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Section 7-3   Identifying Functions from Numerical Patterns

*Go through Patterns on P.280-282

Linear Functions have an Add-Add Property
    Adding a constant to x results in adding a constant to y

Power Functions have a Multiply-Multiply Property
    Multiplying x by a constant results in multiplying y by a constant

Exponential Functions have an Add-Multiply Property
    Adding a constant to x results in multiplying y by a constant

Quadratic Functions have a Constant-Second-Differences Property
    The second differences between the y values are constant

Determine what kind of pattern the data has. Identify the type of function that has the pattern.

1.

x	y
2	1500
4	750
6	500
8	375
10	300

×2, ×2   * ½, * ½

Muit-muit
Power

2.

x	y
2	12
4	48
6	192
8	768
10	3072

+2   ×4

Add-Mult
Exponential

3.

x	y
2	400
4	100
6	-200
8	-500
10	-800

+2   -300

Add-Add
Linear

4.

x	y
1	352
3	136
5	64
7	136
9	352

+2   -216, -72, 72, 216   144

Constant 2ⁿᵈ diff
Quadratic

5. Find the indicated function value if f is
   a. a linear function
   b. a power function
   c. an exponential function

   Given f(3) = 80 and f(6)=120, find f(24).

a.)

x	f(x)
3	80
6	120
9	160
12	200
15	240
18	280
21	320
24	360

+3 between 3 and 6; +40

$$f(24) = 360$$

b.)

x	f(x)
3	80
6	120
12	180
24	270

×2 ; ×1.5

$$f(24) = 270$$

c.)

x	f(x)
3	80
6	120
9	180
12	270
15	405
18	607.5
21	911.25
24	1366.875

$$f(24) = 1366.875$$

6. Given that f(x) varies inversely with the square of x and that f(5) = 1296, find f(10) and f(20).

$$f(x) = \frac{a}{x^2} \qquad 1296 = \frac{a}{5^2} \qquad a = 32,400$$

$$f(10) = \frac{32,400}{10^2} \qquad \boxed{f(10) = 324} \qquad f(20) = \frac{32,400}{20^2} \qquad \boxed{f(20) = 81}$$

7. Describe the effect on y of doubling x if
   a. y varies directly with x.

   doubling x | doubles y

   b. y varies inversely with the square of x.

   $$\frac{1}{x^2} \qquad \frac{1}{2^2} \qquad \frac{1}{4^2} \qquad \frac{1}{4} \qquad \frac{1}{16} \qquad \boxed{\tfrac{1}{4} \text{ times } y}$$

   c. y varies directly with the cube of x.

   $$x^3 \qquad 2^3 \qquad 4^3$$
   $$8 \qquad 64$$

   $$\boxed{8 \text{ times } y}$$

8. The weight, W, of any animal is roughly proportional to the cube of its length, L.

   a. Write the general equation using W and L. $W = aL^3$

   b. An elephant is roughly 10 times as long as a dog. How does an elephant's weight compare to a dog's weight?
   $$W = a(1)^3 \qquad W = a$$
   $$W = a(10)^3 \qquad W = 1000a$$

   a's going to be same, so W will be 1000 times greater

   c. The skin area is roughly proportional to the square of its length. If the dog has 4 square feet of skin, how much skin does an elephant have?

   $$SA = aL^2$$