

The KNAER Math Knowledge Network presents:

Hour of *Math* + Code

4-10 December 2017
during Computer Science Education Week

In partnership with:



ACSE - Association for Computer Studies Educators



BACK ←
TO THE FUTURE

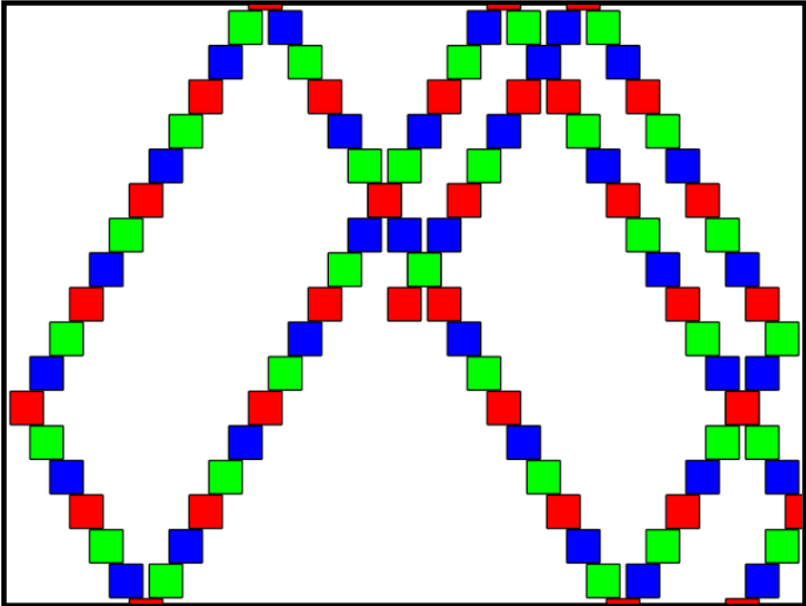
**We are bringing back to the future
Coding for Young Mathematicians**

mathnetwork.ca/future

1. Repeating Patterns

Go to researchideas.ca/patterns

Click on Example #1. Click on Run This Code. Study the code and the result.

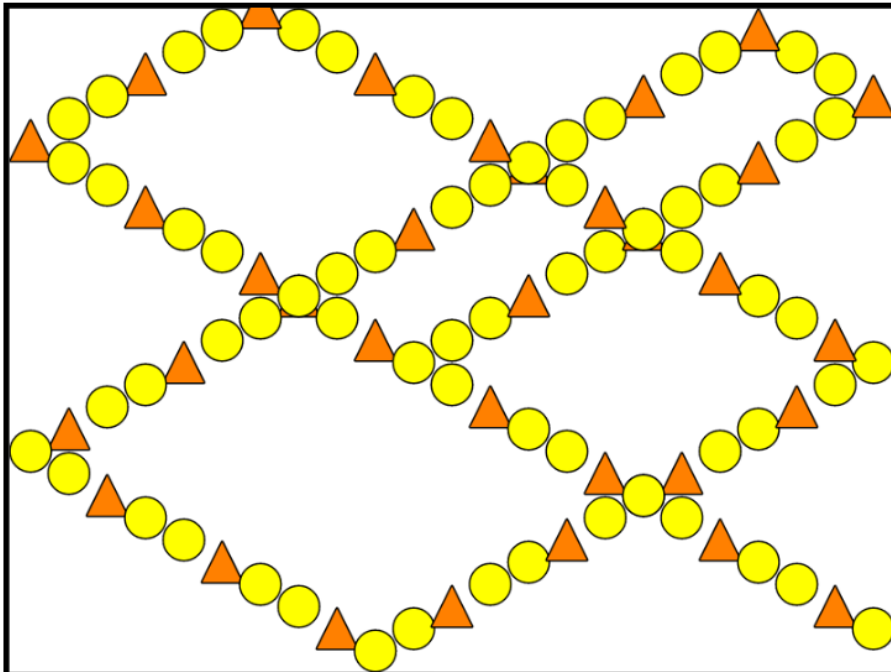


```
clear paths
new pattern
set size to 20
set rotation to 0
set x to 400
set y to 300
set angle to 60
set step size to 40
set stamp rate to 5
add red square to pattern
add green square to pattern
add blue square to pattern
repeat 100 times
do stamp
```

Clear All Clear Paths Stop Patterns Add Pattern Remove Pattern Sound Off [Save Image](#) Run This Code Run All Code Show Code Copy Paste

Puzzle #1

Edit the code to get this result:

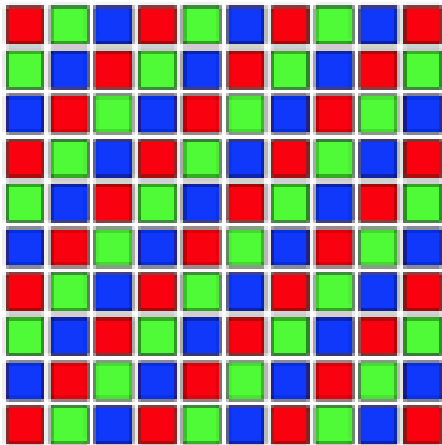


Puzzle #2

Refresh your browser.

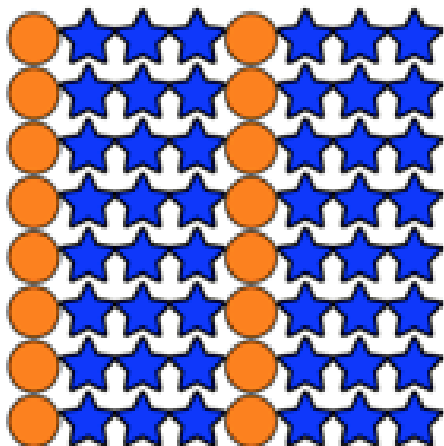
Edit the code to match changes circled at right.

Click on Run This Code to get this result.



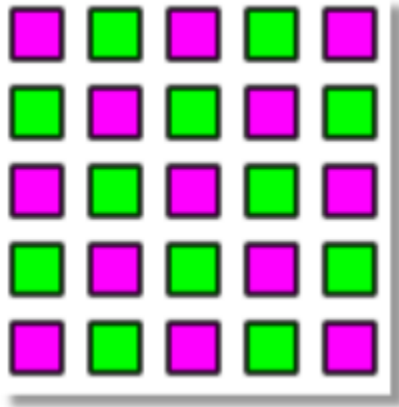
```
clear paths
new pattern
set size to 20
set rotation to 0
set x to 200
set y to 500
set angle to 0
set step size to 40
set stamp rate to 10
add red square to pattern
add green square to pattern
add blue square to pattern
repeat 10 times
do
  repeat 10 times
  do stamp
  set x to 200
  change y by -40
```

Edit the code to get this result:



Puzzle #3

Edit the code to get this result:



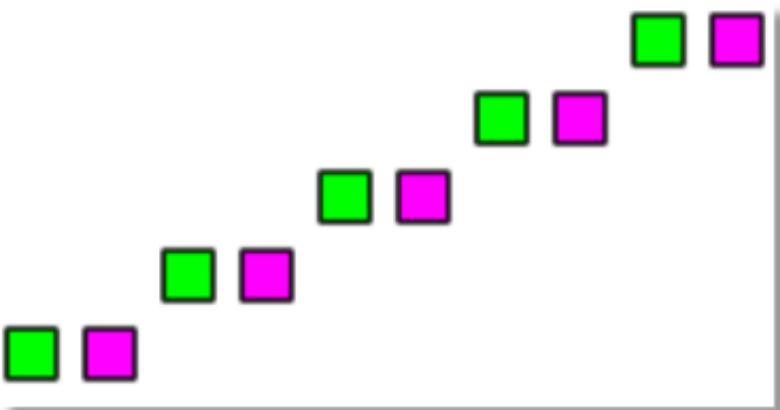
Puzzle #4

Edit the code to get this result:



Puzzle #5

Edit the code to get this result:

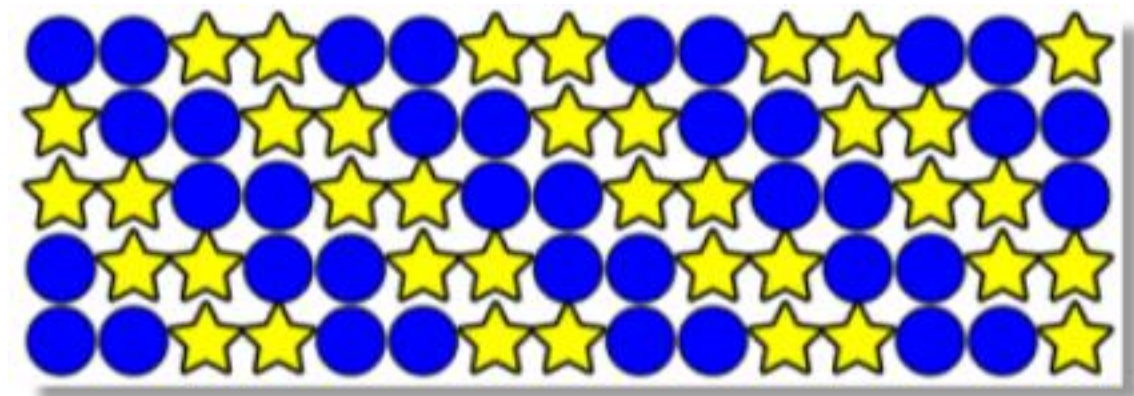


More?

Can't get enough of math + coding? Go to researchideas.ca/patterns

Get the **PDF tutorials**: on Repeating Patterns and Fractions

- Learn more ways to code repeating patterns.
- Learn to code fraction representations with repeating patterns.



Making Challenges

Visit janettehughes.ca/lab/steam-challenges to investigate Making Challenges with repeating patterns!




































2. Number Patterns

Numbers are beautiful. Especially on a grid.

1	2		4	5		7	8		10
11		13	14		16	17		19	20
	22	23		25	26		28	29	
31	32		34	35		37	38		40
41		43	44		46	47		49	50
	52	53		55	56		58	59	
61	62		64	65		67	68		70
71		73	74		76	77		79	80
	82	83		85	86		88	89	
91	92		94	95		97	98		100

Go to researchideas.ca/numbers

Click on Run Code. Study the code and the result.

1	2		4	5		7	8		10
11		13	14		16	17		19	20
	22	23		25	26		28	29	
31	32		34	35		37	38		40
41		43	44		46	47		49	50
	52	53		55	56		58	59	
61	62		64	65		67	68		70
71		73	74		76	77		79	80
	82	83		85	86		88	89	
91	92		94	95		97	98		100

New Puzzle Clear Canvas

Logic
Loops
Math
Variables
Grid
Effects
Puzzle



```

reset grid
set animation speed to fast
set number to 1
repeat 100 times
do
  if number mod 3 = 0
  do
    create green Gork in front of number
  change number by 1
  
```

Run Code Show Code Example #1 Example #2 Example #3
Save Code Load Code




Puzzle #1

Click on **Example #1**. Click on Run Code. Study the code and the result.
Edit the code to get this result:

1	2	3	4	5	6	7	8	9	10
11	12	13	14		16	17	18	19	
21	22	23	24		26	27	28	29	
31	32	33	34		36	37	38	39	
41	42	43	44		46	47	48	49	
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
















































Puzzle #2

Click on **Example #2**. Click on Run Code. Study the code and the result.
Edit the code to get this result:

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

















































Puzzle #3

Click on **Example #3**. Click on Run Code. Study the code and the result.
Edit the code to get this result:

1	2		4			7	8		
11		13	14		16	17		19	
	22	23			26		28	29	
31	32		34			37	38		
41		43	44		46	47		49	
	52	53			56		58	59	
61	62		64			67	68		
71		73	74		76	77		79	
	82	83			86		88	89	
91	92		94			97	98		

Puzzle #4

Click on **Example #2**. Click on Run Code. Study the code and the result.
Edit the code to get this result:

1	2			5		7		
	10	11		13	14			
17		19			22	23		
25	26			29		31		
	34	35		37	38			
41		43		45		46	47	
49	50			53		55		
	58	59		61	62			
65		67			70	71		
73	74			77		79		
	82	83		85	86			
89		91			94	95		

More?

MORE PUZZLES

Click on New Puzzle. Study the pattern of circled numbers. Can you create code that decorates the circled numbers differently from the rest?

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

CREATE PUZZLES

Create your own puzzle. Then, save and share for others to solve. Here is some sample code.

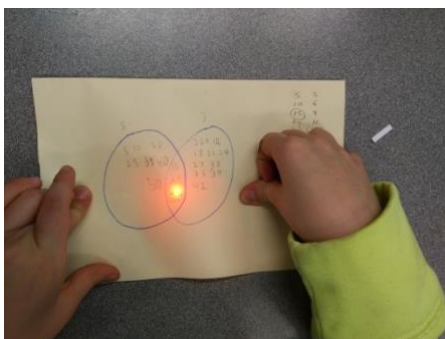
SAVE & SHARE

Click on Save Code and name your project. The URL that appears under the Project Name can be shared.

```
reset grid
clear current puzzle
set number to 1
repeat 50 times
do
  if number mod 7 = 0
  do
    circle number red
  change number by 1
```

Making Challenges

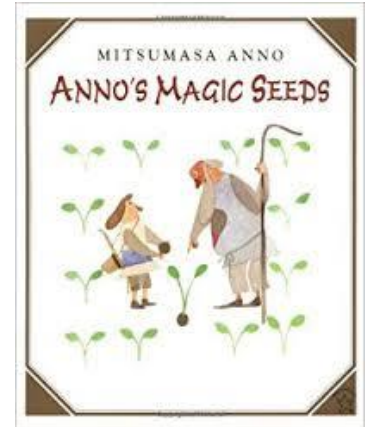
Visit janettehughes.ca/lab/steam-challenges to investigate Making Challenges with number patterns!



3. Growing Patterns

In the story *Anno's Magic Seeds*, Jack has 2 magic seeds. Each seed will sustain him for 1 year. Each seed planted also produces 2 new seeds in one year.

In Year 1, Jack eats 1 seed and plants the other, to get 2 new seeds. In Year 2, Jack eats 1 seed and plants the other, to get 2 new seeds. He continues like this for a number of years.



Go to researchideas.ca/seeds

Click on Example #1, and then on Run Code, to model this pattern.

```
reset
set animation speed to slow
set seed size to 10
set grown seeds colour to blue
set eaten seeds colour to red
set seeds to 2
set seeds eaten to 1
set year to 1
repeat 10 times
do
  set seeds to seeds - seeds eaten
  set seeds grown to seeds * 2
  set seeds to seeds grown
  display data
  wait 1 seconds
  change grown seeds colour by 0
  change year by 1
```

Puzzle #1

What would happen if Jack finds something else to eat, and does not eat any of the seeds?

Would he have 10 seeds more at the end of the 10 years?

How could you edit the code to model this pattern?



Puzzle #2

In the story, eventually Jack decides to plant both seeds, and eat something else that year. The 2 seeds grow into 4 seeds. Next year, he eats 1 seed, and plants 3, to get 6 seeds. He then eats 1 seed and plants 5. How will his number of seeds grow if he continues in this way?

Click on Example #2, and then on Run Code, to model this pattern.

Jack has a partner named Alice. Suppose they start with 2 seeds. How should Jack and Alice plan what they eat and plant?

Edit the code to model their plan.

SAVE & SHARE

Click on Save Code and name your project. The URL that appears under the Project Name can be shared.

With Python

Go to cscircles.cemc.uwaterloo.ca/console

Enter the code below. Click on Run Program. Study the code and the output.

How is it similar to, or different from, the code that solves Puzzle 1?

```
1 seeds = 2
2 for year in range(1,11):
3     if year == 1:
4         eaten = 0
5     else:
6         eaten = 1
7     planted = seeds - eaten
8     grown = planted * 2
9     seeds = seeds + grown - eaten - planted
10    print (year, seeds)
```

Making Challenges

Visit janettehughes.ca/lab/steam-challenges to investigate Making Challenges with growing patterns!

