J. K. SHAH CLASSES
FYJC - TEST 01 - SOLUTION

BRANCH : ANDHERI | **BATCH : FYJC A1 + A2**
CHAPTER : COMPLEX NUMBERS & PARTITION VALUE | **TIME : 1 hr 15 mins**
MARKS : 30

SOLUTION

Section – 1

1. Ascending order = 169,225,289,324,325,400,625,729,784,841.
N = 10
D_5 = value of $\left[\frac{5(10+1)}{10}\right]^{th}$ observation

= Value of 5.5^{th} observation
= 325+ 0.5(400-325)
= 362.5

2.

Marks	No.of Students	Less than cumulative frequency
0-10	15	15
10-20	20	35
20-30	25	60 → P_{30}class
30-40	24	84
40-50	22	106
50-60	14	120
60-70	5	125

$\Sigma f = N = 125$
$P_{30} = \frac{30N}{100}$

P_{30} = Value $\left(\frac{30 \times 125}{100}\right)^{th}$ observation
= Value of 37.5 th observation
$\therefore P_{30} = l_1 + \left[\frac{\frac{30N}{100} - C.F}{f}\right](l_2 - l_1)$
$= 20 + \left[\frac{37.5-35}{25}\right] \times (30-20)$
$= 20 + 1$
= 21

3.

Daily wages	F	<CF
0-50	7	7
50-100	a	7+a
100-150	25	32+a
150-200	30	62+a
200-250	b	62+a+b
	Σf = 62+a+b	

$\Sigma f = 100$

$62+a+b = 100$

$a+b = 38$ ……….(1)

$\therefore D_3 = 110$

D_3 Class = 100 to 150

$$D_3 = l_1 + \left[\frac{3\frac{N}{10} - CF}{f}\right](l_2 - l_1)$$

$$110 = 100 + \left(\frac{3\left(\frac{100}{10}\right) - (7+a)}{25}\right)(150\text{-}100)$$

$$10 = \left[\frac{(30-7-a)}{25}\right] \text{X } 50$$

$$\frac{10X25}{50} = 23\text{-}a$$

$5 = 23-a$

a =18

$a+b = 38$

$18+b = 38$

b =20

4.

Class interval	Frequency(f)	Less than cumulative frequency (l.c.f)
20-30	80	80
30-40	160	240
40-50	180	420←Px
50-60	80	500

Since, P_x = 45 lies in the class 40-50

L = lower boundry of P_x class = 40

h = class width of P_x class = 10

f = frequency of P_x class = 180

c.f = less than cumulative frequency of the class just preceding P_x class = 240

N = total frequency = 500

$$Px = L + \frac{h}{f}\left(\frac{xN}{100} - c.f\right)$$

$$45 = 40 + \frac{10}{180}\left(\frac{x \text{ X } 500}{100} - 240\right)$$

$$45\text{-}40 = \frac{10}{180}\left(\frac{x \text{ X } 500}{100} - 240\right)$$

$\frac{180X5}{10}$ = $\left(\frac{x \text{ X } 500}{100} - 240\right)$

$90 + 240 = 5x$
330 = 5x
X = 66
66% workers have age below 45 years and 34% workers have age more than 45 years.

SECTION – 2

1. $\left(\frac{1}{\sqrt{2}} + \frac{i}{\sqrt{10}}\right)^{10}$ + $\left(\frac{1}{\sqrt{2}} - \frac{i}{\sqrt{2}}\right)^{10}$

$= \left[\left(\frac{1+i}{\sqrt{2}}\right)^2\right]^5$ + $\left[\left(\frac{1-i}{\sqrt{2}}\right)^2\right]^5$

= $\left[\frac{1+2i+i^2}{2}\right]^5$ + $\left[\frac{1-2i+i^2}{2}\right]^5$

= $\left[\frac{1+2i+1}{2}\right]^5$ + $\left[\frac{1-2i-1}{2}\right]^5$

= $\left[\frac{2i}{2}\right]^5$ + $\left[\frac{-2i}{2}\right]^5$

= $(i)^5$ + $(-i)^5$

= $(i)^5$ - $(+i)^5$

= 0

2. x = $\frac{9}{2+\sqrt{5}\,i}$

x = $\frac{9}{2+\sqrt{5}i}$ $\frac{2-\sqrt{5}\,i}{2-\sqrt{5}\,i}$

x = $\frac{9(2-\sqrt{5}\,i)}{4-5i^2}$

x = $\frac{9(2-\sqrt{5}\,i)}{4+5}$

x = $\frac{9(2-\sqrt{5}\,i)}{9}$

x = 2-$\sqrt{5}\,i$

x -2 = - $\sqrt{5}\,i$

$(x - 2)^2 = (-\sqrt{5}\,i)^2$

$x^2 - 4x + 4 = 5i^2$

$x^2 - 4x + 4 = -5$

$x^2 - 4x + 4 + 5 = 0$

$x^2 - 4x + 9 = 0$

$$\begin{array}{r|l} & x + 3 \\ \hline x^2 - 4x + 9 & x^3 - x^2 - 3x + 30 \\ & x^3 - 4x^2 + 9x \\ & - \quad + \quad - \\ \hline & 3x^2 - 12x + 30 \\ & 3x^2 - 12x + 27 \\ & - \quad + \quad - \\ \hline & 3 \end{array}$$

$\therefore$ $x^3-x^2-3x+30$
$= (x^2 -4x+9)(x+3)+3$
$= 0(x+3)+3$
$= 0+3$
$= 3$

3. Let $\sqrt{6+8i}$ = a+ib, a, b $\in$ R
On squaring
$6+8i = (a + ib)^2$
$6+8i = a^2 - b^2 + 2abi$
Equating real and imaginary parts,
$6 = a^2 - b^2$ …………(1)
$8 = 2ab$ …………(2)
$\therefore$ $a = \frac{4}{b}$
$6 = \left(\frac{4}{b}\right)^2 - b^2$
$6 = \frac{16}{b^2} - b^2$

$\therefore b^4 + 6b^2 - 16 = 0$

Put $b^2 = m$
$\therefore m^2 + 6m - 16 = 0$
$(m+8)(m-2) = 0$
$\therefore$ m = -8 or m = 2
$i.e.$ $b^2 = -8$ or $b^2 = 2$

but $b \in R$ $\therefore b^2 \neq -8$
$\therefore b^2 = 2$ $b = \pm\sqrt{2}$
$when\ b = \sqrt{2}$, $a = 2\sqrt{2}$
$\therefore$ Square root of 6+8i
$= 2\sqrt{2} + \sqrt{2}\,i = \sqrt{2}\,(2+i)$
when $b = -\sqrt{2}$, $a = -2\sqrt{2}$
$\therefore$ Square root of 6+8i
$= -2\sqrt{2} - \sqrt{2}i = -\sqrt{2}(2+i)$
$\sqrt{6+8i} = \pm\sqrt{2}\,(2+i)$