

There are 11 True-False questions (1 – 11) worth 2 points each. If the statement is true, write 'true' in the blank. If the statement is false, write 'false' in the blank.

There are 6 multiple choice questions (12 – 17) worth 5 points each. For each problem, four possible answers are given, only one of which is correct. You should solve the problem and write the letter in the blank.

There are 6 fill in the blank questions (18 – 23) worth 5 points each. Write the correct answer in the blank. There is no partial credit for these questions.

There are 2 free response questions (24 – 25) worth 9 points each. In order to obtain full credit for these problems, all work must be shown. Credit will **not** be given for answers not supported by work.

The use of calculators is **NOT** permitted.

You have 75 minutes to complete the exam. Do **not** spend too much time on each problem.

**Answer Sheet.** Record all answers for numbers 1 – 23 below.

- |           |                                |
|-----------|--------------------------------|
| 1. _____  | 12. _____                      |
| 2. _____  | 13. _____                      |
| 3. _____  | 14. _____                      |
| 4. _____  | 15. _____                      |
| 5. _____  | 16. _____                      |
| 6. _____  | 17. _____                      |
| 7. _____  | 18. _____                      |
| 8. _____  | 19. U = _____                  |
| 9. _____  | 20. _____                      |
| 10. _____ | 21. _____                      |
| 11. _____ | 22. _____                      |
|           | 23. a) _____ b) _____ c) _____ |

**I. True or False ( 2 points each )**

1. The sum of four consecutive integers will always be even.
2. The common difference of the sequence: 10, 4, -2, -8, .... is 6.
3. The next term of 2, 5, 10, 17, .... is 26.
4. In an arithmetic series, the  $n$ th term is obtained by adding  $n$  times the common difference to the 1<sup>st</sup> term.
5. The 1<sup>st</sup> five terms in the Fibonacci Sequence are: 1, 2, 3, 5, 8.
6.  $\{1, 2, 3\} \subset \{1, 2, 3\}$
7.  $\overline{(A \cap B)} = (\overline{A} \cup \overline{B})$  for all sets A & B.
8. For all sets A and B, if  $A \sim B$ , then  $A = B$ .
9. If  $A = \{5, 2\}$  and  $B = \{7\}$ , then  $A \times B = \{35, 14\}$ .
10. To find the total number of handshakes in a room of 50 people when everyone shakes all others hands is to find the sum of:  $1 + 2 + 3 + \dots + 50$ .
11.  $9_{\text{eleven}} = 9_{\text{twelve}}$

**II. Multiple Choice ( 5 points each )**

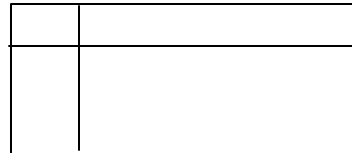
12. At the local restaurant, a hamburger and fries cost \$3.35, a hamburger and drink cost \$3.60, while fries and a drink cost \$2.45. Find the cost of a drink.

- a) \$1.35
- b) \$1.25
- c) \$1.15
- d) \$1.10

13. It takes 125 cubes to fill a box with a lid. Find the number of cubes that do **not** touch a side, bottom, or lid.

- a) 45
- b) 27
- c) 25
- d) 9

14. The number of rectangles in this figure is:



- a) 5
- b) 7
- c) 8
- d) 9

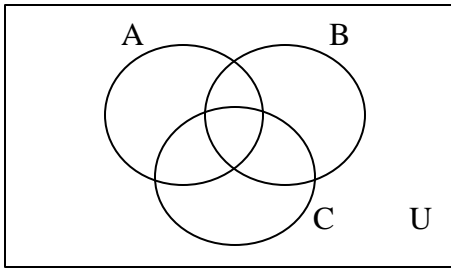
15. Use the given pattern to find the sum of the 1<sup>st</sup> 25 terms in the sequence:

8, 11, 14, 17, ....

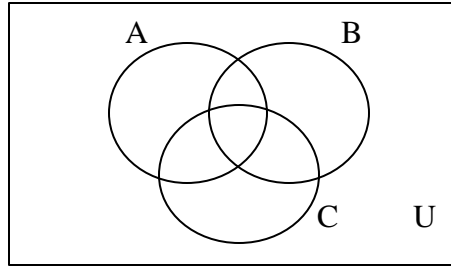
- a) 900
- b) 956
- c) 1100
- d) 1875

16. Choose the Venn Diagram which represents:  $\overline{B - (A \cap C)}$

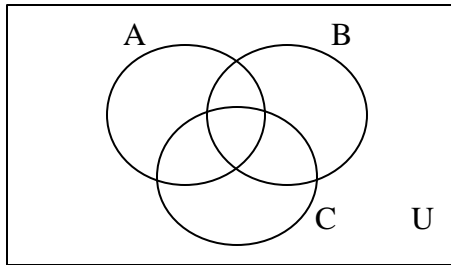
a)



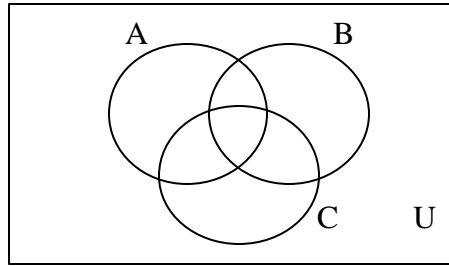
b)



c)



d)



17. Find the **tens digit** of the base ten numeral when  $1010111_{\text{two}}$  is changed to a base 10 numeral.

- a) 6
- b) 7
- c) 8
- d) 9

**III. There is no partial credit given for each of these. ( 5 points each )**

18. We plan on installing a sewage drain with 10 foot pipe. However, if we use 15 foot pipe, we can use 4 less pieces of pipe. How many total feet of pipe do we need?

19. Find U in the following cryptarithm:  
Each letter represents a different  
digit from 0 through 9.

$$\begin{array}{r} \text{U P} \\ + \text{P A} \\ \hline \text{P A P} \end{array}$$

20. Find the units (ones) digit of  $3^{1003}$ .

21. Change  $115_{\text{ten}}$  to a number in base four.

22. Change  $18E_{\text{twelve}}$  to a number in base ten.

23. Find the number that comes next.

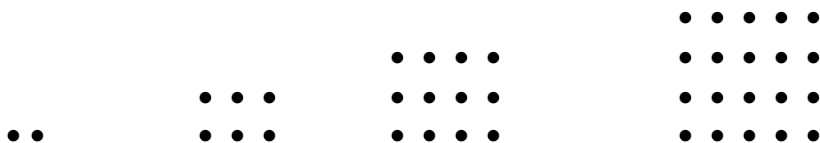
a)  $203_{\text{four}}$ , \_\_\_\_\_

b)  $355_{\text{six}}$ , \_\_\_\_\_

c)  $777_{\text{eight}}$ , \_\_\_\_\_

**IV. Partial Credit.** Do these problems on **this** page.

24. Consider the following figures:



a) Find the next three terms in the sequence from the pictures above. (Answers should be numbers, not pictures.)

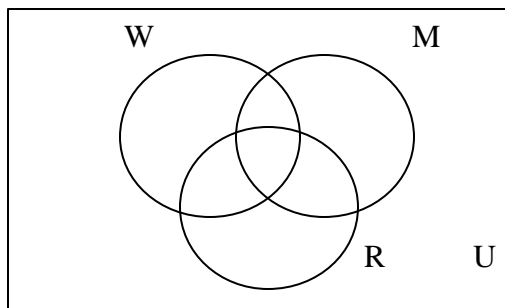
\_\_\_\_\_ , \_\_\_\_\_ , \_\_\_\_\_

b) Find the  $n$ th term in the sequence.  $a_n =$  \_\_\_\_\_

c) Find the 100<sup>th</sup> term.  $a_{100} =$  \_\_\_\_\_

25. The three major grain crops raised in the world are wheat, maize, and rice. A survey of 40 countries that raise grain yielded the following results.

- 20 countries raised wheat.
- 16 countries raised maize.
- 12 countries raised rice.
- 9 countries raised wheat and maize.
- 3 countries raised maize and rice.
- 4 countries raised wheat and rice.
- 2 raised all three crops.



a) Fill in the Venn Diagram to represent the above information.

b) Find the number of countries that raised exactly one of these crops. \_\_\_\_\_

c) Find the number of countries that raised none of these three crops. \_\_\_\_\_

1. T
2. F
3. T
4. F
5. F
6. F
7. T
8. F
9. F
10. F
11. T
12. a
13. b
14. d
15. c
16. a (see instructor for shading)
17. c
18. 120 ft.
19.  $U = 9$
20. 7
21.  $1303_{\text{four}}$
22.  $251_{\text{ten}}$
23. a)  $210_{\text{four}}$       b)  $400_{\text{six}}$       c)  $1000_{\text{eight}}$
24. a) 30, 42, 56      b)  $n(n + 1)$  or  $n^2 + n$       c) 10,100 or 100 (101)
25. b) 22      c) 6