Sec 4 Maths P Date 29/7/02 No 1

Topic 25 : Number Patterns

1a $a = 18$

$b = 33$

$c = 22$

$d = 40$

b $h = 6 + 4(n-1) = 4n + 2$

c. $k = 12 + 7(n-1) = 7n + 5$

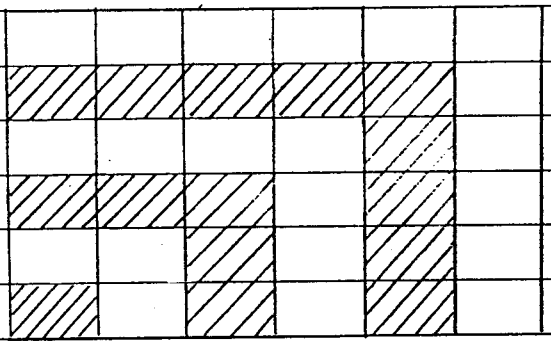
d. No. of small triangles in the 15th figure $= 4 \times 15 + 2$

$= 62$

e. To form the 20th figure, no. of toothpicks needed $= 7 \times 20 + 5$

$= 145$

2



a Figur 5 : $1 + 3 + 5 + 7 + 9 + 11 = 36 = 6 \times 6$

b $(49+1) \div 2 = 25$ odd integes from 1 to 49.

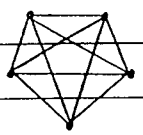
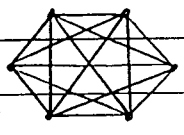
c. $1 + 3 + 5 + 7 + 9 + \cdots + 49 = 25 \times 25 = 625$

d. $1 + 3 + 5 + 7 + 9 + \cdots + n = 100$

$(n+1) \div 2 = 10$

$n + 1 = 20$

$n = 19$

3a Fig 5  Fig 6 

3b

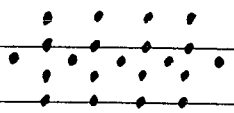
	P	L	N
	No. of points	No. of line segments	P(P-1)
Fig 1	1	0	0
Fig 2	2	1	2
Fig 3	3	3	6
Fig 4	4	6	12
Fig 5	5	10	20
Fig 6	6	15	30

c. $L = \frac{1}{2}N$

d. In the 200 - point fig., the no. of line segments $= \frac{1}{2} \times 200(200-1)$

$= 19900$

4a



4th pattern : $5+5+5+5+1 = 21$

b. (i) In the 8th pattern, no. of buttons used $= 8 \times 5 + 1 = 41$

(ii) In the 56th pattern, no. of buttons used $= 56 \times 5 + 1 = 281$.

c. In the nth pattern, no. of buttons used $= 5n+1$

d. $\sqrt{76176} = 276$

$\therefore 5n+1 = 276$

$\therefore n = 55$

The 55th pattern consists of $\sqrt{76176}$ buttons.

e. $583 - 1 = 582$.

Since 582 is not divisible by 5, it is not possible for a pattern to consist of 583 buttons.

5a

n	1	2	3	4	5
n^2	1	4	9	16	25
n^4	1	16	81	256	625

b $P = 1^3 + 2^3 + 3^3 = 14$

$Q = 1^3 + 2^3 + 3^3 + 4^3 = 30$

$R = 3(3^2) + 3(3) - 1 = 35$

$S = 3(4^2) + 3(4) - 1 = 59$

$t = 1^4 + 2^4 + 3^4 = 98$

$u = 1^4 + 2^4 + 3^4 + 4^4 = 354$

c.

n	1	2	3	4	5	...	25
Row P	1	5	14	30	55	...	
Row Q	5	17	35	59	89	...	
Row R	1	17	98	354	979	...	
PQ	5	85	490	1770	4895	...	

From the table above, it can be observed that $PQ = 5R$

d. $P = \frac{1}{6} n(n+1)(2n+1)$

$n = 25, \quad P = \frac{1}{6} 25(26)(51)$

$= 5525$

e. $Q = 3n^2 + 3n - 1$

$= 3(25^2) + 3(25) - 1$

$= 1949$

f $PQ = 5R$

$R = \frac{PQ}{5}$

When $n = 25, \quad R = \frac{1}{5} \times 5525 \times 1949$

$= 2153645$