

MATH 7 UNIT: Algebra: linear relations, graphing, expressions, solving equations

NAME: _____ **DATE:** _____

| LEARNING INTENTION | | Evaluation | | | |
|------------------------------------------------------------------------------------------------------------|--|--------------------------------------|--------------------------------------------|------------------------------------------|------------------------------------------|
| I can translate verbal expressions into algebraic expressions | | BEGINNING <i>(Not Yet)</i> | DEVELOPING <i>(A Good Start)</i> | APPLYING <i>(Almost There)</i> | EXTENDING <i>(You Got It!)</i> |
| I can represent linear relations using expressions | | BEGINNING <i>(Not Yet)</i> | DEVELOPING <i>(A Good Start)</i> | APPLYING <i>(Almost There)</i> | EXTENDING <i>(You Got It!)</i> |
| I can solve expressions and equations given the value of a variable and can graph linear relations. | | BEGINNING <i>(Not Yet)</i> | DEVELOPING <i>(A Good Start)</i> | APPLYING <i>(Almost There)</i> | EXTENDING <i>(You Got It!)</i> |
| I can solve one and two step equations | | BEGINNING <i>(Not Yet)</i> | DEVELOPING <i>(A Good Start)</i> | APPLYING <i>(Almost There)</i> | EXTENDING <i>(You Got It!)</i> |
| I can use algebra to solve word problems | | BEGINNING <i>(Not Yet)</i> | DEVELOPING <i>(A Good Start)</i> | APPLYING <i>(Almost There)</i> | EXTENDING <i>(You Got It!)</i> |
| Summative Teacher Evaluation | | BEGINNING <i>(Not Yet)</i> | DEVELOPING <i>(A Good Start)</i> | APPLYING <i>(Almost There)</i> | EXTENDING <i>(You Got It!)</i> |

Variable - letters "A", "X", "n" can symbolize anything

Constant - numbers - specific and definite

Coefficient - a numerical constant that multiplies a variable

Expression

$$y+4$$

Equation

$$4m-2=10$$

6. a) Sheila baby-sits for five dollars an hour.
Copy and complete the chart.
- b) What is the variable in this problem?
- c) What is the constant in this problem?
- d) Let h represent the variable. Then, write the algebraic expression for the amount Sheila earns per hour for any number of hours.

| | | | | | | |
|---------------|---|----|---|---|---|---|
| Time (h) | 1 | 2 | 3 | 4 | 5 | 6 |
| Earnings (\$) | 5 | 10 | | | | |

Understand and Apply

1. What is the variable in each algebraic expression?

- a) $5p$ b) $2a$ c) $7t$
 d) $3q$ e) $9w$ f) $6b$

2. What is the constant in each algebraic expression?

- a) $10c$ b) $18z$ c) $11m$
 d) $19d$ e) $13t$ f) $17x$

3. Identify the variable and the constant in each expression.

- a) $8z$ b) $5r$ c) $9c$
 d) $12m$ e) $16p$ f) $14q$

4. Simplify these expressions.

- a) $p + p + p + p + p$
 b) $a + a + a$
 c) $q + q + q + q$
 d) $w + w + w + w + w + w$
 e) $z + z$
 f) $x + x + x + x + x + x + x$

5. Write each algebraic expression as repeated addition.

- a) $2r$ b) $4x$ c) $3s$
 d) $5y$ e) $8n$ f) $6u$

9. Enzo cuts lawns for \$8/h.

a) Copy and complete the chart.

| | | | | | |
|----------|---|---|---|---|---|
| Time (h) | 1 | 2 | 3 | 4 | 5 |
|----------|---|---|---|---|---|

| | | | | | |
|---------------|--|--|--|--|--|
| Earnings (\$) | | | | | |
|---------------|--|--|--|--|--|

b) Identify the variable and the constant in this problem.

c) Use the variable h to write an algebraic expression that describes Enzo's earnings.

10. Tickets for the school play cost \$6.50 each.

a) Copy and complete the chart.

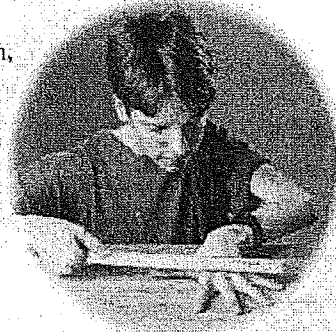
| | | | | | |
|-------------------|---|---|---|---|---|
| Number of Tickets | 1 | 2 | 3 | 4 | 5 |
|-------------------|---|---|---|---|---|

| | | | | | |
|-----------|--|--|--|--|--|
| Cost (\$) | | | | | |
|-----------|--|--|--|--|--|

b) Identify the variable and the constant in this problem.

c) Use the variable c to write an algebraic expression that describes the cost of tickets for the school play.

11. The variable s represents the length, in centimetres, of a person's handspan. What does $2s$ represent?



If p represents the number of people in your family, what could $2p$ represent? $10p$?

6. Identify each of the following as a variable or a constant. Explain your choice.

- a) the number of cars in a school parking lot
 b) the number of cents in a dollar

7. It costs \$5.00 an hour to rent a bicycle at a resort. Which expression represents the cost to rent for any number of hours?

- a) $10h$ b) $7h$ c) $5h$

8. It costs \$6.00 for a dozen lilies. Which expression represents the cost of any number of dozen lilies?

- a) $3d$ b) $6d$ c) $10d$

In Your Journal

Name four examples of constants and four examples of variables in your school or community.

Translating Verbal Expressions:

- A number minus 4

- 4 times a number

- half of n

- the product of a number and 6

- 5 less than a P is 30

- 2 less than quotient of a number and 4

- 6 times r decreased by 200

- a number squared

- 8 more than half the product of a number and 6

- the difference between a number and 3 is 24

- $X+7$

- $\frac{4t}{2}$

Variable and Verbal Expressions

Write each as an algebraic expression.

1) the difference of 10 and 5

2) the quotient of 14 and 7

3) u decreased by 17

4) half of 14

5) x increased by 6

6) the product of x and 7

7) the sum of q and 8

8) 6 squared

9) twice q

10) the product of 8 and 12

11) the quotient of 18 and n

12) n cubed

Write each as a verbal expression.

13) $\frac{x}{2}$

14) $a + 9$

15) $19 - 3$

16) $5n$

17) q^2

18) $\frac{40}{5}$

19) $\frac{a}{8}$

20) $x + 8$

21) $n - 14$

22) 2^2

23) $\frac{60}{5}$

24) $n \cdot 6$

Evaluate each expression.

25) 5 squared

26) the product of 8 and 10

27) 20 decreased by 17

28) the quotient of 96 and 8

29) twice 6

30) 10 less than 17

31) 9 times 5

32) 10 increased by 8

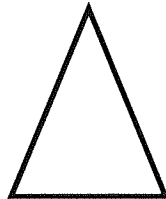
33) 7 squared

34) the product of 4 and 5

relation

a property that allows you to use one number to get information about another number. For example, the perimeter of a square is 4 times the length of one side, so if you know the length of one side of the square, you can determine the perimeter. This relation can be represented by the formula $P = 4s$ or by a table of values.

| Side length (cm) | Perimeter (cm) |
|------------------|----------------|
| 1 | 4 |
| 2 | 8 |
| 3 | 12 |
| 4 | 16 |

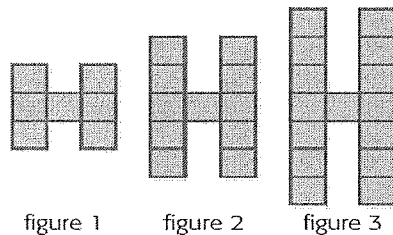


| | |
|--------------------|----------------|
| # of triangles (t) | # of sides (s) |
|--------------------|----------------|



| | |
|---------------|------------------|
| # Of bags (b) | # of suckers (S) |
|---------------|------------------|

B. Use words to describe the **relation** between the number of orange tiles in a figure and its figure number.



C. Represent the figure number using the variable n . Write an algebraic expression that tells how to calculate the number of orange tiles in figure n .

D. How many green tiles are in figure n ?

E. Write an algebraic expression to represent the total number of tiles in figure n .

F. Identify the **constant term** and the **numerical coefficient** in your algebraic expression.

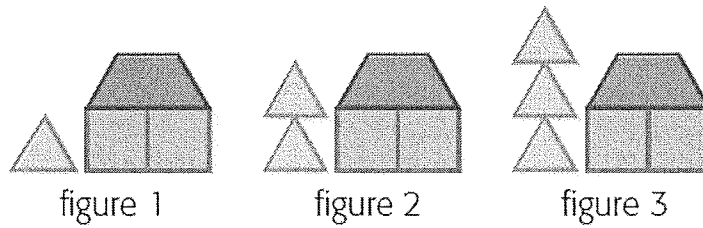
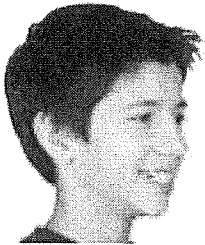
G. Why is your expression from part E a **pattern rule**?

▶ How can you write the pattern rule using numbers and variables?

Complete the table.

| Figure number | Number of green tiles | Number of orange tiles | Total number of tiles |
|---------------|-----------------------|------------------------|-----------------------|
| 1 | 3 | 4 | 7 |
| 2 | 3 | 8 | 11 |
| 3 | | | 15 |
| 4 | | | |
| 5 | | | |
| 6 | | | |

Write a pattern rule to represent the relation between the number of blocks in any figure in this pattern and its figure number, n .

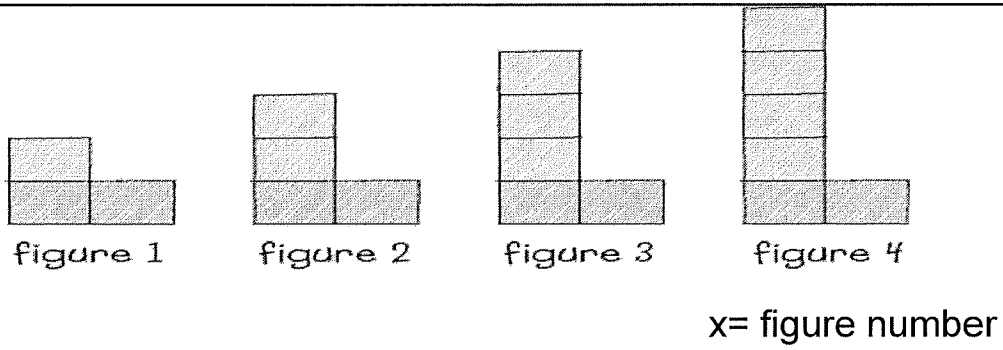


| figure | green | red & orange | total |
|--------|-------|--------------|-------|
| 1 | 1 | 3 | 4 |
| 2 | 2 | 3 | 5 |
| 3 | 3 | 3 | 6 |

What is the relation between the number of green blocks and the figure number?

How many red and orange blocks are in any figure number?

What pattern rule or expression can we write to figure out the number of blocks in any figure number?

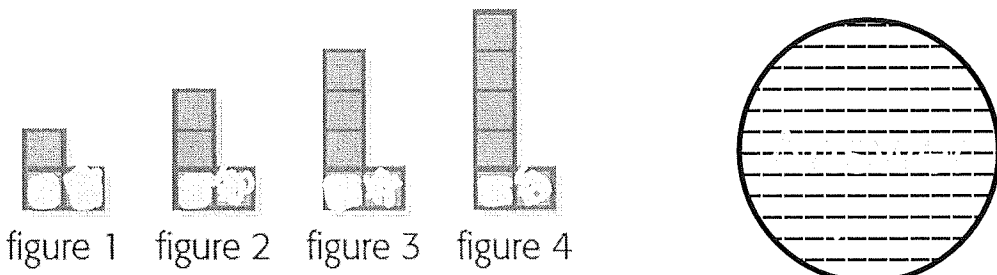


| figure | blue | green | total |
|--------|------|-------|-------|
| | | | |
| | | | |
| | | | |

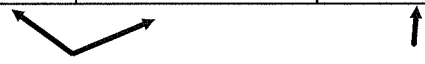
What is the relation between the number of green blocks and the figure number?

How many blue tiles are there in any figure number?

Write an expression to figure out the number of times in any given figure number.



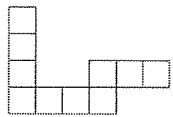
| x= fig | fig | Orange | Yellow | total |
|--------|-----|--------|--------|-------|
| | 1 | | | |
| | 2 | | | |
| | 3 | | | |
| | 4 | | | |



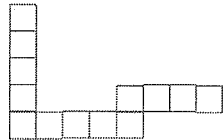
What is the relationship between the number of orange tiles and the figure number?

How many yellow tiles are in any given figure number?

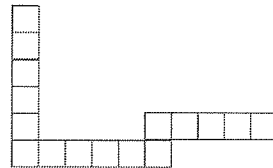
Write an expression to figure out the number of total times in any given figure number.



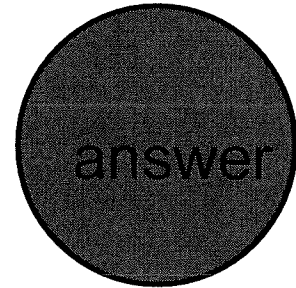
Case 1



Case 2



Case 3



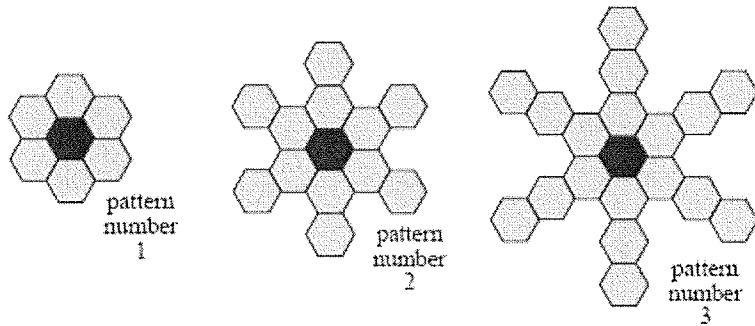
How is the above pattern growing?

Represent the pattern in a t-table, a graph, in words, and with an algebraic expression

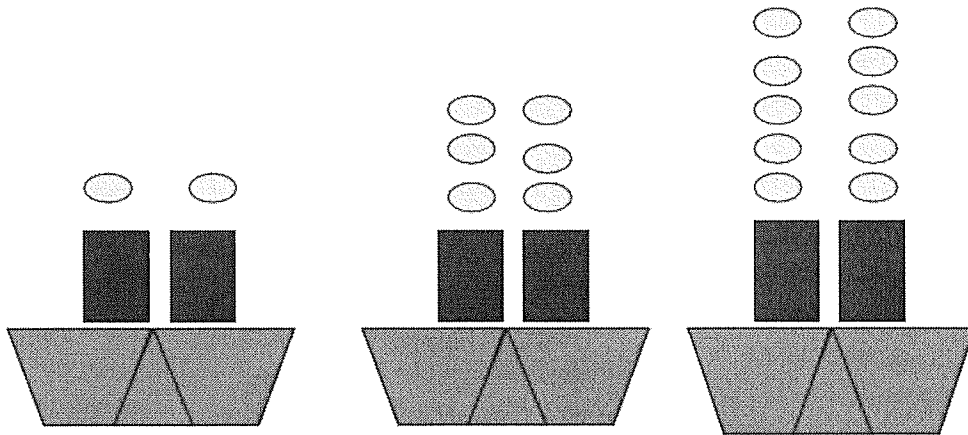
How many squares would be in Case 100?

| fig =X | number | change |
|--------|--------|--------|
| 1 | | |
| 2 | | |
| 3 | | |

Can you colour the figures to match your expression?



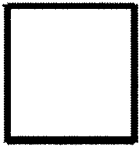
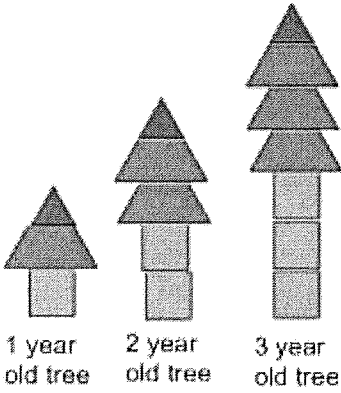
| fig | # of shapes | change |
|-----|-------------|--------|
| | | |
| | | |
| | | |



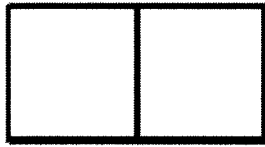
1st horn blow

2nd horn blow

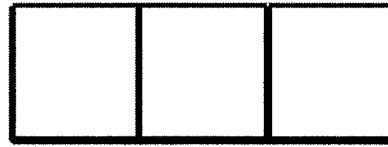
3rd horn blow



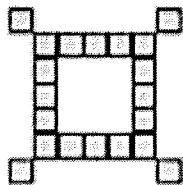
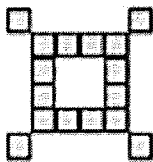
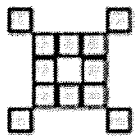
1 - square path



2 - square path



3 - square path



Work in.. 

Use materials to make 3 increasing patterns

- In 2 of the patterns, use one colour to clearly show the constant
- Patterns must increase the same amount from figure to figure
- Draw the pattern on paper
- Figure out the algebraic expression of the pattern that can tell the number of shapes in any figure number

(put the answer on the back of the paper)

******Make 1 pattern that does not show the constant by colour******

Challenge:

Can you make a pattern that
has a negative constant?

Math Focus

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