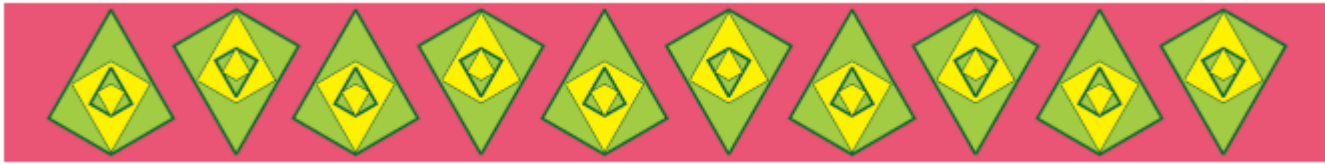


1.



Now you use these two rules to make patterns with this  block.

Solution:-



2. What should come next?

(a)



Solution:-



(b)



Solution:-



(c)



Solution:-



(d)



Solution:-



3. See this pattern

(a)



The rule of the pattern is turning by  $45^\circ$  each time. Which will be the next?

Tick ( $\checkmark$ ) the right one.



Solution:-



4. Using the same rule take it forward till you get back to what you started with.

(a)



Solution:-



(b)




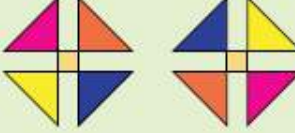
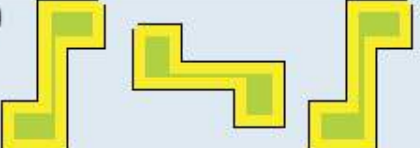
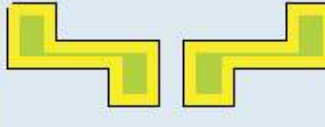




Solution:-





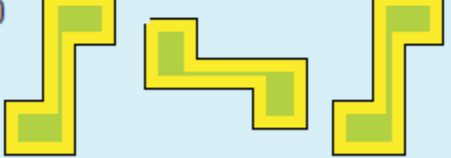





5. Some patterns are given below on the left side of the red line. For each pattern, write the rule. Then choose what comes next from the right side of the line and tick (✓) it.



<p>a)</p>  <p>Rule: _____ _____</p>	 <p>( ) ( )</p>
<p>b)</p>  <p>Rule: _____ _____</p>	 <p>( ) ( )</p>
<p>c)</p>  <p>Rule: _____ _____</p>	 <p>( ) ( )</p>
<p>d)</p>  <p>Rule: _____ _____</p>	 <p>( ) ( )</p>

**Solution:-**

<p>a)</p>  <p>Rule: <u>Turn by 45° each time</u></p> <p>_____</p>	 <p>( )      (✓)</p>
<p>b)</p>  <p>Rule: <u>Turn by 90° each time</u></p> <p>_____</p>	 <p>( )      (✓)</p>
<p>c)</p>  <p>Rule: <u>Turn by 90° each time</u></p> <p>_____</p>	 <p>(✓)      ( )</p>
<p>d)</p>  <p>Rule: <u>Turn by 90° each time</u></p> <p>_____</p>	 <p>(✓)      ( )</p>

6. Mark that picture which is breaking the rule. Also correct it.

(a)



**Solution:-**

The below marked picture is breaking the rule.



The correct rule is as shown in the picture below.



(b)



**Solution:-**

The below marked picture is breaking the rule.



The correct rule is as shown in the picture below.



(c)



**Solution:-**

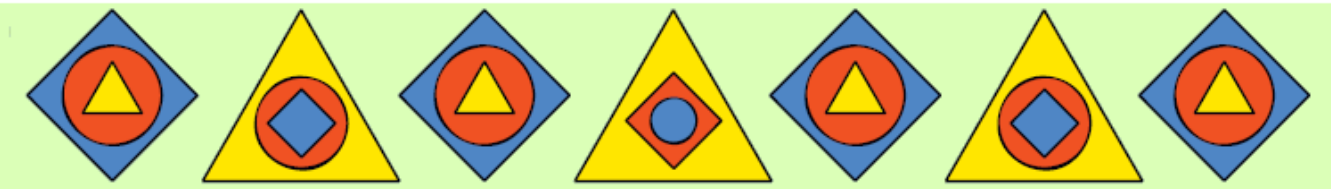
The below marked picture is breaking the rule.



The correct rule is as shown in the picture below.

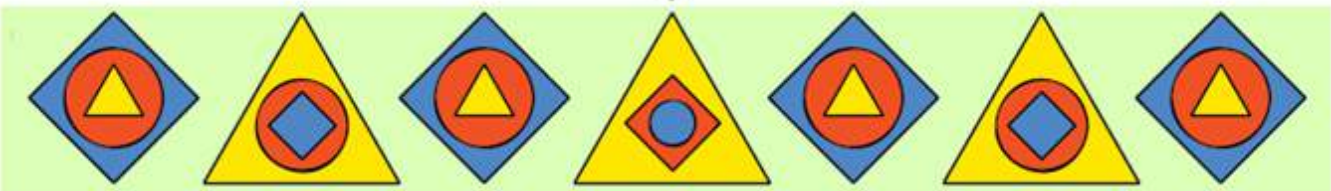


(d)

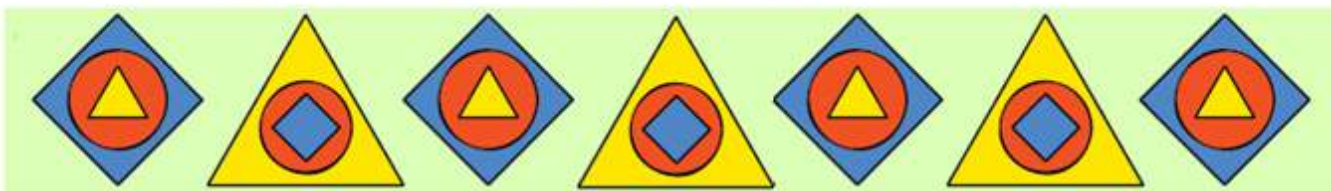


**Solution:-**

The below marked picture is breaking the rule.



The correct rule is as shown in the picture below.



## 7. Magic Squares



Do you remember magic triangles? Come now, let's make some magic squares.

(i) Fill this square using all the numbers from 46 to 54.

Rule: The total of each line is 150.

		49
46		
	52	47

**Solution:-**

From the question it is give that, total of each line is equal to 150.

So, let us take third row,

From the rule, \_\_\_\_\_ + 52 + 47 = 150

$$\text{_____} + 99 = 150$$

$$\text{_____} = 150 - 99$$

Therefore, number in the first box in third row = 51

Now, let us take first column,

From the rule, \_\_\_\_\_ + 46 + 51 = 150

$$\text{_____} + 97 = 150$$

$$\text{_____} = 150 - 97$$

Therefore, number in the first box in first column = 53

Let us take first row,

From the rule, 53 + \_\_\_\_\_ + 49 = 150

$$\text{_____} + 102 = 150$$

$$\text{_____} = 150 - 102$$

Therefore, number in the second box in first row = 48

Let us take second column,

From the rule, 48 + \_\_\_\_\_ + 52 = 150

$$\text{_____} + 100 = 150$$

$$\text{_____} = 150 - 100$$

Therefore, number in the second box in second column = 50

Let us take third column,

From the rule, 49 + \_\_\_\_\_ + 47 = 150

$$\underline{\quad\quad} + 96 = 150$$

$$\underline{\quad\quad} = 150 - 96$$

Therefore, number in the second box in third column = 54

53	48	49
46	50	54
51	52	47

(ii) Fill this square using all the numbers from 21 to 29.

Rule: The total of each side is 75.

	25	

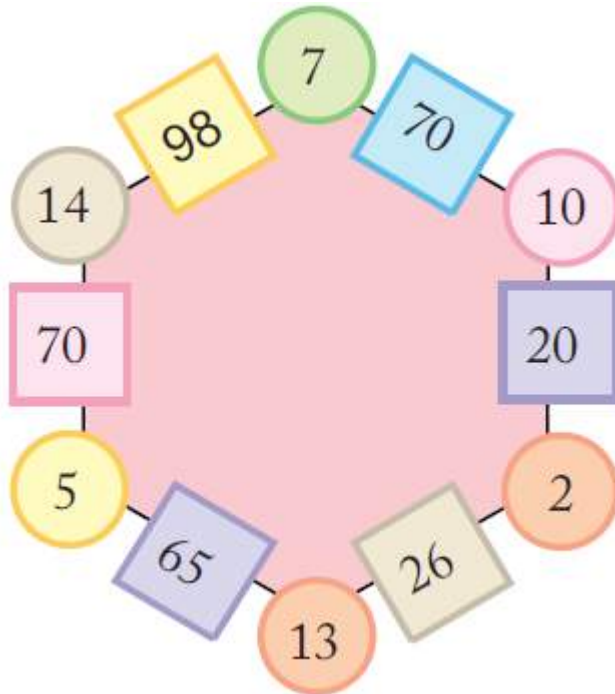
**Solution:-**

From the question it is give that, total of each line is equal to 75.

24	23	28
29	25	21
22	27	26

## 8. Magic Hexagons

Look at the patterns of numbers in hexagons. Each side has 2 circles and 1 box.



Look at the number 65 in the box. Which are the circles next to it? Can you see how the rule works?

$$\begin{array}{l} \text{5} \times \text{13} = \text{65} \\ \text{7} \times \text{10} = \text{70} \end{array}$$

**Solution:-**

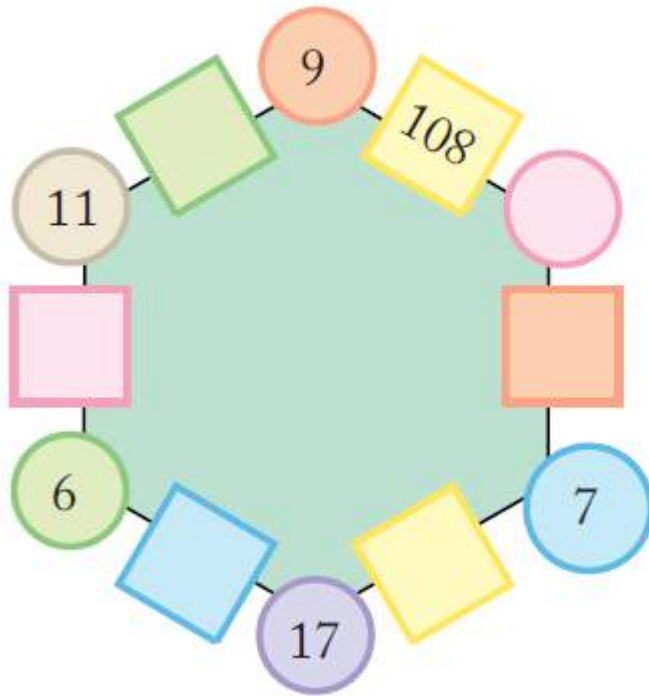
The circles next to 65 are 5 and 13.

$$\begin{array}{l} \text{5} \times \text{13} = \text{65} \\ \text{7} \times \text{14} = \text{70} \end{array}$$

The rule of this method is we get the number in each box by multiplying the numbers in the circles next to it.

(i) Use the same rule to fill the hexagons below.

(a)



**Solution:-**

$$11 \times 9 = 99$$

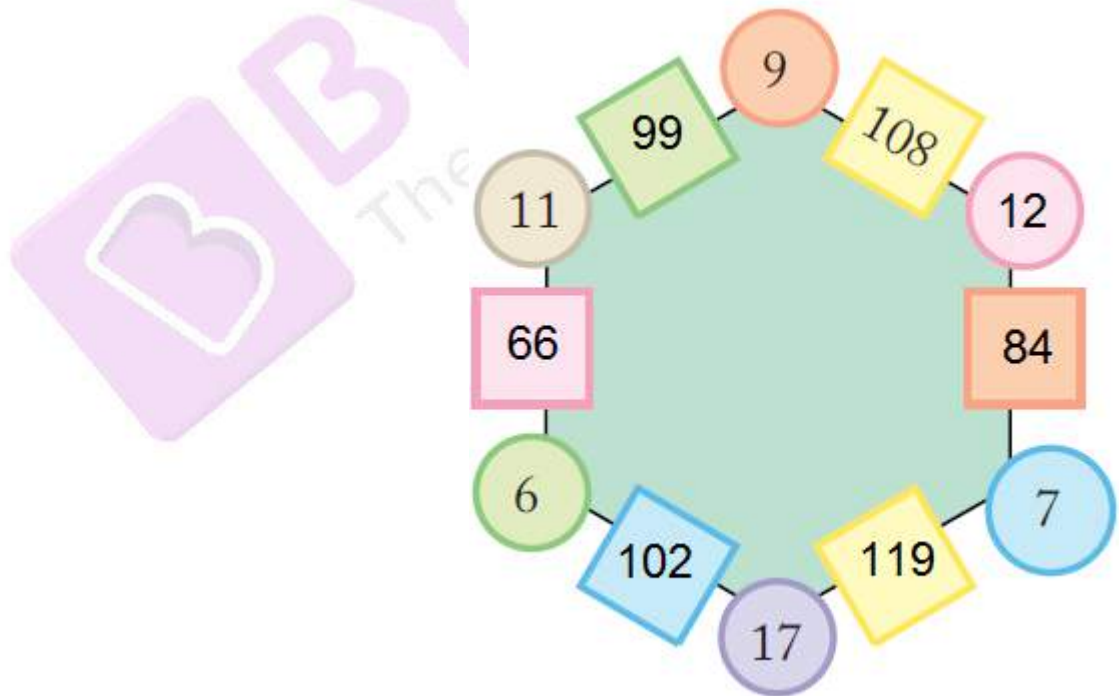
$$11 \times 6 = 66$$

$$6 \times 17 = 102$$

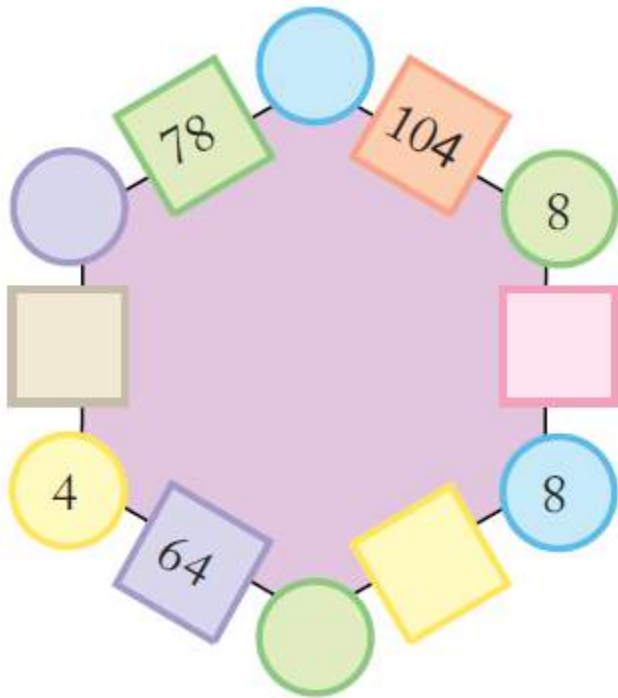
$$17 \times 7 = 119$$

$$9 \times 12 = 108$$

$$12 \times 7 = 84$$



(b)



**Solution:-**

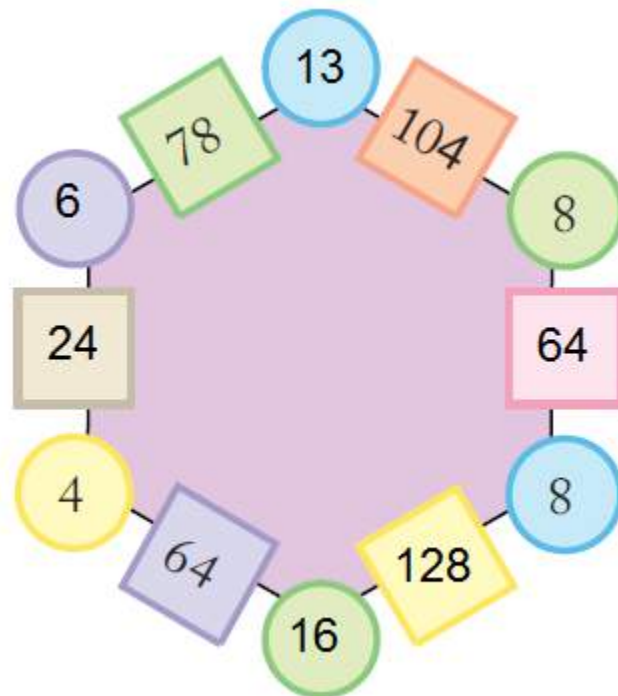
$$4 \times 16 = 64$$

$$16 \times 8 = 128$$

$$8 \times 8 = 64$$

$$13 \times 8 = 104$$

$$13 \times 6 = 78$$



9. Numbers and Numbers

$$\begin{array}{ccccccc}
 \text{★ } 24 & + & \text{⬠ } 19 & + & \text{◇ } 37 & = & \text{◇ } 37 & + & \text{★ } 24 & + & \text{⬠ } 19 \\
 \text{○ } 215 & + & \text{◇ } 120 & + & \text{⬠ } 600 & = & \text{⬠ } 600 & + & \text{○ } 215 & + & \text{◇ } 120
 \end{array}$$

(i) Are they equal?

**Solution:-**

Yes, the mentioned equation are equal.

Because, let us consider left hand side (LHS) of first equation =  $24 + 19 + 37$

$$\text{LHS} = 80$$

Now, Right hand side (RHS) =  $37 + 24 + 19$

$$\text{RHS} = 80$$

By comparing LHS and RHS,

$$\text{LHS} = \text{RHS}$$

Then consider second equation, LHS =  $215 + 120 + 600$

$$\text{LHS} = 935$$

Now, RHS =  $600 + 215 + 120$

$$= 935$$

By comparing LHS and RHS,

$$\text{LHS} = \text{RHS}$$

(ii) Fill in the blank spaces in the same way.

(a)

$$\text{★ } 14 + \quad + \quad = \text{⬠ } 34 + \text{★ } 14 + \text{○ } 20$$

**Solution:-**

$$\text{★ } 14 + \text{⬠ } 34 + \text{○ } 20 = \text{⬠ } 34 + \text{★ } 14 + \text{○ } 20$$

(b)

$$+ \text{flower}(42) + = \text{diamond}(65) + + \text{hexagon}(80)$$

**Solution:-**

$$\text{hexagon}(80) + \text{flower}(42) + \text{diamond}(65) = \text{diamond}(65) + \text{flower}(42) + \text{hexagon}(80)$$

(c)

$$\text{cloud}(200) + \text{star}(300) + = + \text{heart}(400) +$$

**Solution:-**

$$\text{cloud}(200) + \text{star}(300) + \text{heart}(400) = \text{cloud}(200) + \text{heart}(400) + \text{star}(300)$$

(iii) Now, look at this-

$$\text{cup}(48) \times \text{cup}(13) = \text{cup}(13) \times \text{cup}(48)$$

**Check if it is true or not.**

**Solution:-**

First consider the left hand side (LHS) =  $48 \times 13$

$$\text{LHS} = 624$$

Now consider right hand side (RHS) =  $13 \times 48$

$$\text{RHS} = 624$$

By comparing LHS and RHS,

$$\text{LHS} = \text{RHS}$$

(iv) Now you try and change these numbers into special numbers

(a) 28

**Solution:-**

Take another number

28

Now turn it back to front                    82  
Then add them together                    110  
Is this a special number? No!    Why not?  
OK, carry on with the number    110  
Again turn it back to front            011  
Then add the two together            121  
Ah! 121 is a special number.

**(b) 132****Solution:-**

Take another number                    132  
Now turn it back to front            231  
Then add them together            363  
Ah! 363 is a special number.

**(c) 273****Solution:-**

Take another number                    273  
Now turn it back to front            372  
Then add them together            645  
Is this a special number? No!    Why not?  
OK, carry on with the number    645  
Again turn it back to front            546  
Then add the two together            1191  
Is this a special number? No!    Why not?  
OK, carry on with the number    1191  
Again turn it back to front            1911  
Then add the two together            3102  
Is this a special number? No!    Why not?  
OK, carry on with the number    3102  
Again turn it back to front            2013  
Then add the two together            5115  
Ah! 5115 is a special number.

**(v) Now let's use words in a special way.**



N O L E M O N S N O M E L O N  
S T E P N O T O N P E T S

































Did you notice that it reads the same from both sides — right to left and left to right?

**Solution:-**

































EYE, LEVEL, ROTATOR, NOON, REFER, TOP SPOT etc.

### 10. Some more Number Patterns

(i) Take any number. Now multiply it by 2, 3, 4 ..... at every step. Also add 3 to it at each step. Look at the difference in the answer. Is it the same at every step?

	×		+		=	
	×		+		=	
	×		+		=	
	×		+		=	
	×		+		=	
	×		+		=	
	×		+		=	
	×		+		=	

**Solution:-**

	×		+		=	
	×		+		=	
	×		+		=	
	×		+		=	
	×		+		=	
	×		+		=	
	×		+		=	
	×		+		=	

Let us check difference in the answer,  $39 - 27 = 12$ ,  $51 - 39 = 12$ ,  $63 - 51 = 12$ ,  $75 - 63 = 12$ ,  $87 - 75 = 12$ ,  $99 - 87 = 12$ ,  $111 - 99 = 12$ .

Therefore, the difference in the answer are same at every step.

(ii) Look at the numbers below. Look for the pattern. Can you take it forward?

$$(9 - 1) \div 8 = 1$$

$$(98 - 2) \div 8 = 12$$

$$(987 - 3) \div 8 = 123$$

$$(9876 - 4) \div 8 = \underline{\quad}$$

$$(98765 - 5) \div 8 = \underline{\quad}$$

$$(\underline{\quad} - \underline{\quad}) \div 8 = \underline{\quad}$$

$$(\underline{\quad} - \underline{\quad}) \div 8 = \underline{\quad}$$

**Solution:-**

$$(9 - 1) \div 8 = 1$$

$$(98 - 2) \div 8 = 12$$

$$(987 - 3) \div 8 = 123$$

$$(9876 - 4) \div 8 = 1234$$

$$(98765 - 5) \div 8 = 12345$$

$$(987654 - 6) \div 8 = 123456$$

$$(9876543 - 7) \div 8 = 1234567$$

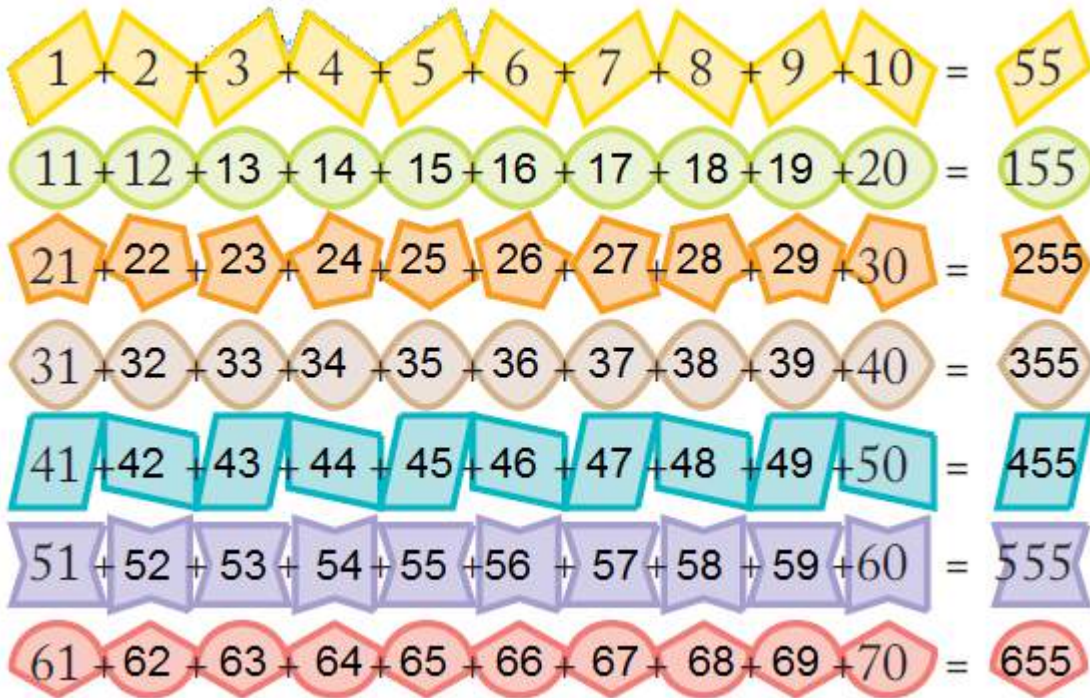
$$(98765432 - 8) \div 8 = 12345678$$

$$(987654321 - 9) \div 8 = 123456789$$

### 11. Smart Adding

$1 + 2 + 3 + 4 + 5 + 6 + 7 + 8 + 9 + 10 = 55$   
 $11 + 12 + \dots + 20 = 155$   
 $21 + \dots + 30 = \dots$   
 $31 + \dots + 40 = \dots$   
 $41 + \dots + 50 = \dots$   
 $51 + \dots + 60 = 555$   
 $61 + \dots + 70 = \dots$

**Solution:-**



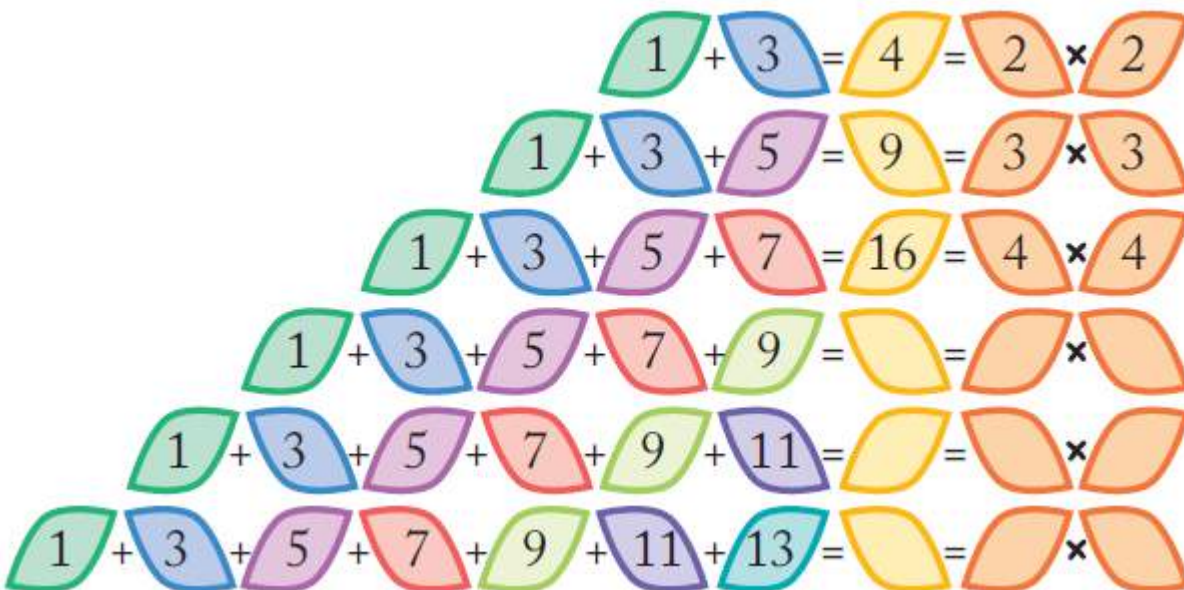
(ii) Did you notice some pattern in the answers?

**Solution:-**

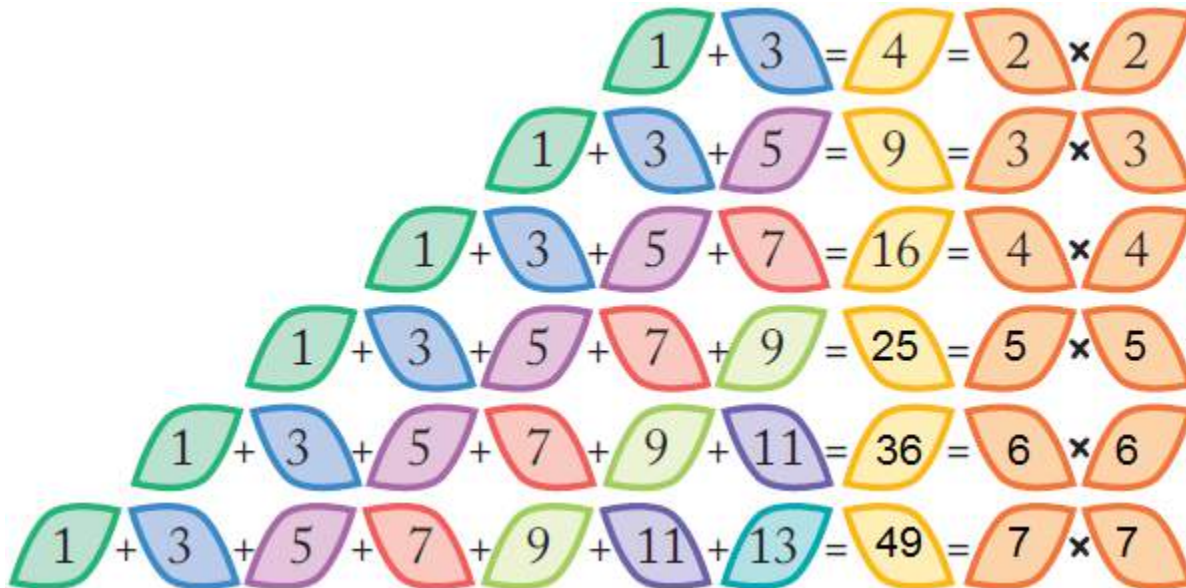
Yes, I found that the difference in the answer are same i.e. 100 at every step.

### 12. Fun with Odd Numbers

Take the first two odd numbers. Now add them, see what you get. Now, at every step, add the next odd number. How far can you go on?



**Solution:-**



We can't predict, because there are infinite numbers.

### 13. Secret Numbers

Banno and Binod were playing a guessing game by writing clues about a secret number. Each tried to guess the other's secret number from the clues. Can you guess their secret numbers?

(i) It is larger than half of 100

It is more than 6 tens and less than 7 tens

The tens digit is one more than the ones digit

Together the digits have a sum of 11

**Solution:-**

It is larger than half of 100, i.e. number  $> 50$

It is more than 6 tens and less than 7 tens = so, number lies between 60 and 70

The tens digit is one more than the ones digit =  $6 - 1 = 5$

Together the digits have a sum of 11 =  $6 + 5 = 11$

Therefore the number is 65

(ii) It is smaller than half of 100

It is more than 4 tens and less than 5 tens

The tens digit is two more than the ones digit

Together the digits have a sum of 6

**Solution:-**

It is smaller than half of 100 = number  $< 50$

It is more than 4 tens and less than 5 tens = number lies between 40 and 50

The tens digit is two more than the ones digit =  $4 - 2 = 2$

Together the digits have a sum of 6 =  $4 + 2 = 6$

Therefore the number is 42

#### 14. Number Surprises

a) Ask your friend rite — W down your age. Add 5 to it. Multiply the sum by 2. Subtract 10 from it. Next divide it by 2. What do you get? Is your friend surprised?

Solution:-

Let us assume the age be 11,

Then, adding 5 to it we get = 16

Multiply by 2 we get = 32

Subtract from 10 we get = 22

Divided by 2 we get = 11

Yes, my friend was really surprised.


b)

- ☆ Take a number
- ☆ Double it  × 2 =
- ☆ Multiply by 5  × 5 =
- ☆ Divide your answer by 10  ÷ 10 =

Solution:-




- ☆ Take a number
- ☆ Double it  ×  =
- ☆ Multiply by 5  ×  =
- ☆ Divide your answer by 10  ÷  =


c)

★ Take a number 

★ Double it  ×  2 = 


★ Again double it  ×  2 = 

★ Add the number you took first to the answer  +  = 

★ Now again double it  ×  2 = 



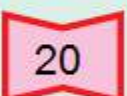
★ Divide by 10  ÷  10 = 




**Solution:-**

★ Take a number 

★ Double it  ×  2 = 

★ Again double it  ×  2 = 

★ Add the number you took first to the answer  +  = 

★ Now again double it  ×  2 = 

★ Divide by 10  ÷  10 = 

d) Look at this pattern of numbers and take it forward.

$$1 = 1 \times 1$$

$$121 = 11 \times 11$$

$$12321 = 111 \times 111$$

$$1234321 = ?$$

Solution:-

$$1 = 1 \times 1$$

$$121 = 11 \times 11$$

$$12321 = 111 \times 111$$

$$1234321 = 1111 \times 1111$$

$$123454321 = 11111 \times 11111$$

$$12345654321 = 111111 \times 111111$$

$$1234567654321 = 1111111 \times 1111111$$