

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 3.

- 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

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

- Write the number pattern.

- 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

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

Practice

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

- d) Write the pattern rule for the number pattern.

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

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.

X	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

Exploring Number Patterns

Quick Review



- The first four **terms** are the **core** of this **repeating pattern**.

2 8 2 9 2 8 2 9 2 8 2 9 ...

The core of a pattern is the smallest part that repeats.

- In a **growing pattern**, the numbers get bigger in a predictable way.

1 6 11 16 21

Pattern rule: Start at 1. Add 5 each time.

1 3 9 27

Pattern rule: Start at 1. Multiply by 3 each time.

1 2 4 7 11 16 22

Pattern rule: Start at 1. Add 1. Increase the number you add by 1 each time.

- In a **shrinking pattern**, the numbers get smaller in a predictable way.

71 66 61 56 51 46

Pattern rule: Start at 71. Subtract 5 each time.

Try These

1. Write the next three terms for each pattern.

a) 4, 7, 10, 13, _____

b) 5, 1, 2, 5, 1, 2, 5, 1, 2, _____

c) 3, 6, 12, 24, _____

d) 2, 3, 5, 8, 12, _____

e) 59, 56, 53, 50, _____

Practice

1. Write the next four terms for each pattern. Write the pattern rule.

a) 1, 3, 6, 10, 15, _____

Rule: _____

b) 1, 2, 2, 3, 3, 3, _____

Rule: _____

2. Write a repeating pattern. Circle the core.

3. a) Write the first six terms of a growing pattern using multiplication.

b) Write the pattern rule. _____

Stretch Your Thinking

You decide to work out 5 minutes the first day, 6 minutes the second day, 8 minutes the third day, 11 minutes the fourth day, and so on.

a) Record and extend the pattern in the table.

b) On which day will you work out for exactly one hour? _____

c) Write the pattern rule.

Day	Time in Minutes
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	

Number Patterns with a Calculator



Quick Review

Explore number patterns with a 4-function calculator.

- Count by 8s starting at 15.

Press 15 $+$ 8 $=$ $=$ $=$...

The pattern is:

15, 23, 31, 39, 47, 55, 63, 71, 79, 87, ...

This is a growing pattern.

It has a repeating pattern in the ones digits:

5, 3, 1, 9, 7, 5, 3, 1, 9, 7, ...

Its core is 5, 3, 1, 9, 7.

- Start at 1. Multiply by 4 repeatedly.

Press 4 \times 1 $=$ $=$ $=$...

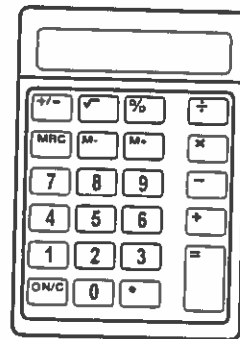
The pattern is: 1, 4, 16, 64, 256, 1024, 4096, ...

This is a growing pattern.

It has a repeating pattern in the ones digits:

1, 4, 6, 4, 6, 4, 6, ...

Its core is 4, 6.



Try These

- Start with 7. Count by 12s. Record the first ten terms.

- Record the pattern in the ones digits. Circle its core.

- Start with 2. Multiply by 4 repeatedly. Record the first six terms.

- Record the pattern in the ones digits. Circle its core.

Practice

1 Record the next three terms. Write the rule.

a) 425, 470, 515, 560, 605, 650, _____

Rule: _____

b) 742, 712, 682, 652, 622, 592, _____

Rule: _____

2. a) Write a 3-digit number with all the digits the same. _____

Add the digits of your number. _____

Divide your 3-digit number by the sum of the digits. _____

Repeat for three other 3-digit numbers in which
all the digits are the same.

b) What do you notice? _____

3. a) Choose any 2-digit number. _____

Multiply your number by 101. _____

Repeat with three other 2-digit numbers.

b) What do you notice? _____

Stretch Your Thinking

a) Record the next six terms of this pattern.

1, 4, 9, 16, 25, 36, _____

b) What pattern rule did you follow?

Equations Involving Addition



Quick Review

Here are the addition facts for the number 8.

- | | | |
|-------------|-------------|--|
| $0 + 8 = 8$ | $5 + 3 = 8$ | Look at the pattern in the numbers that are added.
The first number in each fact increases by 1:
0, 1, 2, 3, ... |
| $1 + 7 = 8$ | $6 + 2 = 8$ | |
| $2 + 6 = 8$ | $7 + 1 = 8$ | The second number in each fact decreases by 1:
8, 7, 6, 5, ... |
| $3 + 5 = 8$ | $8 + 0 = 8$ | |
| $4 + 4 = 8$ | | |

An **equation** is a number sentence that shows two things are equal.

An addition fact is an equation.

$$9 + 3 = 12$$

You can use any pair of addition facts for a number to make an equation.

$$5 + 3 = 4 + 4$$

$$5 + 3 = 8 \text{ and } 4 + 4 = 8,$$

so,

$$5 + 3 = 4 + 4$$

Try These

1. Complete each pattern.

a)

$$0 + 11 = 11$$

$$1 + 10 = 11$$

$$2 + 9 = 11$$

b)

$$15 + 0 = 15$$

$$14 + 1 = 15$$

$$13 + 2 = 15$$

2. Find the missing number in each equation.

- a) $8 + \underline{\quad} = 17$ b) $\underline{\quad} + 10 = 21$ c) $12 = \underline{\quad} + 7$ d) $16 = 8 + \underline{\quad}$

Practice

1. Find the number that completes each equation. Use counters to help.

a) $2 + 8 = 4 + \underline{\quad}$

b) $4 + 9 = \underline{\quad} + 10$

c) $\underline{\quad} + 5 = 9 + 9$

d) $5 + \underline{\quad} = 3 + 11$

e) $4 + 11 = \underline{\quad} + 3$

f) $7 + 6 = 3 + \underline{\quad}$

2. Find all the ways of making each statement an equation.

a) $7 + 6 = \underline{\quad} + \underline{\quad}$

b) $10 + 2 = \underline{\quad} + \underline{\quad}$

3. a) Find two ways to write 12 as a sum of three numbers.

$$\underline{\quad} + \underline{\quad} + \underline{\quad} = 12$$

$$\underline{\quad} + \underline{\quad} + \underline{\quad} = 12$$

b) Find two ways to write 17 as a sum of three numbers.

$$17 = \underline{\quad} + \underline{\quad} + \underline{\quad}$$

$$17 = \underline{\quad} + \underline{\quad} + \underline{\quad}$$

Stretch Your Thinking

1. a) Jillian has 125 guppies and 40 tetras. Ling has 65 different kinds of fish. How many more fish does Ling need so that he and Jillian have an equal number of fish? $\underline{\hspace{2cm}}$

b) Write an equation to show your answer. $\underline{\hspace{4cm}}$

Equations Involving Subtraction

Quick Review

Here are the subtraction facts you can make with 7 counters.

$7 - 7 = 0$	$7 - 3 = 4$	Look at the pattern in the numbers. The number that is subtracted decreases by 1: 7, 6, 5, 4, 3, 2, 1, 0
$7 - 6 = 1$	$7 - 2 = 5$	
$7 - 5 = 2$	$7 - 1 = 6$	The difference increases by 1: 0, 1, 2, 3, 4, 5, 6, 7
$7 - 4 = 3$	$7 - 0 = 7$	

You can use a pair of subtraction facts to make an equation.

The differences must be the same.

$$9 - 4 = 12 - 7$$

$$9 - 4 = 5 \text{ and } 12 - 7 = 5,$$

so,

$$9 - 4 = 12 - 7$$



Try These

1. Complete each pattern.

a)

$$13 - 0 = 13$$

$$13 - 1 = 12$$

$$13 - 2 = 11$$

b)

$$11 - 11 = 0$$

$$11 - 10 = 1$$

$$11 - 9 = 2$$

2. Find the missing number in each equation.

a) $16 - \underline{\quad} = 9$

b) $12 = 20 - \underline{\quad}$

c) $8 = \underline{\quad} - 4$

d) $\underline{\quad} - 10 = 16$

Practice

1. Find the number that completes each equation. Use counters to help.

a) $17 - 9 = 13 - \underline{\quad}$

b) $15 - 6 = \underline{\quad} - 9$

c) $13 - \underline{\quad} = 10 - 1$

d) $\underline{\quad} - 12 = 9 - 2$

e) $11 - 7 = 16 - \underline{\quad}$

f) $\underline{\quad} - 5 = 14 - 3$

2. Find four ways of making each statement an equation.

a) $15 - 8 = \underline{\quad} - \underline{\quad}$

b) $17 - 3 = \underline{\quad} - \underline{\quad}$

3. Renée had 14 bunnies and Arden had 12.

Renée sold 5 bunnies.

How many bunnies would Arden have to sell so that he and Renée have an equal number of bunnies? _____

Write an equation to show your answer. _____

4. Explain how you know that $22 - 7 = 35 - 20$ is an equation.

Stretch Your Thinking

Use each of these numbers once.

Write three equations using subtraction facts.

1	2	3	4
5	6	7	8
9	10	11	12