**Make a conjecture about the next figure in the pattern. Then draw the figure.**

|  |  |
| --- | --- |
| **1.** |   |
|  |  |
| **2.** |  |
|  |  |
| **3.** |  |
|  |  |
| **4.** |  |
|  |  |

**Write a rule for each number pattern, and find the next number.**

|  |  |  |
| --- | --- | --- |
| **5.** | $$1, 5, 9, 13……………$$ |  |
| **6.** | $$1, \frac{2}{3}, \frac{1}{3} , 0………$$ |  |
| **7.** | $$-5,-2,4,13………..$$ |  |
| **8.** | $$3,12,48,192………..$$ |  |
| **9.** | $$0.45,0.70,0.95,1.2………..$$ |  |
| **10.** | $$1,8,27,64,125………..$$ |  |

**Find one counterexample to show that each conjecture is false.**

|  |  |  |  |
| --- | --- | --- | --- |
| **11.** | The sum $ a^{2}+b^{2} $is equal to $\left(a+b\right)^{2}$ | **12.** | All numbers that are divisible by 3 are also divisible by 6. |
|  |  |  |  |
| **13.** | All pentagons have exactly five congruent sides. | **14.** | All even numbers are composite. |
|  |  |  |  |
| **15.** | The sum of two numbers is always greater than the larger number. | **16.** | The difference of any two numbers is always smaller than the larger number. |
|  |  |  |  |

**Find the n-th term**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **17.** |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| $$n$$ | $$1$$ | $$2$$ | $$3$$ | $$4$$ | $$5$$ | $$6$$ | $$7$$ |
| $$n-2$$ |  |  |  |  |  |  |  |

 |
|  |  |
| **18.** |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| $$n$$ | $$1$$ | $$2$$ | $$3$$ | $$4$$ | $$5$$ | $$6$$ | $$7$$ |
| $$3n+2$$ |  |  |  |  |  |  |  |

 |
|  |  |
| **19.** |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| $$n$$ | $$1$$ | $$2$$ | $$3$$ | $$4$$ | $$5$$ | $$6$$ | $$7$$ |
| $$n-7$$ |  |  |  |  |  |  |  |

 |
|  |  |
| **20.** |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| $$n$$ | $$1$$ | $$2$$ | $$3$$ | $$4$$ | $$5$$ | $$6$$ | $$7$$ |
| $$2n+4$$ |  |  |  |  |  |  |  |

 |
|  |  |

**ANSWERS**

**Make a conjecture about the next figure in the pattern. Then draw the figure.**

|  |  |
| --- | --- |
| **1.** |   |
|  |  |
| **2.** |  |
|  |  |
| **3.** |  |
|  |  |
| **4.** |  |
|  |  |

**Write a rule for each number pattern, and find the next number.**

|  |  |  |
| --- | --- | --- |
| **5.** | $$1, 5, 9, 13……………$$ | Start with $ 1, $each number is obtained by adding 4 to the previous number.$$ 1+4=5$$$$ 5+4=9$$$$ 9+4=3$$$$13+4=17$$The next number is $17$  |
| **6.** | $$1, \frac{2}{3}, \frac{1}{3} , 0………$$ | Start with $1 , $each number is decreased by $ \frac{1}{3}$ to the previous number. $$1-\frac{1}{3}=\frac{2}{3}$$$$\frac{2}{3}-\frac{1}{3}=\frac{1}{3}$$$$\frac{1}{3}-\frac{1}{3}=0$$$$0-\frac{1}{3}=-\frac{1}{3}$$The next number is $ -\frac{1}{3}$ |
| **7.** | $$-5,-2,4,13………..$$ | Start with $-5 , $each number is increased by successive multiple of $ 3.$ $$-5+1\*3=-2$$$$-2+2\*3=4$$$$ 4+3\*3=13$$$$ 13+4\*3=25$$The next number is $ 25$ |
| **8.** | $$3,12,48,192………..$$ | Start with 3$ , $each number is 4 times the previous number.$$ 3\*4=12$$$$ 12\*4=48$$$$ 48\*4=192$$$$192\*4=768$$The next number is $768$ |
| **9.** | $$0.45,0.70,0.95,1.2………..$$ | Start with 0.45$ , $ 0.25 is being added to each number.$$ 0.45+0.25=0.70$$$$ 0.70+0.25=0.95$$$$ 0.95+0.25=1.2$$$$ 1.2+0.25=1.45$$The next number is $1.45$ |
| **10.** | $$1,8,27,64,125………..$$ | Start with 0.45. Successive natural numbers are cubed.$$1^{3}=1$$$$2^{3}=8$$$$3^{3}=27$$$$4^{3}=64$$$$5^{3}=125$$$$6^{3}=216$$The next number is $216$ |

**Find one counterexample to show that each conjecture is false.**

|  |  |  |  |
| --- | --- | --- | --- |
| **11.** | The sum $ a^{2}+b^{2} $is equal to $\left(a+b\right)^{2}$ | **12.** | All numbers that are divisible by 3 are also divisible by 6. |
|  | $$a^{2}+b^{2}=\left(a+b\right)^{2}$$$$5^{2}+6^{2}=25+36=61$$$$\left(5+6\right)^{2}=11^{2}=121$$$$61\ne 121$$ |  | 15 is divisible by 3 but no divisible by 6. |
| **13.** | All pentagons have exactly five congruent sides. | **14.** | All even numbers are composite. |
|  | An irregular pentagon doesn’t have congruent sides. |  | Number 2 is even but it is a prime number. |
| **15.** | The sum of two numbers is always greater than the larger number. | **16.** | The difference of any two numbers is always smaller than the larger number. |
|  | $$\left(-23\right)+\left(-12\right)=-35$$$$-35<-12$$ |  | $$9-\left(-3\right)=$$$$9+13=22$$$$9<22$$ |

**Find the n-th term**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **17.** |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| $$n$$ | $$1$$ | $$2$$ | $$3$$ | $$4$$ | $$5$$ | $$6$$ | $$7$$ |
| $$n-2$$ |  |  |  |  |  |  |  |

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|  |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| $$n$$ | $$1$$ | $$2$$ | $$3$$ | $$4$$ | $$5$$ | $$6$$ | $$7$$ |
| $$n-2$$ | $$-1$$ | $$0$$ | $$1$$ | $$2$$ | $$3$$ | $$4$$ | $$5$$ |

 |
| **18.** |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| $$n$$ | $$1$$ | $$2$$ | $$3$$ | $$4$$ | $$5$$ | $$6$$ | $$7$$ |
| $$3n+2$$ |  |  |  |  |  |  |  |

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|  |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| $$n$$ | $$1$$ | $$2$$ | $$3$$ | $$4$$ | $$5$$ | $$6$$ | $$7$$ |
| $$3n+2$$ | $$5$$ | $$8$$ | $$11$$ | $$14$$ | $$17$$ | $$20$$ | $$23$$ |

 |
| **19.** |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| $$n$$ | $$1$$ | $$2$$ | $$3$$ | $$4$$ | $$5$$ | $$6$$ | $$7$$ |
| $$n-7$$ |  |  |  |  |  |  |  |

 |
|  |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| $$n$$ | $$1$$ | $$2$$ | $$3$$ | $$4$$ | $$5$$ | $$6$$ | $$7$$ |
| $$n-7$$ | $$-6$$ | $$-5$$ | $$-4$$ | $$-3$$ | $$-2$$ | $$-1$$ | $$0$$ |

 |
| **20.** |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| $$n$$ | $$1$$ | $$2$$ | $$3$$ | $$4$$ | $$5$$ | $$6$$ | $$7$$ |
| $$2n+4$$ |  |  |  |  |  |  |  |

 |
|  |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| $$n$$ | $$1$$ | $$2$$ | $$3$$ | $$4$$ | $$5$$ | $$6$$ | $$7$$ |
| $$2n+4$$ | $$6$$ | $$8$$ | $$10$$ | $$12$$ | $$14$$ | $$16$$ | $$18$$ |

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