

First name: \_\_\_\_\_ Last name: \_\_\_\_\_ Student ID: \_\_\_\_\_

**Patterns Homework****Basic problems****1. Find the missing term in each pattern.**

1. 25, 125, 625, <input type="text"/> , 15,625, 78,125	2. <input type="text"/> , 98, 85, 72, 59, 46, 33, 20, 7
3. 22, <input type="text"/> , 186, 195, 1,170, 1,179	4. 35, 33, 40, 38, 45, 43, <input type="text"/> , 48
5. 30, 44, 58, 72, 86, 100, 114, 128, <input type="text"/>	6. 1,920, 960, <input type="text"/> , 240, 120, 60, 30, 15
7. 31, 34, 37, <input type="text"/> , 43, 46	8. 56, 52, 48, 44, 40, 36, <input type="text"/>



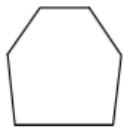

**2. Complete the function table.**

1. Rule: $k = u + 9$								
Input	$u$	<input type="text"/>	<input type="text"/>	20	29	<input type="text"/>	57	<input type="text"/>
Output	$k$	10	15	<input type="text"/>	<input type="text"/>	50	<input type="text"/>	81

2. Rule: $w = 4h$							
Input	$h$	<input type="text"/>	11	18	<input type="text"/>	<input type="text"/>	<input type="text"/>
Output	$w$	16	<input type="text"/>	<input type="text"/>	100	128	156

**3. Find the sum of the interior angles of the given polygons.**

			
Sum of the interior angles = _____	Sum of the interior angles = _____	Sum of the interior angles = _____	Sum of the interior angles = _____

### Challenge problems

1. Five students named Fred, Gail, Henry, Iggy, and Joan are seated around a circular table in that order. To decide who goes first in a game, they play “countdown”. Henry starts by saying ‘34’, with Iggy saying ‘33’. If they continue to count down in their circular order, who will eventually say ‘1’?

2. The letters of the word ‘GAUSS’ and the digits in the number ‘1998’ are each cycled separately and then numbered 1, 2, 3 as shown.

1. AUSSG 9981

2. USSGA 9819

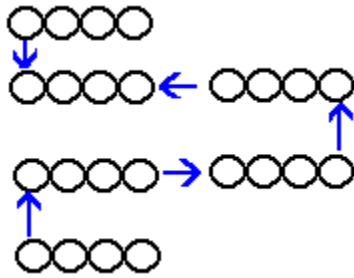
3. SSGAU 8199

etc.

If the pattern continues in this way, what number will appear in front of GAUSS 1998?

3. Chris and Pat are playing catch. Standing 1 m apart, Pat first throws the ball to Chris and then Chris throws the ball back to Pat. Next, standing 2 m apart, Pat throws to Chris and Chris throws back to Pat. After each pair of throws, Chris moves 1 m farther away from Pat. They stop playing when one of them misses the ball. If the game ends when the 29th throw is missed, how far apart are they standing and who misses catching the ball?

4. There are 6 short pieces of link chain, each having 4 links. It takes 10 seconds to cut a link and 25 seconds to weld it back together. What is the shortest possible time to make the longest chain?



5. The letter P is written in a  $2 \times 2$  grid of squares as shown: 

	P

. A combination of rotations about the centre of the grid and reflections in the two lines through the centre achieves the result: 

P	

. When the same combination of rotations and reflections is applied to 

A	

 the result is\_\_

- (A) 

A	

 (B) 

A	

 (C) 

	A

 (D) 

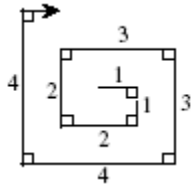
	A

 (E) 

	A

6. The total area of a set of different squares, arranged from smallest to largest, is  $35 \text{ km}^2$ . The smallest square has a side length of 500 m. The next larger square has a side length of 1000 m. In the same way, each successive square has its side length increased by 500 m. What is the total number of squares?

7. On a large piece of paper, Dana creates a “rectangular spiral” by drawing line segments of lengths, in cm, of 1, 1, 2, 2, 3, 3, 4, 4, ... as shown. Dana’s pen runs out of ink after the total of all the lengths he has drawn is 3000 cm. What is the length of the longest line segment that Dana draws?



8. In the pattern of numbers shown, every row begins with a 1 and ends with a 2. Each of the numbers, not on the end of a row, is the sum of the two numbers located immediately above and to the right, and immediately above and to the left. For example, in the fourth row the 9 is the sum of the 4 and the 5 in the third row. If this pattern continues, the sum of all of the numbers in the thirteenth row is

	1	2				
	1	3	2			
	1	4	5	2		
	1	5	9	7	2	
	1	6	14	16	10	2

9. The CMC reception desk has a tray in which to stack letters as they arrive. Starting at 12:00, the following process repeats every five minutes:

- Step 1 – Three letters arrive at the reception desk and are stacked on top of the letters already in the stack. The first of the three is placed on the stack first, the second letter next, and the third letter on top.
- Step 2 – The top two letters in the stack are removed.

This process repeats until 36 letters have arrived (and the top two letters have been immediately removed). Once all 36 letters have arrived, no more letters arrive and the top two letters in the stack continue to be removed every five minutes until all 36 letters have been removed. At what time was the 13th letter to arrive removed?

10. Imagine you're in a room with a row of 100 light switches, all initially in the off position. You make 100 passes by the switches. On the first pass, you flip every switch (every 1st switch). On the second pass, you flip every second switch (2, 4, 6, ...). On the third pass, you flip every third switch (3, 6, 9, ...), and so on, until on the 100th pass, you only flip the 100th switch. After completing all 100 passes, which switches will be in the on position?