

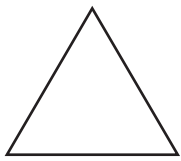
Student Worksheet 1

TI-30XB MultiView™: Matchstick Mathematics

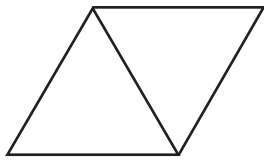
W1

Name: _____

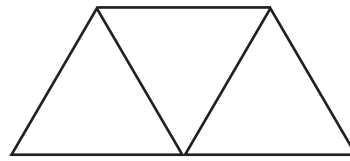
Mia and omar were studying matchstick patterns and made up these patterns.



Number 0



Number 1



Number 2

The beginning shape is number 0. The next shape is number 1 and then shape number 2 and so on.

1. In the space below draw the shapes numbered 3, 4 and 5:

Number 3

Number 4

Number 5

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W1

2. Complete the **table of values** based on the previous matchstick pattern:

Shape number (N)	0	1	2	3	4	5	6	7
Number of matches (M)	3							



Work out the difference between successive patterns

--	--	--	--	--	--	--	--	--

3. Describe the pattern of differences:

4. Mia and Omar liked to work mathematically. They wondered if there was a **RULE** to calculate the number of matches needed for a particular shape number.

Complete the word equation by studying the pattern and table of values.

Hint: The constant difference will form part of the answer as will the number of matches for the pattern number zero.

Total number of matches = _____ × **shape number** + _____

5. Instead of using words, mathematicians prefer to use symbols.

When using symbols the word equation in Question 4 can be written as:

$$Y = 2X + 3$$

Where $Y = M$ (the number of matchsticks)

$X = N$ (pattern number starting from $N = 0$)

The rule for this triangular matchstick pattern is given by $Y = 2X + 3$. Use the **RULE** to find the number of matches (Y), when the pattern number is $X = 20$. Follow the steps in the following example carefully, if uncertain please ask.

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W1

Pattern number (X)	$N = 20$ [this value is substituted in the RULE for X]
Number of matches (Y)	$Y = 2X + 3$ [the X gets replaced by 20]
Pattern number 20 will need 43 matches	$Y = 2(20) + 3$ $Y = 40 + 3$ $Y = 43$

Now do the following problems to find the number of matches Y given the pattern number N.
Use the same setting out as in the example above.

$N = 35$ $Y = ?$	
$N = 125$	
$Y = ?$	
$N = 2001$ $Y = ?$	

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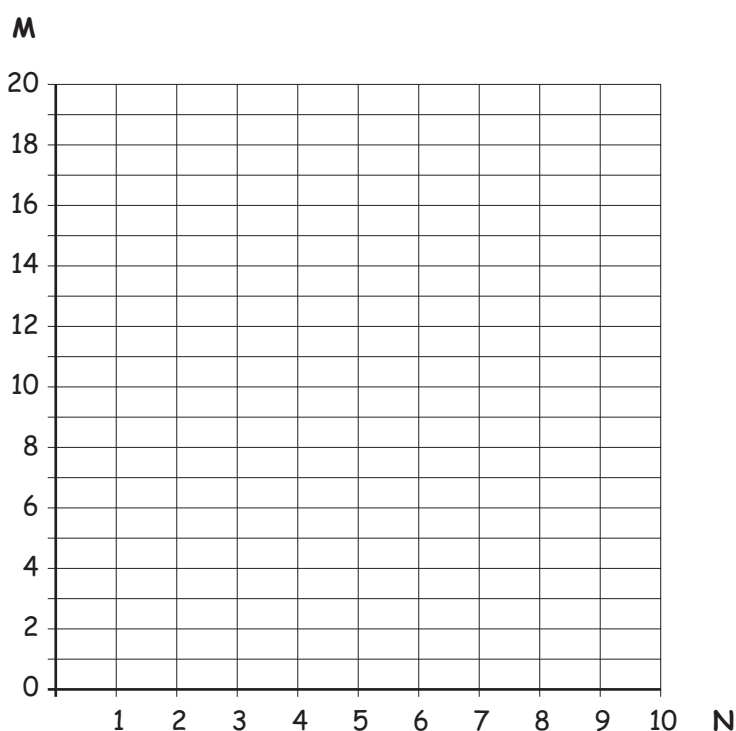
W1

6. The data for this pattern can be shown as a graph as well as a table.

Complete the table below:

Plot the values from the table **as dots** on the graph grid below:

Pattern No [N] $M = 2N + 3$	Matches [M]
0	
1	
2	
3	
4	
5	
6	
7	



7. Describe the pattern the points make in question 8 above:

8. On the TI-30XB MultiView™ calculator you are able to enter RULE for linear patterns.

To enter a RULE:

- a) Press **table**
- b) If a previous RULE has been used, clear this by pressing **clear**
- c) Enter the RULE $y = 2x + 3$. Use the key **$\frac{x,y,z}{a,b,c}$** to enter 'x'. Then press **enter**
- d) Use the down arrow on the NAVIGATION button to highlight *Ask-x*. Then move to highlight *OK* and press **enter**
- e) Enter a desired x value (N) to find the y value (M) using the entered equation.
- f) Check your answers for the number of matches required for Quest. 6

THINK SPOT

Use a 'Guess and Check' method to enter N values into RULE in the calculator to find the N pattern number for a pattern which has 2009 matchsticks.

Student Worksheet 2

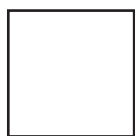
TI-30XB MultiView™: Matchstick Mathematics

W2

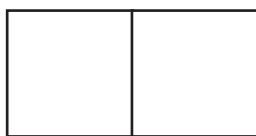
Name: _____

Mia and omar continued to study match stick patterns and came up with this square pattern.

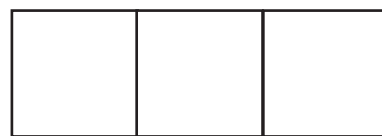
1. Draw in the shapes numbered 3 and 4:



N = 0



N = 1

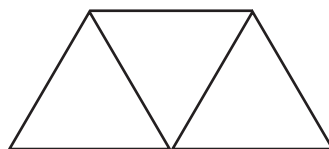
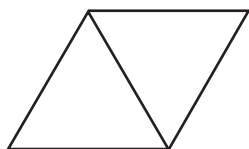
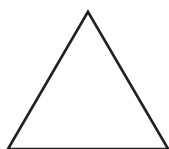


N = 2

N = 3

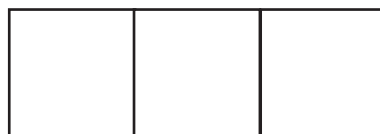
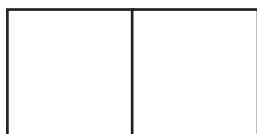
N = 4

2. Using the rule developed from the previous triangle patterns



Number of matches = $2 \times \text{shape number} + 3$

propose a rule for the number of matches in the square pattern.



Number of matches = _____

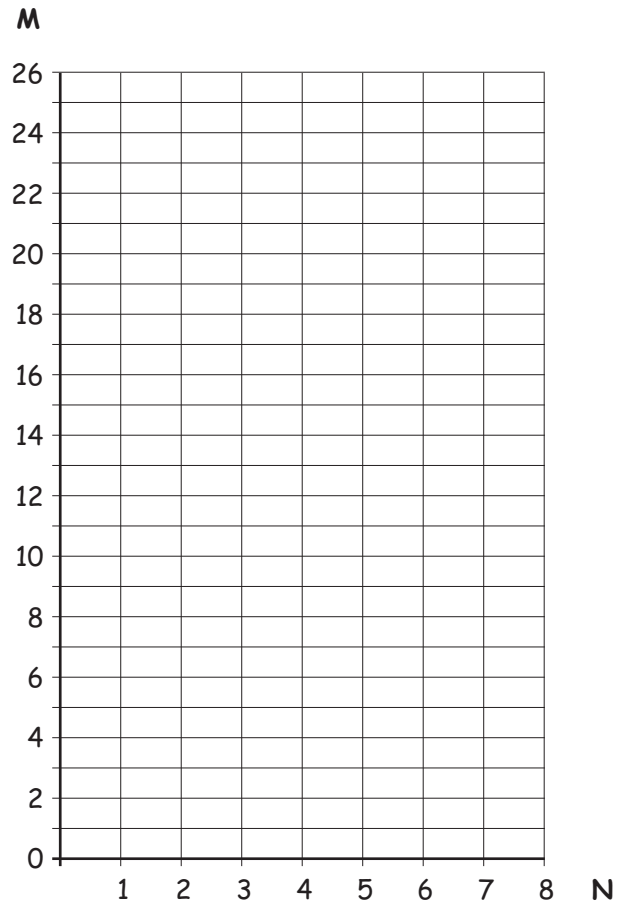
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W2

3. Complete the table for the square match stick pattern and plot the points:

Shape Number [N]	Number of Matches [M]
0	
1	
2	
3	
4	
5	
6	
7	



4. Complete the table of facts about the graph:

Fact	Value or Answer
Difference between successive M values, is the pattern a linear pattern?	
The point on the M axis where the line connecting the points cuts the M axis	
By what amount does an M change as N changes by a value of 1?	
Rule for the pattern	

Student Worksheet 2

TI-30XB MultiView™: Matchstick Mathematics

W2

5. Use the TI-30XB MultiView™ calculator to enter the data into a table for this square matchstick pattern. Use a Statistical Calculation to determine the RULE that models this LINEAR DATA. Find the value 'a' and 'b'

Linear Rules have the pattern $Y = aX + b$

- a) Enter the table of values from Question 3 into the DATA table on the calculator.

Put the N values into LIST 1 [L1] and the M values into LIST 2 [L2].

- b) Find the RULE for the values in the DATA table

Select Statistics [stat], then **2:2-Var-Stats**

The **xDATA** is List 1, so highlight and **enter** this

The **yDATA** is List 2, so highlight and **enter** this

Move to [CALC], and press **enter**

The calculator gives a list of values. The line equation is in the form

$$Y = aX + b$$

Find the value for 'a' and 'b' in the list of values:

$$a = \underline{\hspace{10em}}$$

$$b = \underline{\hspace{10em}}$$

Write the RULE $Y = \underline{\hspace{10em}}$

where the $Y = M$ (the number of matches) and $X = N$ (the pattern number)

6. Use the rule for the square matchstick pattern to complete the table:

Pattern number (N)	N = 20	N = 35	N = 125	N = 2009
Number of matches (M) needed to make the square match stick pattern	M =	M =	M =	M =

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W2

THINK SPOT

If the number of matches (M) is known then the RULE can be used to find N the pattern shape number.

- Enter the Rule into the TI-30XB MultiView™ calculator
- Use a 'Guess and Check' method to enter an N value into the calculator to find the N pattern number to give the required number of matches

Find the shape number N for the following number of matches.

Number of matches	$M = 103$	$M = 244$	$M = 1,126$	$M = 2,497$
Pattern number (N)				

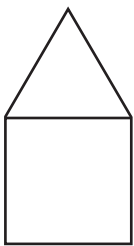
Assessment Task

TI-30XB MultiView™: Matchstick Mathematics

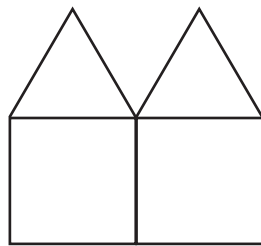
AT

Name: _____

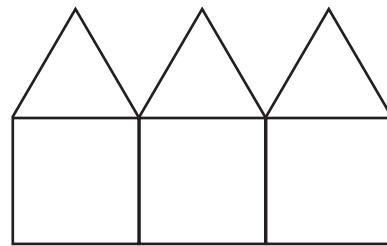
Demonstrate your knowledge about linear patterns by completing the information about the following matchstick pattern.



$N = 0$



$N = 1$



$N = 2$

1. Draw the next shape in the matchstick house pattern ($N = 3$):

2. How many matches are needed to make matchstick house shape $N = 3$?

3. How many additional matches are required when you change the matchstick house shape $N = 10$ to the house shape $N = 11$?

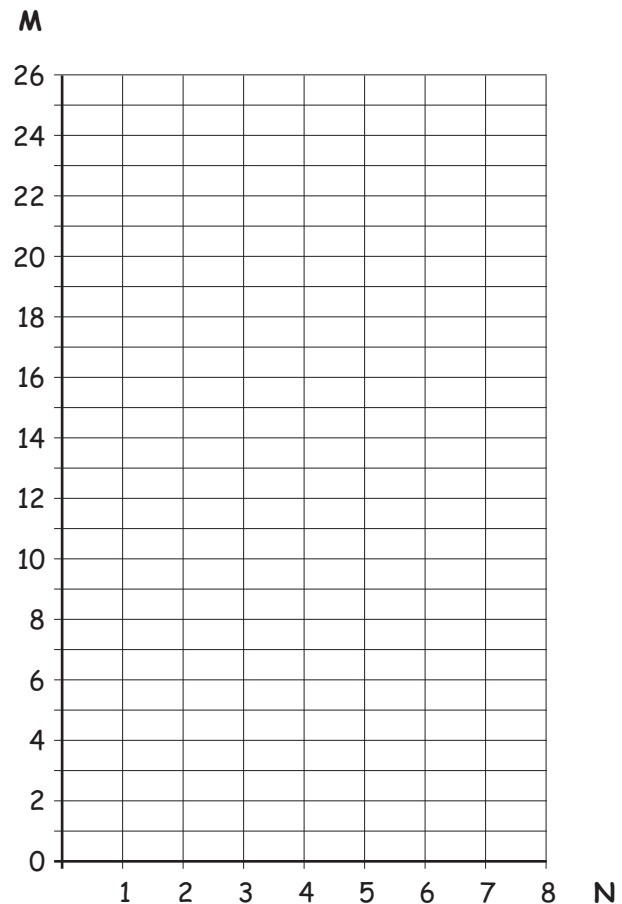
Assessment Task

TI-30XB MultiView™: Matchstick Mathematics

AT

4. Complete the table and graph for the matchstick house pattern:

Pattern Number [N]	Matches [M]
0	
1	
2	
3	
4	
5	
6	
7	



5. Complete the table:

Fact	Value or Answer
Difference between successive M values	
By what amount does an M change as N changes by a value of 1?	
The point where the line joining the points crosses the M -axis	
Rule for the value of M	

Assessment Task

TI-30XB MultiView™: Matchstick Mathematics

AT

6. Using the rule $M = 5N + 1$ for a matchstick pattern, show your working to find the answer for:

a) The number of matches M required for matchstick house pattern number 30:

b) The pattern number (N) when the number of matches is 961: