SMILE WORKCARDS

Patterns and Generalisations Pack One

Contents

You will need: 100 square, red pencil, blue pencil

COLUMNS

(1) Take a
       100 square.

(2) Shade this
    column red.

(3) Shade this column
    blue.

(4) Here **is** a pattern from the numbers in the red column:-

$$2 \rightarrow \quad\quad 2 = 2$$
$$12 \rightarrow 1 + 2 = 3$$
$$22 \rightarrow 2 + 2 = 4$$
$$32$$
$$42$$
$$\cdot$$
$$\cdot$$
$$\cdot$$
$$\cdot$$
$$\cdot$$
$$92$$

Copy the pattern and
       finish it.

(5) Do the same for the
    numbers in the blue
    column.

$$4 \rightarrow \quad\quad 4 = 4$$
$$14 \rightarrow 1 + 4 = 5$$
$$24$$
$$\cdot$$
$$\cdot$$
$$\cdot$$
$$\cdot$$
$$\cdot$$

(6) Make another number pattern, like these, using any other column.

You will need: 100 square, red pencil, blue pencil

100 square patterns

(1) Take a 100 square.

(2) Shade these numbers red

(3) Shade these numbers blue

1	2	3	▓	5	6	▓	8	9	10
11	12	▓	14	15	▓	17	18	19	20
21	▓	23	24	▓	26	27	28	29	30
▓	32	33	▓	35	36	37	38	39	40
41	42	▓	44	45	46	47	48	49	50
51	▓	53	54	55	56	57	58	59	60
▓	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

(4) Here is a pattern from the red numbers:

$4 \longrightarrow \quad 4 = 4$

$13 \longrightarrow 1 + 3 = 4$

$22 \longrightarrow$

$31 \longrightarrow$

Copy the pattern and
finish it.
Space your numbers carefully.

---

(5) Do the same for the
blue numbers.

$7 \longrightarrow \quad 7 = 7$

$16 \longrightarrow 1 + 6 = 7$

$25 \longrightarrow$

$\vdots$

$61 \longrightarrow$

---

(6) Make another number pattern using any other line like these.

You will need: 100 square, red pencil, blue pencil.

More 100 - square patterns

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

(1) Take a 100 square.

(2) Shade this line of numbers red

(3) Shade this line of numbers blue

(4) Here is a number pattern using the red numbers.

$$3 \longrightarrow \qquad 3 = 3 \longrightarrow \qquad 3 = 3$$
$$14 \longrightarrow 1 + 4 = 5 \longrightarrow \qquad 5 = 5$$
$$25$$
$$36$$
$$47 \longrightarrow 4 + 7 = 11 \longrightarrow 1 + 1 = 2$$
$$58$$
$$69$$
$$80$$

Copy the pattern and complete it. (Look carefully at the spacing)

(5) Do the same for the blue numbers

$$11 \longrightarrow 1 + 1 = 2 \longrightarrow \qquad 2 = 2$$
$$22 \longrightarrow 2 + 2 = 4 \longrightarrow \qquad 4 = 4$$
$$\vdots \qquad \vdots \qquad \vdots \qquad \vdots \qquad \vdots \qquad \vdots$$
$$55 \longrightarrow 5 + 5 = 10 \longrightarrow 1 + 0 = 1$$
$$\vdots$$
$$99$$

(6) Make another pattern like these.

You will need a hundred square and colours.

9's

1. Take a 100-square;
   colour in every 9th square.

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

2. Write down the numbers:
   9
   18
   27
   •
   •
   •

3. Complete this pattern:
   $0 + 9 = 9$
   $10 + 8 = 18$
   $20 + 7 = 27$
   •
   •
   •

4. Finish this pattern of 9's
   $10 - 1 = 9$
   $20 - 2 = \blacksquare$
   $30 - 3 = \blacksquare$
   •
   •
   •

5. Here is a way to check your 9 times
   table. You have to **add** the **tens** to
   the **units**!
   So 9 gives   9 $= 9$
   So 18 gives $1 + 8 = \blacksquare$
   So 27 gives $2 + 7 = \blacksquare$
   •
   •
   •

   Complete the pattern.

Number words

Start with a number.

TWO

↓
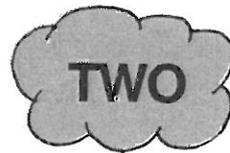
How many letters are there?

3

↓

Write down the number.

THREE

↓

How many letters are there?

5

↓

... and so on ...

FIVE

↓

4

↓

FOUR

↓

4

Start chains with different numbers.

What do you notice?

Try making chains in other languages.

Doubling Patterns

Example

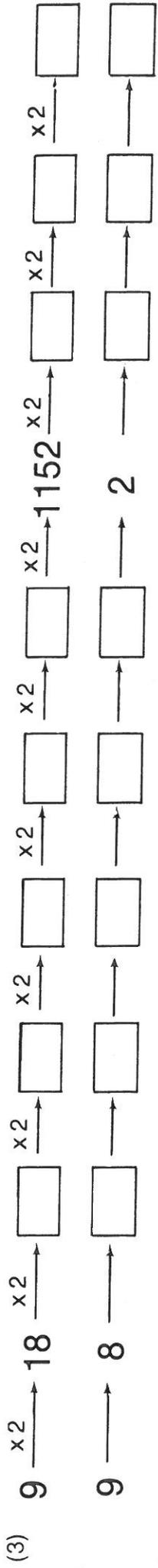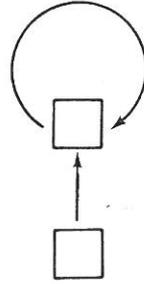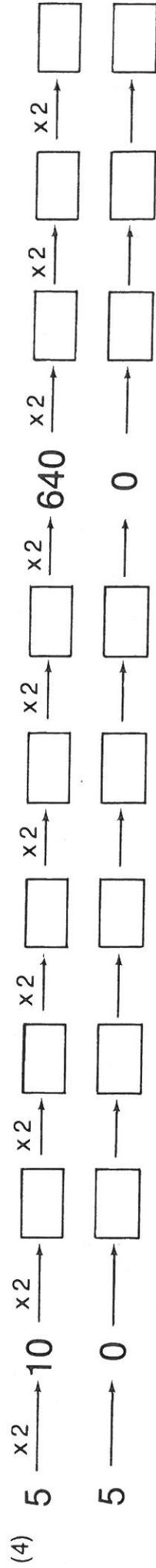$3 \xrightarrow{\times 2} 6 \xrightarrow{\times 2} 12 \xrightarrow{\times 2} 24 \xrightarrow{\times 2} 48 \xrightarrow{\times 2} 96 \xrightarrow{\times 2} 192 \xrightarrow{\times 2} 384 \xrightarrow{\times 2} 768 \xrightarrow{\times 2} \Box \xrightarrow{\times 2} \Box$

This sequence is made from the last digit of each number above:

$3 \longrightarrow 6 \longrightarrow 2 \longrightarrow 4 \longrightarrow 8 \longrightarrow 6 \longrightarrow 2 \longrightarrow 4 \longrightarrow 8 \longrightarrow \Box$

We could write the sequence like this:

$3 \longrightarrow 6 \longrightarrow 2 \longrightarrow 4 \longrightarrow 8 \longrightarrow 6$ (in a circle)

Fill in the missing numbers in these sequences:

(1) $7 \xrightarrow{\times 2} 14 \xrightarrow{\times 2} \Box \xrightarrow{\times 2} \Box \xrightarrow{\times 2} \Box \xrightarrow{\times 2} \Box \xrightarrow{\times 2} 896 \xrightarrow{\times 2} \Box \xrightarrow{\times 2} \Box$

$7 \longrightarrow 4 \longrightarrow \Box \longrightarrow \Box \longrightarrow \Box \longrightarrow \Box \longrightarrow 6 \longrightarrow \Box$

$7 \longrightarrow \Box \longrightarrow \Box \longrightarrow \Box$ (in a circle)

(2) $1 \xrightarrow{\times 2} 2 \xrightarrow{\times 2} 4 \xrightarrow{\times 2} \Box \xrightarrow{\times 2} \Box \xrightarrow{\times 2} 32 \xrightarrow{\times 2} \Box \xrightarrow{\times 2} \Box \xrightarrow{\times 2} 256 \xrightarrow{\times 2} \Box \xrightarrow{\times 2} \Box$

$1 \longrightarrow 2 \longrightarrow 4 \longrightarrow \Box \longrightarrow \Box \longrightarrow 2 \longrightarrow \Box \longrightarrow \Box \longrightarrow 6 \longrightarrow \Box$

$1 \longrightarrow 2 \longrightarrow \Box \longrightarrow \Box$ (in a circle)

(3)

$9 \xrightarrow{\times 2} 18 \xrightarrow{\times 2} \square \xrightarrow{\times 2} \square \xrightarrow{\times 2} \square \xrightarrow{\times 2} \square \xrightarrow{\times 2} 1152 \xrightarrow{\times 2} \square \xrightarrow{\times 2} \square \xrightarrow{\times 2} \square$

$9 \rightarrow 8 \rightarrow \square \rightarrow \square \rightarrow \square \rightarrow 2 \rightarrow \square \rightarrow \square \rightarrow \square$

$9 \rightarrow$

(4)

$5 \xrightarrow{\times 2} 10 \xrightarrow{\times 2} \square \xrightarrow{\times 2} \square \xrightarrow{\times 2} \square \xrightarrow{\times 2} 640 \xrightarrow{\times 2} \square \xrightarrow{\times 2} \square \xrightarrow{\times 2} \square$

$5 \rightarrow 0 \rightarrow \square \rightarrow \square \rightarrow \square \rightarrow 0 \rightarrow \square \rightarrow \square$
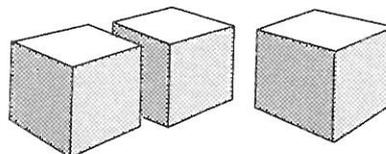
$\square \rightarrow \square \circlearrowleft$

(5) All these patterns can be shown on a single diagram.
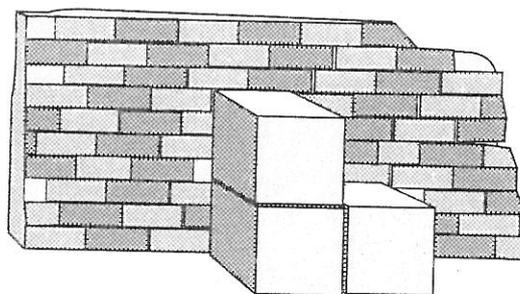   Can you fill in the missing numbers?
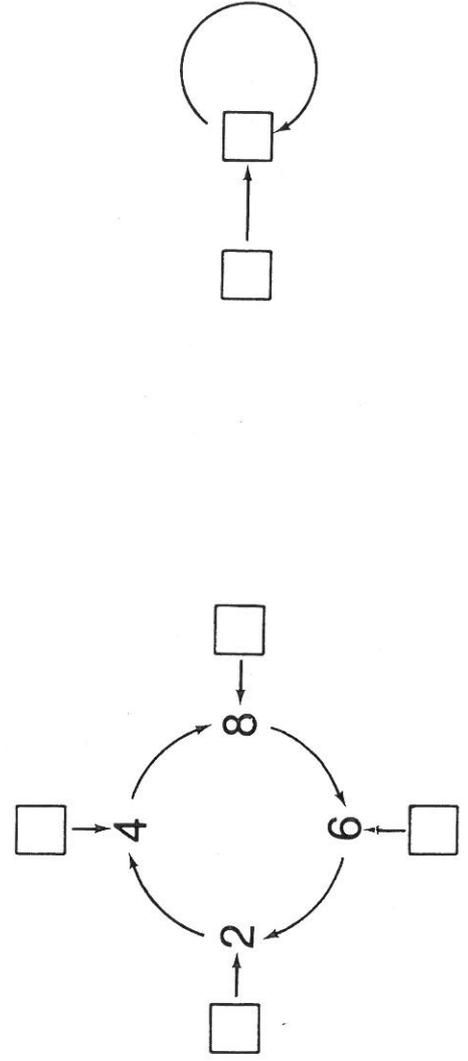
STACKING

Three boxes have to be
stacked against a wall.

Each box has to have one face next to the wall, and
another whole face touching one of the other boxes.

This is one possible way.

For three boxes there are four possible ways.
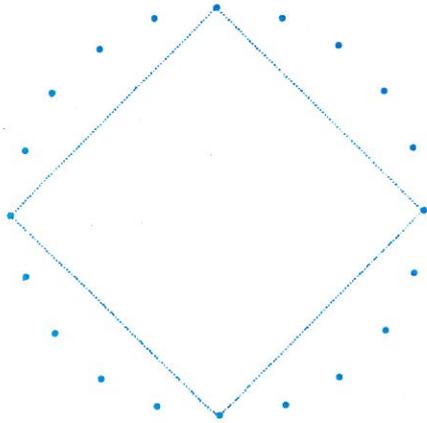Can you find them all?
Draw your results.

How many possible ways can four boxes be stacked?
Investigate for other numbers of boxes.

CIRCLES TO POLYGONS

Draw a **square** using
the MicroSMILE program
CIRCLE.
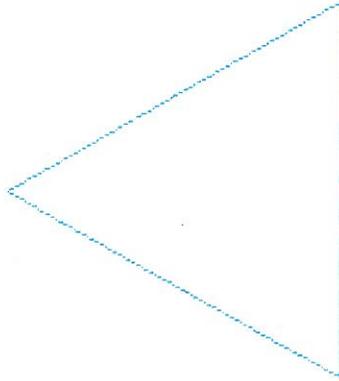
Find at least **three**
more ways to draw
a square.

Record the points and jump
sizes you used.

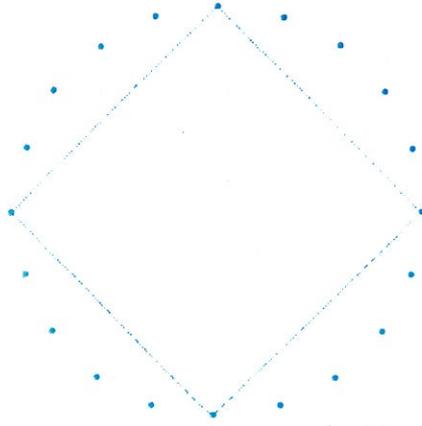Find as many ways as you can to draw these
other polygons.

A **triangle**.

CIRCLES TO POLYGONS

Draw a **square** using
the MicroSMILE program
CIRCLE.

Find at least **three**
more ways to draw
a square.
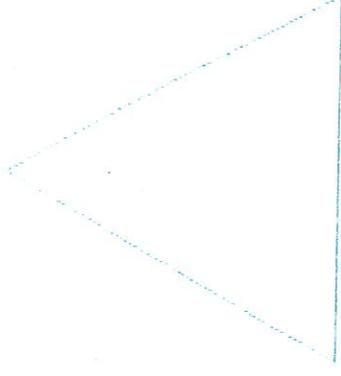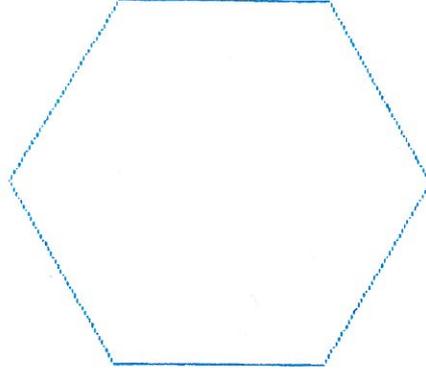
Record the points and jump
sizes you used.

A **pentagon**.

Find as many ways as you can to draw these
other polygons.

A triangle.

A **hexagon**.

Try some other polygons.

How many ways can you find of drawing a
five pointed star? (pentagram)

Nine Nine Nine

1. Copy and complete the following multiplication sequences.

$1 \times 9 = 9$	$1 \times 99 = 99$
$2 \times 9 = 18$	$2 \times 99 =$
$3 \times 9 = 27$	$3 \times 99 =$
$4 \times 9 =$	
$5 \times 9 =$	
$6 \times 9 =$	
$7 \times 9 =$	
$8 \times 9 =$	
$9 \times 9 = 81$	$9 \times 99 =$

$1 \times 999 = 999$
$2 \times 999 =$
$3 \times 999 =$
$9 \times 999 =$

$1 \times 9999 = 9999$
$2 \times 9999 =$
$3 \times 9999 =$
$9 \times 9999 =$

$1 \times 99999 = 99999$
$2 \times 99999 =$
$3 \times 99999 =$
$9 \times 99999 =$

Do not use a calculator

2. Write about your methods. How did you work out the sequences?

3. Do your methods still work for:

$10 \times 9 =$	$10 \times 99 =$
$11 \times 9 =$	$11 \times 99 =$
$12 \times 9 =$	$12 \times 99 =$
$13 \times 9 =$	$13 \times 99 =$

$10 \times 999 =$
$11 \times 999 =$
$12 \times 999 =$
$13 \times 999 =$