Unit 7: Linear Relations

: Representing Patterns

→ Create a table of values for a pattern.

x	y

→ Create a linear equation.

$y = mx + b$

- Solve for m using:

$$m = \frac{(y_2 - y_1)}{(x_2 - x_1)}$$

y_1, y_2 are y-coordinates

x_2, x_1 are x-coordinates

- Solve for b by substitution using a third x : y coordinate.

Example equation: $y = 3x + 5$ (3 = m, 5 = b)

* leave x : y as variables.

→ Verify the equation.

↳ Substitute for x and y then perform a "check".

Examples:

1.

Fig. 1

a) Make a table of values for the pattern above.

Figure (x)	1	2	3	4
# of sides (y)	5	9	13	17

"Touching" sides count only as 1 side.

b) Describe the relationship between the number of pentagons and the number of sides.

# of pentagons: 1, 2, 3, 4 (increase by 1)

# of sides: 5, 9, 13, 17 (increase by 4)

As the number of pentagons increase by 1, the number of sides increase by 4.

c) Find a linear equation for this pattern.

	x_1	x_2	x_3	x_4
x	1	2	3	4
y	5	9	13	17
	y_1	y_2	y_3	y_4

$$m = \frac{(y_2 - y_1)}{(x_2 - x_1)}$$

$$= \frac{(9-5)}{(2-1)}$$

* BEDMAS
Brackets 1st!

$$= \frac{4}{2}$$

$$= 2$$

$\boxed{m = 2}$

$y = mx + b$

$y = 2x + b$ Use a third point. (x_3, y_3) or (x_4, y_4)

$13 = 2(3) + b$

$13 = 6 + b$

$-6 \quad -6$

$\boxed{7 = b}$

$y = mx + b$

$\boxed{y = 2x + 7}$ ← equation.

x - Figure #
y - # of sides

← "x" statement.

d) How many sides would a shape with 18 pentagons have?

Sides = y

pentagons = $x = 18$

$y = 2x + 7$ (from c)

$y = 2(18) + 7$

$y = 36 + 7$

$\boxed{y = 43}$

18 pentagons would have 43 sides.

e) How many pentagons would yield 33 sides?

pentagons = x

sides = $y = 33$

$y = 2x + 7$

$33 = 2x + 7$

$33 = 2x + 7$
$-7 \quad -7$

$26 = 2x$

$\frac{26}{2} = \frac{2x}{2}$

$\boxed{13 = x}$ 13 pentagons would have 33 sides.

2. 5, 11, 17, ...

a) Make a table of values for the 1st 5 terms.

x (term)	1	2	3	4	5
y (value of term)	5	11	17	23	29

(+1, +1; +6, +6)

b) Find the equation for the pattern.

$y = mx + b$

$m = \frac{(y_2 - y_1)}{(x_2 - x_1)}$

$= \frac{(29 - 5)}{(5 - 1)}$

$= \frac{24}{4}$

$= 6$

$y = 6x + b$

$11 = 6(2) + b$

$11 = 12 + b$

$11 = 12 + b$
$-12 \quad -12$

$-1 = b$

$y = 6x + b$

$y = 6x \pm 1$

$\boxed{y = 6x - 1}$

y - value of term

x - term number

c) What is the value of the 106th term?

y x

$y = 6x - 1$

$y = 6(106) - 1$

$y = 636 - 1$

$y = 635$

The 106th term would be 635.

d) Which term would equal 311.?

x y

$y = 6x - 1$

$311 = 6x - 1$

$311 = 6x - 1$
$+1 \quad +1$

$312 = 6x$

$\frac{312}{6} = \frac{6x}{6}$

$52 = x$

The 52nd term would be 311.

Pg. 217 # 4-10