Times Tables Shifts Solution

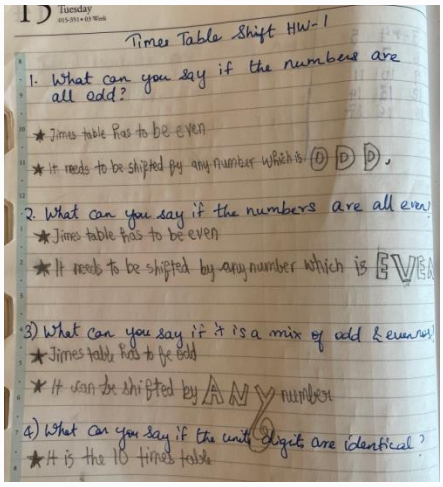
Myself **Shubhangee (Facilitator)** had worked collaboratively on '**Times Tables Shifts**' with a group of 13 students of 3rd and 4th grade, in online mode, in '**Ganit Kreeda', Vicharvatika, India.** The names of the students are:

Advaya,Shivashree,Kanaa,Reeve,Ananya, Tiana, Ishaan, Veer, Amay, Avic, Aheedutt, Ela, Ashrith and Shreehari.

Advaya, Tiana, Ishaan and Amay's answers are given here:

1. What can you say if the numbers are all odd? :
    - **ANS-** We can say that the table is even and the number used to shift is odd. For example, a table of 4 shifted by 3 will make odd numbers.
2. What about if they are all even?
    - **ANS** - If all the numbers are even that means that the table and the number used to shift it were even. For example, a table of 4 shifted by 2 will make even numbers as 6,10,14,18...
3. Or a mixture of odd and even?
    - **ANS** - If the numbers are mixed, that means a table of odd numbers was shifted by any number, as the odd tables have odd and even products.
4. What can you say if the unit digits are all identical?
    - **ANS** -If all the unit digits are the same, then that means the table shifted is a 10's or 10's multiple's table.
5. What if there are only two different unit digits?
    - **ANS**- This means it is a 5's table,as 5's products end with 5 or 0.
6. Can you explain how you worked out the table and shift each time, and why your method will always work?
    - **ANS** - For example 4's table:
        - 4,8,12,16,20,24 shifted by 3
        - 7,11,15,19,23,27
        - From the shifted table, I first subtract 7 from 11 (second number - first number), this gives me the number whose table it is. In this case, it is 4's table.
        - Then I take 4 and subtract it from the first number of the shifted table. In this case, it is 7-4= 3 which is the number shifted up by.
        - Next, I write down the shifted table, ie, 7,11,15,19, 23,27
        - I write the 4's table near it.
        - Then I subtract the first number in the shifted table from the second number in the 4's table.The answer is the shifted down by.

Here is Kanaa's work:



Here is Avic's response to following 3 questions:

1. What can you say if the difference between two numbers is prime?

   It is the table of the prime number.
   Eg 16,27,38, 49, 60
   Table 11 - prime number
   Shift up - 5
   Shift down 6

2. What can you say if the difference between two numbers is composite (not prime)?

   The times table will be highest factor of the composite number.
   Eg - 15, 31, 47, 63, 71
   On minusing we get 16 and 8, so answer will be 8
   Table - 8
   Shift up - 7
   Shift down - 1

3. Can you explain how you worked out the table and shift each time, and why your method will always work?

Eg, 115,154,89,24, 37
Step 1 - Put numbers in ascending order
24,37,89,115,154
Step 2 - Minus numbers and find difference.
154 - 115 = 39
115 - 89 = 26

89 - 37 = 52
37 - 24 = 13
Step 3 - We will find highest common factor or prime number and that will be table. Shift up can be done by finding number in tables closest to first number and difference. Shift down is table minus the shift up.
Table is 13
Shift up - 11 (13x1=13, 24-13 = 11)
Shift down - 2 (13-11)

Tiana's response:

To find the tables, I would subtract the first two numbers.

To find the shift, I would find the difference of the tables and the first number.

To find the second shift, I would subtract the previous shift from the tables.

The difference between two numbers next to each other in the shifted tables would be same with the difference in the actual tables. And this difference is the required tables.

To find the upward shift, we subtract the first number and the tables.

The upward shift and the downward shift together make the tables. So, we can find it by subtracting.

Shivashree's approach was very different and unique. It's explained here.

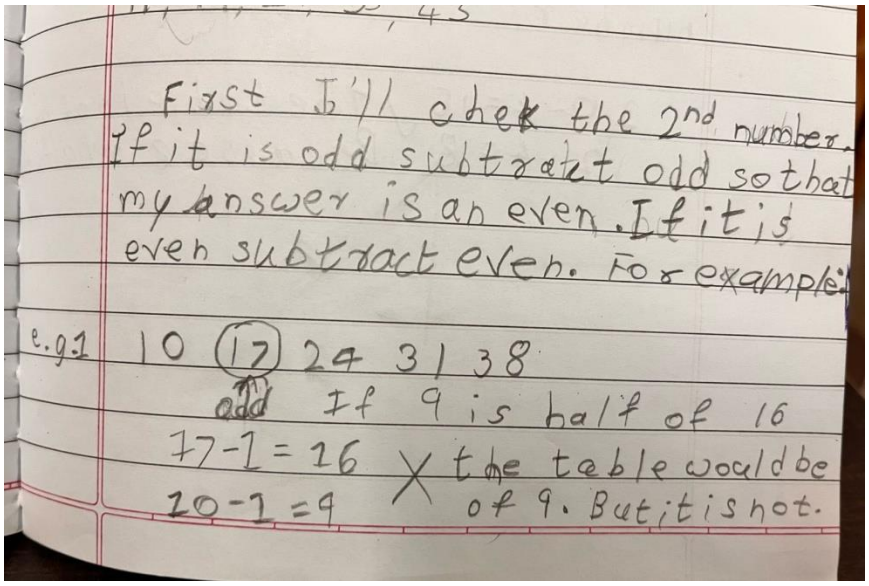
She tried by subtracting one common number from first and second term. She selected this number in such a way that second term will be even. Now she compared first term with the second term. If first term is half of second term then that's the answer. I was really surprised to see her approach.

When I asked her why did you take the half of second term?

Her response was unbelievable...she said because there's only one term before this and by adding it two times, you will get second term.

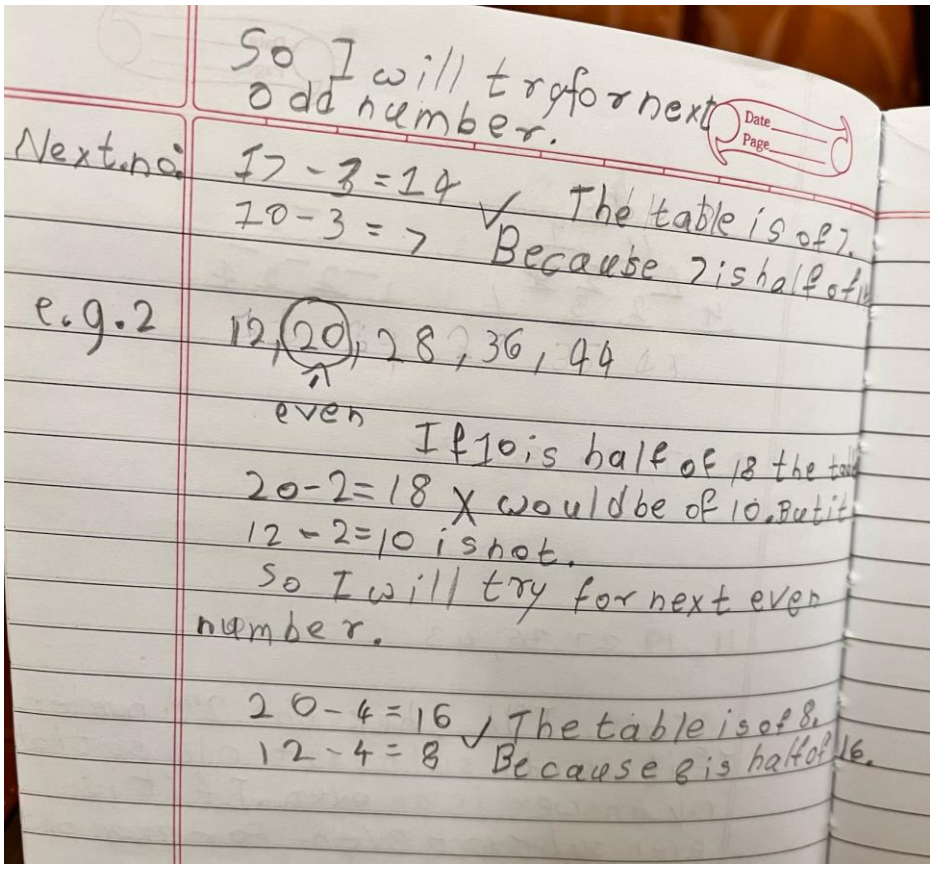
This was really a new learning for me and AHA moment too.

I am attaching her thought process in her own words.



First I'll chek the 2nd number. If it is odd subtract odd so that my answer is an even. If it is even subtract even. For example:

e.g.1 10 (17) 24 31 38
odd If 9 is half of 16
17-1 = 16 ✗ the table would be
10-1 = 9 of 9. But it is not.



So I will try for next odd number.

Next no: 17 - 3 = 14 ✓ The table is of 7.
10 - 3 = 7 Because 7 is half of

e.g.2 12, (20), 28, 36, 44
even If 10 is half of 18 the tab
20 - 2 = 18 ✗ would be of 10. But it
12 - 2 = 10 is not.
So I will try for next even number.

20 - 4 = 16 ✓ The table is of 8.
12 - 4 = 8 Because 8 is half of 16.

Times Tables Shifts Solution

Myself **Shubhangee (Facilitator)** had worked collaboratively on '**Times Tables Shifts**' with a group of 13 students of 3rd and 4th grade, in online mode, in '**Ganit Kreeda', Vicharvatika, India.** The names of the students are:

Kimaya, Mrunmayee, Aarav, Ruhi, Amey, Siddharth, Reyansh, Vihaan, Vivaan, Rudra, Aaryavir, Rudravir and Swara.

We worked for 2 sessions on this task. All their responses are summarized here along with the pictures of their original solutions.

1. What is same between numbers in a times table and numbers in the shifted times table?
Ans:The difference between two numbers of the shifted time table is same as the normal table.

Rudra explained it as:
Shifting a sequence up or down by a constant number doesn't change the differences between the consecutive terms—it just shifts the entire sequence, keeping the step size between each term the same.

2. What can you learn from the difference between any two numbers in a shifted times table?
Ans: The difference is the same as in the original table.

3. How do you find the shift once you've worked out the table?
Ans: Add or subtract the first number from the times table.
Siddharth explained it as:
First I saw that what is the difference between the number and the smaller multiple that is the upper shift. For the smaller shift reverse.

4.What can you say if the numbers from the shifted table are all odd?
A. We can say that an odd number is subtracted or added from an even number table. That means Table is even and the shift is odd.

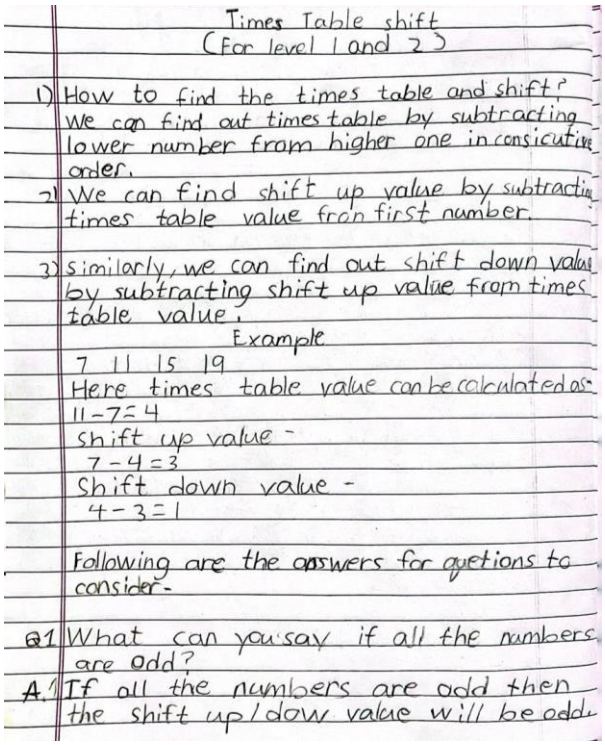
5. What about if they are all even?
A. We can say that an even number is added or subtracted from an even number table. That means Table is even and the shift is also even.

6. Or a mixture of odd and even?
A. We can say that an odd or even number is added or subtracted from an odd number table. Or Table is odd and the shift can be odd or even.

7. What can you say if the unit digits are all identical?
A. We can say that the table is a multiple of 10 means it can be table of 10 / 20/ 30/…

8. What if there are only two different unit digits?
A. We can say that it can be table of 5 or multiple of 5 like, 15 / 25/ 35/…

Here is Aarav's work.



Times Table shift
(For level 1 and 2)

1) How to find the times table and shift?
We can find out times table by subtracting lower number from higher one in consicutive order.

2) We can find shift up value by subtracting times table value from first number.

3) similarly, we can find out shift down value by subtracting shift up value from times table value.

Example

7 11 15 19

Here times table value can be calculated as
11 − 7 = 4

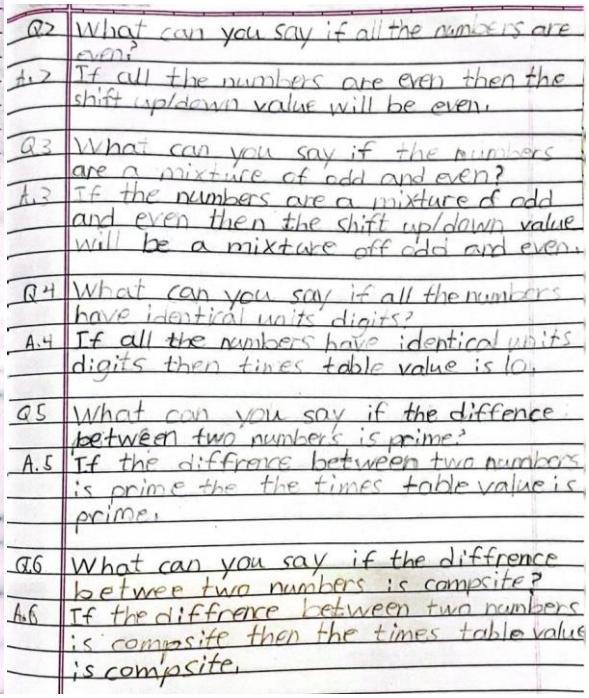
Shift up value -
7 − 4 = 3

Shift down value -
4 − 3 = 1

Following are the answers for quetions to consider-

Q1 What can you say if all the numbers are odd?

A.1 If all the numbers are odd then the shift up/dow value will be odd



Q2 What can you say if all the numbers are even?

A.2 If all the numbers are even then the shift up/down value will be even.

Q3 What can you say if the numbers are a mixture of odd and even?

A.3 If the numbers are a mixture of odd and even then the shift up/down value will be a mixture off odd and even.

Q4 What can you say if all the numbers have identical units' digits?

A.4 If all the numbers have identical units digits then times table value is 10.

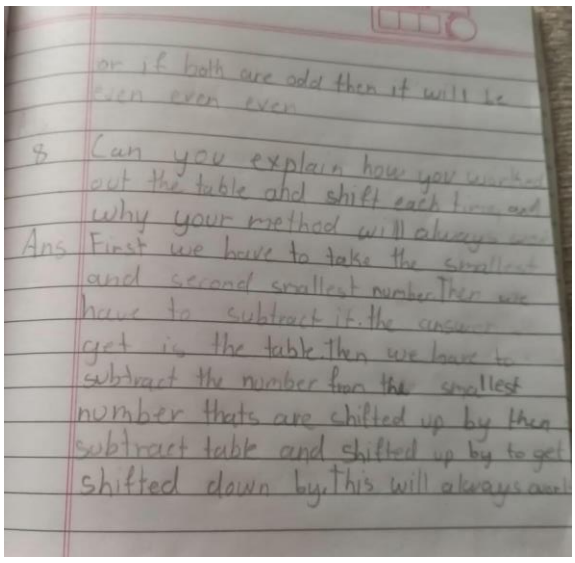
Q5 What can you say if the diffence between two numbers is prime?

A.5 If the diffrence between two numbers is prime the the times table value is prime.

Q6 What can you say if the diffrence betwee two numbers is compsite?

A.6 If the diffrence between two numbers is compsite then the times table value is compsite.

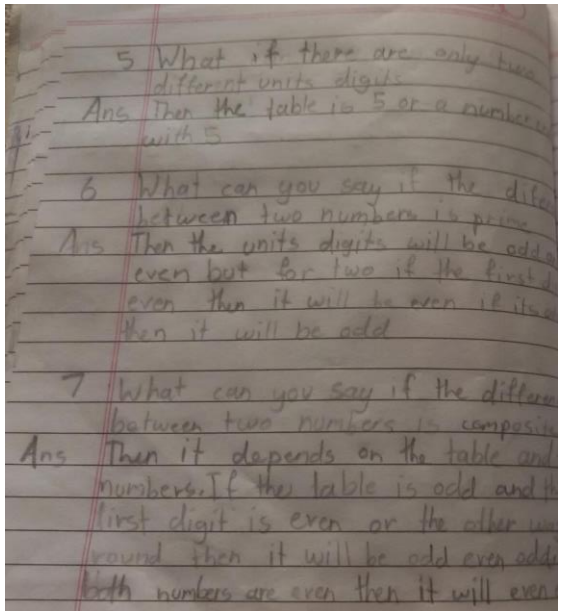
Here is Mrunmayee's Work:



or if both are odd then it will be even even even

8 Can you explain how you worked out the table and shift each time and why your method will always work?

Ans First we have to take the smallest and second smallest number. Then we have to subtract it. the answer we get is the table. then we have to subtract the number from the smallest number thats are shifted up by then subtract table and shifted up by to get shifted down by. this will always work



5 What if there are only two different units digits

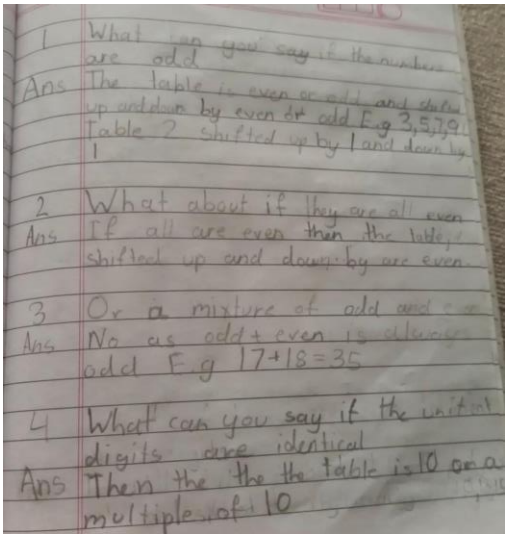
Ans Then the table is 5 or a number with 5

6 What can you say if the diff between two numbers is prime

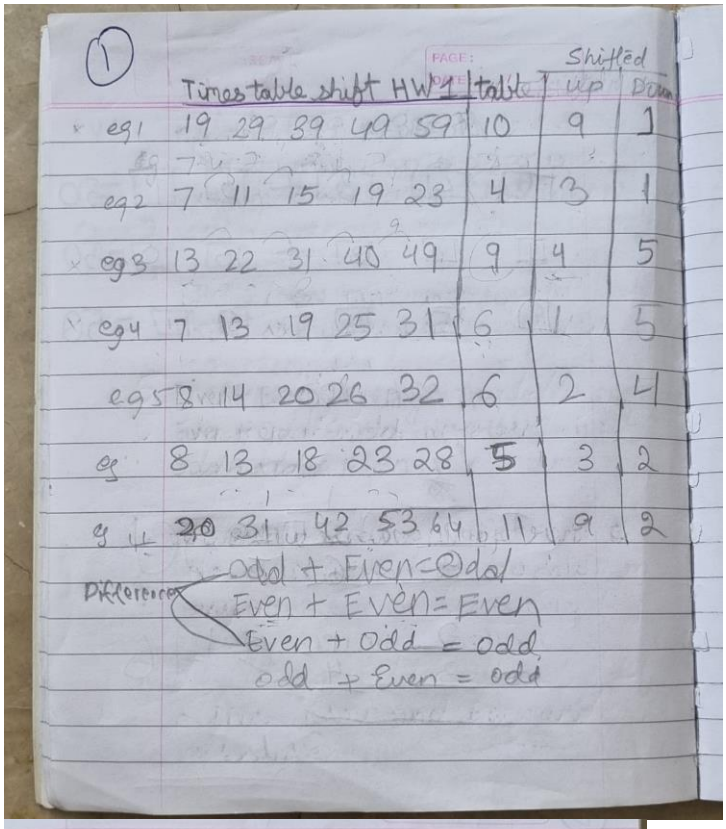
Ans Then the units digits will be odd even but for two if the first even then it will be even if it odd then it will be odd

7 What can you say if the differe between two numbers is composite

Ans Then it depends on the table and numbers. If the table is odd and first digit is even or the other round then it will be odd even odd both numbers are even then it will even



Here is Vihaan's work:



(1)

Times table shift HW 1

						table	Shifted up	Shifted Down
eg1	19	29	39	49	59	10	9	1
eg2	7	11	15	19	23	4	3	1
eg3	13	22	31	40	49	9	4	5
eg4	7	13	19	25	31	6	1	5
eg5	8	14	20	26	32	6	2	4
eg	8	13	18	23	28	5	3	2
eg	~~20~~	31	42	53	64	11	9	2

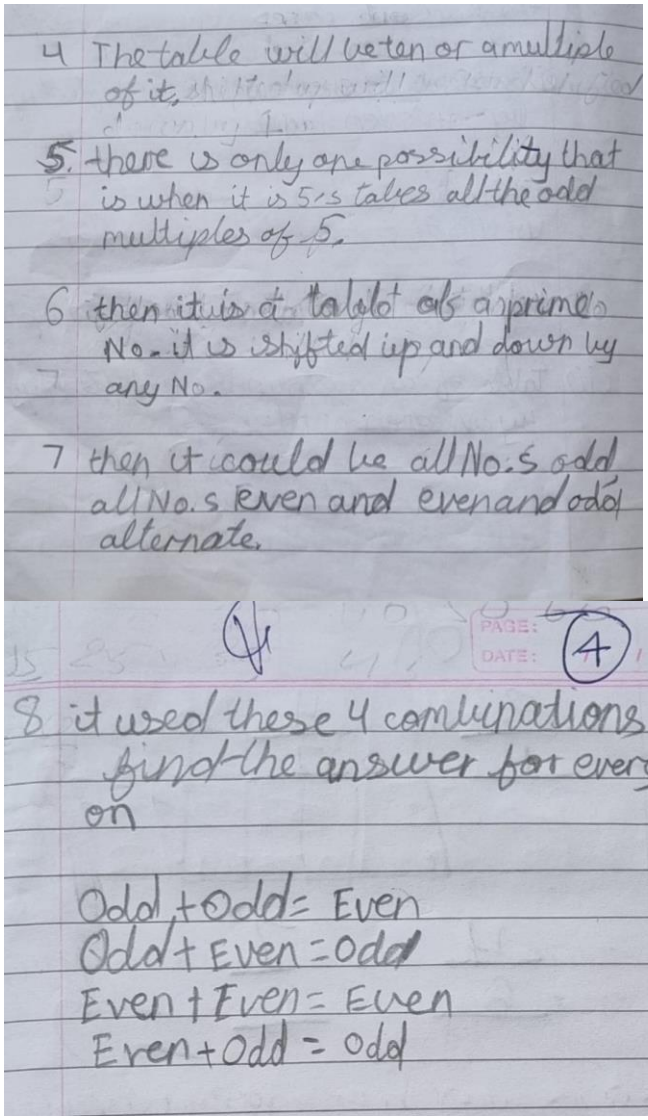
Difference

odd + Even = odd
Even + Even = Even
Even + odd = odd
odd + Even = odd

1 there is one case where you will get an odd number.
(i) Table of an even number + Shifted up by an odd number

2 there are one cases where you will get an even number it is
(i) table of an even number + Shifted up by an even number

3 There are two cases where you will get odd and even numbers.
(i) table of an odd number + shifted up by an even number.
(ii) Table of an odd number + Shifted up by an even number



For Level 1, 2- in each of the problems, the difference between the shifted numbers is always the same. So, the value of the difference gives the table.

For Level 3 -

- **Arrange the numbers in ascending order.**
- **Find out the difference between each consecutive pair.**
- **The HCF of all the difference is the Table number.**