9.1 Practice Problems

Simplify the expression.

1. $5!$

$= 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1$
$= 20 \cdot 6 \cdot 1$
$= 120$

2. $\frac{11!}{9!}$

$= \frac{11 \cdot 10 \cdot 9!}{9!}$
$= 11 \cdot 10$
$= 110$

3. $\frac{7!}{2!5!}$

$= \frac{7 \cdot 6 \cdot 5!}{2! \cdot 5!}$
$= \frac{7 \cdot 6}{2} = \frac{42}{2} = 21$

Write down the first five terms in the sequence.

4. $\{s_n\} = 2n+3$

$S_1 = 2(1)+3 = 5$
$S_2 = 2(2)+3 = 7$
$S_3 = 2(3)+3 = 9$
$S_4 = 2(4)+3 = 11$
$S_5 = 2(5)+3 = 13$

5. $\{s_n\} = 3^n$

$S_1 = 3^1 = 3$
$S_2 = 3^2 = 9$
$S_3 = 3^3 = 27$
$S_4 = 3^4 = 81$
$S_5 = 3^5 = 243$

6. $\{s_n\} = n^2+4$

$S_1 = 1^2+4 = 1+4 = 5$
$S_2 = 2^2+4 = 4+4 = 8$
$S_3 = 3^2+4 = 9+4 = 13$
$S_4 = 4^2+4 = 16+4 = 20$
$S_5 = 5^2+4 = 25+4 = 29$

7. $\{s_n\} = (-1)^{n+1} 5n$

$S_1 = (-1)^{1+1} \cdot 5(1) = (-1)^2 \cdot 5 = 5$
$S_2 = (-1)^{2+1} \cdot 5(2) = (-1)^3 \cdot 10 = -10$
$S_3 = (-1)^{3+1} \cdot 5(3) = (-1)^4 \cdot 15 = 15$
$S_4 = (-1)^{4+1} \cdot 5(4) = (-1)^5 \cdot 20 = -20$
$S_5 = (-1)^{5+1} \cdot 5(5) = (-1)^6 \cdot 25 = 25$

Assuming the given pattern continues, write the nth term of the sequence suggested by the pattern.

8. $1, \frac{1}{4}, \frac{1}{9}, \frac{1}{16}, \frac{1}{25}, \ldots$

$= \frac{1}{1^2}, \frac{1}{2^2}, \frac{1}{3^2}, \frac{1}{4^2}, \frac{1}{5^2}, \ldots$

$S_n = \frac{1}{n^2}$

9. $\frac{1}{8}, \frac{2}{9}, \frac{3}{10}, \frac{4}{11}, \ldots$

$S_n = \frac{n}{n+7}$

10. $1, -2, 3, -4, 5, \ldots$

$S_n = (-1)^n \cdot n$

11. $1, \frac{1}{2}, \frac{1}{4}, \frac{1}{8}, \frac{1}{16}, \ldots$

$\frac{1}{2^0}, \frac{1}{2^1}, \frac{1}{2^2}, \frac{1}{2^3}, \frac{1}{2^4}, \ldots$

$S_n = \frac{1}{2^{n-1}}$

A sequence is defined recursively. Write the first five terms of the sequence.

12. $a_1=5;\ a_n=a_{n-1}+3$

$a_2 = a_1+3 = 5+3=8$
$a_3 = a_2+3 = 8+3=11$
$a_4 = a_3+3 = 11+3=14$
$a_5 = a_4+3 = 17$

13. $a_1=2;\ a_n=a_{n-1}+n$

$a_2 = a_1+2 = 2+2=4$
$a_3 = a_2+3 = 4+3=7$
$a_4 = a_3+4 = 7+4=11$
$a_5 = a_4+5 = 11+5=16$

Find the first, second and last term of the sum.

14. $\sum_{k=1}^{n}(k+2)$

$(1+2)+(2+2)+\ldots+(n+2)$
$3 + 4 + \ldots + (n+2)$
1st 2nd nth

15. $\sum_{k=1}^{n}\left(\frac{k^2}{4}\right)$

$\left(\frac{1^2}{4}\right)+\left(\frac{2^2}{4}\right)+\ldots+\left(\frac{n^2}{4}\right)$
$\frac{1}{4}+1+\ldots+\frac{n^2}{4}$
1st 2nd nth

Find the sum of the sequence.

16. $\sum_{k=1}^{10} 2$

$=2(10)$
$=20$

17. $\sum_{k=1}^{12}(3k+2)$

$= 3\sum_{k=1}^{12} k + \sum_{k=1}^{12} 2$

$= 3\,\frac{12}{2}(1+12)+12(2)$
$= 18(1+12)+24$
$= 18(13)+24$
$= 234+24$
$= 258$