Chapter 1 NUMBER SYSTEMS

PRACTICE EXERCISE

(1) If 'a' and 'b' are real numbers then $a + b$ is a real number. This law is called
(a) Closure law
(b) Commutative law
(c) Associative law
(d) Distributive law

(2) $\frac{\sqrt{18}}{\sqrt{72}}$ is;
(a) Rational number
(b) Irrational
(c) Imaginary
(d) None of these

(3) $\{1,-1\}$ is closed with respect to;
(a) Addition
(b) Multiplication
(c) Division
(d) Both b & c

(4) Multiplicative inverse of a non-zero element $a \in Z$ is _____
(a) 1
(b) $-a$
(c) $\frac{1}{a}$
(d) Not defined

(5) Which of the following cannot be written as a recurring decimal?
(a) $\frac{7}{3}$
(b) $\frac{\sqrt{8}}{\sqrt{18}}$
(c) $1.\dot{2}\dot{1}$
(d) None of these

(6) $2\sin 30° \cos 30°$ is
(a) Irrational
(b) Rational
(c) Integer
(d) Recurring decimal

(7) If x, y, z are non-zero real numbers and $x^2yz > 0$ and $xy^2z < 0$ then which of the following must be true?
(a) $xy > 0$
(b) $xy^2 > 0$
(c) $xy < 0$
(d) $x^2y < 0$

(8) The associative law of _____ does not hold in the set of real numbers.
(a) Addition
(b) Subtraction
(c) Multiplication
(d) None of these

(9) $1 > -1 \Rightarrow -3 > -5$, this property is called
(a) Additive property
(b) Transitive property
(c) Multiplicative property
(d) Closure property

(10) $\forall\ a, b, c, d \in \mathbb{R}$, $a = b$ and $c = d \Rightarrow$
(a) $a + b = c + d$
(b) $a - b = c + d$
(c) $a + c = b + d$
(d) $a - c = b + d$

(11) Polar form of $-i$ is

(a) $\cos 90^\circ - i\sin 90^\circ$ (b) $\cos 0^\circ + i\sin 0^\circ$

(c) $\cos 90^\circ + i\sin 90^\circ$ (d) $\cos 45^\circ + i\sin 45^\circ$

(12) If $z_1 = 3-6i$ and $z_2 = 4+5i$ then $z_1 z_2 = ?$

(a) $42-9i$ (b) $9-42i$

(c) $42+9i$ (d) $4+i$

(13) If $z_1 = (1,0), z_2 = (2,3)$ then $\frac{z_2}{z_1} = ?$

(a) $-2+3i$ (b) $2-3i$

(c) $2+3i$ (d) $-2-3i$

(14) $\frac{(1+i)^2}{1-i} = ?$

(a) $-1-i$ (b) $2i$

(c) $2+i$ (d) $-1+i$

(15) Additive inverse of (3,3) in C is

(a) (3, 0) (b) (0, 3)

(c) (–3, 3) (d) $(-3,-3)$

(16) $\left(\frac{-n}{m^2+n^2}, \frac{-m}{m^2+n^2}\right)$ is the multiplicative inverse of

(a) (m,n) (b) $(-n,m)$

(c) (n,m) (d) $(-m,n)$

(17) If $\arg z = \frac{\pi}{4}$, then z^2 is

(a) Pure real (b) Pure imaginary

(c) $1+i$ (d) None of these

(18) If $z = a + b$, then $\bar{z} = ?$

(a) $a-b$ (b) $-(a+b)$

(c) $-a+b$ (d) $a+b$

(19) If $S(n) = i^n + i, \forall n \in Z$, then total number of distinct non-zero values of $S(n)$ is

(a) 1 (b) 2

(c) 3 (d) 4

(20) The value of $i^{-27} + i^{24} = ?$

(a) $i+1$ (b) $-i$

(c) 1 (d) –1

(21) If $|z-1| = |z+1|$ then it represents

(a) Circle (b) Parabola

(c) $y-axis$ (d) $x-axis$

(22) $(-i)^{31} = ?$

(a) i (b) $-i$

(c) 1 (d) –1

(23) The multiplicative in· of $1-3i$ is

(a) $3i$ (b) $\frac{1}{3i}$

(c) $-\frac{1}{3}$ (d) None of these

(24) If $z_1 = 1+10i, z_2 = 1+i$, then which of the following is true?

(a) $z_1 > z_2$ (b) $z_1 < z_2$

(c) $z_1 = z_2$ (d) None of these

(25) If $z = 3-4i$ then $z.\bar{z} = ?$

(a) $9-16i$ (b) $-z$

(c) 5 (d) 25

(26) If z is any n· zero complex number then $z^{-1} + (\bar{z})^{-1}$ is

(a) Pure rea (b) Pure imaginary

(c) 0 (d) $1+i$

(27) The value of $(3+2i)^3$ is

(a) $62+9i$ (b) $46-9i$

(c) $46i-9$ (d) $46i+9$

(28) If the points in complex plane are collinear, then which one is true?

(a) $|z_1+z_2| = |z_1|+|z_2|$ (b) $z_1+z_2 = |z_1|+|z_2|$

(c) $|z_1+z_2| < |z_1|+|z_2|$ (d) $|z_1+z_2| > |z_1|+|z_2|$

(29) C has no identity with respect to addition other than_____.

(a) $1+0i$ (b) $0+i$

(c) $0+0i$ (d) $1+i$

(30) The conjugate of $\frac{2+3i}{-i+1} = ?$

(a) $\frac{2-3i}{1+i}$ (b) $\frac{2-3i}{1-i}$

(c) $\frac{2+3i}{1+i}$ (d) $\frac{2+3i}{-1-i}$

(31) $\left(-1+\sqrt{-3}\right)^4 + \left(-1-\sqrt{-3}\right)^4 = ?$

(a) –2 (b) 4

(c) –4 (d) –16

(32) The smallest positive integer "k" for which $\left(\frac{1+i}{1-i}\right)^k = 1$ is;

(a) 2 (b) 4
(c) 8 (d) 16

(33) If $z = 1+i$ then $\left|(-\bar{z})^4\right| = ?$

(a) $\sqrt{2}$ (b) 2
(c) 4 (d) 1

(34) If n is any positive integer then the value of $\frac{i^{4n+1} - i^{4n-1}}{2} = ?$

(a) 1 (b) -1
(c) i (d) $-i$

(35) $2\sqrt{-9} \times \sqrt{-16} = ?$

(a) 24 (b) -24
(c) 48 (d) -48

(36) $\left|\frac{1+i}{1+\frac{1}{i}}\right| = ?$

(a) $\sqrt{2}$ (b) $\frac{1}{\sqrt{2}}$
(c) $\frac{3}{\sqrt{2}}$ (d) 1

(37) $\left(\frac{1-i}{1+i}\right)^{100} = x+iy$ then;

(a) $x=2, y=-1$ (b) $x=1, y=0$
(c) $x=0, y=1$ (d) $x=-1, y=2$

(38) $(\cos 20° + i\sin 20°)^5 \div (\cos 30° + i\sin 30°)^3 = ?$

(a) $\cos 20° + i\sin 20°$ (b) $\cos 30° + i\sin 30°$
(c) $\cos 10° + i\sin 10°$ (d) $\cos 20° - i\sin 20°$

(39) The polar coordinates of a point are $(2, 319°)$ then the Cartesian coordinates of the point are;

(a) $(1.509, -1.312)$ (b) $(-1.509, -1.312)$
(c) $(1.509, 1.312)$ (d) $(-1.509, 1.312)$

(40) If $z_1 = 1+i$, $z_2 = 2+2i$ then which one is true?

(a) $|z_1+z_2| > |z_1| + |z_2|$ (b) $|z_1+z_2| < |z_1| + |z_2|$
(c) $|z_1+z_2| = |z_1| + |z_2|$ (d) $|z_1+z_2| < |z_1| - |z_2|$

(41) If $x>0$ and $y<0$ then additive inverse of $x-iy$ lies in

(a) Quad-I (b) Quad-II
(c) Quad-III (d) Quad-IV

(42) The argument of $(0,-2)$ is

(a) $\frac{\pi}{2}$ (b) $\frac{3\pi}{2}$
(c) $-\frac{\pi}{4}$ (d) π

(43) $a+b$ is the square of modulus of

(a) $z = a+b$ (b) $z = (a,b)$
(c) $z = (-\sqrt{a}, -\sqrt{b})$ (d) $z = (-a,b)$

(44) $z+\bar{z} = 0$ if and only if z is

(a) Pure real (b) Pure imaginary
(c) Multiplicative identity (d) None of these

(45) If z is a complex number then the minimum value of $|z|+|z-1|$ is _____

(a) 1 (b) 2
(c) 0 (d) -2

(46) If $\frac{z_1}{z_2}$ is purely imaginary then $\left|\frac{z_1+z_2}{z_1-z_2}\right| = ?$

(a) 0 (b) 1
(c) -1 (d) Cannot be determined

(47) $\left(\frac{1}{2} + \frac{i\sqrt{3}}{2}\right)^6 =$ _____

(a) ω (b) ω^2
(c) 1 (d) 0

(48) If the square of a number x is "i" then $x = ?$

(a) $\left(\frac{1+i}{\sqrt{2}}\right)$ (b) $\frac{1-i}{\sqrt{2}}$
(c) $\frac{i}{\sqrt{2}}$ (d) $1+i$

(49) If $z = x+iy$, then $z^2 = |z|^2$ if

(a) $x=0, y=1$ (b) $y=0$
(c) $x \neq 0, y \neq 0$ (d) $x=0, y \neq 0$

(50) $\arg\left(\frac{\sqrt{3}+i}{\sqrt{3}-i}\right)=?$

(a) 30° (b) −30°
(c) 60° (d) −60°

(51) The modulus of the complex number $1+i\tan\alpha=?$

(a) 1 (b) $\tan\alpha$
(c) $\sec\alpha$ (d) $\operatorname{cosec}\alpha$

(52) If $(\cos\theta+i\sin\theta)^2=x-iy$ then $x^2+y^2=?$

(a) 1 (b) 0
(c) 2 (d) −1

(53) If $z=4+6i^2$ then $|z|=?$

(a) $\sqrt{52}$ (b) 16
(c) 36 (d) 2

(54) If $z=\frac{2+7i}{2-8i}$, then $\frac{2-7i}{2+8i}=?$

(a) z^{-1} (b) $\bar{z}$
(c) $\frac{}{z}$ (d) $-z$

(55) If $z=\cos\theta+i\sin\theta$, then $\frac{1}{z}=?$

(a) 1 (b) −1
(c) $\cos\theta-i\sin\theta$ (d) None of these

ANSWER KEY

1	a	11	a	21	c	31	d	41	c	51	c
2	a	12	a	22	a	32	b	42	b	52	a
3	d	13	c	23	d	33	c	43	c	53	d
4	d	14	d	24	d	34	c	44	b	54	b
5	d	15	d	25	d	35	b	45	a	55	c
6	a	16	b	26	a	36	d	46	b		
7	c	17	b	27	c	37	b	47	c		
8	b	18	d	28	a	38	c	48	a		
9	a	19	c	29	c	39	a	49	b		
10	c	20	a	30	a	40	c	50	c		

Chapter 1 NUMBER SYSTEMS

SELF ASSESSMENT TEST

(1) If p,q,r,s are all positive real numbers and $p<q\wedge r<s$ then which one is always true?

(a) $pq<rs$ (b) $p+r>q+s$
(c) $p-r<q-s$ (d) $pr<qs$

(2) The set of real numbers $\mathbb{R}$ is closed under the operation of

(a) Addition (b) Multiplication
(c) Subtraction (d) All of these

(3) $\forall l,m,n\in\mathbb{R},(\ell+m)n=\ell n+mn$. The property used is called

(a) Associative property (b) Right distributive property
(c) Left distributive property (d) Commutative property

(4) If $a<b$ and a and b have opposite signs then which one is true?

(a) $\frac{1}{a}>\frac{1}{b}$ (b) $\frac{1}{a}<\frac{1}{b}$
(c) $\frac{1}{a}=\frac{1}{b}$ (d) $a>\frac{1}{b}$

(5) The property used in $a<0\Rightarrow -a>0$ is

(a) Additive property (b) Multiplicative property
(c) Both (a) and (b) (d) Transitive property

(6) Trichotomy property does not hold in the set of

(a) Integers (b) Rational numbers
(c) Real numbers (d) Complex numbers

(7) If $(a,b)=a+bi$, then $(0,1)^{39}=?$

(a) $(1,0)$ (b) $(-1,0)$
(c) $(0,-1)$ (d) $(0,1)$

(8) A value of $(-i)^{\frac{1}{3}}$ is

(a) $-\frac{i}{3}$ (b) 1
(c) i (d) $i+1$

(9) The real part of $\left(\sqrt{3}+i\right)^3$ is

(a) 2 (b) −1
(c) $\sqrt{3}$ (d) None of these

(10) $1+\sqrt{3}i$ can be expressed as

(a) $2(\cos 30°+i\sin 30°)$ (b) $\cos 60°+i\sin 60°$

(c) $\sin 30°+i\cos 30°$ (d) $2(\cos 60°+i\sin 60°)$

(11) The additive inverse of $\frac{2}{1-i}$ is;

(a) $-1-i$ (b) $1+i$

(c) $-1+i$ (d) $1-i$

(12) $\left(\frac{1+i}{1-i}\right)^{12}=?$

(a) -4 (b) 4

(c) 1 (d) $2i$

(13) The complex number $\frac{(1-i)^3}{1-i^3}$ is equal to

(a) -2 (b) 2

(c) i (d) $-i$

(14) Modulus of $(1-\cos\theta)+i\sin\theta$ is

(a) $1-\cos\theta$ (b) $2+2\cos\theta$

(c) $2\cos\frac{\theta}{2}$ (d) $2\sin\frac{\theta}{2}$

(15) If $z=\cos\frac{\pi}{4}+i\sin\frac{\pi}{6}$ then arg z is equal to

(a) $\frac{\pi}{4}$ (b) $\frac{\pi}{6}$

(c) $\tan^{-1}\left(\frac{1}{\sqrt{2}}\right)$ (d) None of these

(16) If $z=1+i$ then point representing iz lies in _____ quadrant

(a) I (b) II

(c) III (d) IV

(17) If z_1 and z_2 are two non-zero complex numbers such that $|z_1+z_2|=|z_1|+|z_2|$, then $\arg z_1-\arg z_2=?$

(a) 0 (b) $\frac{\pi}{2}$

(c) $\frac{\pi}{3}$ (d) $-\frac{\pi}{2}$

(18) If $|z|=1$ then it represents

(a) Parabola (b) Ellipse

(c) Circle (d) Hyperbola

(19) If $z=\frac{(2-3i)(1+i)}{2+3i}$ then $|z|=?$

(a) 26 (b) $\sqrt{2}$

(c) 10 (d) $\sqrt{13}$

(20) $(\sin\theta+i\cos\theta)^4=?$

(a) $\sin 4\theta+i\cos 4\theta$ (b) $\sin 4\theta-i\cos 4\theta$

(c) $\cos 4\theta+i\sin 4\theta$ (d) $\cos 4\theta-i\sin 4\theta$

(21) $i+i^2+i^3+...+i^{25}=?$

(a) i (b) $-i$

(c) 1 (d) 0

(22) If $z=(\sqrt{5},\sqrt{3})$, then $|z^{-1}|=?$

(a) 8 (b) $2\sqrt{2}$

(c) $\frac{1}{2\sqrt{2}}$ (d) $\frac{1}{8}$

(23) If $z=(3,-a)$ and $z^{-1}=\left(\frac{3}{13},\frac{2}{13}\right)$ then $a=?$

(a) 2 (b) $-\frac{2}{\sqrt{13}}$

(c) -2 (d) $\frac{-2}{13}$

(24) If $z=\frac{2}{2-i}+\frac{3}{2+i}$ then $\text{Re}(z)+\text{Im}(z)=?$

(a) $2-\frac{1}{5}i$ (b) $-\frac{9}{5}$

(c) 9 (d) $\frac{9}{5}$

(25) $\text{Re}\left(\frac{1+2i}{1-i}\right)=?$

(a) $-\frac{1}{2}$ (b) $\frac{3}{2}$

(c) 1 (d) $\frac{1}{2}$

(26) The principal value of the argument of $-1-i$ is

(a) $\frac{5\pi}{4}$ (b) $-\frac{\pi}{4}$

(c) $-\frac{3\pi}{4}$ (d) $\frac{3\pi}{4}$

(27) If $z=3-4i^2$, then $\bar{z}=?$

(a) $3+4i^2$ (b) $3+4i$

(c) 7 (d) -7

(28) If $|z_1|=8$ and $|z_2|=3$ then maximum value of $|z_1-z_2|$ is

(a) 5 (b) 11

(c) 24 (d) None of these

(29) $\frac{(\cos\theta+i\sin\theta)^6}{\cos 4\theta-i\sin 4\theta}=?$

(a) $\cos 2\theta+i\sin 2\theta$ (b) $\cos 2\theta-i\sin 2\theta$

(c) $\cos 10\theta-i\sin 10\theta$ (d) $\cos 10\theta+i\sin 10\theta$

(30) If $z_1=a+bi$, $z_2=c+di$ and z_1+z_2 is real then which one is true?

(a) $b=d$ (b) $a=-c$

(c) $b=-d$ (d) $a=c$

ANSWER KEY

1	d	11	a	21	a
2	d	12	c	22	c
3	b	13	a	23	a
4	b	14	d	24	d
5	c	15	c	25	a
6	d	16	b	26	c
7	c	17	a	27	c
8	c	18	c	28	b
9	d	19	b	29	d
10	d	20	d	30	c

EXPLANATORY NOTES

(1) Order property of real numbers.

(2) Property of real numbers.

(3) Property of real numbers.

(4) (i) If a and b have opposite signs then $a<b\Rightarrow\frac{1}{a}<\frac{1}{b}$

(ii) If a and b have same sign then $a<b\Rightarrow\frac{1}{a}>\frac{1}{b}$

(5) (i) $a<0\Rightarrow(-1)(a)>(0)(-1)\Rightarrow -a>0$

(ii) $a<0\Rightarrow(-a)+(a)<0+(-a)\Rightarrow 0<-a\Rightarrow -a>0$

(6) Set of complex numbers does not satisfy order axioms

(7) $(0,1)^{39}=i^{39}=i^{36}.i^3=(i^4)^9.i^3=-i=(0,-1)$

(8) $(-i)^{\frac{1}{3}}=(i^3)^{\frac{1}{3}}=i$

(9) $(\sqrt{3}+i)^3=(\sqrt{3})^3+i^3+3\sqrt{3}\,i(\sqrt{3}+i)$

$=3\sqrt{3}-i+9i+3\sqrt{3}\,i^2$

$=3\sqrt{3}+8i-3\sqrt{3}=8i$

So real part = 0

(10) $r=\sqrt{(1)^2+(\sqrt{3})^2}=2,\ \theta=\tan^{-1}\frac{\sqrt{3}}{1}=60^\circ$

(11) $\frac{2}{1-i}\times\frac{1+i}{1+i}=\frac{2(1+i)}{1-i^2}=\frac{2(1+i)}{2}=1+i$

Additive inverse $=-1-i$

(12) $\left(\frac{1+i}{1-i}\right)^{12}=\left[\frac{(1+i)^2}{(1-i)^2}\right]^6=\left[\frac{1+i^2+2i}{1+i^2-2i}\right]^6=\left[\frac{\cancel{1}-\cancel{1}+2i}{\cancel{1}-\cancel{1}-2i}\right]^6=\left[\frac{2i}{-2i}\right]^6=(-1)^6=1$

(13) $\frac{(1-i)^3}{1-i^3}=\frac{(1-i)(1-i)^2}{(1-i)(1+i+i^2)}=\frac{(1-i)^2}{1+i+i^2}=\frac{1-2i+i^2}{1+i-1}=\frac{1-2i-1}{i}=\frac{-2i}{i}=-2$