

Math Sheet

Name: _____ Date: _____

Summation Properties

Evaluate each sum using linearity, constant sums, and power-sum identities. Show your reasoning. Supplied sums use the same bounds as the question.

1. Given: the sum of $u(i)$ is 34, and the sum of $v(i)$ is 34, each from $i=5$ through 10.

$$\sum_{i=5}^{10} (4 \cdot u(i) + v(i) - 3)$$

Sum = _____

- 2.

$$\sum_{j=4}^{10} (-2 + 6 \cdot j)$$

Sum = _____

- 3.

$$\sum_{k=2}^6 (-2 + 3 \cdot k + 4 \cdot k^2)$$

Sum = _____

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Evaluate each sum using linearity, constant sums, and power-sum identities. Show your reasoning. Supplied sums use the same bounds as the question.

4. Given: the sum of $u(n)$ is -6, and the sum of $v(n)$ is 9, each from $n=1$ through 7.

$$\sum_{n=1}^7 (6 \cdot u(n) + v(n) - 2)$$

Sum = _____

5.

$$\sum_{i=4}^{15} (1)$$

Sum = _____

6.

$$\sum_{j=5}^{18} (2 + 3 \cdot j)$$

Sum = _____

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Evaluate each sum using linearity, constant sums, and power-sum identities. Show your reasoning. Supplied sums use the same bounds as the question.

7. Given: the sum of $u(k)$ is -21, and the sum of $v(k)$ is 14, each from $k=3$ through 16.

$$\sum_{k=3}^{16} (\quad - 5 \cdot u(k) - 2 \cdot v(k) + 6)$$

Sum = _____

8.

$$\sum_{n=4}^{17} (\quad - 5 + n + 2 \cdot n^2 - 4 \cdot n^3)$$

Sum = _____

9.

$$\sum_{i=2}^9 (\quad 1)$$

Sum = _____

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Summation Properties

Evaluate each sum using linearity, constant sums, and power-sum identities. Show your reasoning. Supplied sums use the same bounds as the question.

10. Given: the sum of $u(j)$ is 30, and the sum of $v(j)$ is 30, each from $j=4$ through 12.

$$\sum_{j=4}^{12} (u(j) - v(j))$$

Sum = _____

- 11.

$$\sum_{k=1}^7 (2 - 3 \cdot k + 3 \cdot k^2)$$

Sum = _____

- 12.

$$\sum_{n=3}^6 (-5 - n + 4 \cdot n^3)$$

Sum = _____

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Summation Properties - Worked Key

Evaluate each sum using linearity, constant sums, and power-sum identities. Show your reasoning. Supplied sums use the same bounds as the question.

1. Given: the sum of $u(i)$ is 34, and the sum of $v(i)$ is 34, each from $i=5$ through 10.

$$\sum_{i=5}^{10} (4 \cdot u(i) + v(i) - 3)$$

Use linearity: $\text{sum}[a u + b v + c] = a \text{sum}[u] + b \text{sum}[v] + c(\text{number of terms})$.

Number of terms = $10 - 5 + 1 = 6$.

Total = $(4)(34) + (1)(34) + (-3)(6) = 152$.

- 2.

$$\sum_{j=4}^{10} (-2 + 6j)$$

Distribute the sum and take each constant coefficient outside.

$S_0(n) = n$; $S_0(10) - S_0(3) = 7$.

$S_1(n) = n(n+1)/2$; $S_1(10) - S_1(3) = 49$.

Total = $(-2)(7) + (6)(49) = 280$.

- 3.

$$\sum_{k=2}^6 (-2 + 3k + 4k^2)$$

Distribute the sum and take each constant coefficient outside.

$S_0(n) = n$; $S_0(6) - S_0(1) = 5$.

$S_1(n) = n(n+1)/2$; $S_1(6) - S_1(1) = 20$.

$S_2(n) = n(n+1)(2n+1)/6$; $S_2(6) - S_2(1) = 90$.

Total = $(-2)(5) + (3)(20) + (4)(90) = 410$.

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Evaluate each sum using linearity, constant sums, and power-sum identities. Show your reasoning. Supplied sums use the same bounds as the question.

4. Given: the sum of $u(n)$ is -6, and the sum of $v(n)$ is 9, each from $n=1$ through 7.

$$\sum_{n=1}^7 (6 \cdot u(n) + v(n) - 2)$$

Use linearity: $\text{sum}[a u + b v + c] = a \text{sum}[u] + b \text{sum}[v] + c(\text{number of terms})$.

Number of terms = $7 - 1 + 1 = 7$.

Total = $(6)(-6) + (1)(9) + (-2)(7) = -41$.

5.

$$\sum_{i=4}^{15} (1)$$

Distribute the sum and take each constant coefficient outside.

$S_0(n) = n$; $S_0(15) - S_0(3) = 12$.

Total = $(1)(12) = 12$.

6.

$$\sum_{j=5}^{18} (2 + 3 \cdot j)$$

Distribute the sum and take each constant coefficient outside.

$S_0(n) = n$; $S_0(18) - S_0(4) = 14$.

$S_1(n) = n(n+1)/2$; $S_1(18) - S_1(4) = 161$.

Total = $(2)(14) + (3)(161) = 511$.

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Summation Properties - Worked Key

Evaluate each sum using linearity, constant sums, and power-sum identities. Show your reasoning. Supplied sums use the same bounds as the question.

7. Given: the sum of $u(k)$ is -21, and the sum of $v(k)$ is 14, each from $k=3$ through 16.

$$\sum_{k=3}^{16} (-5 \cdot u(k) - 2 \cdot v(k) + 6)$$

Use linearity: $\text{sum}[a u + b v + c] = a \text{sum}[u] + b \text{sum}[v] + c(\text{number of terms})$.

Number of terms = $16 - 3 + 1 = 14$.

Total = $(-5)(-21) + (-2)(14) + (6)(14) = 161$.

8.

$$\sum_{n=4}^{17} (-5 + n + 2 \cdot n^2 - 4 \cdot n^3)$$

Distribute the sum and take each constant coefficient outside.

$S_0(n) = n$; $S_0(17) - S_0(3) = 14$.

$S_1(n) = n(n+1)/2$; $S_1(17) - S_1(3) = 147$.

$S_2(n) = n(n+1)(2n+1)/6$; $S_2(17) - S_2(3) = 1771$.

$S_3(n) = [n(n+1)/2]^2$; $S_3(17) - S_3(3) = 23373$.

Total = $(-5)(14) + (1)(147) + (2)(1771) + (-4)(23373) = -89873$.

9.

$$\sum_{i=2}^9 (1)$$

Distribute the sum and take each constant coefficient outside.

$S_0(n) = n$; $S_0(9) - S_0(1) = 8$.

Total = $(1)(8) = 8$.

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10. Given: the sum of $u(j)$ is 30, and the sum of $v(j)$ is 30, each from $j=4$ through 12.

$$\sum_{j=4}^{12} (u(j) - v(j))$$

Use linearity: $\text{sum}[a u + b v + c] = a \text{sum}[u] + b \text{sum}[v] + c(\text{number of terms})$.

Number of terms = $12 - 4 + 1 = 9$.

Total = $(1)(30) + (-1)(30) + (0)(9) = 0$.

- 11.

$$\sum_{k=1}^7 (2 - 3 \cdot k + 3 \cdot k^2)$$

Distribute the sum and take each constant coefficient outside.

$S_0(n) = n$; $S_0(7) - S_0(0) = 7$.

$S_1(n) = n(n+1)/2$; $S_1(7) - S_1(0) = 28$.

$S_2(n) = n(n+1)(2n+1)/6$; $S_2(7) - S_2(0) = 140$.

Total = $(2)(7) + (-3)(28) + (3)(140) = 350$.

- 12.

$$\sum_{n=3}^6 (-5 + n + 4 \cdot n^3)$$

Distribute the sum and take each constant coefficient outside.

$S_0(n) = n$; $S_0(6) - S_0(2) = 4$.

$S_1(n) = n(n+1)/2$; $S_1(6) - S_1(2) = 18$.

$S_3(n) = [n(n+1)/2]^2$; $S_3(6) - S_3(2) = 432$.

Total = $(-5)(4) + (-1)(18) + (4)(432) = 1690$.