13 105, 112, 121, ... 994

$a = 105$ $d = 7$ $a_n = 994$

$994 = 105 + (n-1)7$

$\Rightarrow 994 = 105 + 7n - 7$

$\Rightarrow 994 + 7 = 105 + 7n$

$\Rightarrow 994 - 98 = 7n$

$\Rightarrow 896 = 7n$

$\Rightarrow \frac{896}{7} = n$

$\Rightarrow 128 = n$

So there are 128 number that are divisibly.

14 12, 16, 20 248

$a = 12$ $d = 16 - 12 = 4$

$a_n = 248$

$248 = 12 + (n-1)4$

$\Rightarrow 248 = 12 + 4n - 4$

$\Rightarrow 248 - 8 = 4n$

$\Rightarrow \frac{240}{4} = n$

$\Rightarrow 60 = n$

So there are 60 number multiples of 4 between 10 and 250.

15 AP1: 63, 65, 67 .....

$a_n = a + (n-1)d$

$a_n = 63 + (n-1)2$

$a_n = 63 + 2n - 2$ ——— (1)

AP2: 3, 10, 17 .....

$a_n = a + (n-1)d$

$a_n = 3 + (n-1)7$ ——— (2)

$= 3 + 7n - 7$

a_n of A1 = a_n of AP2

$\Rightarrow 63 + 2n - 2 = 3 + 7n - 7$

$\Rightarrow 63 - 3 + 7 = 7n - 2n$

$\Rightarrow 61 + 4 = 5n$

$\Rightarrow 65 = 5n$

$\Rightarrow 13 = n$

So the 13th term has nth term of both AP's

16

third term = 16
$a + 2d = 16$

5th term
$a + 4d = a_5$

7th term
$a + 4d + 12 = a_7$

$a_7 - a_5 = 12$

$\Rightarrow a + 6d - (a + 4d) = 12$
$\Rightarrow a + 6d - a - 4d = 12$
$\Rightarrow 2d = 12$
$\Rightarrow d = \frac{12}{2}$
$\Rightarrow d = 6$

$\Rightarrow a + 2d = 16$
$\Rightarrow a + 2(6) = 16$
$\Rightarrow a + 12 = 16$
$\Rightarrow a = 4$

AD = 4, 10, 16, 22, ...

17 On reversing 8th term of the present AP we get our AP as
253, 248, ..., 13, 8, 3

$a = 253$ $\quad d = -5$

$n = 20$

$a_n = 253 + (20-1)(-5)$

$= 253 - (95)$

$a_{20} = 158$

18 Sum of 4th and 8th term = 24

$a_4 + a_8 = 24$

$\Rightarrow a+3d + a+7d = 24$

$\Rightarrow 2a + 10d = 24$ ——— (I)

Sum of 6th and 10th terms = 44

$a_6 + a_{10} = 44$

$\Rightarrow a+5d + a+9d = 44$

$\Rightarrow 2a + 14d = 44$ ——— (II)

Substracting eq1 from eq2

eq2 $2a + 14d = 44$

eq1 $-\ 2a + 10d = 24$

$\Rightarrow 4d = 20$

$\Rightarrow d = \frac{20}{4} 5$

$\Rightarrow d = 5$

$\Rightarrow 2a + 10(5) = 24$

$\Rightarrow 2a + 50 = 24$

$\Rightarrow 2a = 24 - 50$

$\Rightarrow 2a = 26$

$\Rightarrow a = \frac{26}{2}13$

$\Rightarrow a = -13$

$a = -13$

$a_2 = a+2d = 13+2(5) = 13+10 = 23$

$a_3 = a+3d = 13$

$a_2 = a+2d = -13+2(5) = -8$

$a_3 = a+2d = -13+2(5) = -3$

AP $-13, -8, -3$

19 Year of Start = 1995

annual salary = 5000

increment = 200

$a = 5000$ $\quad d = 200$

$a_n = 7000$

$7000 = 5000 + (n-1)200$

$\Rightarrow 7000 = 5000 + 200n - 200$

$\Rightarrow 7000 = 4800 + 200n$

$\Rightarrow 7000 - 4800 = 200n$

$\Rightarrow 2200 = 200n$

$\Rightarrow \frac{2200}{200} = n$

$\Rightarrow 11 = n$

$a_{11} = 1995 + (11-1)1$

$= 1995 + 10$

$= 2005$

20 $a = 5$ $d = 1.75$

$a_n = 20.75$

$a_n = a + (n-1)d$

$20.75 = 5 + (n-1)\frac{175}{100}$

$\Rightarrow \frac{2075}{100} = 5 + \frac{175n}{100} - \frac{175}{100}$

$\Rightarrow \frac{2075}{100} = \frac{500 + 175n - 175}{100}$

$\Rightarrow \frac{2075}{100} = \frac{325 + 175n}{100}$

$\Rightarrow 2075 - 325 = 175n$

$\Rightarrow \frac{1750}{175} = n$

$\Rightarrow 10 = n$