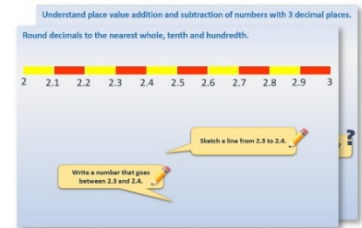


## Week 12, Day 3

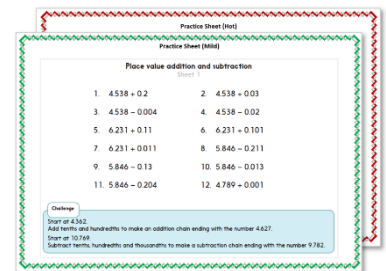
### Recognise and use square numbers and cube numbers

Each day covers one maths topic. It should take you about 1 hour or just a little more.

1. Start by carefully reading through the **Learning Reminders**.



2. Tackle the questions on the **Practice Sheet**.  
There might be a choice of either **Mild** (easier) or **Hot** (harder)!  
Check the answers.

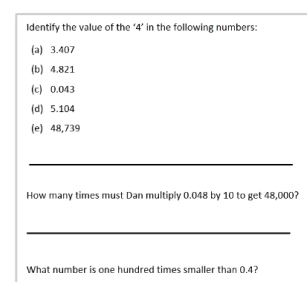


3. Finding it tricky? That's OK... have a go with a grown-up at **A Bit Stuck?**



4. Think you've cracked it? Whizzed through the Practice Sheets?  
Have a go at the **Investigation...**

5. Have I mastered the topic? Tackle the questions to **Check your understanding**.  
Fold the page to hide the answers!

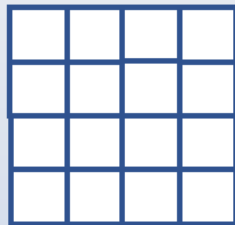


## Learning Reminders

Recognise and use square numbers and cube numbers.



The area of this square is  $9\text{cm}^2$ .



The area of this square is  $16\text{cm}^2$ .

We can write  $3 \times 3$  like this:

$$3^2$$

This means 3 multiplied by itself.  
It's like the little 2 we write after cm to show that each centimetre is squared.

$$3^2 = 9$$

$$4^2 = 16$$

$$5^2 = 25$$

How will this sequence continue? Try it out before looking at the next page!

## Learning Reminders

Recognise and use square numbers and cube numbers.

If you ring the square numbers on a times tables grid you get some interesting patterns...

Multiplication grid

x	1	2	3	4	5	6	7	8	9	10	11	12
1	1	2	3	4	5	6	7	8	9	10	11	12
2	2	4	6	8	10	12	14	16	18	20	22	24
3	3	6	9	12	15	18	21	24	27	30	33	36
4	4	8	12	16	20	24	28	32	36	40	44	48
5	5	10	15	20	25	30	35	40	45	50	55	60
6	6	12	18	24	30	36	42	48	54	60	66	72
7	7	14	21	28	35	42	49	56	63	70	77	84
8	8	16	24	32	40	48	56	64	72	80	88	96
9	9	18	27	36	45	54	63	72	81	90	99	108
10	10	20	30	40	50	60	70	80	90	100	110	120
11	11	22	33	44	55	66	77	88	99	110	121	132
12	12	24	36	48	60	72	84	96	108	120	132	144

The square numbers form a diagonal line.

The square numbers are alternately odd and even!

## Learning Reminders

Recognise and use square numbers and cube numbers.



The cube is 3cm by 3cm  
by 3cm.

We can find the number of 1cm in this cube by multiplying 3 by 3 by 3....

$3 \times 3 \times 3 = 27$ . We can write this as:  $3^3 = 27$ . The small '3' means cubed.

We write 4 cubed as  $4^3$ .  $4^3 = 4 \times 4 \times 4 = 64$ .

We write 5 cubed as  $5^3$ .  $5^3 = 5 \times 5 \times 5 = 125$

Cube numbers get big  
very quickly!

## Practice Sheet Mild

### Square and cube numbers

1. Ring all the square numbers. **Clue:** There are nine!

9	25	30	4	21	45	81	100
3	36	16	49	13	64	52	15

2.  $2^3 = 2 \times 2 \times 2 =$   
 $3^3 = 3 \times 3 \times 3 =$   
 $4^3 =$   
 $5^3 =$

#### Challenge

Calculate square numbers up to  $15^2$ .

## Practice Sheet Hot

### Square and cube numbers

Carry on marking this person's homework. Write the correct answers for any wrong answers at the side.

1.  $2^2 = 4$  ✓

2.  $3^2 = 6$  ✗  $3^2 = 3 \times 3 = 9$

3.  $5^2 = 25$

4.  $4^2 = 8$

5.  $10^2 = 100$

6.  $9^2 = 18$

7.  $7^2 = 48$

8.  $6^2 = 36$

9.  $8^2 = 64$

10.  $2^3 = 8$

11.  $3^3 = 9$

12.  $5^3 = 125$

13.  $4^3 = 64$

14.  $7^3 = 21$

15.  $8^3 = 512$

16.  $10^3 = 100$

17.  $6^3 = 216$

18.  $9^3 = 629$

#### Challenge

Calculate square numbers up to  $20^2$ .

## Practice Sheets Answers

### Square and cube numbers (mild)

- The square numbers are:  
4, 9, 16, 25, 36, 49, 64, 81, 100
- $2^3 = 2 \times 2 \times 2 = 8$   
 $3^3 = 3 \times 3 \times 3 = 27$   
 $4^3 = 4 \times 4 \times 4 = 64$   
 $5^3 = 5 \times 5 \times 5 = 125$

### Square and cube numbers (hot)

- $2^2 = 4$  ✓
- $3^2 = 6$  x  $3^2 = 3 \times 3 = 9$
- $5^2 = 25$  ✓
- $4^2 = 8$  x  $4^2 = 4 \times 4 = 16$
- $10^2 = 100$  ✓
- $9^2 = 18$  x  $9^2 = 9 \times 9 = 81$
- $7^2 = 48$  x  $7^2 = 7 \times 7 = 49$
- $6^2 = 36$  ✓
- $8^2 = 64$  ✓
- $2^3 = 8$  ✓
- $3^3 = 9$  x  $3^3 = 3 \times 3 \times 3 = 27$
- $5^3 = 125$  ✓
- $4^3 = 64$  ✓
- $7^3 = 21$  x  $7^3 = 7 \times 7 \times 7 = 343$
- $8^3 = 512$  ✓
- $10^3 = 100$  x  $10^3 = 10 \times 10 \times 10 = 1000$
- $6^3 = 216$  ✓
- $9^3 = 629$  x  $9^3 = 9 \times 9 \times 9 = 729$

### Challenge

$1^2 = 1$	$2^2 = 4$
$3^2 = 9$	$4^2 = 16$
$5^2 = 25$	$6^2 = 36$
$7^2 = 49$	$8^2 = 64$
$9^2 = 81$	$10^2 = 100$
$11^2 = 121$	$12^2 = 144$
$13^2 = 169$	$14^2 = 196$
$15^2 = 225$	

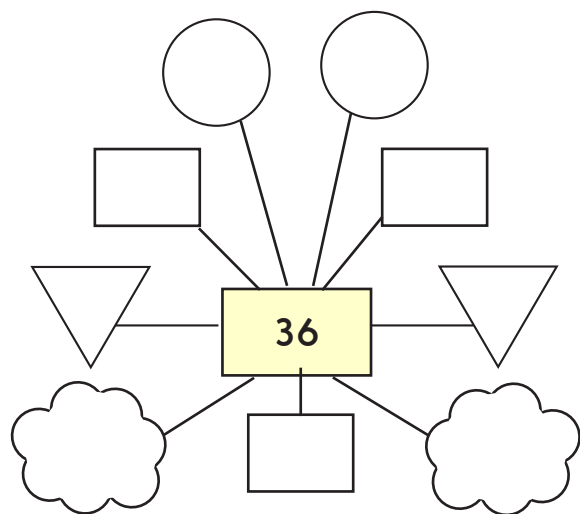
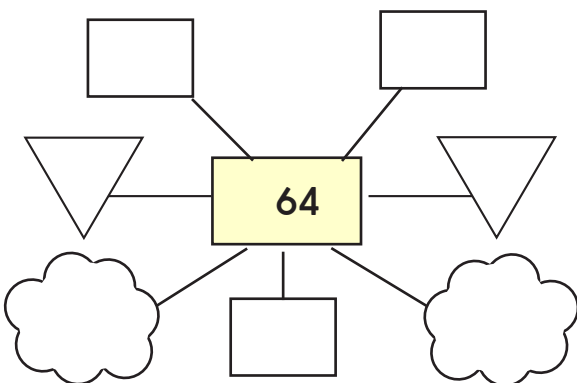
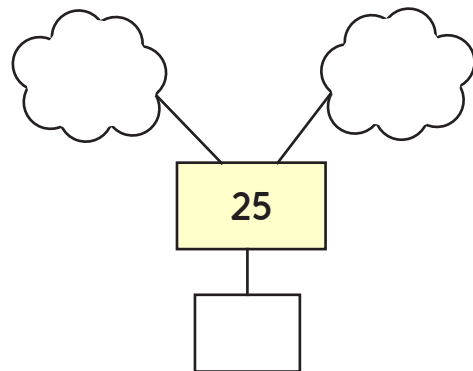
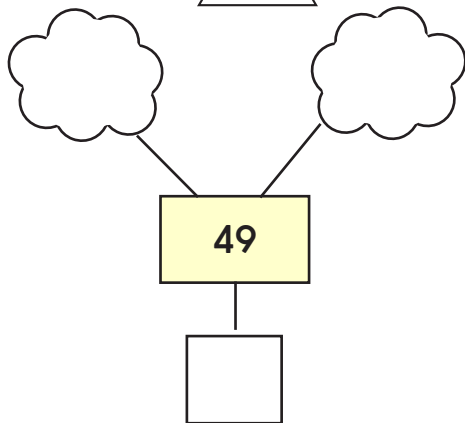
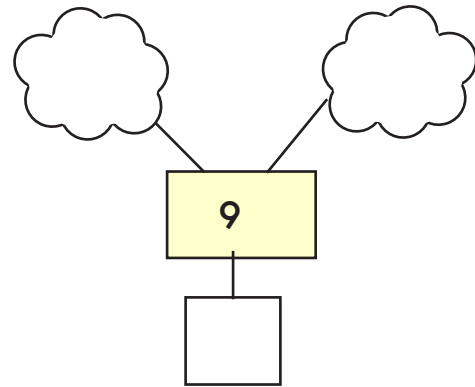
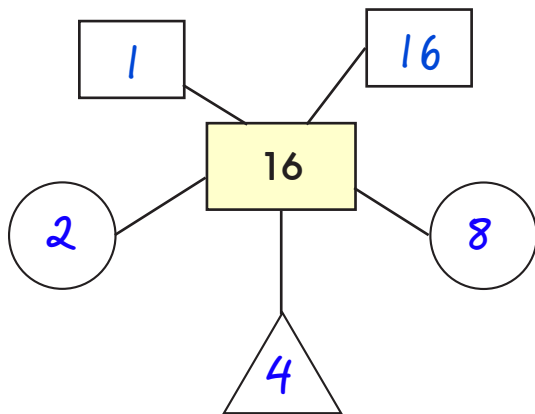
### Challenge

$1^2 = 1$	$2^2 = 4$
$3^2 = 9$	$4^2 = 16$
$5^2 = 25$	$6^2 = 36$
$7^2 = 49$	$8^2 = 64$
$9^2 = 81$	$10^2 = 100$
$11^2 = 121$	$12^2 = 144$
$13^2 = 169$	$14^2 = 196$
$15^2 = 225$	$16^2 = 256$
$17^2 = 289$	$18^2 = 324$
$19^2 = 361$	$20^2 = 400$

# A Bit Stuck?

## Factors of square numbers

Write the factors of each number. Remember that factors come in pairs. Record them as pairs in similar shapes, e.g. 16: 1 x 16, 2 x 8, 4 x 4 (we only need to write the 4 once). The first one is done for you.





## A Bit Stuck! Answers

### Factors of square numbers

Factors of 9 are 1, 3, 9

Factors of 49 are 1, 7, 49

Factors of 25 are 1, 5, 25

Factors of 64 are 1, 2, 4, 8, 16, 32, 64

Factors of 36 are 1, 2, 3, 4, 6, 9, 12, 18, 36

## Investigation

### What an odd thing!

1. Lay out odd numbers in a triangle like this:

```

1
 3  5
7  9  11
13 15 17 19 and so on.
```

2. Continue until you have at least 8 rows.
  3. Add the numbers along each row in the triangle. Write this number in blue.
  4. Add the beginning and end number of each row and divide by 2. Write this number in red.
  5. Look at the blue numbers for each row. Can you recognise and name these numbers?
  6. Look at the red numbers for each row. Can you recognise and name these numbers?
- Discuss what you notice.
7. Try adding two more rows to your triangle.
  8. Is the pattern sustained?

1	1
3 5	8
7 9 11	27 9
13 15 17 19	
21 23...	
	$18 \div 2 = 9$

### Challenge

Can you find any other patterns in the triangle of odd numbers? Try looking at the triangle inside the large one (i.e. remove the outer diagonals, 1, 3, 7, 13, etc. and 1, 5, 11, 19, etc.) Add the rows. You will have to play about a bit with square numbers to spot the pattern.

## Check your understanding

### Questions

Ring the numbers that are the common factors of 12 and 18:

2    3    6    9    12

---

Write all the common multiples of 3 and 8 that are less than 50.

---

Using the digits 1, 5 and 6, make the following 2-digit numbers:

- a prime number;
  - a common multiple of 5 and 13;
  - a common factor of 60 and 90.
- 

Put these values in order with the smallest first:

$5^2$      $3^2$      $3^3$      $2^3$ .

---

## Check your understanding

### Answers

Ring the numbers that are the common factors of 12 and 18:

**2**   **3**   **6**   **9**   12

12 and 18 are each divisible (without remainder) by all the highlighted numbers.

---

Write all the common multiples of 3 and 8 that are less than 50.

24, 48 Listing ALL the multiples of 3 and 8 less than 50 suggests that term 'common multiples' has not been understood.

---

Using the digits 1, 5 and 6, make the following 2-digit numbers:

- a prime number; 61
  - a common multiple of 5 and 13; 65
  - a common factor of 60 and 90. 15
- 

Put these values in order with the smallest first:

$5^2$     $3^2$     $3^3$     $2^3$

$2^3$   $3^2$   $5^2$   $3^3$  which are equal to 8, 9, 25 and 27, respectively.

Check that children who haven't got this correct are not multiplying by 2 or 3 rather than squaring or cubing the numbers, e.g. thinking  $2^3 = 6$ .