

Example: Find the linear equation.

Increase by 1

r	v
0	10
1	8
2	6
3	4
4	2

Format: $y = mx + b$

$v = mr + b$

$m = -2$

So, $v = -2r + b$

* When $r = 0$
the value of v
is "b".

↑
find
+ h.s

So $b = 10$

So finally, $v = -2r + 10$

Example 2

p	q
-5	10
-4	7
-3	4
-2	1
-1	-2
0	-5

$q = mp + b$

So, $m = -3$

$q = -3p + b$

Find "b"

When $p = -5, q = 10$

$10 = -3(-5) + b$

$10 = 15 + b$

* What added to 15 gives 10?

* We must subtract 5.

So, $b = -5$

$q = -3p - 5$

Practice: Write the linear equation that represents the pattern of numbers given in the tables.

1.

n	p
0	3
1	4
2	5
3	6
4	7

Handwritten annotations for table 1: A right-pointing arrow from n=0 to p=3. A bracket from p=3 to p=4 with a '+' sign. A bracket from p=4 to p=5 with a '+' sign. A bracket from p=5 to p=6 with a '+' sign. A bracket from p=6 to p=7 with a '+' sign.

2.

r	v
0	0
1	4
2	8
3	12
4	16

3.

t	d
0	2.0
1	3.5
2	5.0
3	6.5
4	8.0

4.

t	v
2	8
3	10
4	12
5	14
6	16

5.

x	y
0	0
1	-2
2	-4
3	-6
4	-8

6.

x	y
0	6
1	3
2	0
3	-3
4	-6

7.

x	y
-5	0
-4	-1
-3	-2
-2	-3
-1	-4

8.

x	y
-4	-10
-2	-4
1	5
4	14
5	17

9.

x	y
-4	5
-2	4
0	3
2	2
4	1

10.

x	y
-2	-3.28
-1	-0.14
0	3.00
1	6.14
2	9.28

Challenge! Write the non-linear equation based on the pattern given in each:

11.

n	t
-2	1
-1	-2
0	-3
1	-2
2	1
3	6

12.

n	t
1	2
2	6
3	12
4	20
5	30

13.

n	t
-2	-6
-1	-12
1	12
2	6
3	4

14.

n	t
16	0
9	-1
4	-2
1	-3
0	-4

15.

n	t
1	1
2	3
3	7
4	15
5	31

Results of playing the Tower of Hanoi game:
<http://www.dynamicdrive.com/dynamicindex12/towerhanoi.htm>

$$\#1) \quad p = mn + b \quad m = +1$$

$$p = 1n + b \quad b = 3$$

$$\boxed{p = n + 3}$$

$$2) \quad v = mr + b \quad m = 4$$

$$b = 0$$

$$\boxed{v = 4r}$$

$$3) \quad d = mt + b \quad m = 1.5$$

$$\boxed{d = 1.5t + 2} \quad b = 2$$

$$4) \quad v = mt + b \quad m = 2$$

t	v
0	4
1	6
2	8
3	10
4	12

$$b = 4$$

$$v = 2t + b$$

$$8 = 2(2) + ?$$

$$b = 4$$

$$\boxed{v = 2t + 4}$$

$$5) \quad y = mx + b \quad m = -2$$

$$b = 0$$

$$\boxed{y = -2x}$$

8)

x	y
-4	-10
-2	-4
1	5 ←
4	14
5	17 ↗ +3

+1 {

$$y = mx + b$$

$$y = 3x + b$$

$$5 = 3(1) + b$$

2 → ?

$$y = 3x + 2$$

9)

x	y
-4	5
-3	4.5
-2	4
-1	3.5
0	3
1	2.5
2	2
3	1.5
4	1

$$y = mx + b$$

↑
0.5

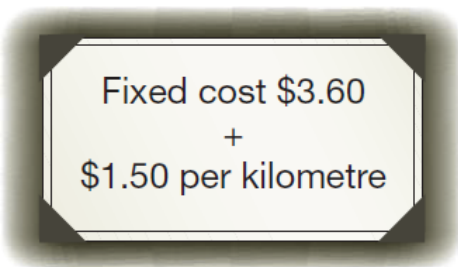
$$y = -0.5x + b$$

$$b = 3$$

$$y = -0.5x + 3$$

Example 2 Writing an Equation to Represent an Oral Pattern

I called Kelly's Cabs. The cost of a ride is shown on a poster in the cab.



- Write an expression for the fare in terms of the fixed cost and the cost per kilometre.
- Write an equation that relates the fare to the distance travelled.
- What is the fare for an 11-km ride?

▶ **A Solution**

- The fare is \$3.60, plus \$1.50 per kilometre.

That is, the fare is $3.60 + 1.50 \times (\text{distance in kilometres})$.

Let d represent the distance in kilometres.

So, an expression for the fare is: $3.60 + 1.50 \times d$, or $3.60 + 1.50d$

- Let F represent the fare in dollars.

Then, an equation that relates F and d is $F = 3.60 + 1.50d$

- To determine the cost for an 11-km trip, use the equation: $F = 3.60 + 1.50d$

Substitute: $d = 11$

$$F = 3.60 + 1.50(11)$$

$$= 3.60 + 16.50$$

$$= 20.10$$

$$F = 1.50d + 3.60$$

The fare for an 11-km ride is \$20.10.

4.1

Writing Equations to Describe Patterns

Practice

Page 159 #s 4-9, 11, 12, 14, 15