$$\frac{(n+1)(n+2)}{6} \in \mathbb{Z}$$

$n=1$	$\frac{2\cdot 3}{6} = 1$
$n=2$	$\frac{3\cdot 4}{6} = 2$
$n=3$	$\frac{4\cdot 5}{6} \notin \mathbb{Z}$
$n=4$	$\frac{5\cdot 6}{6} = 5$
$n=5$	$\frac{6\cdot 7}{6} = 7$
$n=6$	$\frac{7\cdot 8}{6} \notin \mathbb{Z}$

$$\{n \geq 1 \mid n \mid (t_1 + \cdots + t_n)\} = \{n \geq 1 \mid n \text{ is not a multiple of } 3\}$$

To prove this equality of sets, need to show:

(1) If $n \mid (t_1 + \cdots + t_n)$, then n is not a multiple of 3.

$$n \mid (t_1 + \cdots + t_n) \rightsquigarrow \frac{(n+1)(n+2)}{6} \in \mathbb{Z} \rightsquigarrow 3 \nmid n.$$

to prove this, use contrapositive:

$$3 \mid n \rightsquigarrow \frac{(n+1)(n+2)}{6} \notin \mathbb{Z}.$$

$(n+1)(n+2)$

(2) If n is not a multiple of 3, then $n \mid (t_1 + \cdots + t_n)$.

$a^2 = 7d + 3$

a	a^2	rem. of a^2
1	1	1
2	4	4
3	9	2

4	16	2
5	25	4
6	36	1
7	49	0
8	64	1
9	81	4
10	100	2
11	121	2
		4
		1
		0

$a^2 = 7d + 3$ want to prove this is impossible.

remainder of a^2 depends on remainder of a.

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2 $(*)$

$(*) = \binom{a}{b}$ for some $0 \le b \le a$.

$\binom{a}{b} \in \mathbb{Z}$. consequence of binomial thm.

$$(x+y)^a = \sum_{b=0}^{a} \binom{a}{b} x^b y^{a-b}$$

$(n+1)!+1$ $\quad$ $n!+1$

$(n+2)!+1$ $\quad$ $(n+1)!+1$

$d = \gcd((n+1)!+1,\ n!+1)$.

d divides any linear combination of $(n+1)!+1$ & $n!+1$.

$x((n+1)!+1) + y(n!+1) =$ something nice??

$d \mid$ nice thing.

$\vdots$