

# Patterns in Charts



## Quick Review

Look at this hundred chart.

- There is a pattern in the circled numbers.  
The **pattern rule** is:  
Start at 3. Count on by 3s.
- There is a pattern in the positions of the squares with circles.  
The **pattern rule** is:  
The squares with circles lie along every third diagonal.  
The diagonals go 1 down, 1 left.

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

## Try These

1. Look at the squares with circled numbers on this hundred chart.
- a) Describe the position pattern.

\_\_\_\_\_

\_\_\_\_\_

- b) Write the number pattern.

\_\_\_\_\_

\_\_\_\_\_

- c) Write a pattern rule for the number pattern.

\_\_\_\_\_

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

- d) Circle numbers to complete the pattern on the hundred chart.

## Practice

1. **a)** Start at 102. Count on by 2s. Circle these numbers.
- b)** Start at 102. Count on by 5s. Put an X on each number.
- c)** Write the numbers that have both an X and are circled.

101	102	103	104	105	106	107	108	109	110
111	112	113	114	115	116	117	118	119	120
121	122	123	124	125	126	127	128	129	130
131	132	133	134	135	136	137	138	139	140
141	142	143	144	145	146	147	148	149	150
151	152	153	154	155	156	157	158	159	160
161	162	163	164	165	166	167	168	169	170
171	172	173	174	175	176	177	178	179	180
181	182	183	184	185	186	187	188	189	190
191	192	193	194	195	196	197	198	199	200

- \_\_\_\_\_
- \_\_\_\_\_
- d)** Write the pattern rule for the number pattern in part c.
- \_\_\_\_\_

2. Look at the squares with circled numbers in this multiplication chart.

- a)** Write a pattern rule for the position pattern.

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

- b)** Write a pattern rule for the number pattern.

\_\_\_\_\_

\_\_\_\_\_

×	1	2	3	4	5	6	7
1	1	2	3	4	5	6	7
2	2	4	6	8	10	12	14
3	3	6	9	12	15	18	21
4	4	8	12	16	20	24	28
5	5	10	15	20	25	30	35
6	6	12	18	24	30	36	42
7	7	14	21	28	35	42	49

## Stretch Your Thinking

Follow this position rule. Put an X in the squares on the chart. The squares with an X lie along every third diagonal, starting at the first diagonal. The diagonals go 1 down and 1 right.

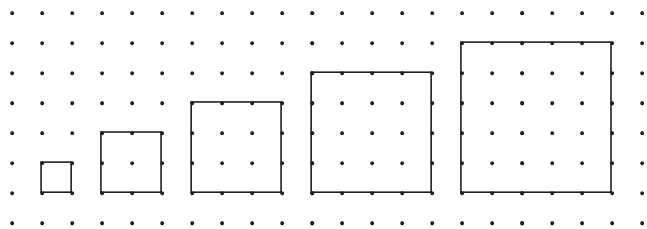
1	2	3	4	5	6	7	8	9	10	11	12
13	14	15	16	17	18	19	20	21	22	23	24
25	26	27	28	29	30	31	32	33	34	35	36
37	38	39	40	41	42	43	44	45	46	47	48

# Extending Number Patterns



## Quick Review

► Here is a pattern of squares drawn on dot paper.



Square	Number of Dots on Perimeter
1	4
2	8
3	12
4	16
5	20

One pattern rule for the number of dots on the perimeter is:

Start at 4. Add 4 each time.

Another pattern rule for the number of dots is:

Multiply the square number by 4.

► The number of dots on any perimeter is a number we get when we start at 0 and skip count by 4.

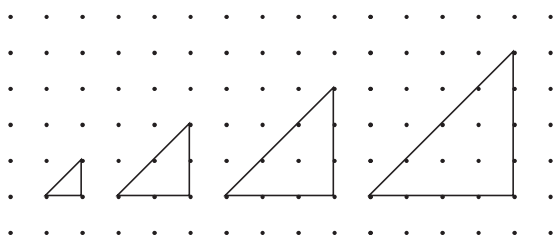
For the 10th square, skip count by 4 ten times:

4, 8, 12, 16, 20, 24, 28, 32, 36, 40

The 10th square will have 40 dots on its perimeter.

## Try These

1. a) Complete the table for this pattern.



Triangle	Number of Dots on Perimeter
1	
2	
3	
4	

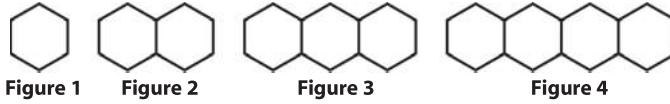
b) Write the pattern rule. \_\_\_\_\_

c) Which triangle will have 21 dots? \_\_\_\_\_ 30 dots? \_\_\_\_\_

d) Will any triangle have 22 dots? \_\_\_\_\_  
Why or why not? \_\_\_\_\_

## Practice

1. a) Complete the table for this pattern of regular hexagons.



The side length of each hexagon is 1 unit.

- b) Write the pattern rule for the perimeters.  
\_\_\_\_\_

Figure	Perimeter (units)
1	6
2	
3	
4	

- c) Which figure will have a perimeter of 22 units? \_\_\_\_\_ 34 units? \_\_\_\_\_
- d) Predict the perimeter of the 10th figure. \_\_\_\_\_
- e) Will any figure have a perimeter of 40 units? Explain. \_\_\_\_\_  
\_\_\_\_\_

2. a) Complete the table for this pattern.

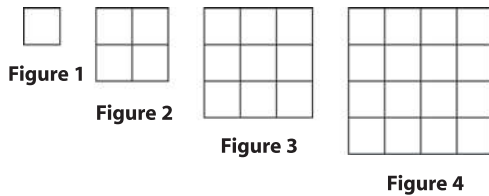


Figure	Perimeter (units)	Area (square units)
1		
2		
3		
4		

- b) Write the pattern rule for the areas.  
\_\_\_\_\_  
\_\_\_\_\_

## Stretch Your Thinking

1. a) Which figure in question 2 will have a perimeter of 60 units? \_\_\_\_\_  
What will its area be? \_\_\_\_\_
- b) Which figure in question 2 will have an area of 81 square units? \_\_\_\_\_  
What is its perimeter? \_\_\_\_\_

# Representing Patterns



## Quick Review

Here is a pattern.

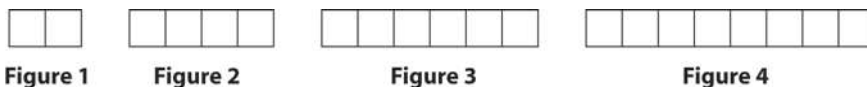
From the table, the Squares in a Figure increase by 2.

Here are 2 different ways to build this pattern:

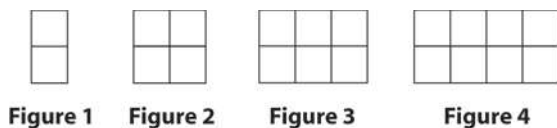
Figure	Squares in Figure
1	2
2	4
3	6
4	8

} + 2  
} + 2  
} + 2

### Pattern 1



### Pattern 2



The pattern rule for the number of squares in a figure is:  
Start at 2. Add 2 each time.

## Try These

1. a) Use counters to build this pattern.  
Record the pattern below.

Figure	Counters in a Figure
1	1
2	3
3	5
4	7

- b) What is a pattern rule?

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## Practice

1. a) Use toothpicks to build this pattern.  
Draw the pattern below.

Figure	Toothpicks in a Figure
1	2
2	4
3	6
4	8

- b) Write a pattern rule. \_\_\_\_\_
- c) How many toothpicks would be in the eighth figure? \_\_\_\_\_

2. a) Use counters to build this pattern.  
Record the pattern below.

Figure	Counters in a Figure
1	2
2	5
3	8
4	11

- b) Build the pattern in a different way.  
Record the pattern below.

- c) Write a pattern rule: \_\_\_\_\_

## Stretch Your Thinking

Choose a pattern rule.  
Complete the data in the table.  
Draw the pattern below.

Figure	Squares in a Figure
1	
2	
3	
4	

# Equations Involving Addition and Subtraction

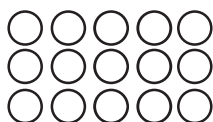


## Quick Review

Here are 3 ways to solve this subtraction equation:  $15 - \square = 6$

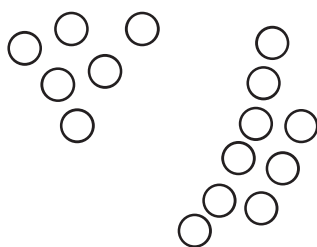
- Use counters.

Put out 15 counters.

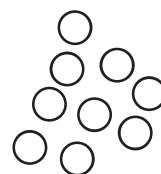


So,  $15 - 9 = 6$

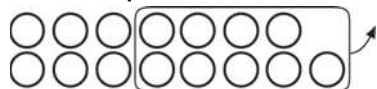
Take away all but 6 counters.



Count the counters you took away.



- Draw a picture.



$15 - 9 = 6$

$\square = 9$  is the solution to the equation.

- Use guess and test.

Guess:  $\square = 7$

Test:  $15 - 7 = 8$  This is too low.

Guess:  $\square = 9$

Test:  $15 - 9 = 6$  This is correct.

## Try These

- Use counters to solve each equation.

Rewrite each equation.

Replace the symbol with the correct value.

a)  $8 + \square = 40$

\_\_\_\_\_

b)  $25 - \square = 15$

\_\_\_\_\_

c)  $\square + 17 = 24$

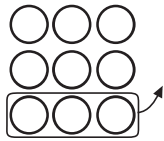
\_\_\_\_\_

d)  $\square - 25 = 20$

\_\_\_\_\_

## Practice

1. Write an equation for each set of counters.

a)  \_\_\_\_\_

b)  \_\_\_\_\_

2. Use counters to solve each equation.

a)  $\triangle - 8 = 8$

b)  $7 + \triangle = 24$

c)  $15 - \triangle = 13$

$\triangle = \underline{\hspace{2cm}}$

$\triangle = \underline{\hspace{2cm}}$

$\triangle = \underline{\hspace{2cm}}$

3. Draw a picture to solve each equation.

a)  $19 - \square = 14$

b)  $\square + 5 = 16$

$\square = \underline{\hspace{2cm}}$

$\square = \underline{\hspace{2cm}}$

4. Use guess and test to solve each equation.

a)  $53 + \square = 68$

b)  $37 - \triangle = 14$

$\square = \underline{\hspace{2cm}}$

$\triangle = \underline{\hspace{2cm}}$

5. Write a story problem you could solve using the equation:  $20 = 38 - \square$   
Solve the equation.

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## Stretch Your Thinking

Solve:  $126 + \square + 847 = 1000$

$\square = \underline{\hspace{2cm}}$



# Equations Involving Multiplication and Division



## Quick Review

Here are 3 ways to solve this multiplication equation:  $4 \times \square = 12$

- Use counters.

Put out 12 counters. Divide the counters into 4 equal groups.



- Draw a picture.



$$4 \times 3 = 12$$

$\square = 3$  is the solution to the equation.

- Use mental math.

Think of a related division fact.

What do we divide 12 by to get 4?

$$12 \div 3 = 4$$

$$\text{So, } 4 \times 3 = 12$$

## Try These

1. Use counters to solve each equation.

a)  $5 \times \square = 20$

$\square = \underline{\hspace{2cm}}$

b)  $24 \div \square = 6$

$\square = \underline{\hspace{2cm}}$

c)  $\square \div 3 = 6$

$\square = \underline{\hspace{2cm}}$

d)  $\square \times 8 = 32$

$\square = \underline{\hspace{2cm}}$

e)  $2 \times 3 = \square$

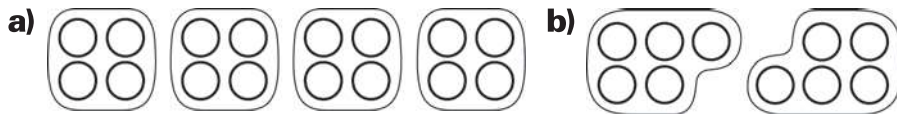
$\square = \underline{\hspace{2cm}}$

f)  $7 \times 6 = \square$

$\square = \underline{\hspace{2cm}}$

## Practice

1. Write a multiplication and division equation for each picture.



\_\_\_\_\_

\_\_\_\_\_

2. Draw a picture to solve each equation.

a)  $9 \times \square = 18$

b)  $14 \div \square = 2$

c)  $\square \times 6 = 12$

$\square =$  \_\_\_\_\_

$\square =$  \_\_\_\_\_

$\square =$  \_\_\_\_\_

3. Use mental math to solve each equation.

a)  $\square \times 9 = 81$

b)  $21 \div \triangle = 3$

c)  $3 \times \triangle = 27$

$\square =$  \_\_\_\_\_

$\triangle =$  \_\_\_\_\_

$\triangle =$  \_\_\_\_\_

4. Write a story problem that could be solved by using this equation:  $28 \div \square = 7$ .  
Solve the problem.

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

## Stretch Your Thinking

Use these numbers and some of these symbols: 3, 4,  $\square$ ,  $\times$ ,  $\div$ ,  $=$ .

Write as many different equations as you can.