

Question: how can the next # in the pattern be determined? 2 3 14 ?

## 1.1 Notes Using Inductive and Deductive Reasoning to Problem Solve

### Inductive Reasoning

**Inductive Reasoning** is the process of arriving at a general conclusion based on observations of specific examples. When you try to find the pattern for a list of numbers or visuals, you are using inductive reasoning.

Although inductive reasoning is a powerful method of drawing conclusions, we can never be absolutely certain that these conclusions are true. For this reason, the conclusions are called **conjectures, hypotheses, or educated guesses**. A **counterexample** is an example that shows or proves that the conjecture is false.

Ex.1 Each example below shows that the sum of two two-digit numbers is a three-digit number. Can we conclude that the sum of any two two-digit numbers is always a three-digit number?

$$47 + 73 = 120$$

$$56 + 46 = 102$$

$$56 + 80 = 136$$

$$91 + 48 = 139$$

No. Counter example  $10 + 10 = 20$

Ex. 2 Identify a pattern in each list of numbers. Then use this pattern to find the next number.

a)  $3, 12, 21, 30, 39, \underline{48}$   
+9 +9 +9 +9

c)  $3, 4, 6, 9, 13, 18, \underline{24}$   
1 2 3 4 5 6

e)  $3, 6, 18, 72, 144, 432, 1728, \underline{3456}$   
x2 x3 x3 x3 x3 x4 x2

g)  $1, 1, 2, 3, 5, 8, 13, 21, \underline{34}$   
1 1 2 3 5 8 13 21

i)  $2, 3, 5, 9, 17, 33, 65, 129, \underline{257}$   
x1 +2 x4 x8 x16 x32 x64 x128

k)  $1, 4, 9, 16, 25, \underline{36}$   
1<sup>2</sup> 2<sup>2</sup> 3<sup>2</sup>

4 + 3 = 7

b)  $3, 12, 48, 192, 768, \underline{3072}$   
x4 x4 x4 x4

d)  $3, 6, 18, 36, 108, 216, \underline{648}$   
x2 x3 x3 x3

f)  $1, 9, 17, 3, 11, 19, 5, 13, 21, \underline{7}$   
x8 +8 -14 +8 x8 -14 +8 x8 -14

h)  $23, 54, 95, 146, 117, 98, \underline{89}$  or 179  
+31 +41 +51 -29 -19 -9

j)  $1, 2, 4, \underline{8}$   
x2

l)  $-5, 3, -2, 1, -1, 0, \underline{-1}$   
+8 (-5 + 3) (-2 + 1) -1

→ 2+3 = 5 4 5+4 = 9 5 9+5 = 14 6 14+6 = 20 7

\* Note: Inductive reasoning can result in different patterns that produce the same result as well as different results.