

Name Answer Key

ESSAY. Write your answer in the space provided or on a separate sheet of paper (justify your answers).

Determine the most probable next term in the sequence.

1) 0008, 0080, 0800, 8000, 8008

8080

Inductive Reasoning

Use the method of Gauss to find the sum.

2) $1 + 2 + 3 + \dots + 350$

Gauss method $1 + 2 + 3 + \dots + n = \frac{n(n+1)}{2}$

So $1 + 2 + 3 + \dots + 350 = \frac{350(350+1)}{2} = 61,425$

3) $4 + 8 + 12 + \dots + 900$

$$4 + 8 + 12 + \dots + 900 = 4 [1 + 2 + 3 + \dots + 225]$$

$$= 4 \left[225 \left(\frac{225+1}{2} \right) \right] = 4(25425)$$

$$= 101,700$$

Determine if the sequence is an arithmetic sequence, a geometric sequence, or neither. If it is either arithmetic or geometric, give the next term in the sequence.

4) 0, 8, 16, 32, 48, ...

Neither

It is not an AP

It is also not a GP.

5) 13, 33, 53, 73, 93, ...

Arithmetic Sequence

Next term

$$a + 5d = 13 + 5(20) = 113$$

Since $a = 13$
 $d = 20$

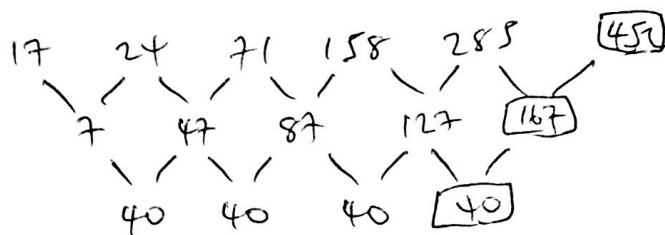
$a, a+d, a+2d, a+3d, a+4d, \dots$

13, $13+20$, $13+2(20)$, $13+3(20)$, $13+4(20), \dots$

13, 33, 53, 73, 93, ...

Use the method of successive differences to determine the next term in the sequence.

6) 17, 24, 71, 158, 285, ...



Determine what the next equation would be, and verify that it is indeed a true statement.

7) $70 - 9 = 61$

$700 - 89 = 611$

$7000 - 789 = 6211$

$70000 - 6789 = 63211$

True

Use the indicated formula to find the sum.

8) Use $S = \frac{n(n+1)}{2}$ to find the sum of $1 + 2 + 3 + \dots + 700$.

$$1 + 2 + 3 + \dots + 700 = \frac{700(700+1)}{2}$$

$$= 245,350$$

Use the appropriate formula to find the indicated figurate number.

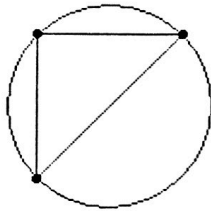
9) the 11th pentagonal number

$$P_n = \frac{n(3n-1)}{2}$$

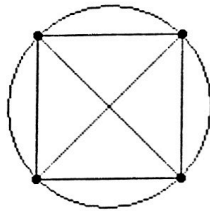
$$P_{11} = \frac{11(3(11)-1)}{2} = 176$$

Solve the problem using inductive reasoning.

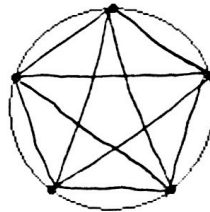
10) How many line segments are determined by joining dots on the last two circles?



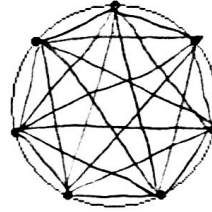
3 segments



6 segments



10 segments



21 segments

Determine the indicated term in the given sequence.

11) The 16th term of $\frac{3}{8}, \frac{3}{4}, \frac{9}{8}, \dots$

$$a_1 = \frac{3}{8}, \quad d = \frac{3}{8}, \quad a_n = a_1 + (n-1)d$$

$$a_{16} = a_1 + (16-1)d = \frac{3}{8} + 15\left(\frac{3}{8}\right) = \frac{3}{8} + \frac{45}{8} = \frac{48}{8} = 6$$

Use logic to solve the problem.

12) In India, water lilies grow extremely fast. In one pond, a lily grew so fast that each day it doubled the area it covered. In 20 days it covered the pond. How long would it take 2 such lilies to cover the pond?

Days	1 lily	2 lilies
1	A	2A
2	2A	4A
3	4A	8A
⋮		
19		Covered pond
20	Covered pond	3

Let A be area of 1 lily
 So 2A is the area of 2 lilies

It is easy to see from the table that if it takes 20 days for one lily to cover the pond, it will take 2 lilies one less days which is 19 days

Solve the problem.

13) If you raise 9 to the 387th power, what is the units digit of the result?

unit digit

$$1 = 9^0 = 9^2 = 9^4$$

$$9 = 9^1 = 9^3 = 9^5 = \dots = 9^{387}$$

Find $n(A)$ for the set.

14) $A = \{600, 601, 602, \dots, 6000\}$

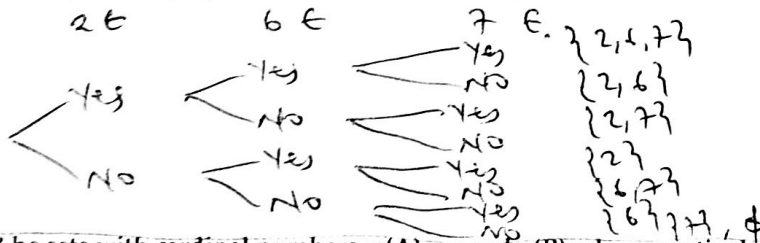
first I will re-write the set

$$A = \{600, 601, 602, 6000\} = \{600+0, 600+1, 600+2, \dots, 600+5400\}$$

It is easy to see that $n(A) = 5401$

Solve the problem.

15) List all possible proper subsets of the set $\{2, 6, 7\}$.



Since $A \subset B \iff A \subseteq B$ and $A \neq B$
 proper subset of $\{2, 6, 7\}$
 $\{\{2, 6\}, \{2, 7\}, \{2\}, \{6, 7\}, \{6\}, \{7\}, \emptyset\}$

Let A and B be sets with cardinal numbers, $n(A) = a$ and $n(B) = b$, respectively. Decide whether the statement is true or false.

16) $n(A \cup B) = n(A) + n(B) - n(A \cap B)$

True

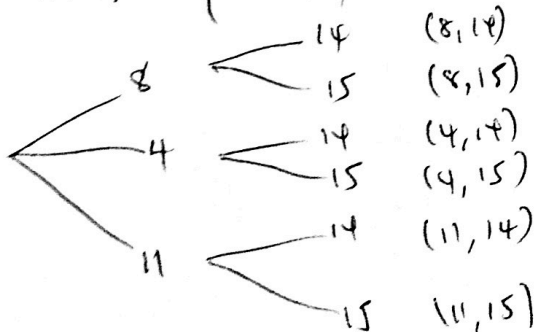
Find the Cartesian product.

17) $A = \{8, 4, 11\}$

$B = \{14, 15\}$

Find $A \times B$.

$$A \times B = \{(a, b) \mid a \in A \text{ and } b \in B\} = \{(8, 14), (8, 15), (4, 14), (4, 15), (11, 14), (11, 15)\}$$

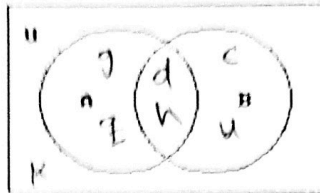


MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

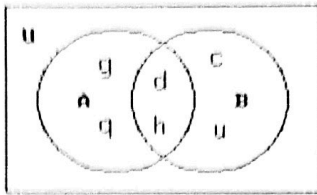
For the given sets, construct a Venn diagram and place the elements in the proper region.

- 18) Let $U = \{c, d, g, h, k, u, q\}$
 $A = \{d, h, g, q\}$
 $B = \{c, d, h, u\}$

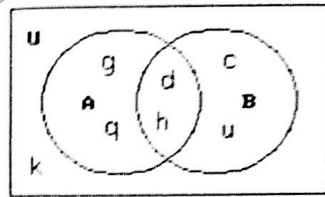
18) B



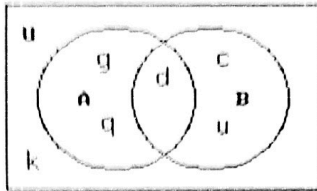
A)



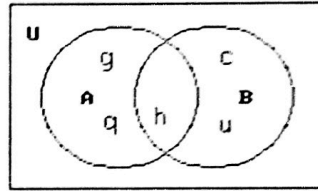
B)



C)



D)

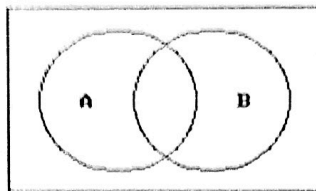


Shade the regions representing the set.

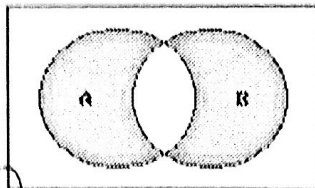
- 19) $A' \cap B'$

Using De Morgan's Law
 $A' \cap B' = (A \cup B)'$

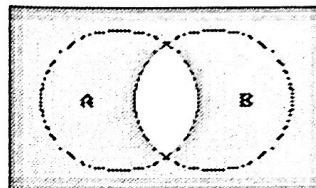
19) C



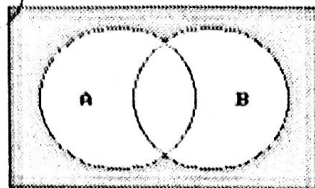
A)



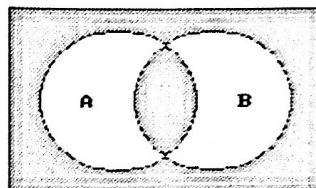
B)



C)

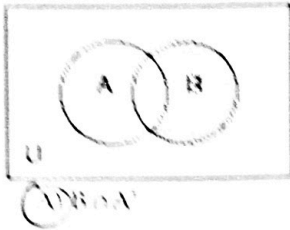


D)



Write a description of the shaded region using the symbols A , B , C , \cup , \cap , and $'$ as needed.

20)



$$B - A = \{x \mid x \in B \text{ and } x \notin A\}$$

$$= B \cap A'$$

20) A

A) $A \cup B \cap A'$

B) $A - B$

C) $A \cap B'$

D) $B - A'$

Draw an appropriate Venn diagram and use the given information to fill in the number of elements in each region.

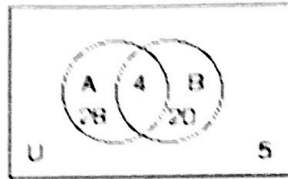
21) $n(U) = 52$, $n(A) = 28$, $n(A \cap B) = 4$, $n(B') = 28$

21) A

A)



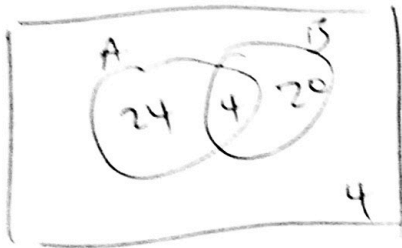
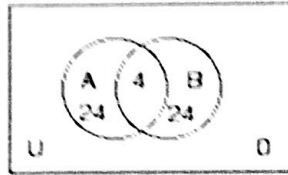
B)



C)



D)



$$n(A \cap B) = 4$$

$$\text{Since } n(A) = 28$$

$$\text{So } n(A - B) = n(A) - n(A \cap B)$$

$$= 28 - 4 = 24$$

$$\text{Since } n(B') = 28$$

$$n(A \cup B)' = n(B') - n(A - B)$$

$$= 28 - 24 = 4$$

$$n(B - A) = n(U) - n(A - B) - n(A \cup B)'$$

$$= 52 - 24 - 4 - 4$$

$$= 20$$