1. [Marks 10]

Fill-in the missing numbers in the following row in Pascal's triangle,

7 24 35 35 21 7

2. Marks 101

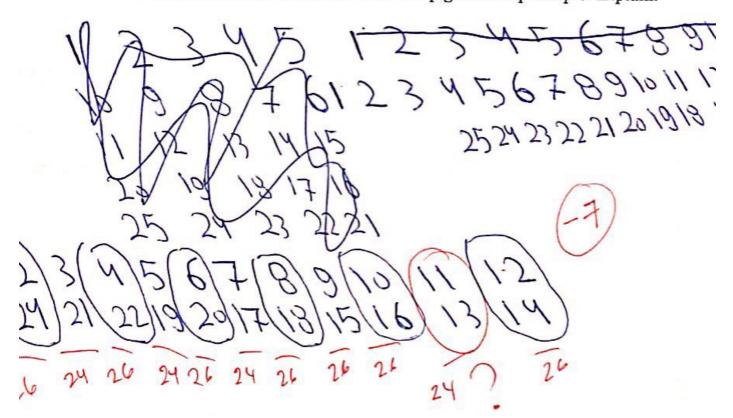
How many distinct words can you make by re-arranging the letters in the word

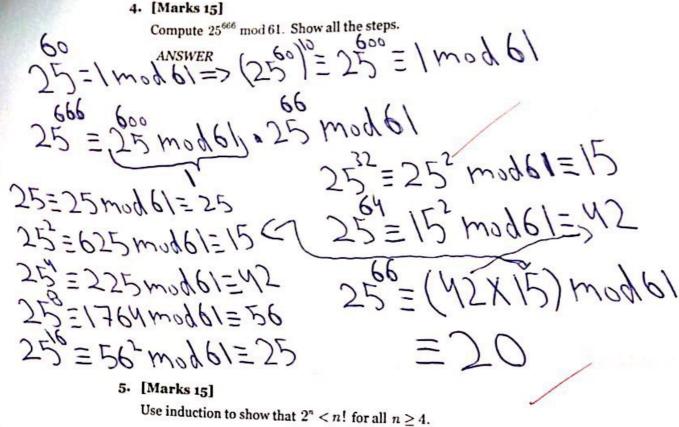
ANSWER

carcal

3. [Marks 15]

Show that if any 14 integers are selected from the set $A = \{1, 2, 3, ..., 25\}$, there are at least two integers whose sum is 26. HINT: Use pigeonhole principle. Explain.





Baus caus (n=q) let P(M) RHS 2'=16; LHS 4!=24 $16 \angle 24$ The baus caus is true inductore caus Asumebaus caus is true for some n reshow than for $n \in X$ the same baus caus is true or some n reshow than let P(n+1) $RHS = 2^{n+1} \Rightarrow 2^n \cdot 2^n \mid LHS \mid (n+1) \mid$ from Baus caus $2^n < n!$ and becaus that $2^n \cdot 2 < (n+1) \cdot 1$ $2^n \cdot 2 < (n+1) \cdot 1$

5. [Marks 10]

If p, q are two different primes, show that if $a \equiv b \mod p$ and $a \equiv b \mod q$, then $a \equiv b \mod pq$.

$$a \equiv b \mod p$$
 $\Rightarrow p \mid a-b \Rightarrow a-b = px$

$$a \equiv b \mod q \Rightarrow q \mid a-b \Rightarrow a-b = qy$$

6. [Marks 10]
Suppose x is rational, and y is irrational. Use proof by contradiction to show that x + y is irrational.

↓ x = a/b

a, b integers

Assume x+y is national.

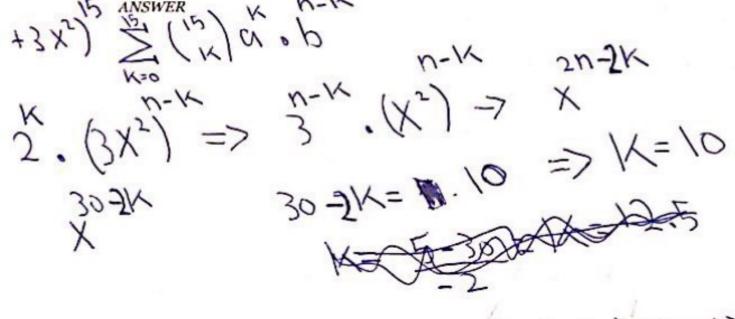
then
$$y = \frac{c}{d} - x$$

= $\frac{c}{d} - \frac{a}{b}$ = $\frac{bc-ad}{bd} \leftarrow integer$

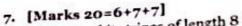
that is y is rational, a contradiction.

6. [Marks 15]

Find the coefficient of x^{10} in the expansion of $(2+3x^2)^{15}$.



$$X = \begin{pmatrix} 15 \\ 10 \end{pmatrix} 2^{10} \cdot 3$$

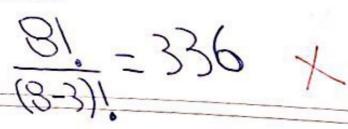


How many bit strings of length 8 contains (no need to calculate):

a. Exactly 3 zeros.

$$b(u',v) \Rightarrow \frac{1}{|u-v|} = \frac{8}{|u-v|} = \frac{2}{|u-v|}$$

b. Exactly 3 zeros where one of the zeros must be at the rightmost bit.





Odd number of zeros. ANSWER

