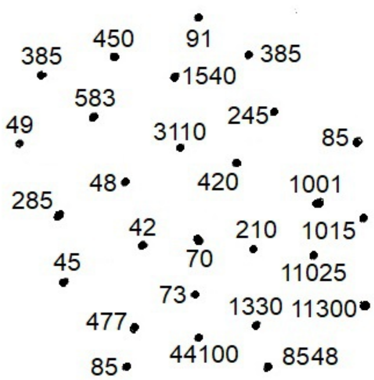
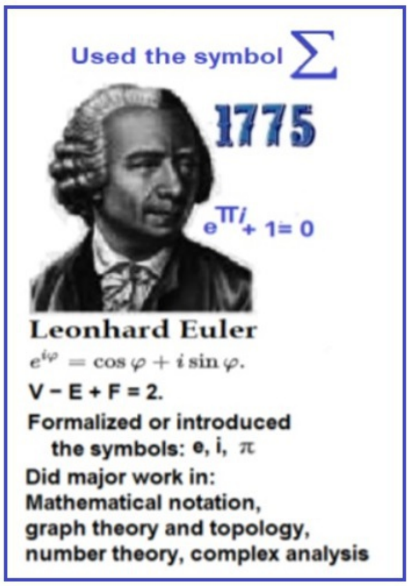
Simplify. Connect the answer dots in order





1. $\sum_{i=1}^{20} i$

2. $\sum_{i=1}^{14} 3$

3. $1^2 + 2^2 + 3^2 + \ldots + 9^2$

4. $\sum_{i=1}^{11} (i^2 + i + 1)$

5. $2^2 + 4^2 + 6^2 + \ldots + 20^2$

6. $\sum_{i=8}^{10} i^2$

7. $\sum_{i=4}^{14} i^2$

8. $\sum_{i=1}^{30} 7$

9. $1^2 + 3^2 + 5^2 + 7^2 + \ldots + 19^2$

10. $\sum_{i=1}^{20} i^3$

11. $\sum_{i=6}^{14} (5i+3)$

12. $\sum_{i=1}^{6} 7$

Properties of Summation

1. $\sum_{i=1}^{n} c = c \cdot n$, where c is a constant
2. $\sum_{i=m}^{n} (a_i \pm b_i) = \sum_{i=m}^{n} a_i \pm \sum_{i=m}^{n} b_i$
3. $\sum_{i=m}^{n} c \cdot a_i = c \cdot \sum_{i=m}^{n} a_i$
4. $\sum_{i=m}^{j} a_i + \sum_{i=j+1}^{n} a_i = \sum_{i=m}^{n} a_i$

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$$\sum_{i=0}^{n} i = \sum_{i=1}^{n} i = \frac{n(n+1)}{2}$$ (Sum of first natural numbers)

$$\sum_{i=0}^{n} i^2 = \sum_{i=1}^{n} i^2 = \frac{n(n+1)(2n+1)}{6} = \frac{n^3}{3} + \frac{n^2}{2} + \frac{n}{6}$$

$$\sum_{i=0}^{n} i^3 = \left(\sum_{i=0}^{n} i\right)^2 = \left(\frac{n(n+1)}{2}\right)^2 = \frac{n^4}{4} + \frac{n^3}{2} + \frac{n^2}{4}$$

(Nicomachus's theorem)

$$\sum_{i=1}^{n} (2i-1) = n^2$$ (Sum of first odd natural numbers)

$$\sum_{i=0}^{n} 2i = n(n+1)$$ (Sum of first even natural numbers)

Summation - Wikipedia en.wikipedia.org/wiki/Summation#Capital-sigma_notation

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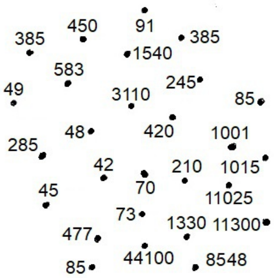
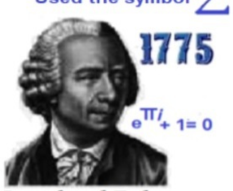


1. $\sum_{i=1}^{20} i$ $\boxed{210}$
2. $\sum_{i=1}^{14} 3$ $\boxed{42}$
3. $1^2 + 2^2 + 3^2 + \ldots + 9^2$ $\boxed{285}$
4. $\sum_{i=1}^{11} (i^2 + i + 1)$ $\boxed{583}$
5. $2^2 + 4^2 + 6^2 + \ldots + 20^2$ $\boxed{1540}$
6. $\sum_{i=8}^{10} i^2$ $\boxed{245}$
7. $\sum_{i=4}^{14} i^2$ $\boxed{1001}$
8. $\sum_{i=1}^{30} 7$ $\boxed{210}$
9. $1^2 + 3^2 + 5^2 + 7^2 + \ldots + 19^2$ $\boxed{1330}$
10. $\sum_{i=1}^{20} i^3$ $\boxed{44100}$
11. $\sum_{i=6}^{14} (5i+3)$ $\boxed{477}$
12. $\sum_{i=1}^{6} 7$ $\boxed{42}$

Used the symbol $\sum$

1775



Leonhard Euler

$e^{i\varphi} = \cos\varphi + i \sin\varphi.$

V − E + F = 2.

Formalized or introduced the symbols: e, i, π

Did major work in: Mathematical notation, graph theory and topology, number theory, complex analysis

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3. $\sum_{i=m}^{n} c \cdot a_i = c \cdot \sum_{i=m}^{n} a_i$
4. $\sum_{i=m}^{j} a_i + \sum_{i=j+1}^{n} a_i = \sum_{i=m}^{n} a_i$

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$$\sum_{i=0}^{n} i = \sum_{i=1}^{n} i = \frac{n(n+1)}{2}$$ (Sum of first natural numbers)

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$$\sum_{i=0}^{n} i^3 = \left(\sum_{i=0}^{n} i\right)^2 = \left(\frac{n(n+1)}{2}\right)^2 = \frac{n^4}{4} + \frac{n^3}{2} + \frac{n^2}{4}$$

(Nicomachus's theorem)

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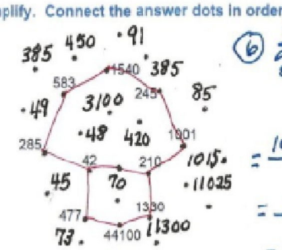

① $\sum_{1}^{20} i = \frac{20(20+1)}{2} = 210$

② $\sum_{1}^{14} 3 = 3(14) = 42$

③ $1^2 + 2^2 + 3^2 + \ldots + 9^2$

$\frac{9^3}{3} + \frac{9^2}{2} + \frac{9}{6} = 285$

$\frac{9(9+1)(2(9)+1)}{6} = 285$

④ $\sum_{1}^{11} i^2 + i + 1 = \sum_{1}^{11} i^2 + \sum_{1}^{11} i + \sum_{1}^{11} 1$

$= \left(\frac{11^3}{3} + \frac{11^2}{2} + \frac{11}{6}\right) + \frac{11(11+1)}{2} + 11(1)$

$= \frac{1331}{3} + \frac{121}{2} + \frac{11}{6} + \frac{132}{2} + 11$

$= 583$

⑤ $2^2 + 4^2 + 6^2 + \ldots + 20^2$ $+18^2 + 20^2$

$8^2 + 10^2 + 12^2 + 14^2 + 16^2$

use $\sum_{0}^{n} (2i) = n(n+1) = \sum_{0}^{10} 2i = 10(10+1)$

$= 210$ no! not odd squares

$4 + 16 + 36 + 64 + 100 + 121 + 144 +$
$196 + 256 + 324 + 400 = 1540$

⑫ $\sum_{1}^{6} 7 = 7(6) = 42$

⑥ $\sum_{8}^{10} i^2 = \sum_{1}^{10} i^2 - \sum_{1}^{7} i^2 =$

up to 10 remove all before 8

$= \frac{10(10+1)(2(10)+1)}{6} - \frac{7(7+1)(2(7)+1)}{6}$

$= \frac{2310}{6} - \frac{840}{6} = 385 - 140$

$= 245$ up to remove

⑦ $\sum_{4}^{14} i^2 = \sum_{1}^{14} i^2 - \sum_{1}^{3} i^2 =$

$= \frac{14^3}{3} + \frac{14^2}{2} + \frac{14}{6} - \frac{3^3}{3} - \frac{3^2}{2} - \frac{3}{6} =$

$= 914\frac{2}{3} + 98 + 2\frac{1}{3} - 9 - 4.5 - \frac{1}{2} = 1001$

⑧ $\sum_{1}^{30} 7 = 7(30) = 210$

⑨ $1^2 + 3^2 + 5^2 + 7^2 + \ldots + 19^2$

1 3 5 7 9 11 13 15 17 19 odd
1 2 3 4 5 6 7 8 9 10th

$\sum_{1}^{n} (2i-1) = n^2$ $\sum_{1}^{10} (2i-1) = 10^2 = 100$

again! not odd squares!

$1 + 9 + 25 + 49 + 81 + 121 + 169 +$
$225 + 289 + 361 = 1330$

⑩ $\sum_{1}^{20} i^3 = \frac{20^4}{4} + \frac{20^3}{2} + \frac{20^2}{4} =$

$\frac{160{,}000}{4} + \frac{8{,}000}{2} + \frac{400}{4} =$

$40{,}000 + 4{,}000 + 100 =$ 44100

⑪ $\sum_{6}^{14} (5i+3) = \sum_{1}^{14} (5i+3) - \sum_{1}^{5} (5i+3)$

$= 5\sum_{1}^{14} i + 3(14) - 5\sum_{1}^{5} i - 3(5)$

$= 5\left(\frac{14(15)}{2}\right) + 42 - 5\left(\frac{5(6)}{2}\right) - 15$

$= 5(105) + 42 - 5(15) - 15$

$= 477$