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Chapter 6 Answers

BLM 6–16
(page 1)

Prerequisite Skills

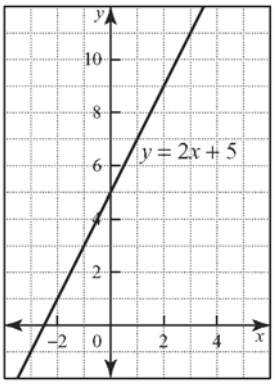
1. a) 32, 64, 128 **b)** 17, 19, 23
c) g, H, i **d)** x^5y^4, x^4y^5, x^3y^6

2. a) -15 **b)** $12t + 13$ **c)** -4 **d)** $8m - 15$

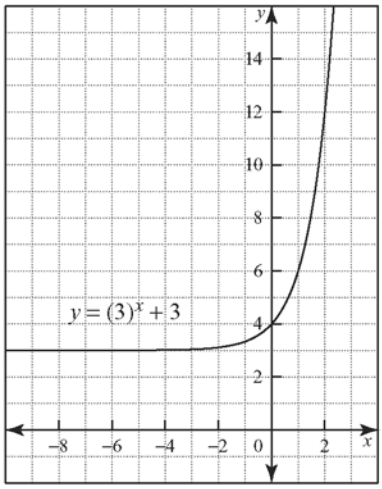
3. a) 19 **b)** -1 **c)** $-\frac{11}{8}$ **d)** $8x^4 - 2x^2 - 2$

4. a) 5 **b)** $\frac{11}{4}$ **c)** $\frac{7}{2}$ **d)** $3(4)^k + 2$

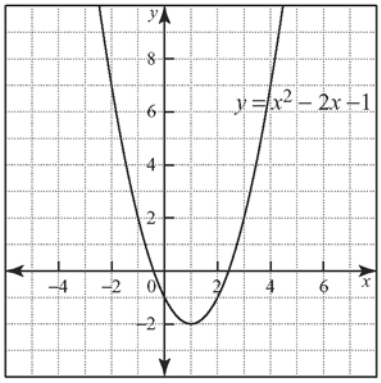
5. a)



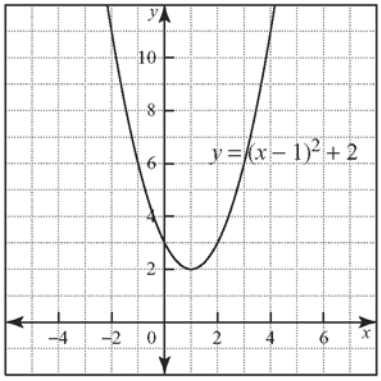
b)



c)



d)



6. a) -11 **b)** -2 **c)** 4 **d)** 24

7. a) 33.6 **b)** 7.29 **c)** 36 **d)** 0.18

8. a) $\frac{1}{2}$ **b)** $-\frac{2}{3}$ **c)** $-\frac{5}{14}$ **d)** 42

9. a)

x	y	First Differences	Second Differences
-3	44		
		-20	
-2	24		6
		-14	
-1	10		6
		-8	
0	2		6
		-2	
1	0		6
		4	
2	4		

quadratic

b)

x	y	First Differences	Second Differences
-1	$\frac{9}{2}$		
		-0.5	
0	4		-0.5
		-1	
1	3		-1
		-2	
2	1		-2
		-4	
3	-3		-4
		-8	
4	-11		

neither

10. a) 6

b) Answers may vary. Sample answer: The coefficient of the x^2-term multiplied by 2 gives the constant second difference.

c) -8

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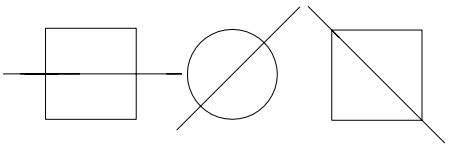
d) Answers may vary. Sample answer:

x	y	First Differences	Second Differences
1	−5		
		−14	
2	−19		−8
		−22	
3	−41		−8
		−30	
4	−71		−8
		−38	
5	−109		−8
		−46	
6	−155		

11. a) (1, −2) **b)** (−3, −4) **c)** (4, 15)

Exploring Patterns and Sequences

1. T, F, S (initials of days of the week, starting at Sunday)
2. 256, 289, 324 (squares of numbers, starting at 12)
3. T, D, R (musical notes, starting at Do)
4. −5, 0, −7 (increase by 5, decrease by 7, starting at 3)
5.



6.

(numbers with their mirror images)

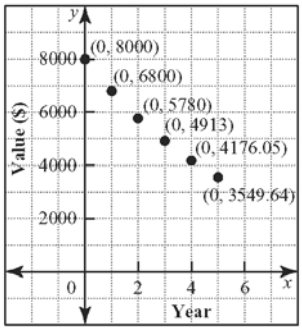
6.1 Sequences as Discrete Functions

1. a) $t_n = 2^n$ **b)** $t_n = -3n + 4$
2. Answers may vary. Sample answers:
a) The terms start at −2 and increase by 2. The next three terms are 8, 10, 12.
b) The starting two terms are 1 and 2, and the next term is the addition of the two terms before the term of interest. The next three terms are 21, 34, 55.
c) The first term is $\frac{1}{27}$, and the terms increase by a factor of 3. The next three terms are 9, 27, 81.
d) The first term is 3, and the terms increase by a factor of $\sqrt{3}$. The next three terms are $27\sqrt{3}, 81, 81\sqrt{3}$.
3. a) yes; is a multiple of 6
b) no; is not a multiple of 6
c) no; is not a multiple of 6
d) yes; is a multiple of 6

4. a)

Year	Value ($)
0	8000
1	6800
2	5780
3	4913
4	4176.05
5	3549.64

b)



c) Answers may vary. Sample answer: This trend will not continue because at some point the car will break down and cost too much to repair when compared to the value of the car at the time the repair is needed.

5. a) $t_n = 3n$ **b)** $t_n = 2n + 1$ **c)** $t_n = \frac{1}{2^{n-1}}$ **d)** $t_n = \frac{2n-1}{2n+3}$

6. a) i) 24 **ii)** 48 **iii)** 72 **b) i)** 17 **ii)** 33 **iii)** 49
c) i) $\frac{1}{2^7}$ **ii)** $\frac{1}{2^{15}}$ **iii)** $\frac{1}{2^{23}}$ **d) i)** $\frac{15}{19}$ **ii)** $\frac{31}{35}$ **iii)** $\frac{47}{51}$

7. a) 100, 120, 144, 173 **b) i)** 249 **ii)** 516 **iii)** 743
c) week 14

8. a) 125, 160, 195, 230 **b)** $t_n = 35n + 90$
c) i) 335 **ii)** 440 **d)** 15 weeks

6.2 Recursive Procedures

1. a) 11, 13, 15, 17 **b)** 729, 243, 81, 27
c) −2, −4, −7, −12 **d)** 1, 2, 2, 4

2. a) $t_1 = 4$, $t_n = t_{n-1} + 3$ **b)** $t_1 = 3$, $t_n = t_{n-1} + 2n + 1$
c) $t_1 = 1$, $t_n = t_{n-1} + 2n - 5$ **d)** $t_1 = 2$, $t_n = t_{n-1} + n^2$

3. a) $5000, $5300, $5618, $5955.08, $6312.38, $6691.13, $7092.60, $7518.15
b) $t_1 = \$5000$, $t_n = 1.06 \times t_{n-1}$
c) $9491.49

4. a) 256, 16, 4, 2 **b)** 2, 3, 6, 18
c) 2, 4, −2, −14 **d)** 0, 1, $\frac{1}{2}$, $\frac{1}{\sqrt{2}}$

5. a) 1, 2, 6, 24, 120
b) 1!: 1 × 1, 2!: 2 × 1 = 2, 3!: 3 × 2 × 1 = 6, 4!: 4 × 3 × 2 × 1 = 24, 5!: 5 × 4 × 3 × 2 × 1 = 120

6. a) 3, 10, 38, 150 **b)** $t_1 = 3$, $t_n = 4t_{n-1} - 2$

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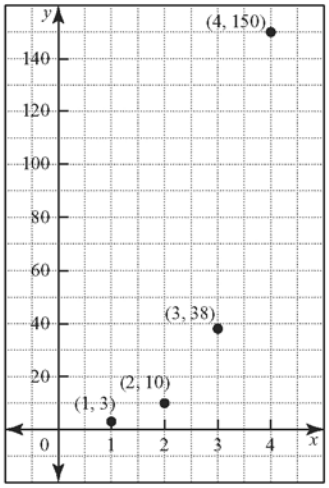
c)



7. a) 1, 2, 4, 8, 16, 32, … **b)** $t_1 = 1$, $t_n = 2 \times t_{n-1}$
c) Answers may vary. Sample answer: This represents discrete data, since the number of people that are told is a natural number.

6.3 Pascal's Triangle and Expanding Binomial Powers

1. a) $x^3 + 12x^2 + 48x + 64$ **b)** $1 - 8x + 24x^2 - 32x^3 + 16x^4$
c) $9x^2 + 6xy + y^2$
d) $x^5 - 25x^4 + 250x^3 - 1250x^2 + 3125x - 3125$
2. a) 32 **b)** 1024 **c)** 8192
3. a) 7 **b)** 12 **c)** 16 **d)** 13
4. a) 256 **b)** 8 **c)** 5 **d)** 3
5. 3
6. a)

1
1 1
1 2 1
1 3 3 1
1 4 6 4 1
1 5 10 10 5 1
1 6 15 20 15 6 1

b) $t_1 = 1$, $t_n = t_{n-1} + n$ **c)** 21, 28, 36
d)

1
1 1
1 2 1
1 3 3 1
1 4 6 4 1
1 5 10 10 5 1
1 6 15 20 15 6 1
1 7 21 35 35 21 7 1
1 8 28 56 70 56 28 8 1
1 9 36 84 126 126 84 36 9 1

7. a)

Row	Sum
0	1
1	0
2	0
3	0
4	0
5	0
6	0

b) 0
c) row 11: 1 – 11 + 55 – 165 + 330 – 466 + 466 – 330 + 165 – 55 + 11 – 1 = 0
8. $S_1 = 1$, which is equal to $2^1 - 1$
$S_2 = 3$, which is equal to $2^2 - 1$
$S_3 = 7$, which is equal to $2^3 - 1$
$S_4 = 15$, which is equal to $2^4 - 1$

6.4 Arithmetic Sequences

1. a) $t_n = 3 - n$ **b)** $t_n = -1 - 3n$
c) $t_n = -9 + 2n$ **d)** $t_n = 9 + 4n$
2. a) i) $t_2 = -7$ **ii)** $t_{10} = -15$ **iii)** $t_{14} = -19$
b) i) $t_2 = 4$ **ii)** $t_{10} = -36$ **iii)** $t_{14} = -56$
c) i) $t_2 = 6$ **ii)** $t_{10} = 62$ **iii)** $t_{14} = 90$
d) i) $t_2 = 29$ **ii)** $t_{10} = 61$ **iii)** $t_{14} = 77$
3. a) 26 **b)** 51 **c)** 43
4. a) 26 **b)** 44 **c)** 100 **d)** 61
5. Answers may vary. Sample answer: For the sequence 5, 10, 15, 20, 25, … , $a = 5$ and $d = 5$, which means that the sequence is arithmetic.
6. a) $a = 6$, $d = -2$ **b)** $a = 6$, $d = 5$
c) $a = -9$, $d = 2$ **d)** $a = -41$, $d = -2$
7. a) $t_1 = 6$, $t_n = t_{n-1} - 2$
b) $t_1 = 6$, $t_n = t_{n-1} + 5$
c) $t_1 = -9$, $t_n = t_{n-1} + 2$
d) $t_1 = -34$, $t_n = t_{n-1} - 3$
8. 19 months
9. 9

6.5 Geometric Sequences

1. a) 4 **b)** –3 **c)** $\frac{1}{2}$ **d)** $-\frac{1}{2}$
2. a) 2, –6, 18, –54 **b)** 40, 20, 10, 5
c) $\frac{1}{8}, \frac{1}{2}$, 2, 8 **d)** –2, 10, –50, 250
3. a) 8 **b)** 10 **c)** 11 **d)** 8
4. a) geometric; $a = 500$ $r = 0.25$ **b)** neither
c) geometric; $a = 7$, $r = 2$ **d)** arithmetic; $a = 11$, $d = 3$
5. 10
6. 81
7. 409 600
8. a) $a = 1600$, $r = 0.5$ **b)** $t_n = 1600\left(\frac{1}{2}\right)^{n-1}$
c) i) 1000 mg **ii)** 15.625 mg **iii)** 62.5 mg

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6.6 Arithmetic Series

1. a) 480 **b)** 75 **c)** –90 **d)** –225
2. a) 252 **b)** 4620 **c)** 1020 **d)** –400
3. 2077
4. a) 28, 25, 22, 19, 16 **b)** –10
5. –588
6. 207
7. a) $n^2 + n$ **b)** n^2
8. a) 306 **b)** 289

6.7 Geometric Series

1. a) 8188 **b)** –5.9065 **c)** 820 **d)** –341
2. a) 12 285 **b)** 19 682 **c)** 198.4375 **d)** 1066.601 563
3. 2, 10, 50, 250
4. 13 120
5. 62 m
6. $1.20
7. $659 840
8. 1.1068×10^{15} kg

Chapter 6 Review

1. Answers may vary. Sample answers:
a) The first term is 1, and each successive term is found by multiplying the previous term by $\frac{1}{2}$.
b) The first term is 3, and each odd term after the first is obtained by adding 1 to the previous odd term. All even terms are the value 4.
c) The first term is 11. The absolute value of each term is increased by 5, then multiplied by $(-1)^{n+1}$.
d) The first term is $\frac{1}{2}$. In each successive term, the values in the numerator and denominator increase by 1.

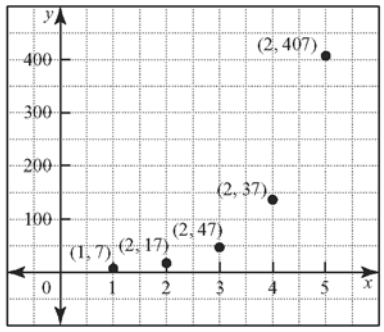
2. a) $t_n = 4n - 1$, $t_{10} = 39$ **b)** $t_n = -\frac{1}{2^n}$, $t_{10} = -\frac{1}{2^{10}}$
c) $t_n = \frac{2n+2}{2n+3}$, $t_{10} = \frac{22}{23}$ **d)** $t_n = n^2$, $t_{10} = 100$

3. a) 5, 10, 15, 20 **b)** $-2, \frac{1}{2}, \frac{9}{8}, \frac{41}{32}$
c) 1, 7, 11, 1 **d)** –3, 0, 9, 30
4. b) $22 053.13
c) $18 000 was invested; $4053.13 is interest
5. Answers may vary. Sample answers:
a) A diagram of the first four rows of Pascal's triangle
b) The values in the arrangement are the values of the first four rows of Pascal's triangle.
6. a) 5 **b)** 9 **c)** 7 **d)** 15
7. a) 19 **b)** 43 **c)** 23 **d)** 20
8. a) $44 800 **b)** $52 800 **c)** $72 000
9. $135
10. Answers may vary. Sample answers:
a) No, since the terms are not a constant multiple of each other as you move from term to term.
b) Yes, since to move from term to term, the frequency doubles

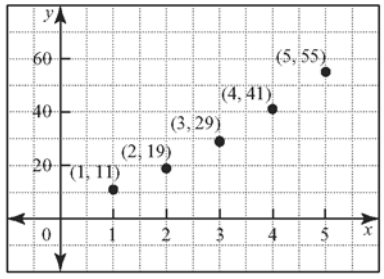
11. a) $a = 3$, $r = \pm 2$
b) Answers may vary. Sample answer: The sequence can alternate from positive to negative or be all positive and still have the same 1st and 7th terms.
c) 3, ±6, 12, ±24, 48
12. a) 196 608 **b)** seventh
13. a) 43 **b) i)** 175 **ii)** 329 **c)** 1161
14. $1250
15. 4, 7, 10, 13
16. a) i) 183 **ii)** 132 861 **b)** 132 678
17. $45 648
18. –2 + 6 – 18 + 54 – 162

Chapter 6 Practice Test

1. B **2.** C **3.** C **4.** A **5.** D
6. a) $x^4 + 16x^3 + 96x^2 + 256x + 256$
b) $27x^3 - 54x^2 + 36x - 8$
c) $x^6 + 6x^5y + 15x^4y^2 + 20x^3y^3 + 15x^2y^4 + 6xy^5 + y^6$
d) $x^{10} - 5x^8 + 10x^6 - 10x^4 + 5x^2 - 1$
7. Answers may vary.
8. a) 7, 17, 47, 137, 407 **b)** 11, 19, 29, 41, 55
c) 10, 12, 14, 16, 18 **d)** $\frac{1}{3}$, 1, 3, 9, 27
e) –6, –7, –8, –9, –10 **f)** $1, 2, \frac{1}{2}, 4, 8$
9. a) i)



ii) neither
b) i)



ii) neither

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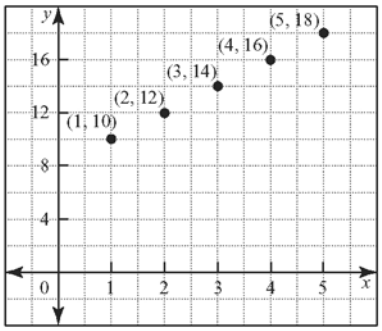
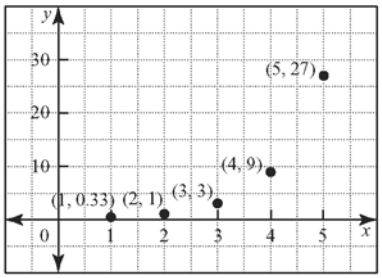
c) i)



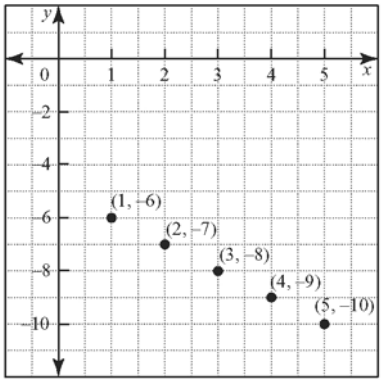
ii) arithmetic

d) i)



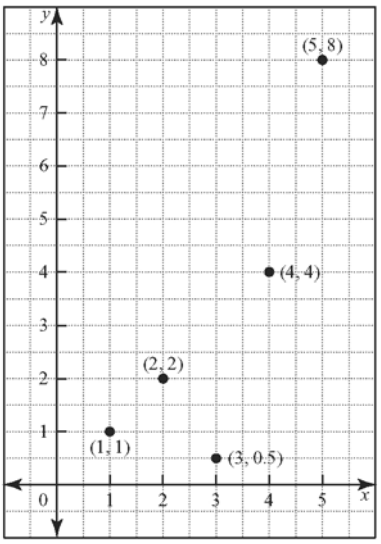
ii) geometric

e) i)



ii) arithmetic

f) i)



ii) neither

10. a) 7 **b)** 10 **c)** 315 **d)** 9

11. a) 9 **b)** 2044

c) Answers may vary. Sample answer: Use the sum of a series formula to find the sum of the first 4 terms and then the sum of the first 8 terms. Then subtract the results.

12. Plan B; (Plan A: $1 100 000, Plan B: $10 737 418.23)

13. a) 16 383 **b)** 6120 **c)** 3069 **d)** –616

14. a) 13; 9; 5 **b)** –6; 0; 6 **c)** 7; 9; 13

15. a) 3; 192; 768 **b)** 320; –160; 80 **c)** 1000; 5062.5

16. 63

17. 1440

18. $55 847.82

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