}{x} = k$

$y = 2x$

Formation of equation **-1 mark**

Plotting the points and drawing the curve **-5 marks**

Drawing x and y axes, scale **-2 marks**

$y = 40x$ **-2 marks**

distance travelled in 3 hours = 120 kms

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