

Mana tangata: Build on individual strengths, increase learners' self-confidence and self-esteem, and allow your learners to make a contribution. Mana tangata means developing self-esteem through contributing. Mana tangata helps describe a learner-centred teaching environment because the learner's contribution and resulting self-esteem is important. (PE tough guy & girl challenge at Barry Curtis Park, Radio station, band, wearable art, mural, students to identify their passion projects, etc...)

Do Now**Do Now 2**

WALT Complete match stick pattern and predict values

EXERCISE 3A

- 1 For each of the following matchstick patterns:
- i draw the next two members
 - ii construct a table of 'matches needed' for the first 5 members
 - iii without drawing them, predict the number of matchsticks needed to make the next two members.

a b

c d

Example 2

Consider the number pattern: $1 \times 3 + 2$, $2 \times 3 + 2$, $3 \times 3 + 2$, $4 \times 3 + 2$,

- a Find the value of the first 4 members of the pattern.
- b Find the value of the 100th member of the pattern.
- c Draw a matchstick pattern which fits the number pattern.

a

$$\begin{aligned} 1 \times 3 + 2 &= 5 \\ 2 \times 3 + 2 &= 8 \\ 3 \times 3 + 2 &= 11 \\ 4 \times 3 + 2 &= 14 \end{aligned}$$

b The 100th member is

$$\begin{aligned} 100 \times 3 + 2 \\ &= 300 + 2 \\ &= 302 \end{aligned}$$

c

Reason:

$$\begin{aligned} & 3 + 2 & 3 + 3 + 2 & 3 + 3 + 3 + 2 & \text{etc.} \end{aligned}$$

Use the link to complete match stick patterns

Complete level 1 and 2

[Link](#)

- 2 Consider the following number pattern, then:
- find the value of its first 4 members
 - find the value of its 100th member
 - draw a matchstick pattern which fits the number pattern.
- a $1 \times 3 + 1, 2 \times 3 + 1, 3 \times 3 + 1, 4 \times 3 + 1, \dots$
 b $1 \times 3 - 1, 2 \times 3 - 1, 3 \times 3 - 1, 4 \times 3 - 1, \dots$
 c $1 \times 4 + 2, 2 \times 4 + 2, 3 \times 4 + 2, 4 \times 4 + 2, \dots$
 d $1 \times 4 - 3, 2 \times 4 - 3, 3 \times 4 - 3, 4 \times 4 - 3, \dots$

Extra Challenge

- 1 Find the next 3 members of the following number patterns and in each case write down the *rule* for finding the next member:
- a 1, 4, 7, 10, 13, ... b 11, 15, 19, 23, 27, ... c 2, 9, 16, 23, 30, ...
 d 6, 12, 18, 24, ... e 13, 22, 31, 40, ... f 7, 20, 33, 46, ...
- 2 Find the next 3 members of the following number patterns and in each case write down the rule for finding the next member:
- a 38, 36, 34, 32, 30, ... b 29, 26, 23, 20, ... c 57, 51, 45, 39, ...
 d 100, 97, 94, 91, ... e 250, 242, 234, 226, ... f 65, 61, 57, 53, 49, ...
 g 1, 2, 4, 8, 16, ... h 2, 6, 18, 54, ... i 2, 8, 32, 128, ...
 j 64, 32, 16, 8, 4, ... k 80, 40, 20, 10, ... l 243, 81, 27, 9, ...
 m 250, 25, 2.5, 0.25, ... n 2, 3, 5, 8, 12, 17, ... o 1, 1, 2, 3, 5, 8, 13, ...
- 3 Using the first number and the rule given, write down the next three numbers in each pattern:
- a 7; "add 6" b 3; "add 9"
 c 4; "add $1\frac{1}{2}$ " d 56; "take 11"
 e 150; "subtract 25" f 3.8; "reduce by 0.5"
 g 4; "multiply by 2 add 3" h 3; "times by 10 subtract 4"
 i 97; "add one then divide by two" j 2; "multiply number by itself".
- 4 Write down the missing number from each pattern:
- a 3, 9, \square , 21, 27 b 12, \square , 36, 48, 60 c 75, 60, \square , 30, 15
 d 3, 6, \square , 24, 48 e 6, 10, \square , 21, 28, 36 f 3, 9, 27, \square , 243
 g 0.08, 0.8, \square , 80, 800 h 10, \square , 32, 43 i 2, 6, 24, \square , 720
 j 100, 50, \square , 12.5 k 2, 5, 11, \square , 47 l 96, \square , 6, 1.5

INVESTIGATION 2

THE SQUARES PATTERN



Consider the matchstick pattern



What to do:

- Copy and draw the pattern to 6 units.
- How many matchsticks are needed to make the 1 unit, 2 unit, 3 unit, 4 unit, 5 unit and 6 unit figures?

Copy and complete:

<i>Unit number</i>	1	2	3	4	5	6
<i>Matchsticks needed</i>						

VARIABLES

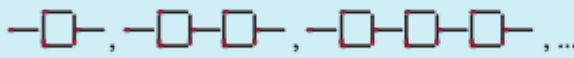
The symbols M and n which are used in place of numbers which may vary, are called **variables**. However, when a symbol such as k or Δ is used to take the place of a number which does not vary, it is called a **constant**.

Example 4

You are given the rule: “the number of matchsticks is three times the unit number plus three”.

- a Rewrite the rule using variable and state what each symbol means.
- b Make up a matchstick pattern which shows the rule.

a $M = 3 \times n + 3$ where M is the number of matchsticks and n is the unit number.

b  is one of many such patterns. Can you find another?

EXERCISE 3C

- 1 For the following rules:
 - i Rewrite using variables, explaining what each symbol represents.
 - ii Make up a matchstick pattern which fits the rule.
- a The number of matchsticks is two times the unit number plus one.
- b The number of matchsticks is three times the unit number plus two.
- c The number of matchsticks is three times the unit number minus one.
- d The number of matchsticks is four times the unit number plus three.

Example 5

For the following matchstick rule $M = 2 \times n - 1$:

- a find the value of M for $n = 1, 2, 3$ and 4 and table your results
- b write out the formula in words
- c draw the first four diagrams of the pattern.

a

n	1	2	3	4
M	1	3	5	7

b The number of matchsticks equals the unit number times two and then one is subtracted.

c 


Challenge

2 For the following rules:

- i Write down the value of M for $n = 1, 2, 3$ and 4. Put your answers in table form.
- ii If M represents the number of matchsticks and n the unit number, write out the formula in words.
- iii Draw the first four diagrams of the matchstick pattern.


a $M = 2 \times n$ b $M = n + 3$ c $M = 3 \times n - 2$ d $M = 4 \times n - 3$

Check your answers

1 a i ,


ii

Unit no.	1	2	3	4	5	6	7
Matches	5	8	11	14	17	20	23

b i ,


ii

Unit no.	1	2	3	4	5	6	7
Matches	4	9	14	19	24	29	34

c i ,

ii

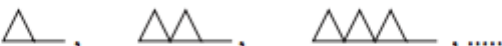
Unit no.	1	2	3	4	5	6	7
Matches	5	9	13	17	21	25	29

d i ,


ii

Unit no.	1	2	3	4	5	6	7
Matches	3	7	11	15	19	23	27

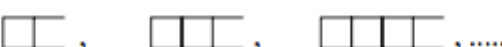
2 a i 4, 7, 10, 13 ii 301

iii ,


b i 2, 5, 8, 11 ii 299

iii ,

c i 6, 10, 14, 18 ii 402

iii ,

d i 1, 5, 9, 13 ii 397

iii ,

- 1 a 16, 19, 22; The next number is equal to the previous number plus 3.
- b 31, 35, 39; The next number is equal to the previous number plus 4.
- c 37, 44, 51; The next number is equal to the previous number plus 7.
- d 30, 36, 42; The next number is equal to the previous number plus 6.
- e 49, 58, 67; The next number is equal to the previous number plus 9.
- f 59, 72, 85; The next number is equal to the previous number plus 13.
- 2 a 28, 26, 24; The next number is equal to the previous number minus 2.
- b 17, 14, 11; The next number is equal to the previous number minus 3.
- c 33, 27, 21; The next number is equal to the previous number minus 6.
- d 88, 85, 82; The next number is equal to the previous number minus 3.

- 1 a i $M = 2 \times n + 1$, where M is the number of matchsticks and n is the unit number.
- ii $\triangle, \nabla, \triangle, \nabla, \triangle, \nabla, \dots$
- b i $M = 3 \times n + 2$, where M is the number of matchsticks and n is the unit number.
- ii $\square, \square, \square, \square, \square, \dots$
- c i $M = 3 \times n - 1$, where M is the number of matchsticks and n is the unit number.
- ii $\square, \square, \square, \square, \dots$
- d i $M = 4 \times n + 3$, where M is the number of matchsticks and n is the unit number.
- ii $\triangle, \triangle, \triangle, \triangle, \triangle, \dots$
- 2 a i
- | | | | | |
|-----|---|---|---|---|
| n | 1 | 2 | 3 | 4 |
| M | 2 | 4 | 6 | 8 |
- ii The number of matchsticks is two times the unit number.

- e 218, 210, 202; The next number is equal to the previous number minus 8.
 - f 45, 41, 37; The next number is equal to the previous number minus 4.
 - g 32, 64, 128; The next number is equal to the previous number multiplied by 2.
 - h 162, 486, 1458; The next number is equal to the previous number multiplied by 3.
 - i 512, 2048, 8192; The next number is equal to the previous number multiplied by 4.
 - j 2, 1, $\frac{1}{2}$; The next number is equal to the previous number divided by 2.
 - k 5, $2\frac{1}{2}$, $1\frac{1}{4}$; The next number is equal to the previous number divided by 2.
 - l 3, 1, $\frac{1}{3}$; The next number is equal to the previous number divided by 3.
 - m 0.025, 0.0025, 0.000 25; The next number is equal to the previous number divided by 10.
 - n 23, 30, 38; Each number is increased by one more than the previous number is increased.
 - o 21, 34, 55; Each number is the sum of the two previous numbers.
- 3 a 13, 19, 25 b 12, 21, 30 c $5\frac{1}{2}$, 7, $8\frac{1}{2}$
d 45, 34, 23 e 125, 100, 75 f 3.3, 2.8, 2.3
g 11, 25, 53 h 26, 256, 2556 i 49, 25, 13
j 4, 16, 256
- 4 a $\square = 15$ b $\square = 24$ c $\square = 45$
d $\square = 12$ e $\square = 15$ f $\square = 81$
g $\square = 8$ h $\square = 21$ i $\square = 120$
j $\square = 25$ k $\square = 23$ l $\square = 24$