Day 33

11.4 ...

Special Formulas (shortcuts)

① $\boxed{\sum_{i=1}^{n} i = \frac{1}{2}(n)(n+1)}$

ex $\sum_{n=1}^{12} n = 1+2+3+4+\cdots+12$

instead we do the shortcut

$\text{Sum} = \frac{1}{2}(12)(12+1)$

$= 78$

② $\boxed{\sum_{i=1}^{n} 1 = n}$ ex $\sum_{n=1}^{54} 1 = 54$ sum

$1+1+1+1+\cdots+1$

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

ex $\sum_{i=1}^{20} i^2 = \frac{1}{6}\cdot 20(20+1)(2\cdot 20+1) = 2870$ Shortcut

Long way $\rightarrow 1^2+2^2+3^2+4^2+\cdots+18^2+19^2+20^2$

ex $\sum_{K=4}^{7} (K!+K)$

$Sum = (4!+4)+(5!+5)+(6!+6)$
$+(7!+7) = \boxed{5926}$

ex $\sum_{K=0}^{6} (3K)! = (3\cdot0)!+(3\cdot1)!+(3\cdot2)!$
$+(3(3))!+(3\cdot4)!+(3\cdot5)!$
$+(3\cdot6)!$

$= 0!+3!+6!+9!+\cancel{8}12!+15!+18!$
$= 874$ $\boxed{6.40368 \times 10^{15}}$

1) $d=-2$ $a_1=2$

$a_n = a_1 + d(n-1)$
$2+-2(n-1)$
$2+-2n+2$
$\boxed{a_n = -2n+4}$

ALGEBRA 2B

11.4 Special Series

NAME ____________________

DATE ____________________

In 1–3, find a formula for the nth term of the arithmetic sequence.

1. Common difference: -2
   First term: 2

2. Common difference: 5
   First term: $\frac{1}{2}$

3. Common difference: 4
   First term: -3

In 4–6, answer the question about the arithmetic sequence.

4. Common difference: 2
   Sixth term: 15
   What is the 9th term?

5. Common difference: $-\frac{1}{2}$
   First term: -5
   What is the 10th term?

6. Common difference: 4
   Eighth term: 36
   What are the 1st 4 terms?

In 7–9, evaluate the sum.

7. $\sum_{i=1}^{25} (4i + 1)$

8. $\sum_{i=1}^{40} (5i - 1)$

9. $\sum_{i=1}^{50} (2i + 5)$

In 11–18, write the terms of the series. Then evaluate the sum.

11. $\sum_{n=0}^{5} (n + 1)^2$

12. $\sum_{j=2}^{6} j(j - 1)$

13. $\sum_{m=1}^{5} (-m^2)$

14. $\sum_{k=0}^{4} (2k)!$

15. $\sum_{n=1}^{5} n^2(n - 1)$

16. $\sum_{j=0}^{4} (j^2 + 5)$

17. $\sum_{i=2}^{5} (i - 1)!$

18. $\sum_{k=3}^{6} (k! + k)$

In 19 and 20, use summation notation to represent the sum. Use i as the index and begin with $i = 1$.

19. $3 + 9 + 19 + 33 + 51 + 73$

20. $1 + 2 + 4 + 8 + 16 + 32$

In 21–24, use a formula to evaluate the sum. Special formulas

21. $\sum_{i=1}^{25} i$

22. $\sum_{i=1}^{40} i^2$

23. $\sum_{i=1}^{36} 1$

24. $\sum_{i=1}^{60} i$

In Exercises 31–42, write the series represented by the summation notation. Then evaluate the sum.

31. $\sum_{n=0}^{4} n^2$

32. $\sum_{i=0}^{6} (2i + 5)$

33. $\sum_{k=1}^{5} (k^2 + 1)$

34. $\sum_{j=3}^{7} (6j - 10)$

35. $\sum_{n=1}^{4} n(n + 1)$

36. $\sum_{n=0}^{5} 2n^2$

37. $\sum_{k=2}^{6} (k! - k)$

38. $\sum_{j=0}^{4} \frac{6}{j!}$

39. $\sum_{m=2}^{6} \frac{2m}{2(m - 1)}$

40. $\sum_{i=2}^{5} -2i!$

41. $\sum_{n=0}^{6} (n! + 10)$

42. $\sum_{k=1}^{5} \frac{10k}{k + 2}$

In Exercises 43–46, use summation notation to represent the sum. Use i as the index and begin with $i = 1$.

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43. $2 + 4 + 6 + 8 + 10 + 12$ $\sum_{n=1}^{6} 2n+0$

44. $3 + 5 + 7 + 9 + 11 + 13$

45. $3 + 9 + 27 + 81 + 243$

46. $\frac{1}{4} + \frac{1}{16} + \frac{1}{64} + \frac{1}{256}$

In Exercises 47–50, use one of the formulas for special series to evaluate the sum. work

47. $\sum_{i=1}^{24} 1$

48. $\sum_{i=1}^{54} i$

49. $\sum_{i=1}^{42} i^2$

50. $\sum_{i=1}^{20} i^2$