

# Assessing pupils' progress in mathematics at Key Stage 3

Year 8 assessment package  
Number/handling data  
Examples of pupils' work



# Year 8

## Number

### LESSON 1: *Powerful stuff*

## Powerful stuff sheet 1

## Level 3

Here are the numbers from *How many factors? sheet 1* again, with more shown.

Number	How many factors?
1	1
2	2
4	3
8	4
16	5
32	6
64	7
128	8
256	9
512	10
1 024	11
2 048	12
4 096	13
8 192	14
16 384	15
32 768	16
65 536	17
131 072	18
262 144	19
524 288	20
1 048 576	21
2 097 152	22
4 194 304	23
8 388 608	24

Which number has **18 factors**?  
Write the number in words.

131072  
thirteenthousand.  
one hundred + seventy-two

Find the first number in the table that is  
bigger than one million.  
How many factors does it have?

2097 152

The number 8 388 608 has 24 factors.  
What number has 25 factors?

16777216

The number 64 has 7 factors.  
What are they?

1, 7

The number 8 has 4 factors.  
Can you find another number (not in this table)  
that also has exactly 4 factors?

5

Here are the numbers from *How many factors? sheet 1* again, with more shown.

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1	1
2	2
4	3
8	4
16	5
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32 768	16
65 536	17
131 072	18
262 144	19
524 288	20
1 048 576	21
2 097 152	22
4 194 304	23
8 388 608	24

Which number has **18 factors**?  
Write the number in words.

One hundred and thirty  
one thousand and seventy  
~~one~~ ~~thousand~~ ~~and~~ ~~seventy~~  
~~two~~

Find the first number in the table that is  
bigger than one million.  
How many factors does it have?

1048 576 = factors

The number 8 388 608 has 24 factors.  
What number has 25 factors?

The number 64 has 7 factors.  
What are they?

The number 8 has 4 factors.  
Can you find another number (not in this table)  
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## Powerful stuff sheet 1

## Level 3

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65 536	17
131 072	18
262 144	19
524 288	20
1 048 576	21
2 097 152	22
4 194 304	23
8 388 608	24

Which number has **18 factors**?

Write the number in words.

thirteen thousand and one hundred seventy two

Find the first number in the table that is bigger than one million.

How many factors does it have?

1048 576 21

The number 8 388 608 has 24 factors.

What number has 25 factors?

167772 16

The number 64 has 7 factors.

What are they?

The number 8 has 4 factors.

Can you find another number (not in this table) that also has exactly 4 factors?

## Powerful stuff sheet 1

## Level 4

Here are the numbers from *How many factors? sheet 1* again, with more shown.

Number	How many factors?
1	1
2	2
4	3
8	4
16	5
32	6
64	7
128	8
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1 024	11
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131 072	18
262 144	19
524 288	20
1 048 576	21
2 097 152	22
4 194 304	23
8 388 608	24

Which number has **18 factors**?

Write the number in words.

One hundred and thirty and Thousand & seventy two

Find the first number in the table that is bigger than one million.

How many factors does it have?

1048 576

The number 8 388 608 has 24 factors.

What number has 25 factors?

167772 16

The number 64 has 7 factors.

What are they?

1, 2, 4, 8, 16, 32, 64.

The number 8 has 4 factors.

Can you find another number (not in this table) that also has exactly 4 factors?

# Powerful stuff sheet 1

## Level 4

Here are the numbers from *How many factors? sheet 1* again, with more shown.

Number	How many factors?
1	1
2	2
4	3
8	4
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128	8
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32 768	16
65 536	17
131 072	18
262 144	19
524 288	20
1 048 576	21
2 097 152	22
4 194 304	23
8 388 608	24

Which number has **18 factors**?

Write the number in words.

one hundred and thirty one Thousand  
Seventy two

Find the first number in the table that is bigger than one million.

How many factors does it have?

not 2 047 152 factors 22

The number 8 388 608 has 24 factors.

What number has 25 factors?

8 388 608  
8 388 608  
16 777 216

The number 64 has 7 factors.

What are they?

1, 2, 4, 8, 16, 32, 64

The number 8 has 4 factors.

Can you find another number (not in this table) that also has exactly 4 factors?

6(1, 2, 3, 6)

Here are the numbers from *How many factors? sheet 1* again, with more shown.

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1	1
2	2
4	3
8	4
16	5
32	6
64	7
128	8
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262 144	19
524 288	20
1 048 576	21
2 097 152	22
4 194 304	23
8 388 608	24

Which number has **18 factors**?

Write the number in words.

one thousand thirty three hundred  
and one Seventy two

Find the first number in the table that is bigger than one million.

How many factors does it have?

1048576 = 21

The number 8 388 608 has 24 factors.

What number has 25 factors?

16777216

The number 64 has 7 factors.

What are they?

1, 2, 4, 8, 16, 32, 64

The number 8 has 4 factors.

Can you find another number (not in this table) that also has exactly 4 factors?

6) 1236 ✓  
10) 12510 -

Powerful stuff sheet 2  
Level 4

Here are the tables for powers of 2, 3 and 4.

powers of 2	Number	1	2	4	8	16
	How many factors?	1	2	3	4	5

powers of 3	Number	1	3	9	27	81
	How many factors?	1	2	3	4	5

powers of 4	Number	1	4	16	64	256
	How many factors?	1	3	5	7	9

Write all the factors of 1, 5, 25, 125 and 625 to show that the table below is correct.

powers of 5	Number	1	5	25	125	625
	How many factors?	1	2	3	4	5

1      1      1      1      1  
       5      5      5      5  
           25    25    25  
               125   125  
                   625

Look at all the tables.

What is the same for powers of 2, powers of 3 and powers of 5?

What is different for powers of 4?

All of them go up in 1's and 4 goes up in 2's

Why might this be?

Think about how the number 4 is different from the numbers 2, 3, and 5

Powerful stuff sheet 2  
Level 5

Here are the tables for powers of 2, 3 and 4.

powers of 2	Number	1	2	4	8	16
	How many factors?	1	2	3	4	5

powers of 3	Number	1	3	9	27	81
	How many factors?	1	2	3	4	5

powers of 4	Number	1	4	16	64	256
	How many factors?	1	3	5	7	9

Write all the factors of 1, 5, 25, 125 and 625 to show that the table below is correct.

powers of 5	Number	1	5	25	125	625
	How many factors?	1	2	3	4	5

1 (1)  
 5 (1, 5)  
 25 (1, 5, 25)  
 125 (1, 5, 25, 125)  
 625 (1, 5, 25, 125, 625)

Look at all the tables.

What is the same for powers of 2, powers of 3 and powers of 5?

What is different for powers of 4?

The tables of the powers of 2, 3, and 5 all go up by 1 each time the powers of 4 go up by 2 each time

Why might this be?

Think about how the number 4 is different from the numbers 2, 3, and 5

The number 4 has more factors than 2, 3, and 5.

Powerful stuff sheet 2

Level 5

Here are the tables for powers of 2, 3 and 4.

powers of 2	Number	1	2	4	8	16
	How many factors?	1	2	3	4	5

powers of 3	Number	1	3	9	27	81
	How many factors?	1	2	3	4	5

powers of 4	Number	1	4	16	64	256
	How many factors?	1	3	5	7	9

Write all the factors of 1, 5, 25, 125 and 625 to show that the table below is correct.

powers of 5	Number	1	5	25	125	625
	How many factors?	1	2	3	4	5

1  
5 5 5 5  
25 25 25  
125 125  
625

Look at all the tables.

What is the same for powers of 2, powers of 3 and powers of 5?

What is different for powers of 4?

the ~~powers~~ of 2, 3 and 5 goes up by one and power of 4 goes up by 2.

Why might this be?

Think about how the number 4 is different from the numbers 2, 3, and 5

2, 3 and 5 are primes and 4 is not

Here are the tables for powers of 2, 3 and 4.

powers of 2	Number	1	2	4	8	16
	How many factors?	1	2	3	4	5

powers of 3	Number	1	3	9	27	81
	How many factors?	1	2	3	4	5

powers of 4	Number	1	4	16	64	256
	How many factors?	1	3	5	7	9

Write all the factors of 1, 5, 25, 125 and 625 to show that the table below is correct.

powers of 5	Number	1	5	25	125	625
	How many factors?	1	2	3	4	5

The table is correct because the pattern is 1, 2, 3, 4, 5

1 → 1  
5 → 1, 5  
25 → 1, 5, 25  
125 → 1, 5, 25, 125  
625 → 1, 5, 25, 125, 625

Look at all the tables.

What is the same for powers of 2, powers of 3 and powers of 5?

What is different for powers of 4?

Because powers of 2, 3, and 5 have 1, 2, 3, 4, 5 but powers of 4 have 1, 3, 5, 7, 9

Why might this be?

Think about how the number 4 is different from the numbers 2, 3, and 5

Because 4 has three factors and 2, 3 and 5 have two factors. Also 2 and 5 have prime numbers.

Powerful stuff sheet 2

Level 6

Here are the tables for powers of 2, 3 and 4.

powers of 2	Number	1	2	4	8	16
	How many factors?	1	2	3	4	5

powers of 3	Number	1	3	9	27	81
	How many factors?	1	2	3	4	5

powers of 4	Number	1	4	16	64	256
	How many factors?	1	3	5	7	9

Write all the factors of 1, 5, 25, 125 and 625 to show that the table below is correct.

powers of 5	Number	1	5	25	125	625
	How many factors?	1	2	3	4	5

1      1      1      1      1  
       5      5      5      5  
           25    25    25  
               125 125  
                   625

Look at all the tables.

What is the same for powers of 2, powers of 3 and powers of 5?

What is different for powers of 4?

the factors +1 each time on the power of 2, 3 and 5 tables - but on 4 they go up in +2

Why might this be?

Think about how the number 4 is different from the numbers 2, 3, and 5

4 has more factors than 2, 3 and 5 because 4 is so you also get the numbers from 2.

Here are the tables for powers of 2, 3 and 4.

powers of 2	Number	1	2	4	8	16
	How many factors?	1	2	3	4	5

powers of 3	Number	1	3	9	27	81
	How many factors?	1	2	3	4	5

powers of 4	Number	1	4	16	64	256
	How many factors?	1	3	5	7	9

Write all the factors of 1, 5, 25, 125 and 625 to show that the table below is correct.

powers of 5	Number	1	5	25	125	625
	How many factors?	1	2	3	4	5

1 - (1)  
 5 - (1, 5)  
 25 - (1, 5, 25)  
 125 - (1, 5, 25, 125)  
 625 - (1, 5, 25, 125, 625)

Look at all the tables.

What is the same for powers of 2, powers of 3 and powers of 5?

What is different for powers of 4?

for powers 2, 3, 5 the factors go up by 1 each time but for 4 it goes up by two

Why might this be?

Think about how the number 4 is different from the numbers 2, 3, and 5

this is ~~because~~ because when you times by 4 you times by 2 twice so you will get ~~the~~ the middle factor  
 eg  
 $4 \times 4 = 16 - (1, 2, 4, 8, 16)$   
 $4 \times 2 = 8 - (1, 2, 4, 8)$



Powerful stuff sheet 2 (continued)

Level 5

Which type of table would you predict for **powers of 9**? Why?

(Try to answer this without working out the numbers of factors.)

As it isn't a prime number I think it wouldn't go 1, 2, 3, 4, 5... insted I think the pattern would go 1, 3, 5, 7, 9... like the powers of 4 because both 9 and 4 are square numbers.

Why would you expect the table for powers of 6 **not** to be like the tables we have seen so far?

I wouldn't expect the powers of 6 factors to be the same patterns as we have seen already because it isn't a prime number so it can't be the 1, 2, 3, 4 pattern and it isn't a square number so it can't be the 1, 3, 5, 7... pattern

Continue investigating.....

Which type of table would you predict for **powers of 9**? Why?

(Try to answer this without working out the numbers of factors.)

It would be like table 4 because its highest factor (not itself) is 3 and it has 3 factors too

Why would you expect the table for powers of 6 **not** to be like the tables we have seen so far?

Because, there are 4 factors in 6. Its highest factor (excluding itself) is 3.

Continue investigating.....

No #	Factors #
1.	1.
6.	4
36	9
216	16?

Powerful stuff sheet 2 (continued)

Level 5

Which type of table would you predict for **powers of 9**? Why?  
(Try to answer this without working out the numbers of factors.)

number	1	9	81	
Factor	1	3	5	

*Handwritten annotations:*  
 Above 9:  $\times 9$   
 Above 81:  $\times 9$   
 To the right of 81:  $\times 9$   
 Below 3:  $+2$   
 Below 5:  $+2$   
 To the right of 5:  $+2$

Same as 4  
with 3 factors  
✓ checked

Why would you expect the table for powers of 6 **not** to be like the tables we have seen so far?

Because it has four factors of its own.

$\times 6$	1	6	36	216
	1	4	9	16

*Handwritten annotations:*  
 A bracket under 1 and 4 with the label "sq numbers".

Continue investigating.....

Powerful stuff sheet 2 (continued)

Level 6

Which type of table would you predict for **powers of 9**? Why?  
(Try to answer this without working out the numbers of factors.)

1	9	81	729	6561
1	3	5	7	9

I think this is because 9 is also divisible by 3 which means it has 3 factors like 4 does.

Why would you expect the table for powers of 6 **not** to be like the tables we have seen so far?

Because 6 is divisible by 2 and 3 which means it will have more factors than 4 and 9 (4 factors)  
 $\times$  by 6 includes  $\times$  by 2 and  $\times$  3 so lots more factors are made.

Continue investigating.....

Powers of 6:

1	6	36	216	1296
1	4	9	16	25

*Handwritten annotations:*  
 Below 6:  $+3$   
 Below 36:  $+5$   
 Below 216:  $+7$   
 Below 1296:  $+9$

Powers of 7: (only 2 factors)

1	7	49	343	2401
1	2	3	4	5

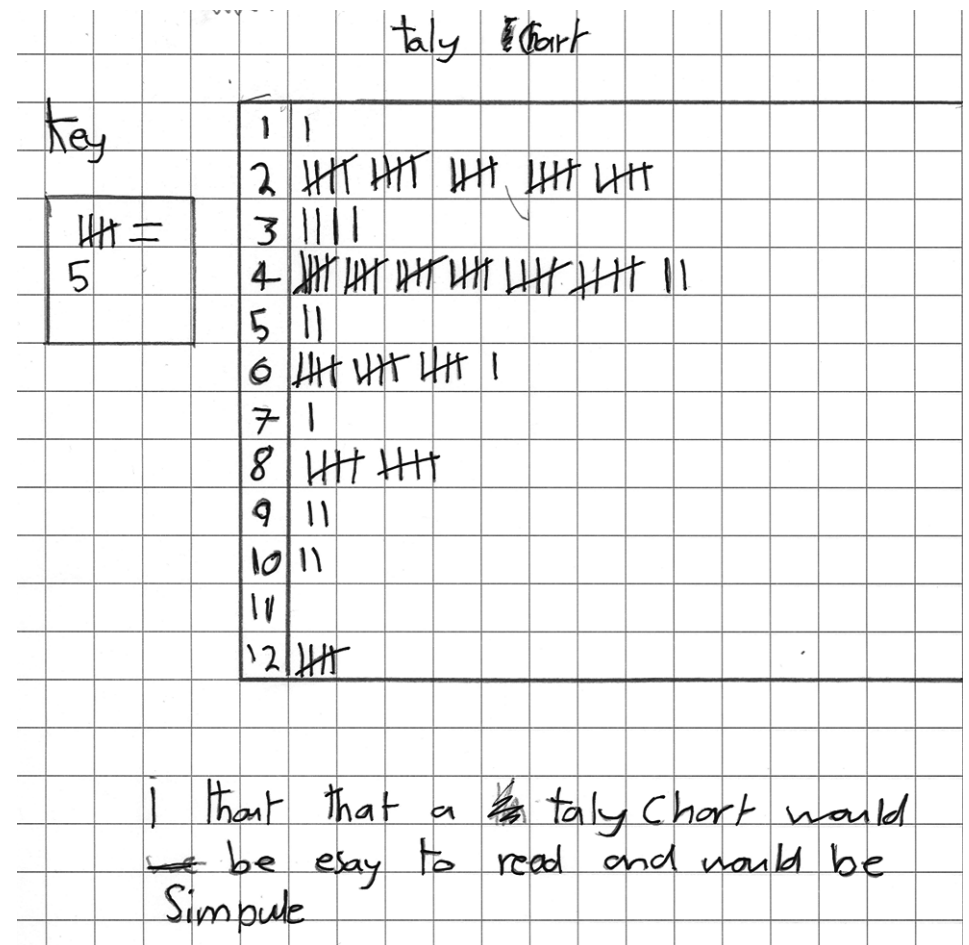
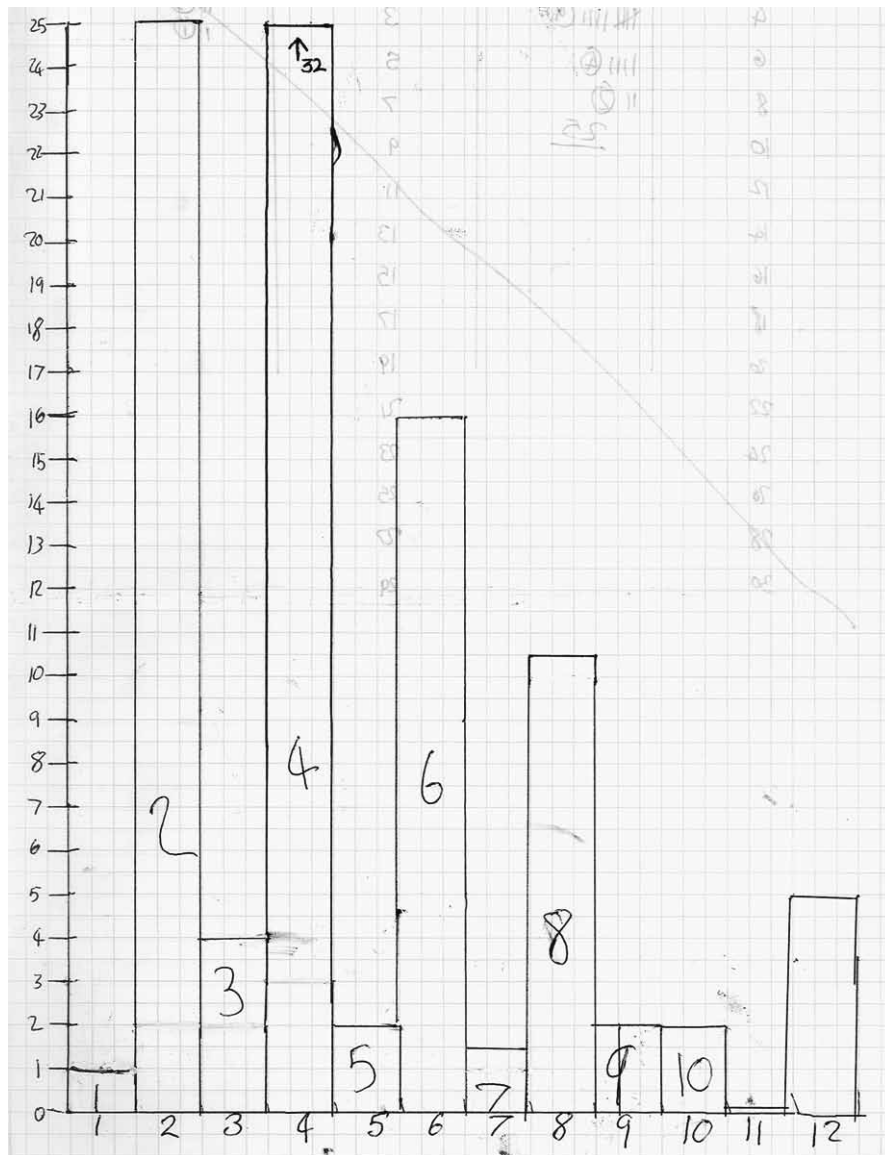
# Year 8

## Handling data

### LESSON 2: *The first hundred*

Task one – The first hundred: a frequency table

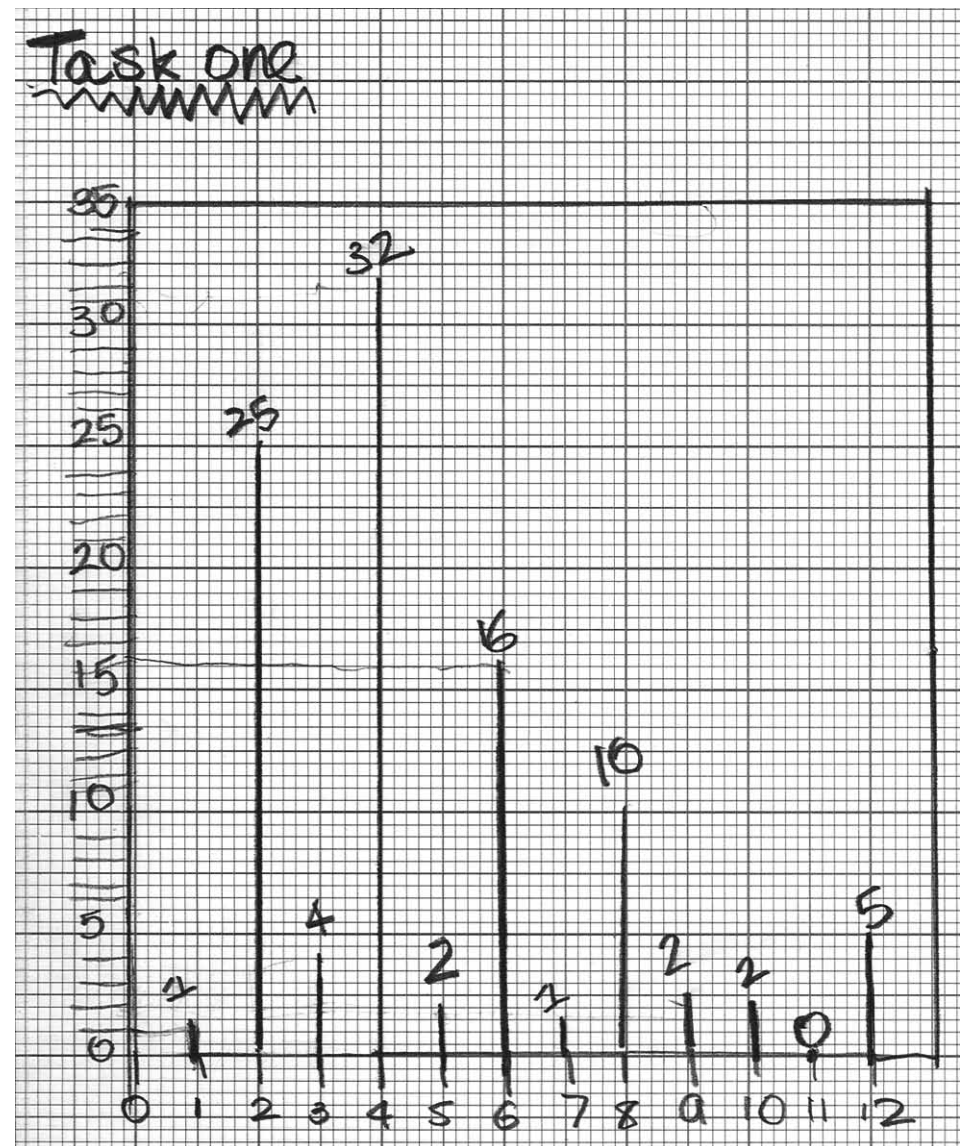
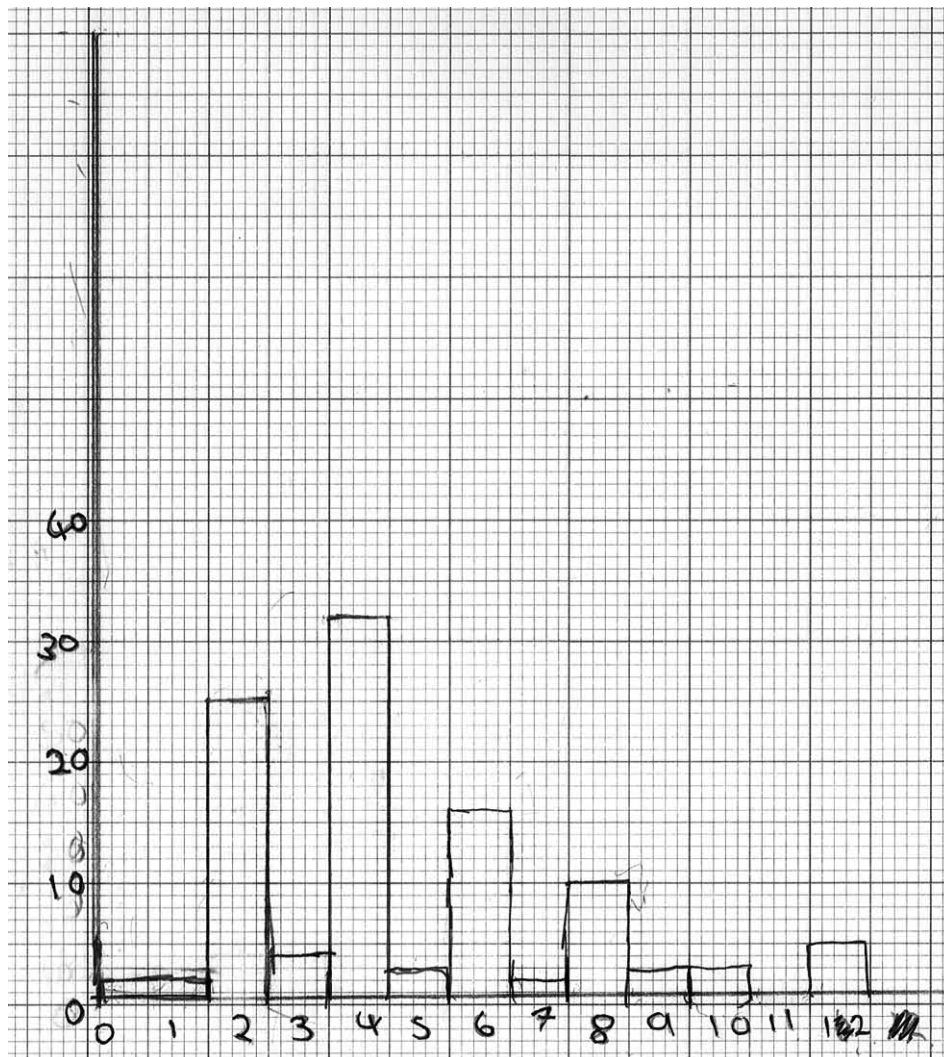
Level 3



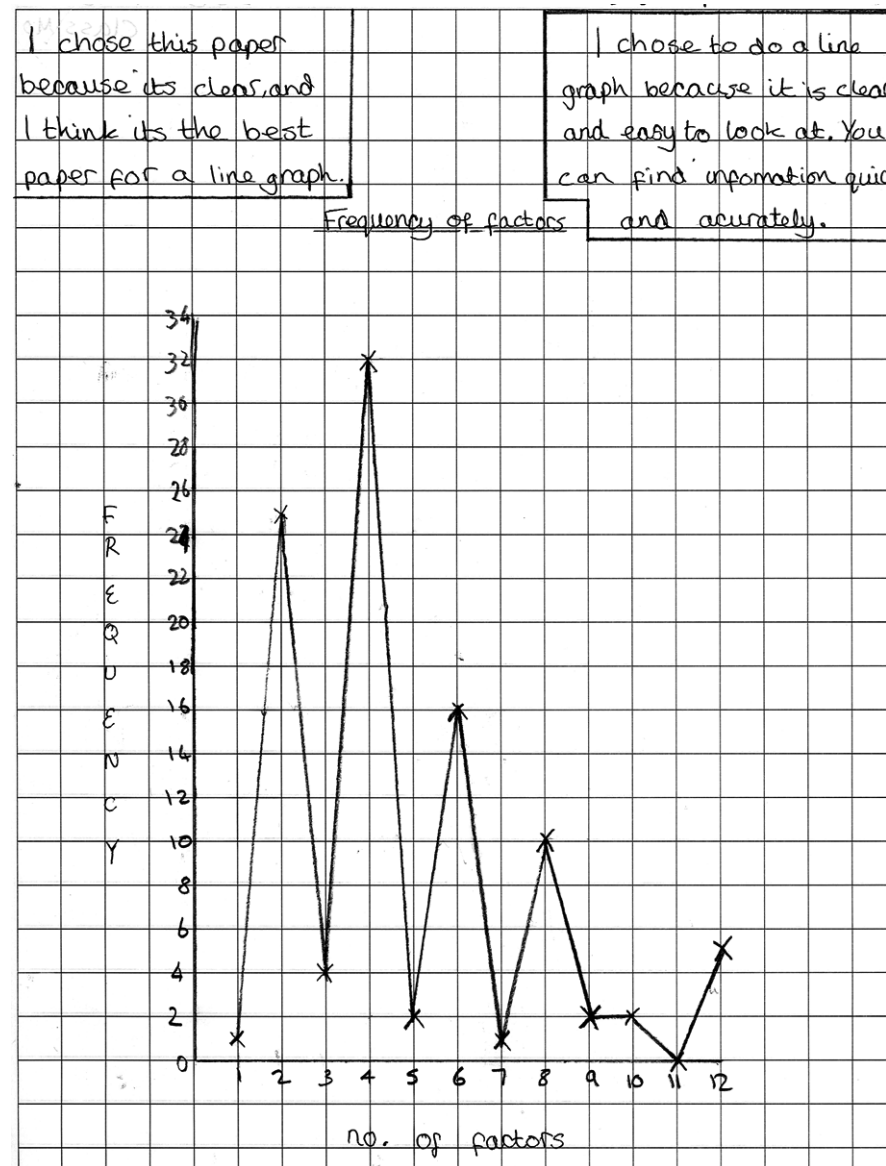
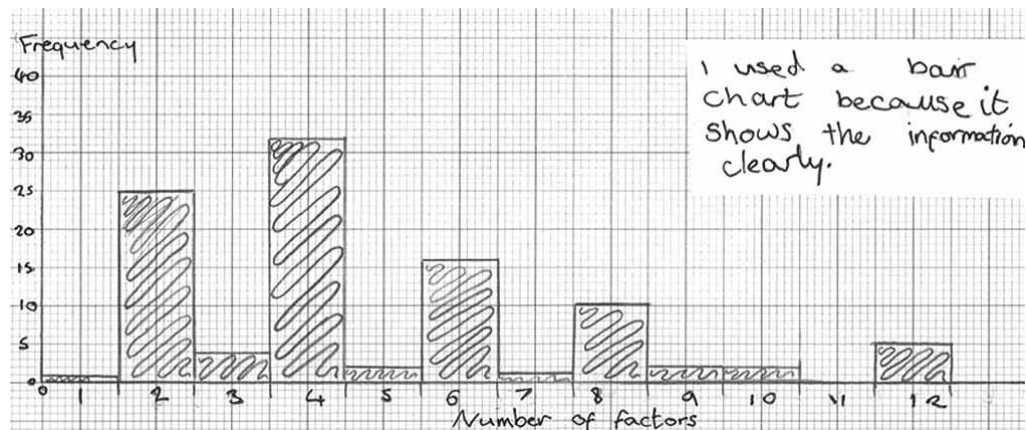
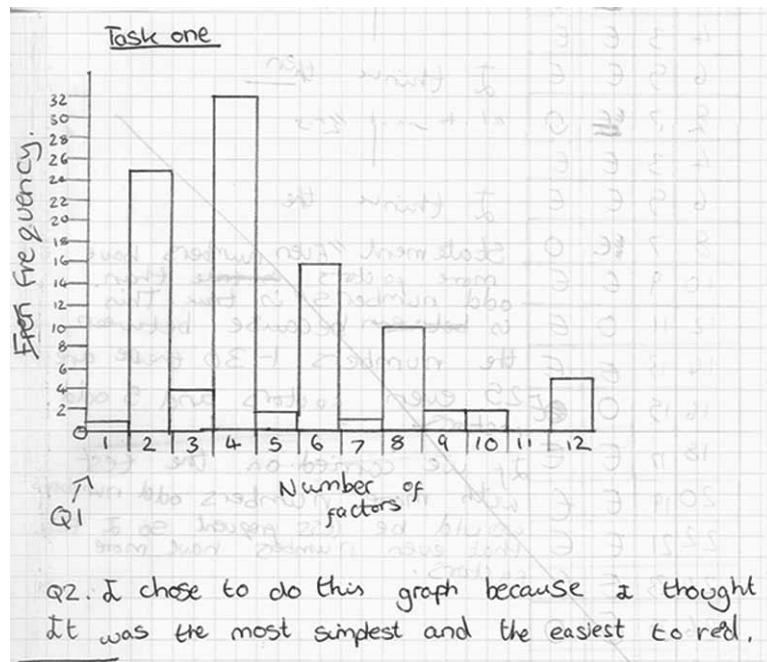


Task one – The first hundred: a frequency table

Level 3

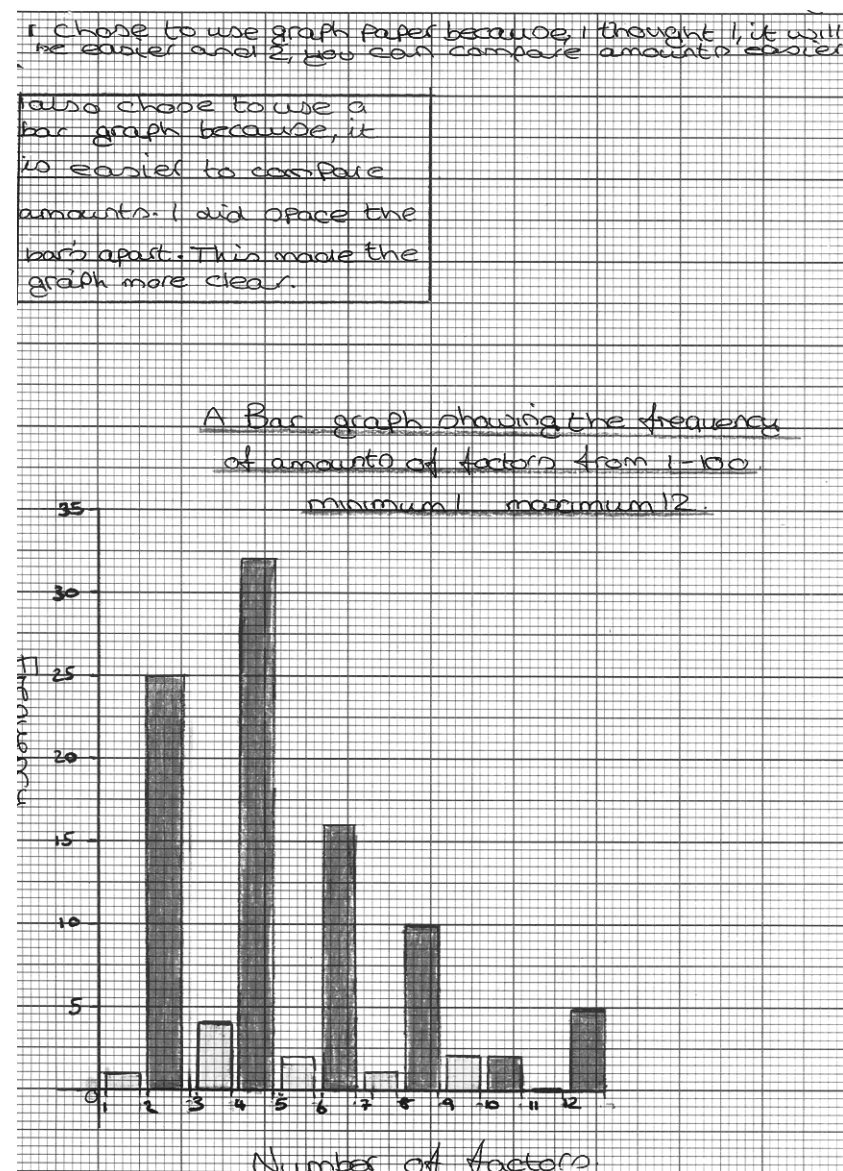
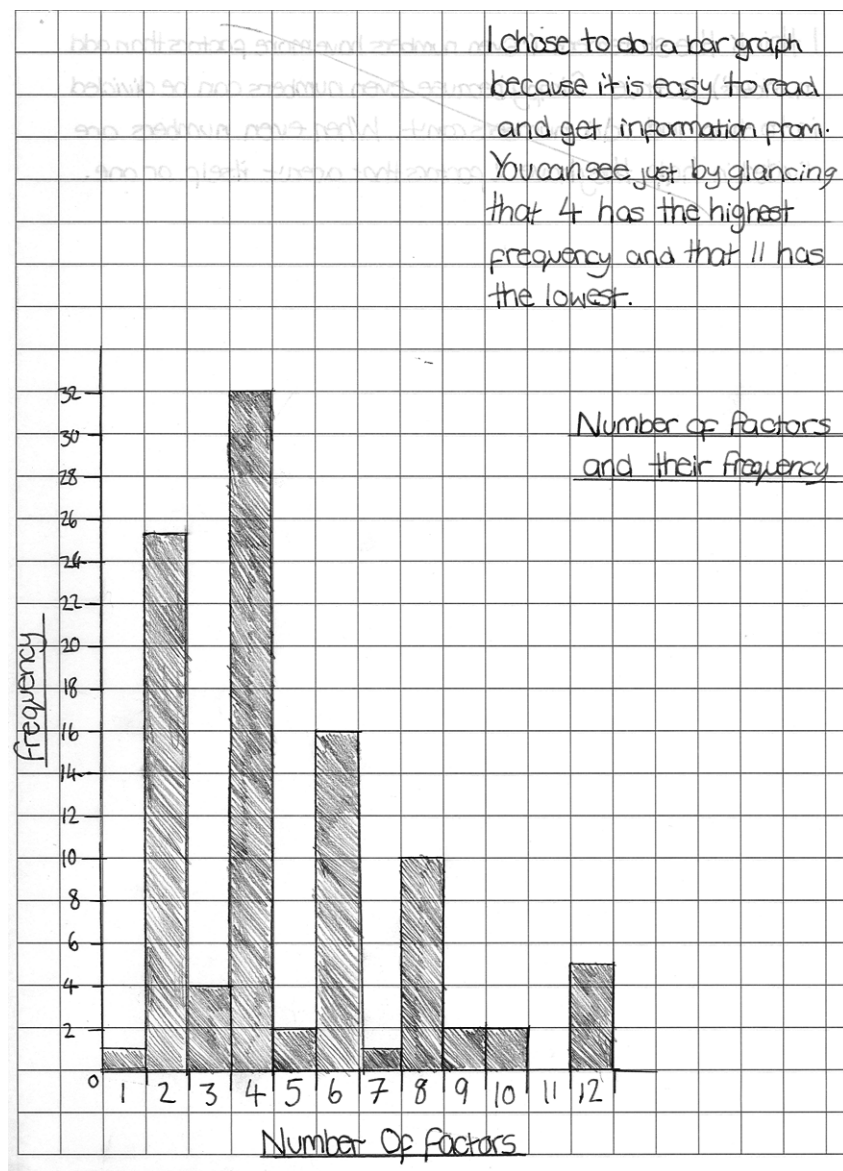


Task one – The first hundred: a frequency table  
Level 4



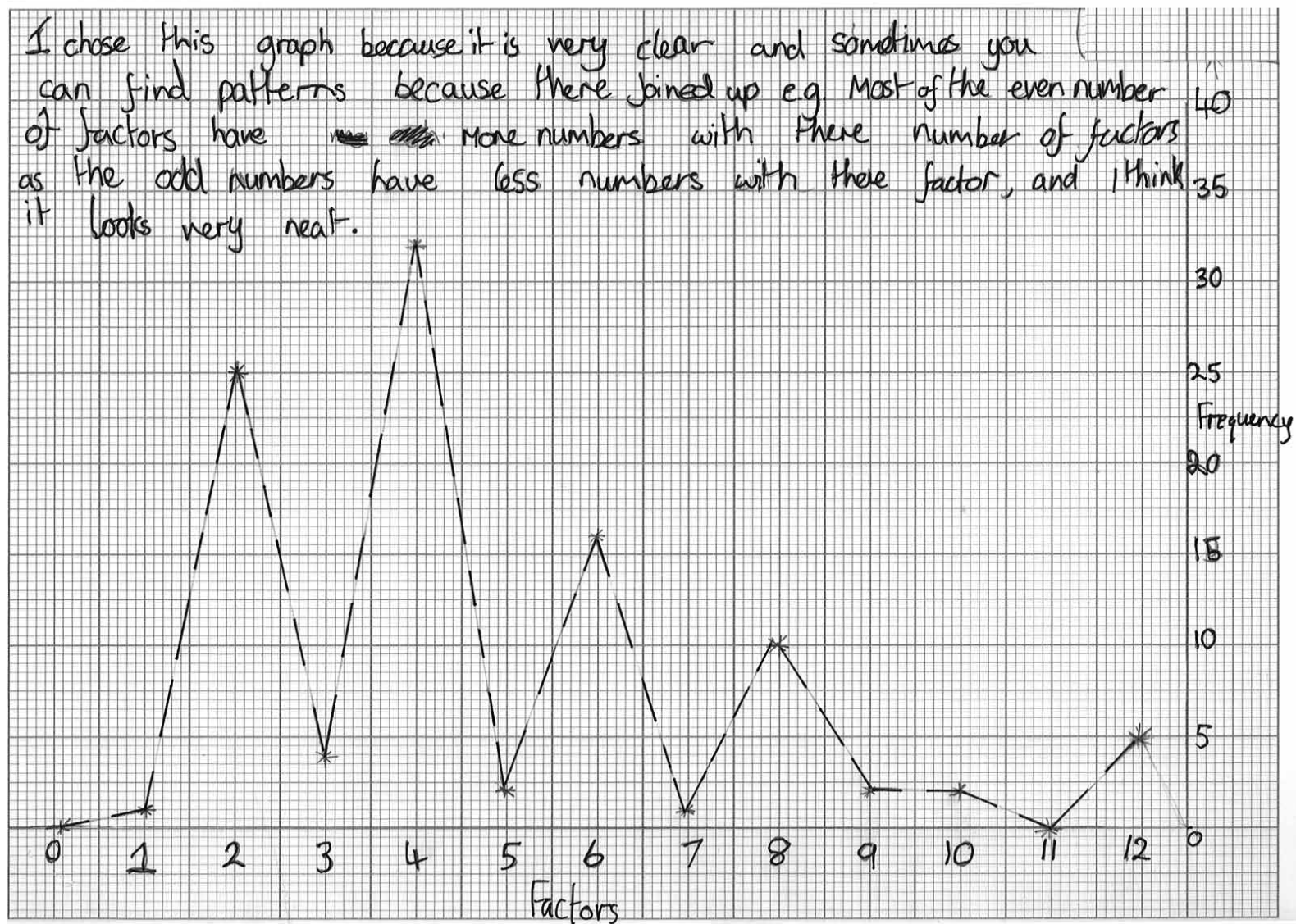


Task one – The first hundred: a frequency table  
Level 5



## Task one – The first hundred: a frequency table

## Level 5

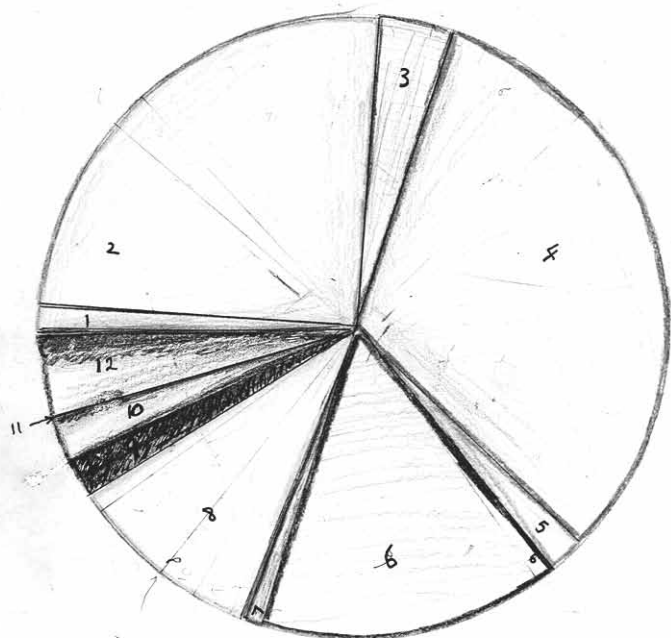




Task one – The first hundred: a frequency table

Level 6

A Graph to Show the Frequency  
of Numbers of Factors:



I chose a pie chart because I think it easily shows how many of each number. You can easily see the 2 and 4 are the most frequent frequency of numbers. I chose this paper because I didn't want to confuse the lines. I also thought I should do something different!

Task two – The first thirty: a hypothesis  
Level 3

Even		ODD	
# Factors	Frequency	# Factors	Frequency
2	(10)	1	① ①
4	(9)	3	③
6	(4)	5	①
8	(2)	7	5
10	25	9	5
12		11	
14		13	
16		15	
18		17	
20		19	
22		21	
24		23	
26		25	
28		27	
30		29	

Statement - True

There are 25 even <sup>number of</sup> factors and only a small 5 number of odd factors.

$25 + 5 = 30$  which means that I haven't miscalculated.

Task two – The first thirty: a hypothesis  
Level 4

Even	Odd
Factor numbers added together equal = 74	factor numbers added together equal = 37
Conclusion	
All the even factor numbers added together equal 74, and all the odd factor numbers added together equal 37, so there is a difference of 37 so the all even numbers up to thirty equal 74 and the odd equal half of that 37.	
	$\begin{array}{r} 74 \\ - 37 \\ \hline 37 \end{array}$

Task two – The first thirty: a hypothesis  
Level 4

Task Two: The first thirty: a hypothesis

even factors	frequency	odd factors	frequency
2	2	1	1
4	3	3	2
6	4	5	2
8	4	7	3
10	4	11	2
12	6	13	2
14	4	15	4
16	5	17	2
18	6	19	2
20	6	21	4
22	4	23	2
24	8	25	3
26	4	27	4
28	6	29	2
30	8	Total	36
Total	74		

The hypothesis have 36 factors

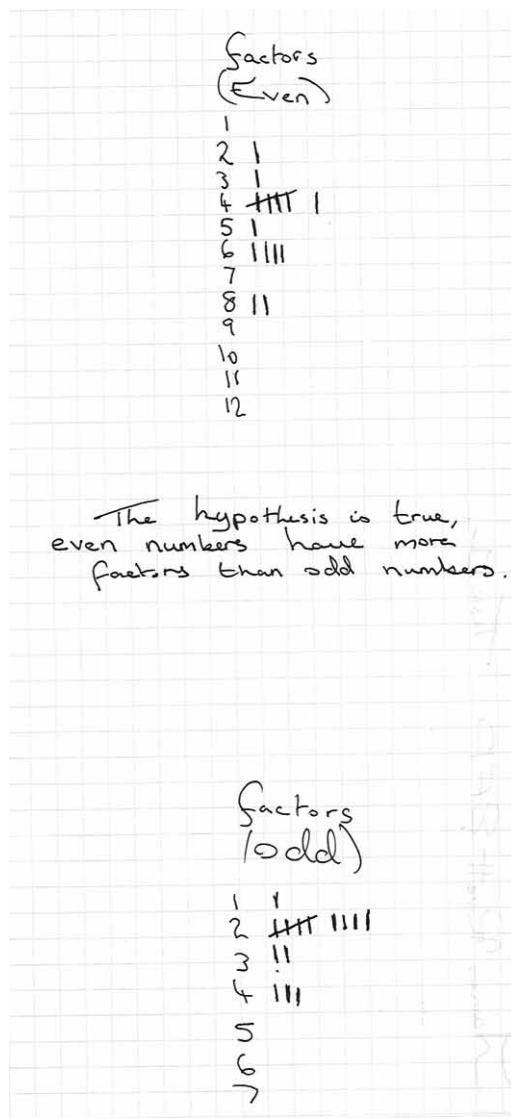
The hypothesis is right because even number have 74 factors and odd numbers have 36 factors

ODD	EVEN	Solomon
1 = odd = 1	2 = even = 2	
2 = even = 2	3 = odd = 3	
3 = odd = 3	4 = even = 4	
4 = even = 4	5 = odd = 5	
5 = odd = 5	6 = even = 6	
6 = even = 6	7 = odd = 7	
7 = odd = 7	8 = even = 8	
8 = even = 8	9 = odd = 9	
9 = odd = 9	10 = even = 10	
10 = even = 10	11 = odd = 11	
11 = odd = 11	12 = even = 12	
12 = even = 12	13 = odd = 13	
13 = odd = 13	14 = even = 14	
14 = even = 14	15 = odd = 15	
15 = odd = 15	16 = even = 16	
16 = even = 16	17 = odd = 17	
17 = odd = 17	18 = even = 18	
18 = even = 18	19 = odd = 19	
19 = odd = 19	20 = even = 20	
20 = even = 20	21 = odd = 21	
21 = odd = 21	22 = even = 22	
22 = even = 22	23 = odd = 23	
23 = odd = 23	24 = even = 24	
24 = even = 24	25 = odd = 25	
25 = odd = 25	26 = even = 26	
26 = even = 26	27 = odd = 27	
27 = odd = 27	28 = even = 28	
28 = even = 28	29 = odd = 29	
29 = odd = 29	30 = even = 30	

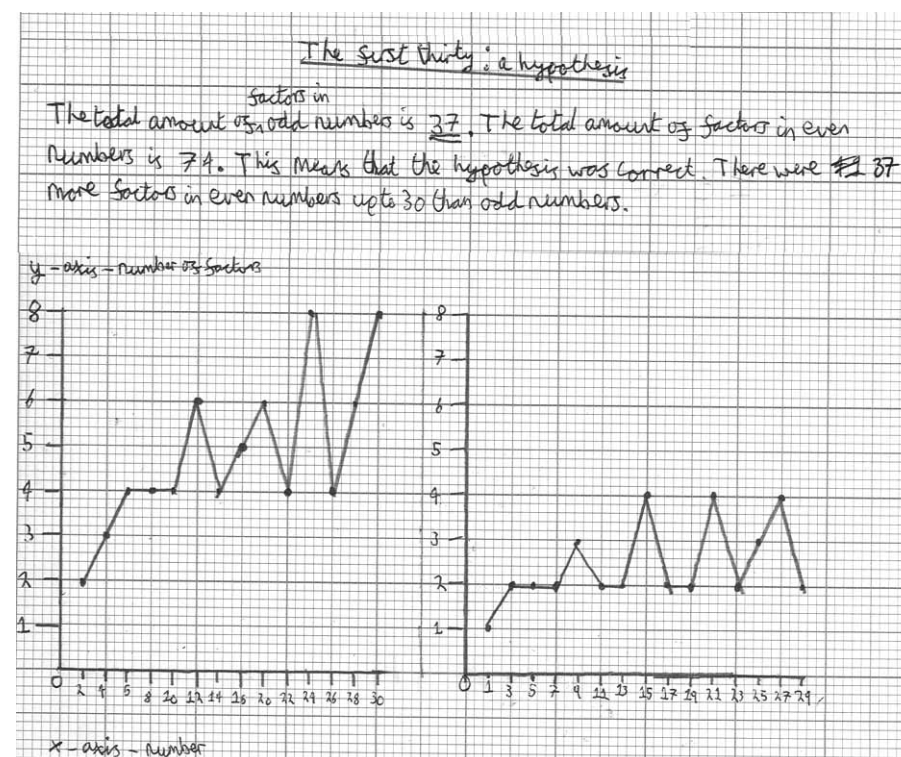
Yes even number do have more factors because if you add all the even number together it makes 74 but if you add all the odd it makes 37 So Even has more than odd so that means that it has more factors.



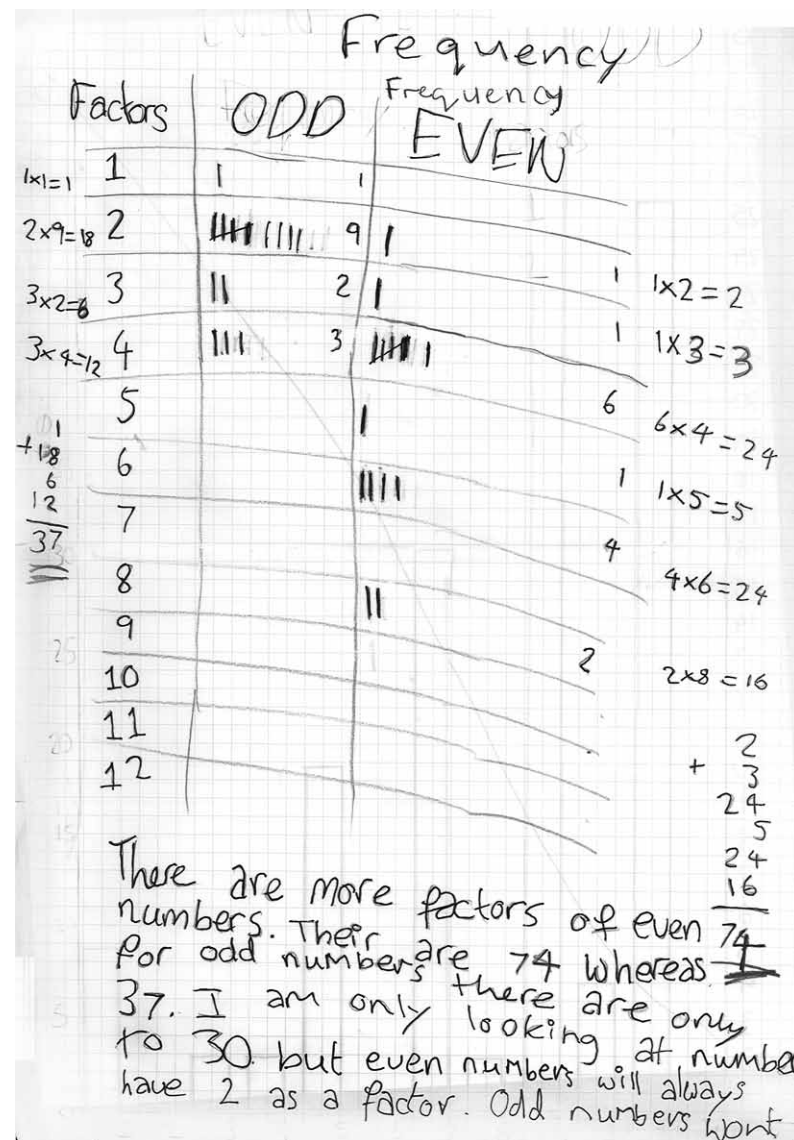
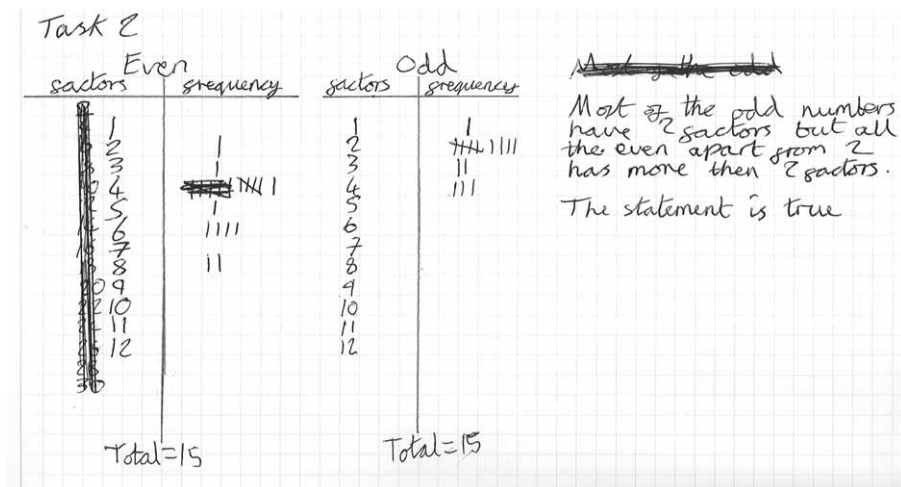
Task two – The first thirty: a hypothesis  
Level 4

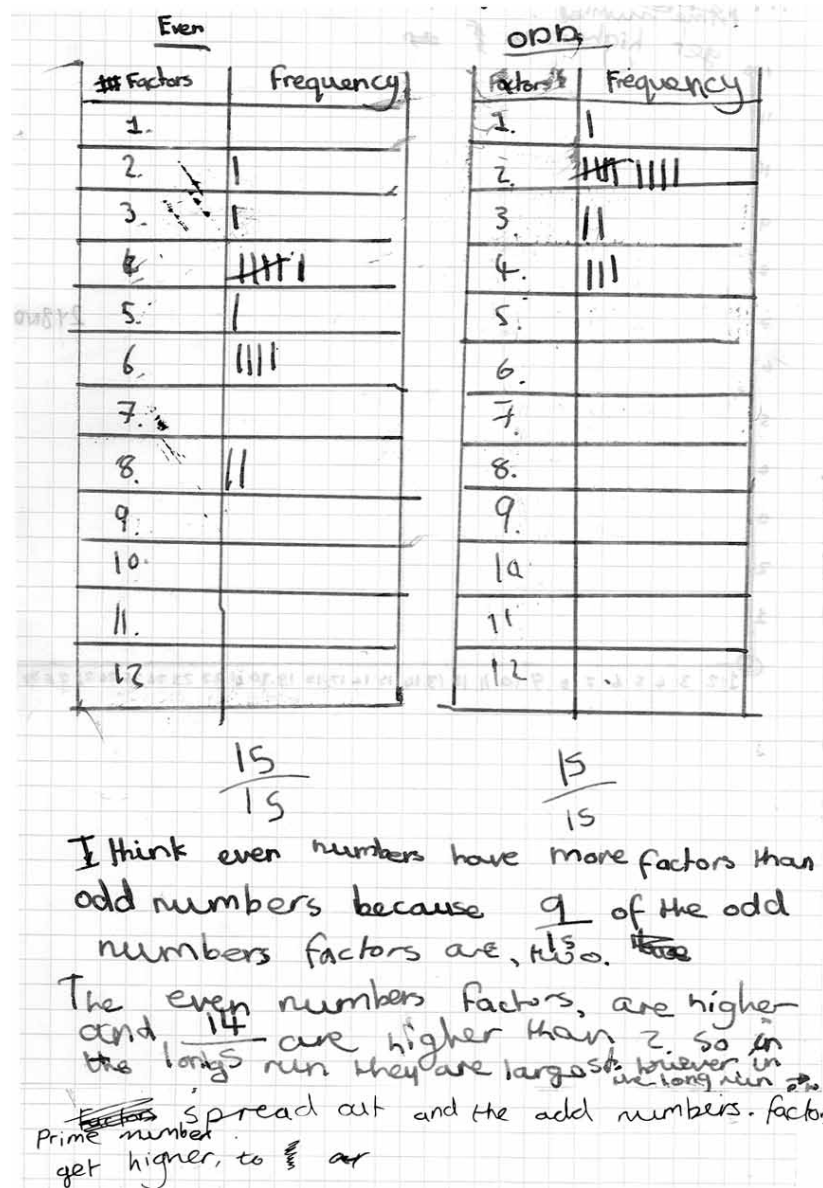


Task two – The first thirty: a hypothesis  
Level 5



Task two – The first thirty: a hypothesis  
Level 5



Task two – The first thirty: a hypothesis  
Level 5Task two – The first thirty: a hypothesis  
Level 6

Statement: Even numbers have more factors than odd numbers.

It seems that the statement is true as from the total of all factors of numbers from 1 to 30, only 37 out of 111 are from odd numbers. 74 are from even numbers. There are the same number of even and odd numbers (15 each).

Even

- every even number has the factor 1
- every even number has the factor 2
- 1 in 3 even numbers has the factor 3
- 1 in 2 even numbers has the factor 4
- 1 in 5 even numbers has the factor 5

Odd

- every odd number has the factor 1 (same)
- no odd numbers have the factor 2 X
- 1 in 3 odd numbers has the factor 3 (same)
- no odd numbers have the factor 4 X
- 1 in 5 odd numbers have the factor 5 (same)

There are too many to list but I think the pattern would carry on as no even numbers go into odd numbers. You might need to check more but from 1 to 30 twice as many factors belonged to even numbers than odd numbers.