

## Section 1.2 – Patterns

**This booklet belongs to: \_\_\_\_\_ Block: \_\_\_\_\_**

- ✓ Mathematical **logic** can help us determine specific patterns
- ✓ We **don't** always **need to know the equation** of the pattern, but we subtly **use our logic** to deduce it
- ✓ Do you remember this equation  $y = mx + b$ ?
- ✓ This equation represents the **pattern of a straight line**.
- ✓ The ***x* and *y*** are the variables that represents the **input and output (place holder and result)**

**Example:** What are the next two numbers?

1, 3, 5, 7, ..., ...

Now, **what is the equation** that represents this pattern?

- ✓ Remember that you have a **variable as a place holder**
  - i.e. 1<sup>st</sup> position, 2<sup>nd</sup> position, etc.
- ✓ You also have a **variable that is the result**

So, what is the equation?

$$y = 2n - 1$$

**Example:** Find the pattern

$$1 * 1 = 1$$

$$11 * 11 = 121$$

$$111 * 111 = 12321$$

$$1111 * 1111 = \underline{\hspace{2cm}}$$

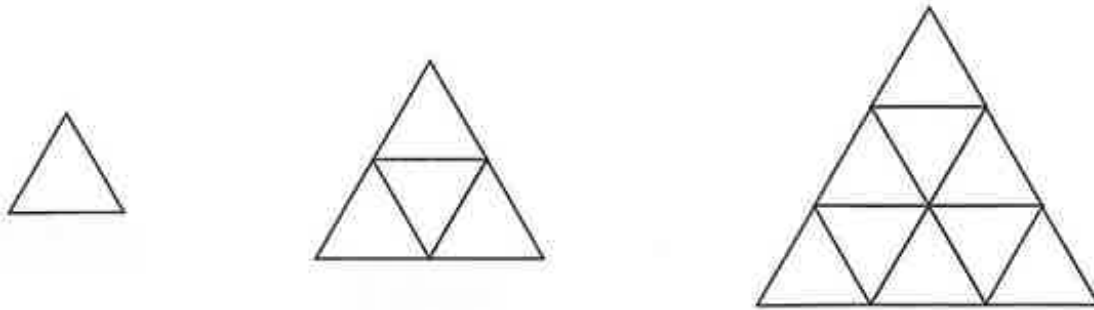
$$11111 * 11111 = \underline{\hspace{2cm}}$$

**Solution:** Can you see the pattern?

Next two lines are:

1234321, 123454321

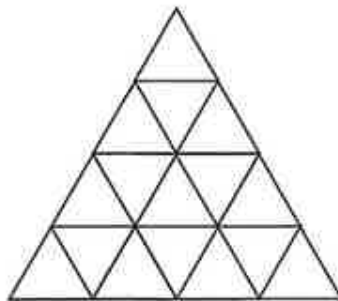
**Example:** Draw the next shape. **Predict** the number of pieces in the next two patterns.



**Solution:** What is happening in the progression?

- The first triangle is made up of: 3 pieces
- The second triangle is made up of: 9 pieces
- The third triangle is made up of: 18 pieces
  
- The new triangle will have: **30 pieces**

The Pattern goes:  
 +6, +9, ... + 12, ...  
 The next will have to be: +12



**Example:** Sometimes patterns are clear, sometimes not so much. Find the next numbers in the patterns.

- a) 3, 6, 8, 16, 18, 36, 38, ...
- b) 2, 4, 5, 10, 12, 24, 27, ...

**Solution:**

- a) 3, 6, 8, 16, 18, 35, 38, **76, 78** (Every odd term is multiplied by 2, then 2 is added to that results)
- b) 2, 4, 5, 10, 12, 24, 27, **54, 58** (First term is multiplies by two, then 1 is added, then the term is multiplied by two and two is added, then multiplied by two and three is added, ...)

### Section 1.2 – Practice Problems

Study the Pattern and predict the missing values

1.  $9 \cdot 9 + 7 = 88$   
 $98 \cdot 9 + 6 = 888$   
 $987 \cdot 9 + 5 =$   
 $9876 \cdot 9 + 4 =$   
 $98765 \cdot 9 + 3 =$

2.  $9^2 = 81$   
 $99^2 = 9801$   
 $999^2 = 998001$   
 $9999^2 =$   
 $99999^2 =$

3.  $1^2 + 1 + 2 = 4$   
 $2^2 + 2 + 3 = 9$   
 $3^2 + 3 + 4 = 16$   
 $4^2 + 4 + 5 =$   
 $5^2 + 5 + 6 =$

4.  $1 = 1$   
 $1 + 2 = 3$   
 $1 + 2 + 3 = 6$   
 $1 + 2 + 3 + 4 = 10$   
 $1 + 2 + 3 + \dots + 10 =$

5.  $1 = 1$   
 $1 + 3 = 4$   
 $1 + 3 + 5 = 9$   
 $1 + 3 + 5 + \dots + 15 =$

6.  $2 = 2$   
 $2 + 4 = 6$   
 $2 + 4 + 6 = 12$   
 $2 + 4 + 6 + 8 =$   
 $2 + 4 + 6 + \dots + 16 =$

Study the Pattern, and predict the next two terms

7. 2, 3, 5, 8, 12, \_\_\_\_\_, \_\_\_\_\_

8. 20, 25, 31, 38, 46, \_\_\_\_\_, \_\_\_\_\_

9. 10, 7, 12, 9, 14, \_\_\_\_\_, \_\_\_\_\_

10. 3, 6, 11, 18, 27, 38, \_\_\_\_\_, \_\_\_\_\_

11. 2, 6, 15, 31, 56, \_\_\_\_\_, \_\_\_\_\_

12. 2, 6, 12, 20, 30, \_\_\_\_\_, \_\_\_\_\_

13. 15, 19, 25, 33, 43, \_\_\_\_\_, \_\_\_\_\_

14. 1, 2, 5, 14, 41, \_\_\_\_\_, \_\_\_\_\_

15. 3, 5, 11, 29, 83, \_\_\_\_\_, \_\_\_\_\_

16. 59, 52, 55, 48, 51, 44, 47, \_\_\_\_\_, \_\_\_\_\_

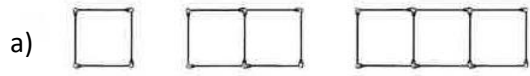
What pattern can you notice in the following (Think about odd and even

17.  $5 + 7 = 12$  and  $47 + 31 = 78$

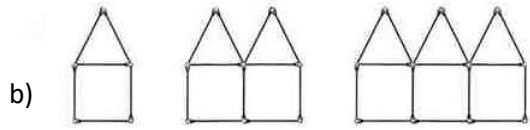
18.  $4 + 12 = 16$  and  $42 + 16 = 58$

19.  $6 + 7 = 13$  and  $14 + (-17) = -3$

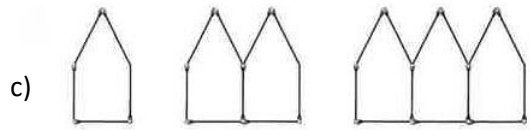
20. Determine the number of matchsticks or squares in the 100<sup>th</sup> pattern



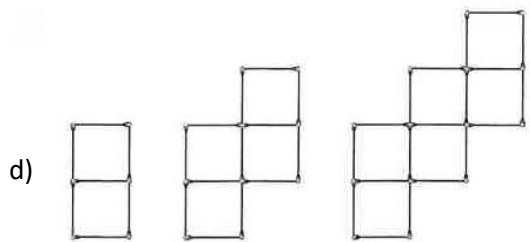
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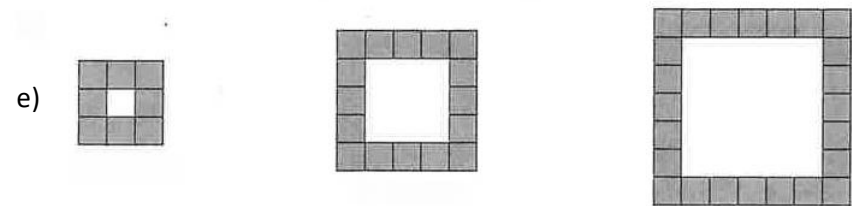
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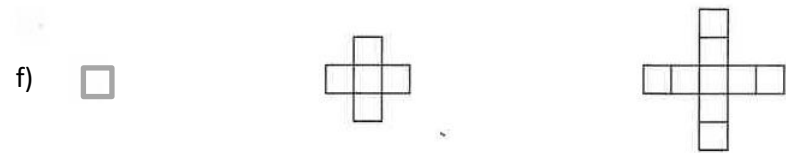
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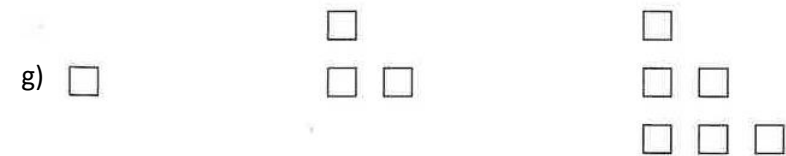
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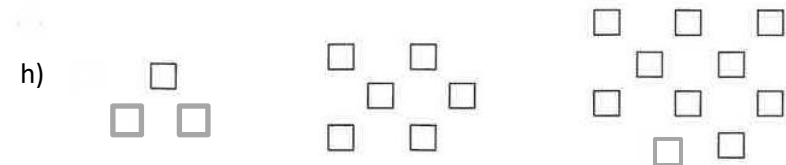
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**Answer Key – Section 1.2**

1. 8888, 88888, 888888	2. 99980001, 9999800001	3. 25, 36	4. 55
5. 64	6. 20, 72	7. 17, 23	8. 55, 65
9. 11, 16	10. 51, 66	11. 92, 141	12. 42, 56
13. 55, 69	14. 122, 365	15. 245, 731	16. 40, 43
17. <i>See Website</i>	18. <i>See Website</i>	19. <i>See Website</i>	

20.

a) 301	b) 501	c) 401	d) 601
e) 800	f) 397	g) 5050	h) 5151

**Extra Work Space**