Geometry and Advanced Geometry Summer Packet

Welcome to Geometry/Advanced Geometry! Geometry is a fundamental course that will include an extension of the algebra skills learned in Algebra 1. You are expected to have a strong background in the skills reviewed in this packet. Resource links are embedded within each section throughout the packet.

DUE: 1st week of school.

Need help on some of the topics? For each section a link to an instructional video has been provided!

Note:
Questions #1-22 are for all students taking Geometry and Advanced Geometry.
The following Thinking Tasks are optional for any student that wants to be challenged! (choose the ones that look most interesting to you--no need to do them all!)

Have a great Summer and we'll see you in the Fall!
-SGS Math Department :)

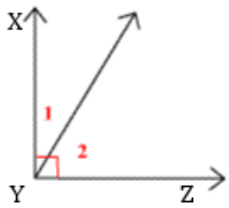
GEOMETRY BASIC SKILLS:

ANGLES: use facts about supplementary, complementary, acute, right and obtuse angles to determine angles and solve simple equations for an unknown angle in a figure.

Complementary and Supplementary Angles: https://www.khanacademy.org/math/geometry-home/geometry-angles/geometry-vert-comp-supp/v/complementary-and-supplementary-angles?modal=1

1. Given the information below, write an equation and solve the equation to determine the missing angle lengths.

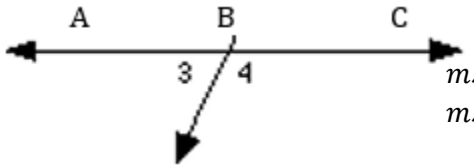
a.



$m\angle 1 = x$
$m\angle 2 = 2x$

If $m\angle XYZ = 90°$ it is called a _____angle.
Equation:_____
m∠1 =_____
m∠2 = _____
∠1 and ∠2 are a pair of:
Complementary / supplementary angles.

b.



$m\angle 3 = y$
$m\angle 4 = y + 40$

If $m\angle ABC = 180°$ it is called a _____angle.
Equation: _____
m∠3 = _____
m∠4 = _____
∠3 and ∠4 are a pair of:
Complementary / supplementary angles.

Ratios, Proportions and Fractions: understand the concepts of ratio and proportions and use this relationship to solve real-world and mathematical problems by reasoning about tables, equivalent ratios or equations.

Ratios and Proportions: https://www.khanacademy.org/test-prep/praxis-math/praxis-math-lessons/praxis-math-number-and-quantity/a/gtp--praxis-math--article--ratios-and-proportions--lesson

Solving Proportions: https://www.khanacademy.org/math/cc-seventh-grade-math/cc-7th-ratio-proportion/cc-7th-write-and-solve-proportions/v/find-an-unknown-in-a-proportion

2. For each of the following, perform the given operation and simplify.

a. $\frac{1}{3}+\frac{1}{4}$ b. $\frac{2}{3}\left(\frac{5}{8}\right)$ c. $\frac{1}{2}\div\frac{3}{4}$

3. Tell whether the following ratios form a proportion. Explain your reasoning.

a. $\frac{2}{7},\frac{4}{21}$ b. $\frac{3}{10},\frac{15}{50}$

4. Solve for x: $\frac{12}{5} = \frac{x}{4}$

5. Solve for x: $\frac{2}{3} = \frac{x+7}{3x}$

6. Solve for x: $\frac{2x+3}{5} = \frac{x-1}{3}$

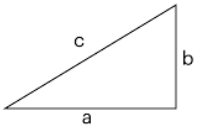
$x =$_____

$x =$ _____

$x =$ _____

PYTHAGOREAN THEOREM: apply the Pythagorean Theorem to determine unknown side lengths in right triangles.

Pythagorean Theorem: https://www.khanacademy.org/math/cc-eighth-grade-math/cc-8th-geometry/cc-8th-pythagorean-theorem/v/the-pythagorean-theorem

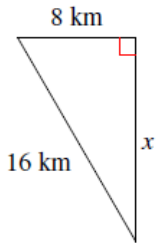


$c^2 = a^2 + b^2$

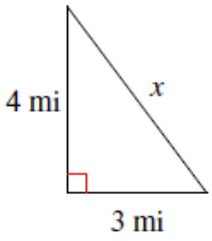
Simplifying Square Roots: https://www.khanacademy.org/math/algebra/x2f8bb11595b61c86:rational-exponents-radicals/x2f8bb11595b61c86:simplifying-square-roots/v/simplifying-square-roots-1

7. Find the length of the missing side in each diagram. Leave your answer in simplest radical form and also give your answers rounded to the nearest hundredth.

a.



b.



8. Simplify. Leave your answer in simplest radical form.

a. $\sqrt{20}$

b. $\sqrt{45}$

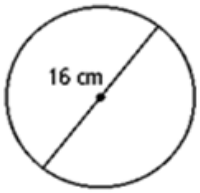
c. $\sqrt{6} \cdot \sqrt{12}$

***CIRCUMFERENCE and AREA*:** know and apply the circumference and area formulas for circle and use them to solve problems.

Area and Circumference of a Circle: https://www.khanacademy.org/math/cc-seventh-grade-math/cc-7th-geometry/cc-7th-area-circumference/v/circles-radius-diameter-and-circumference

https://www.khanacademy.org/math/cc-seventh-grade-math/cc-7th-geometry/cc-7th-area-circumference/v/area-of-a-circle

9. Find the circumference and Area of the circle below. *Leave pi π in your answer **o**r use pi π button and round to hundredth.*



C =_____ A =_____

PREALGEBRA AND ALGEBRA 1 SKILLS:

SIMPLIFYING EXPRESSIONS: Simplify expressions with numerical values and variables

- Order of Operations: https://www.khanacademy.org/math/cc-sixth-grade-math/cc-6th-arithmetic-operations/cc-6th-order-of-operations/v/order-of-operations-1
- Combing Like Terms: https://www.khanacademy.org/math/cc-sixth-grade-math/cc-6th-expressions-and-variables/cc-6th-combining-like-terms/v/combining-like-terms-1

SOLVING LINEAR EQUATIONS: Solve linear equations in one variable with coefficients represented by real numbers and variables

Solving: https://www.khanacademy.org/math/algebra/x2f8bb11595b61c86:solve-equations-inequalities/x2f8bb11595b61c86:linear-equations-variables-both-sides/v/equations-3

10. Simplify/Evaluate.

a. $4 - 2(3 - 2^2)$

b. $3x + 4x - 6x + 2x^2$

c. $-10 - 2x - 6 + 8x$

d. $2a + 4b - 8; \quad if\ a = 3, b = -2$

11. Solve each of the following equations for x.

a. $2x + 4x = 18$

b. $1 + 2x = 8 + 4x$

c. $2(4x + 3) - 8 = 4 + 2x$

d. $3 - 2(x - 1) = 2 + 4x$

e. $2x + 8 + 112 = 180$

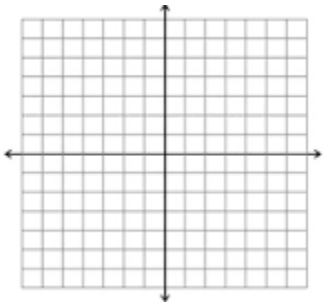
LINEAR FUNCTIONS: Calculate and interpret the average rate of change (slope) of a linear function and graph linear functions.

Slope: https://www.khanacademy.org/math/algebra/two-var-linear-equations-and-intro-to-functions/slope/v/slope-intuition-example

Slope-Intercept Form: https://www.khanacademy.org/math/algebra/two-var-linear-equations-and-intro-to-functions/slope-intercept-form/v/graphing-a-line-in-slope-intercept-form

12. Given two coordinate points M & N on the coordinate plane, find the slope of $\overleftrightarrow{MN}$, and state the slope of the line parallel and perpendicular to $\overleftrightarrow{MN}$.

$M(9, 6), N(1, 4)$



slope of $\overleftrightarrow{MN}$ = _____; parallel slope = _____; ⊥ slope = _____

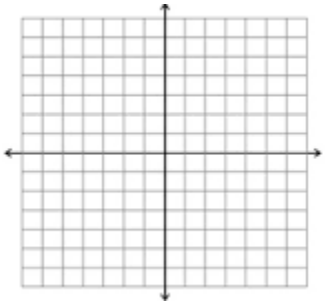
13. Find the slope and y-intercept of the given linear equation. Then, graph the line.

a. $y = -\frac{2}{3}x + 3$

b. $y - 1 = 2(x + 1)$

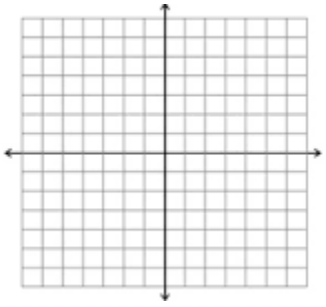
slope: _____

$y - int$: _____



slope: _____

$y - int$: _____



PROBABILITY AND STATISTICS: Represent data using multiple representations and measures of center. Determine the probability of a chance event.

Measures of Center: https://www.khanacademy.org/math/statistics-probability/summarizing-quantitative-data/mean-median-basics/v/statistics-intro-mean-median-and-mode

Probability: https://www.khanacademy.org/math/statistics-probability/probability-library/basic-theoretical-probability/v/basic-probability

Two-Way Tables: https://www.khanacademy.org/math/cc-eighth-grade-math/cc-8th-data/two-way-tables/v/two-way-frequency-tables-and-venn-diagrams

14. The data set below represents the heights of the male teachers at FWHS. Round to the nearest tenth.

Determine the following of the data set:

a. Mean = _____

b. Median = _____

c. Mode = _____

Mens Heights (Inches)

66	65	73	69	73	71	67
67	69	72	71	69	68	70
67	68	66				

15. Ninth grade students were asked whether they participated in an after-school activity. Complete the two-way frequency table below.

After-school Activity

Gender	Yes	No	Total
Male		40	
Female			95
Total	102		187

16. You roll a standard 6-sided die. Find each probability for the number rolled.

a. P(3)

b. P(odd number)

c. P(7)

d. P(number greater than 2)

SYSTEM OF EQUATIONS: Solve systems of equations consisting of two linear equations in two variables algebraically and graphically

Solving Linear Systems by Graphing: https://www.khanacademy.org/math/algebra/systems-of-eq-and-ineq/systems-through-examples/v/solving-linear-systems-by-graphing

Solving Linear Systems by Substitution: https://www.khanacademy.org/math/algebra/systems-of-eq-and-ineq/systems-with-substitution/v/solving-systems-by-substitution-1

Solving Linear Systems by Elimination/Combination: https://www.khanacademy.org/math/algebra/systems-of-eq-and-ineq/solving-systems-addition-elimination/v/solving-systems-by-elimination

Special types of Linear Systems: https://www.khanacademy.org/math/algebra/systems-of-eq-and-ineq/systems-solutions/v/inconsistent-systems-of-equations

17. Solve the following equations for x & y. Use any method.

a. $y = 3x - 4$
$x - 4y = -28$

b. $2x - 3y = 15$
$-2x - 2y = 0$

c. $y = 4x - 1$
$y = -2x - 7$

QUADRATIC EQUATIONS: Solve quadratic equations in one variable using square roots, factoring and quadratic formula

Factoring Quadratic Expressions:
https://www.khanacademy.org/math/algebra/quadratics/factoring_quadratics/v/factoring-quadratic-expressions

Solving Quadratic Equations by Square Roots:
https://www.khanacademy.org/math/algebra/quadratics/quadratics-square-root/v/solving-quadratic-equations-by-square-roots

Solving Quadratic Equations using the Quadratic Formula:
https://www.khanacademy.org/math/algebra/quadratics/quadratic-formula/v/using-the-quadratic-formula

Solving Quadratic Equations by Completing the Square:
https://www.khanacademy.org/math/math2/xe2ae2386aa2e13d6:quad-2/xe2ae2386aa2e13d6:completing-sq/v/solve-completing-square-integer-solutions

18. Factor each expression completely.

a. $x^2 - 25$

b. $x^2 + 2x - 8$

c. $2x^3 + 4x^2 - 6x$

d. $2x^2 - 3x - 9$

19. Solve the following quadratic equations using any method. Non-Calculator, leave solution(s) in simplest radical form.

a. $3x^2 = 48$

b. $x^2 - 12 = 0$

c. $x^2 - 9x - 36 = 0$

d. $2x^2 - 15x - 8 = 0$

20. Using the Quadratic Formula to solve the following quadratic equation. Leave solution(s) in simplest radical form and round to the nearest hundredth.

a. $x^2 + 4x + 2 = 0$

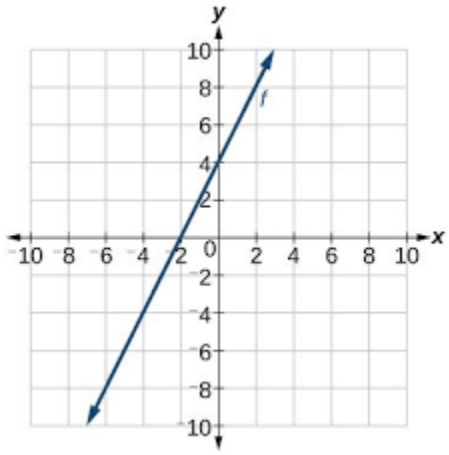
b. $2x^2 - 3x - 4 = 0$

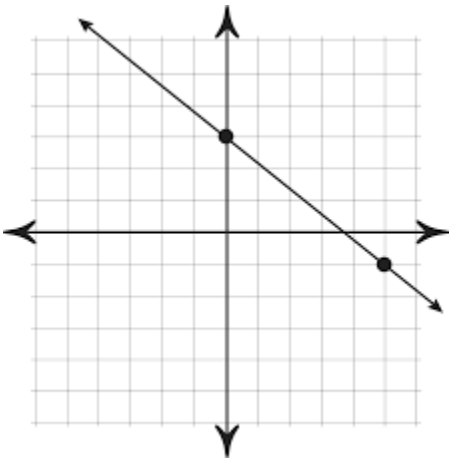
21. Solve the quadratic equation by completing the square. Leave solution(s) in simplest radical form and round to the nearest hundredth.

a. $x^2 - 4x = 5$

b. $x^2 - 10x + 10 = 0$

22. Determine the equation of the given lines. Write your answer in slope-intercept form.



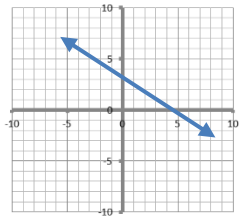


_____

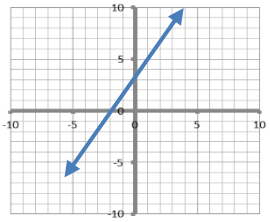
_____

Answer Key

1. a. $right; x + 2x = 90; 30°, 60°; compl.$
   b. $straight; y + y + 40 = 180; 70°; 110°; suppl.$
2. a. $\frac{7}{12}$, b. $\frac{5}{12}$, c. $\frac{2}{3}$
3. a. Not proportional
   b. Proportional
4. $x = 9.6$
5. $x = 7$
6. $x = -14$
7. a. $x = \sqrt{192}$ *or* 13.86; b. $x = 5$
8. a. $2\sqrt{5}$; $b. 3\sqrt{5}$; $c. 6\sqrt{2}$
9. $C = 16\pi$ *or* $50.67cm, A = 64\pi$ *or* $201.06cm^2$
10. a. 6; b. $2x^2 + x$; c. $6x - 16$; d. -10
11. a. $x = 3$; b. $x = -3.5$; c. $x = 1$; d. $x = \frac{1}{2}$; e. $x = 30$
12. *slope of* $\overleftrightarrow{MN} = \frac{1}{4}$, *parallel to* $\overleftrightarrow{MN} = \frac{1}{4}$, *perpendicular to* $\overleftrightarrow{MN} = -4$
11. a. *slope*: $-\frac{2}{3}, y - int$: 3



b. *slope*: $2, y - int$: 3



14. a. 68.9
    b. 69
    c. 67 and 69

15.

	Yes	No	Total
Male	*52*	40	*92*
Female	*50*	*45*	95
Total	102	*85*	187

16. a. $\frac{1}{6}$
    b. $\frac{1}{2}$
    c. 0
    d. $\frac{2}{3}$

17. a. $x = 4, y = 8$ *or* $(4, 8)$
    b. $x = 3, y = -3$ *or* $(3, -3)$
    c. $x = -1, y = -5$ *or* $(-1, -5)$
18. a. $(x + 5)(x - 5)$
    b. $(x + 4)(x - 2)$
    c. $2x(x + 3)(x - 1)$
    d. $(2x + 3)(x - 3)$
19. a. $x = \pm 4$
    b. $x = \pm 2\sqrt{3}$
    c. $x = 12, -3$
    d. $x = -\frac{1}{2}, 8$
20. a. $x = -2 \pm \sqrt{2}$ = -0.59, -3.41
    b. $x = \frac{3+\sqrt{41}}{4} = 2.35, -0.85$
21. a. $x = 5, -1$; b. $x = 5 \pm \sqrt{15}$
22. a. $y = 2x + 4$; b. $y = -\frac{4}{5}x + 3$

Thinking Tasks:

1. **How many 7s?**

If I were to write the numbers from 1 to 1000, how many times would I use the digit 7? Show your method of reaching your answer. (on another sheet of paper)

2. **1,001 Pennies**

a) There are 1001 pennies lined up on a table. How much money do I have?
b) Starting at one end of the line, I replace every second coin with a nickel. Now how much money is on the table?
c) I then go back to the beginning of this new line and replace every third coin with a dime. Now how much money is on the table?
d) Finally, I go back to the beginning of this new line and replace every fourth coin with a quarter. How much money is on the table?

Show your methods / thinking! (Use a separate sheet of paper)

3. **Split 25**

Decompose the number 25 using addition.

Examples:

25 = 10 + 15,

25 = 10 + 10 + 5,

25 = 3 + 3 + 3 + 16

What is the biggest product you can make if you multiply the addends together? Show your thinking / work!

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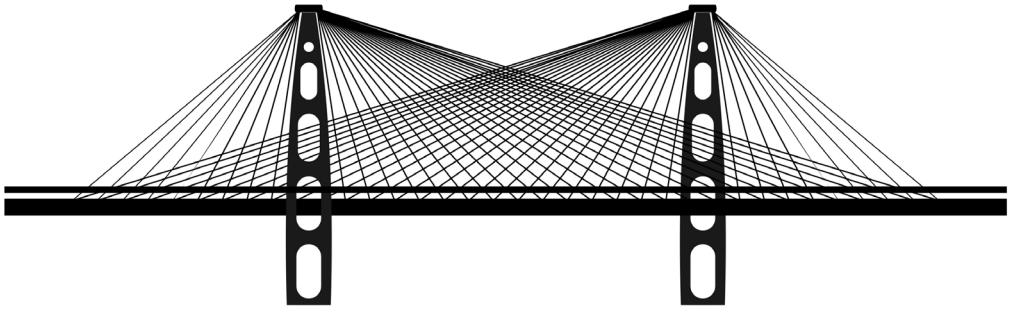
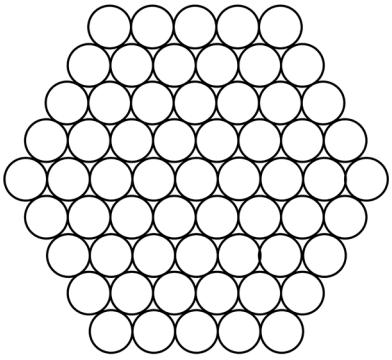
Suspension Bridge Handout





When making a cable for a suspension bridge many strands are assembled into a hexagonal formation and them compacted together. The diagram illustrates a 'size 5' cable made up of 61 strands.

How would the patterns grow?

How many strands are needed for a size 10 cable?

What about a cable of any size?

Use at least four representations to show how the pattern is growing: words, graph, table, visual, or algebraic expression. Show the connections between the representations using color-coding, arrows, and words.

Adapted from Bell, A. (1995). Purpose in School Algebra. The Journal of Mathematical Behavior, 14(1), 41-73.

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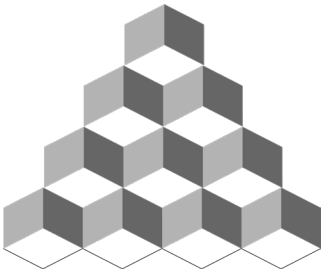
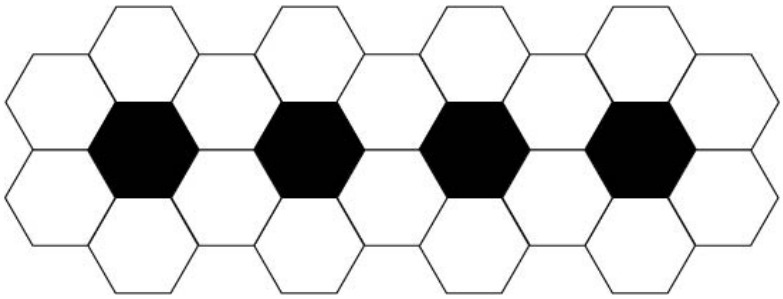


Flowerbed Handout



The colored hexagons are flowerbeds surrounded by white tiles.

How do you see the pattern growing?

How many tiles would surround 10 flowerbeds?

How many tiles would you need for any number of flowerbeds?

Use at least four representations to show how the pattern is growing: words, graph, table, visual, or algebraic expression. Show the connections between the representations using color-coding, arrows, and words.

Adapted from Problems with Patterns and Numbers. (1984). Nottingham: Shell Centre.

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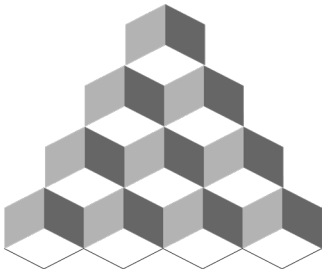
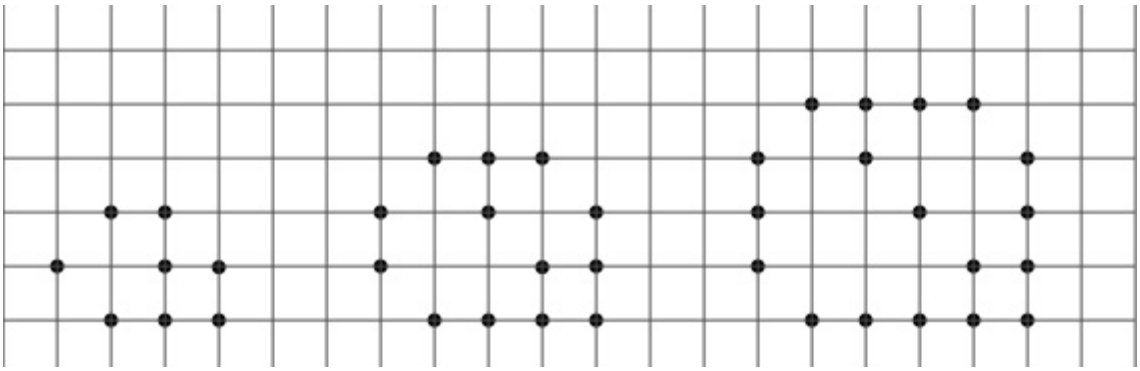


Dotty Pattern Handout



How do you see the pattern growing?

How many dots will be in the tenth case

How many dots would be in any case?

Use at least four representations to show how the pattern is growing: words, graph, table, visual, or algebraic expression. Show the connections between the representations using color-coding, arrows, and words.

Visual pattern from http://www.visualpatterns.org/121-140.html

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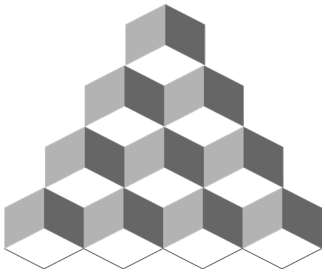
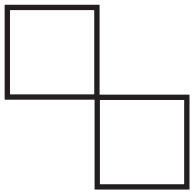
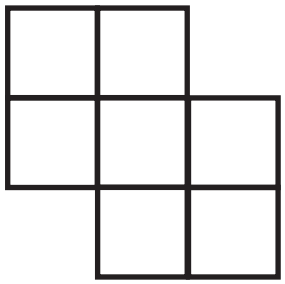


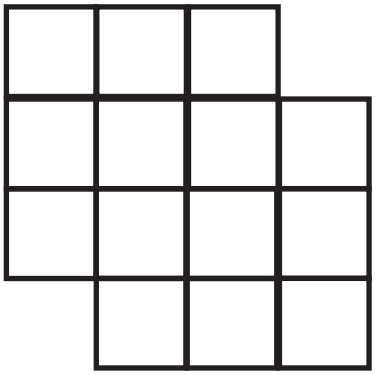
Squares Over Squares Handout



Case 1



Case 2



Case 3

How do you see the pattern growing?

How many unit squares will be in the tenth case?

How many unit squares would be in any case?

Use at least four representations to show how the pattern is growing: words, graph, table, visual, or algebraic expression. Show the connections between the representations using color-coding, arrows, and words.

Visual pattern from http://www.visualpatterns.org/121-140.html

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