



## MATHEMATICS HSSC-I SECTION – A (Marks 20)

Time allowed: 25 Minutes

Section – A is compulsory. All parts of this section are to be answered on this page and handed over to the Centre Superintendent. Deleting/overwriting is not allowed.

Do not use lead pencil.

حصہ اول لازمی ہے۔ اس کے جوابات اسی صفحہ پر دئے کرنا ہم مرکز کے حوالے کریں۔ کٹ کر دوبارہ لکھنے کی اجازت نہیں ہے۔ سیاہ پینسل کا استعمال ممنوع ہے۔

Version No.			
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Answer Sheet No. \_\_\_\_\_

ہر سوال کے سامنے دیے گئے، کریکولم کے مطابق درست دائرہ کو پر کریں۔ Invigilator Sign. \_\_\_\_\_

Fill the relevant bubble against each question according to curriculum: Candidate Sign. \_\_\_\_\_

Question	A	B	C	D	A	B	C	D
1. The multiplicative inverse of $-i$ is:	$i$	1	$-i$	-1	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2. What is the modulus of a complex number $(8-15i)$ ?	$8+15i$	17	$\sqrt{161}$	-15	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3. The contrapositive of a conditional $p \rightarrow q$ is:	$q \rightarrow p$	$\sim q \rightarrow p$	$\sim q \rightarrow \sim p$	$\sim p \rightarrow q$	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4. Which structure in the following is true for the set of natural numbers under multiplication?	Groupoid	Semi group	Monoid	Group	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5. Which one of the following matrices is singular?	$\begin{bmatrix} 1 & -4 \\ 2 & 8 \end{bmatrix}$	$\begin{bmatrix} 1 & 4 \\ \sqrt{4} & 8 \end{bmatrix}$	$\begin{bmatrix} 1 & -4 \\ \sqrt{2} & -8 \end{bmatrix}$	$\begin{bmatrix} -1 & 4 \\ 2 & 8 \end{bmatrix}$	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
6. Rank of matrix $\begin{bmatrix} -2 \\ 0 \\ -1 \end{bmatrix}$ is:	0	1	2	3	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
7. For what value of $k$ , roots of $kx^2 - 12x + 4 = 0$ are equal?	9	-9	9.5	18	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
8. One of the multiplicative factors of $(x^4 - 5x^2 + 4)$ is:	$x+2$	$x-3$	$x+3$	$x+4$	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
9. Which one of the following represents $\frac{x^3 + 2x^2 + 3}{(x^2 + 1)(x + 4)}$ ?	Proper fraction	Improper fraction	Cubic polynomial	Polynomial	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
10. For what value of $x$ , the numbers $\frac{1}{2}, \frac{1}{5}, \frac{1}{x}$ are in harmonic progression?	-10	-8	8	10	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
11. If $\binom{n}{8} = \binom{n}{12}$ , then value of $n$ is:	4	8	12	20	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>



	Question	A	B	C	D	A	B	C	D
12.	The probability of getting same upper face on throwing two fair dice simultaneously is:	$\frac{1}{12}$	$\frac{1}{6}$	$\frac{1}{4}$	$\frac{1}{2}$	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
13.	The coefficient of third term in the expansion of $\left(x - \frac{1}{x}\right)^8$ is:	$\binom{8}{0}$	$\binom{8}{1}$	$\binom{8}{2}$	$\binom{8}{3}$	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
14.	In which quadrant, terminal side of the angle $-510^\circ$ lies?	1 <sup>st</sup>	2 <sup>nd</sup>	3 <sup>rd</sup>	4 <sup>th</sup>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
15.	$(\sin 5x + \sin 7x)$ is expressed in product form as:	$2\sin 6x \cos x$	$2\cos 6x \sin x$	$2\sin 6x \sin x$	$2\cos 6x \cos x$	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
16.	The value of $\cos(x + 60^\circ) + \cos(x - 60^\circ)$ is:	$\cos x$	$\sqrt{3} \cos x$	$\cos 2x$	0	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
17.	The period of $\frac{8}{7} \sec(x - \pi)$ is:	$-\pi$	$\pi$	$3\pi$	$\frac{8\pi}{7}$	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
18.	What is the area of a triangle $\triangle ABC$ , if $a = 10, b = 20$ and $\gamma = 30^\circ$ ?	$25\sqrt{2}$	$50\sqrt{3}$	50	$\frac{100}{\sqrt{3}}$	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
19.	The value of $\cos\left[\frac{\pi}{6} + \cos^{-1}\left(-\frac{1}{2}\right)\right]$ is:	$\frac{1}{2}$	$-\frac{1}{2}$	$\frac{\sqrt{3}}{2}$	$-\frac{\sqrt{3}}{2}$	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
20.	The solution of a trigonometric equation $(\sin x + \cos x = 0)$ is:	$-30^\circ$	$-120^\circ$	$45^\circ$	$135^\circ$	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

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# MATHEMATICS HSSC-I

Time allowed: 2:35 Hours

Total Marks Sections B and C: 80

NOTE: Attempt any twelve parts from Section 'B' and any four questions from Section 'C' on the separately provided answer book. Write your answers neatly and legibly.

## SECTION - B (Marks 48)

Q. 2 Attempt any TWELVE parts. All parts carry equal marks. (12 x 4 = 48)

- (i) If  $Z_1 = 2 + 3i$  and  $Z_2 = 4 + 2i$ , then show that  $(Z_1 \bar{Z}_2 + \bar{Z}_1 Z_2)$  is a real number.
- (ii) Construct a truth table of a logical statement  $(p \leftrightarrow q) \wedge (p \rightarrow q)$
- (iii) Solve for  $x$ : 
$$\begin{vmatrix} x & -1 & 1 \\ 5 & 1-x & 2 \\ 1 & 3 & x-5 \end{vmatrix} = \begin{vmatrix} 1 & 0 & -3 \\ 2 & x & -6 \\ 1 & 3 & x-5 \end{vmatrix}$$
- (iv) If  $\alpha, \beta$  are the roots of  $x^2 + px + q = 0$ , find the quadratic equation whose roots are  $\frac{\alpha}{\beta}$  and  $\frac{\beta}{\alpha}$ .
- (v) Using properties of the cube roots of unity, verify that  $(1 + \omega) + (1 + \omega)^2 + (1 + \omega)^3 = 2\omega$
- (vi) Express  $\frac{125 + 4x - 9x^2}{(x-1)(x+3)(x+4)}$  in partial fractions.
- (vii) Second term of a geometric sequence is 9 and its fourth term is 1. Find sum to infinity.
- (viii) Insert six arithmetic means between 15 and -13.
- (ix) Prove that Sine is a periodic function and its period is  $2\pi$
- (x) A die is thrown twice. Find the probability that sum of the upper face numbers is a prime number or an odd number.
- (xi) Find the value of  $k$ , if the constant term in the expansion of  $(2x^2 + \frac{k}{x})^6$  is 960.
- (xii) If  $\cos \theta = \frac{\sqrt{10}}{10}$  with  $2\pi < \theta < \frac{5\pi}{2}$ , then find values of the remaining five trigonometric ratios.
- (xiii) Verify that:  $\cos 4x \cos x - \sin 6x \sin 3x = \cos 7x \cos 2x$
- (xiv) In an oblique triangle  $\triangle ABC$  (with usual notations)  $a = 6, c = 12$  and  $\beta = 124^\circ$ . Apply law of cosines and law of sines to find the values of 'b',  $\alpha$  and  $\gamma$
- (xv) Verify that:  $2 \tan^{-1} \frac{1}{2} + \tan^{-1} \frac{1}{7} = \tan^{-1} \frac{31}{17}$
- (xvi) Solve the trigonometric equation  $\cos 5\theta + \cos \theta = \cos 3\theta$  where  $\theta \in [0, \pi]$

## SECTION - C (Marks 32)

Note: Attempt any FOUR questions. All questions carry equal marks. (4 x 8 = 32)

- Q. 3 Use Cramer's rule to solve the system of linear equations.  $x + y - z = 3; 2x - y - z = 1; 3x + y + 2z = 0$
- Q. 4 If three consecutive numbers in an arithmetic progression are increased by 1, 2 and 3 respectively, the resulting numbers are in geometric progression. Find the original numbers if their sum is 12.
- Q. 5 If  $y = \frac{1}{4} + \frac{1.3}{4.8} + \frac{1.3.5}{4.8.12} + \dots$  then prove that  $y^2 + 2y - 1 = 0$
- Q. 6 Without using calculator, prove that  $\cos 10^\circ \cdot \cos 30^\circ \cdot \cos 50^\circ \cdot \cos 70^\circ = \frac{3}{16}$
- Q. 7 Solve the following system of equations:  $5x^2 - 14xy + 9y^2 = 0; 4x^2 - 3xy - 16 = 0$
- Q. 8 Solve triangles  $\triangle ABC$  (with usual notations) if,
  - (a)  $\alpha = 60^\circ, \beta = 15^\circ$  and  $b = 33$
  - (b)  $b = 23, c = 24$  and  $\alpha = 75^\circ$



# MATHEMATICS HSSC-I

## SECTION – A (Marks 20)

Time allowed: 25 Minutes

Section – A is compulsory. All parts of this section are to be answered on this page and handed over to the Centre Superintendent. Deleting/overwriting is not allowed.

Do not use lead pencil.

حصہ اول لازمی ہے۔ اس کے جوابات اسی صفحہ پر دے کر تمام مرکز کے حوالے کریں۔ کاٹ کر دیا نہ  
کینے کی اجازت نہیں ہے۔ سیاہ پنسل کا استعمال ممنوع ہے۔

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Answer Sheet No. \_\_\_\_\_

ہر سوال کے سامنے دیے گئے، کریکولم کے مطابق درست دائرہ کو پر کریں۔ Invigilator Sign. \_\_\_\_\_

Fill the relevant bubble against each question according to curriculum: Candidate Sign. \_\_\_\_\_

Question	Candidate Sign.			
	A	B	C	D
1. What is the area of a triangle $\Delta ABC$ , if $a = 1, c = 2$ and $\beta = 60^\circ$ ?	$\sqrt{3}$	$\frac{\sqrt{3}}{2}$	$\frac{1}{2}$	1
2. The value of $\sin(\pi + \sin^{-1} x)$ is:	$\pi x$	$x$	$-x$	$-\pi x$
3. Which one of the following is a solution of $\sin 2x + \cos 2x = -1$ ?	$30^\circ$	$45^\circ$	$90^\circ$	$0^\circ$
4. If $z = -2 - 3i$ then, what is the value of $z - \bar{z}$ ?	$6i$	$-4$	4	$-6i$
5. The simplified form of $i^{18}$ is:	$-i$	1	$-1$	$i$
6. The converse of the conditional $\sim q \rightarrow p$ is:	$\sim q \rightarrow p$	$q \rightarrow \sim p$	$\sim p \rightarrow q$	$q \rightarrow p$
7. Which structure in the following is TRUE for the set of natural numbers under addition?	Semi group	Monoid	Group	Groupoid
8. The determinant of a matrix $\begin{bmatrix} i & 0 & \sqrt{3} \\ 0 & i & \sqrt{3} \\ 0 & 0 & i \end{bmatrix}$ is:	$i$	$-1$	1	$-i$
9. Rank of matrix $\begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix}$ is:	1	2	3	0
10. If $(-1)$ is a root of $x^3 + px^2 - x + 2 = 0$ , then value of $p$ is:	$-4$	0	2	$-2$

	Question	A	B	C	D	A	B	C	D
11.	For what value of $m$ , $(x^2 - 2mx - 3)$ has zero remainder, when divided by $(x - 3)$ ?	1	-2	2	-1	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
12.	For what value of $B$ , $\frac{1}{x^2 - 1} = \frac{A}{x - 1} + \frac{B}{x + 1}$ ?	2	-1	$-\frac{1}{2}$	$\frac{1}{2}$	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
13.	If $a - 3, 6, b + 3$ are in arithmetic progression, then value of $(a + b)$ is:	6	12	18	0	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
14.	If ${}^n P_2 = 30$ then, value(s) of $n$ is/are:	6, -5	8	12	6, 5	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
15.	The probability of getting two tails when two coins are tossed is:	$\frac{1}{6}$	$\frac{1}{4}$	$\frac{1}{3}$	$\frac{1}{2}$	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
16.	The middle term in the expansion of $\left(x - \frac{1}{2x}\right)^{12}$ is:	6 <sup>th</sup>	7 <sup>th</sup>	8 <sup>th</sup>	5 <sup>th</sup>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
17.	If $\sin^2 \theta = \frac{1}{7}$ the value of $\sec^2 \theta$ is:	$\frac{6}{7}$	$\frac{7}{6}$	$\frac{8}{7}$	7	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
18.	$2\sin 7x \cos 3x$ is expressed in sum or difference form as:	$\sin 10x - \sin 4x$	$\sin 5x - \sin 2x$	$\cos 5x + \cos 2x$	$\sin 10x + \sin 4x$	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
19.	The value of $\sin(90^\circ + x) + \sin(90^\circ - x)$ is:	0	$-2\sin x$	$-2\cos x$	$2\cos x$	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
20.	The period of $3\cos \frac{x}{5}$ is:	$10\pi$	$30\pi$	$\frac{\pi}{5}$	$5\pi$	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

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# MATHEMATICS HSSC-I

36

Time allowed: 2:35 Hours

Total Marks Sections B and C: 80

NOTE: Attempt any twelve parts from Section 'B' and any four questions from Section 'C' on the separately provided answer book. Write your answers neatly and legibly.

## SECTION - B (Marks 48)

Q. 2 Attempt any TWELVE parts. All parts carry equal marks.

(12 x 4 = 48)

- (i) If  $Z_1 = 3 + 4i$  and  $Z_2 = 4 + 3i$ , then show that  $\left| Z_1 + \frac{1}{Z_2} \right| \cong 5$ .
- (ii) Construct truth table of a logical statement  $(\sim p \rightarrow \sim q) \wedge p$
- (iii) Show that 
$$\begin{vmatrix} y+z & x & y \\ z+x & z & x \\ x+y & y & z \end{vmatrix} = (x+y+z)(z-x)^2$$
- (iv) If  $(-5)$  is a root of the equation  $2x^2 + px - 15 = 0$  and the equation  $p(x^2 + x) + k = 0$  has equal roots, find values of 'p' and 'k'.
- (v) Using properties of the cube roots of unity, Show that  $(x+y)^2 + (x\omega + y\omega^2)^2 + (x\omega^2 + y\omega)^2 = 6xy$
- (vi) Express  $\frac{x^2 + 2x - 1}{(x)(x+2)(2x-1)}$  in partial fractions.
- (vii) Which term of the arithmetic sequence  $4, -4, -12, -20, -28, \dots$  is  $(-172)$ ?
- (viii) Show that  $S_n = \sum_{k=1}^n (6k^2 + 4k - 1) = n(n+2)(2n+1)$
- (ix) Prove that Tangent is a periodic function and its period is  $\pi$
- (x) A fair cubical die is rolled three times.  
 (a) Find the probability of getting a six all three times.  
 (b) Find the probability of getting no sixes.
- (xi) Find the value of  $k$ , if the constant term in the expansion of  $\left(4x^2 + \frac{k}{2x}\right)^9$  is 84.
- (xii) If  $\sin \theta = \frac{-\sqrt{15}}{15}$  and  $\pi < \theta < \frac{3\pi}{2}$ , then find values of the remaining trigonometric ratios.
- (xiii) If  $\operatorname{Cosec} \alpha = \frac{5}{3}$ , where  $0 < \alpha < \frac{\pi}{2}$  and  $\operatorname{Sec} \beta = \frac{13}{12}$ , where  $\frac{3\pi}{2} < \beta < 2\pi$ , then find the value of  $\cos(\alpha - \beta)$
- (xiv) Two escribed circles of radii  $r_2$  and  $r_3$  are connected with triangle  $\Delta ABC$ . Using usual notations, prove that  $(r_2 + r_3) \tan \frac{\alpha}{2} = a$
- (xv) Prove that:  $2 \tan^{-1} \frac{1}{3} + \tan^{-1} \frac{1}{7} = \frac{\pi}{4}$
- (xvi) Solve the trigonometric equation  $\sin 2x = \sqrt{3} \cos x$ , where  $0 < x < 2\pi$

## SECTION - C (Marks 32)

Note: Attempt any FOUR questions. All questions carry equal marks.

(4 x 8 = 32)

- Q. 3 Use Cramer's rule to solve the system of linear equations  $x + 5y - 3z = -36$  ;  $x + 4y + 2z = -11$  ;  $2x - y = 7$
- Q. 4 If 1, 4 and 3 are added to three consecutive terms of a geometric progression, the resulting numbers are in arithmetic progression. What are the numbers if their sum is 13?
- Q. 5 If  $y = \frac{3}{4} + \frac{3.5}{4.8} + \frac{3.5.7}{4.8.12} + \dots$  then prove that  $y^2 + 2y - 7 = 0$
- Q. 6 Without using calculator, prove that  $\cos 40^\circ \cdot \cos 80^\circ \cdot \cos 120^\circ \cdot \cos 160^\circ = \frac{1}{16}$
- Q. 7 Solve the following system of equations  $6x^2 + 9xy + 3y^2 = 0$  ;  $x^2 - 5xy + 6y^2 = 26$
- Q. 8 Solve triangle  $\Delta ABC$  (with usual notations) if,  
 (a)  $a = 7, b = 10$  and  $c = 13$   
 (b)  $a = 25, b = 24$  and  $\gamma = 120^\circ$