# A ROXY ESTIMATION

PROBLEM SCORING: 2 POINTS POSSIBLE

DIRECTIONS:

GIVEN THE CUP WITH 49 ROCKS, DETERMINE THE NUMBER OF ROCKS IN THE REMAINING CUPS USING ESTIMATION.

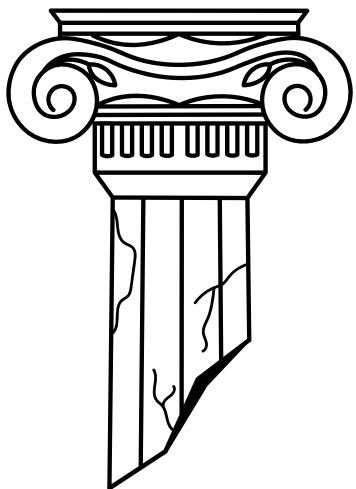TO DETERMINE YOUR SOLUTIONS, YOU MAY USE ADDITION/SUBTRACTION FOR **ONE POINT, OR,**

YOU MAY USE FRACTIONS/DECIMALS/PERCENTAGES FOR **TWO POINTS**.

WHICHEVER STRATEGY YOU SELECT MUST BE APPLIED TO ALL THREE CUPS.

49 rocks
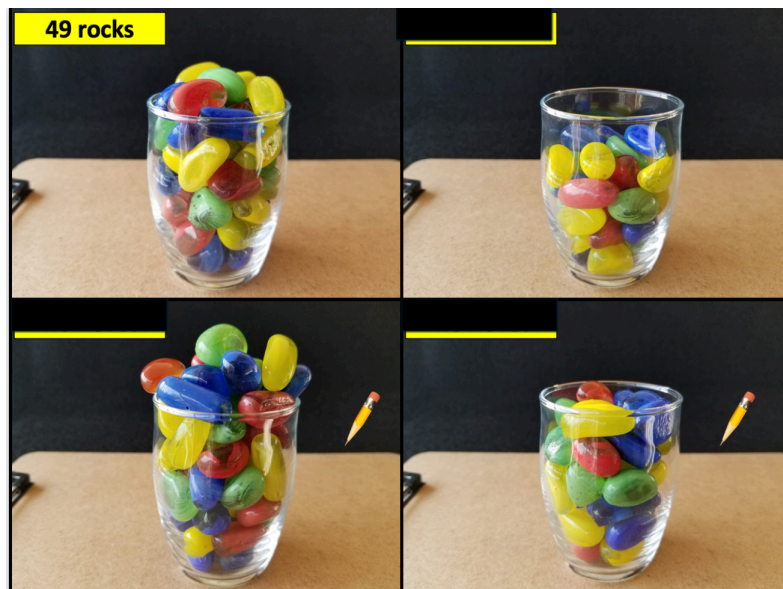
WHEN YOU HAVE SOLVED THIS PROBLEM, GO TO ROOM HISTORIC **ROOM 1069** TO PRESENT YOUR SOLUTION TO THE MASTER TEACHER.
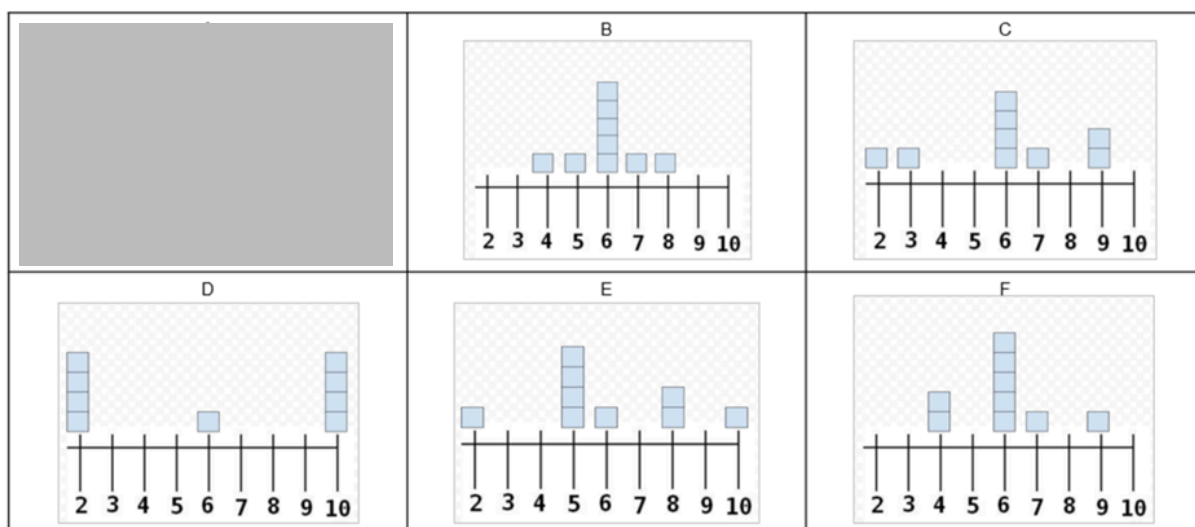
BE PREPARED TO JUSTIFY YOUR SOLUTION.

MAD ABOUT M.A.D.

DIRECTIONS: REVIEW EACH DOT PLOT AND ANSWER THE QUESTIONS BELOW:

1. WHAT IS THE MEAN OF EACH DOT PLOT ABOVE?
2. DETERMINE THE VARIABILITY OF EACH DATA SET USING MEAN ABSOLUTE DEVIATION (M.A.D.).
3. WHICH DATA SET BEST REPRESENTS THE MEAN? WHICH DATA SET LEAST REPRESENTS THE MEAN? WHY?

WHEN YOU HAVE SOLVED THIS PROBLEM, GO TO HISTORIC **ROOM 1070** TO PRESENT YOUR SOLUTION TO THE MASTER TEACHER.

BE PREPARED TO JUSTIFY YOUR SOLUTION.
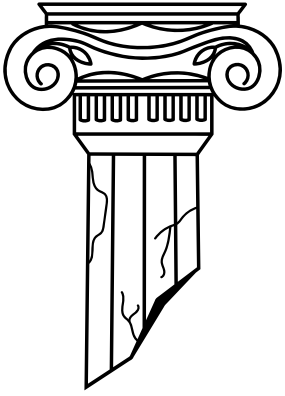
CIRCULUS AROUND

PROBLEM SCORING: 3 POINTS POSSIBLE
3 POINTS WITHOUT A HINT
2 POINTS WITH A HINT

DIRECTIONS:

1. CUT OUT THE THREE CIRCLE SETS. DO NOT MIX UP THE SETS; KEEP THEM TOGETHER IN ORIGINAL SETS.

2. ARRANGE EACH SET IN A MANNER THAT RELATES THE AREAS OF THE CIRCLES.

3. BE PREPARED TO DESCRIBE YOUR ARRANGEMENT.

4. USING THE CIRCLES, JUSTIFY YOUR DISCOVERIES ABOUT THE AREAS WITH WORDS AND NUMBERS. USE THE CIRCLE MEASUREMENTS IN YOUR JUSTIFICATION.

5. CREATE A RULE TO EXPLAIN THE RELATIONSHIP BETWEEN THE CIRCLE SETS.

IF YOUR RULE WORKS FOR ALL THREE CIRCLE SETS, GO DEFEND IT WITH THE MASTER TEACHER!

WHEN YOU HAVE SOLVED THIS PROBLEM, GO TO HISTORIC **ROOM 1067** TO PRESENT YOUR SOLUTION TO THE MASTER TEACHER.
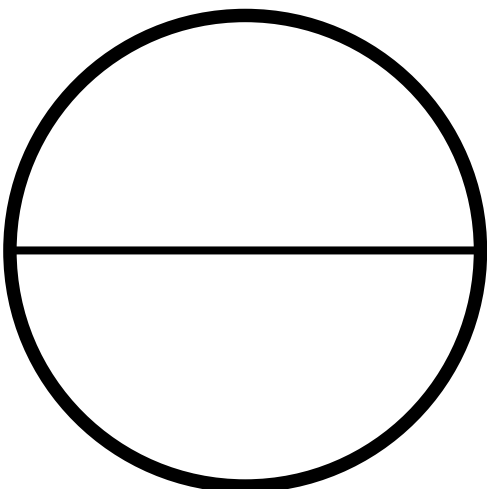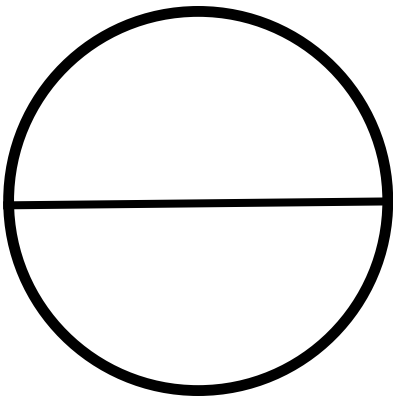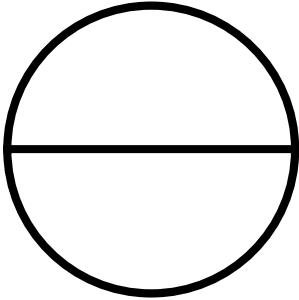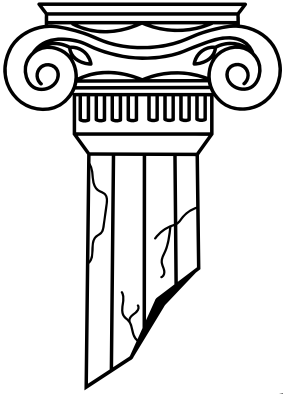
BE PREPARED TO JUSTIFY YOUR SOLUTION.
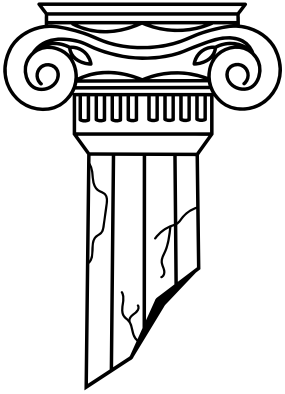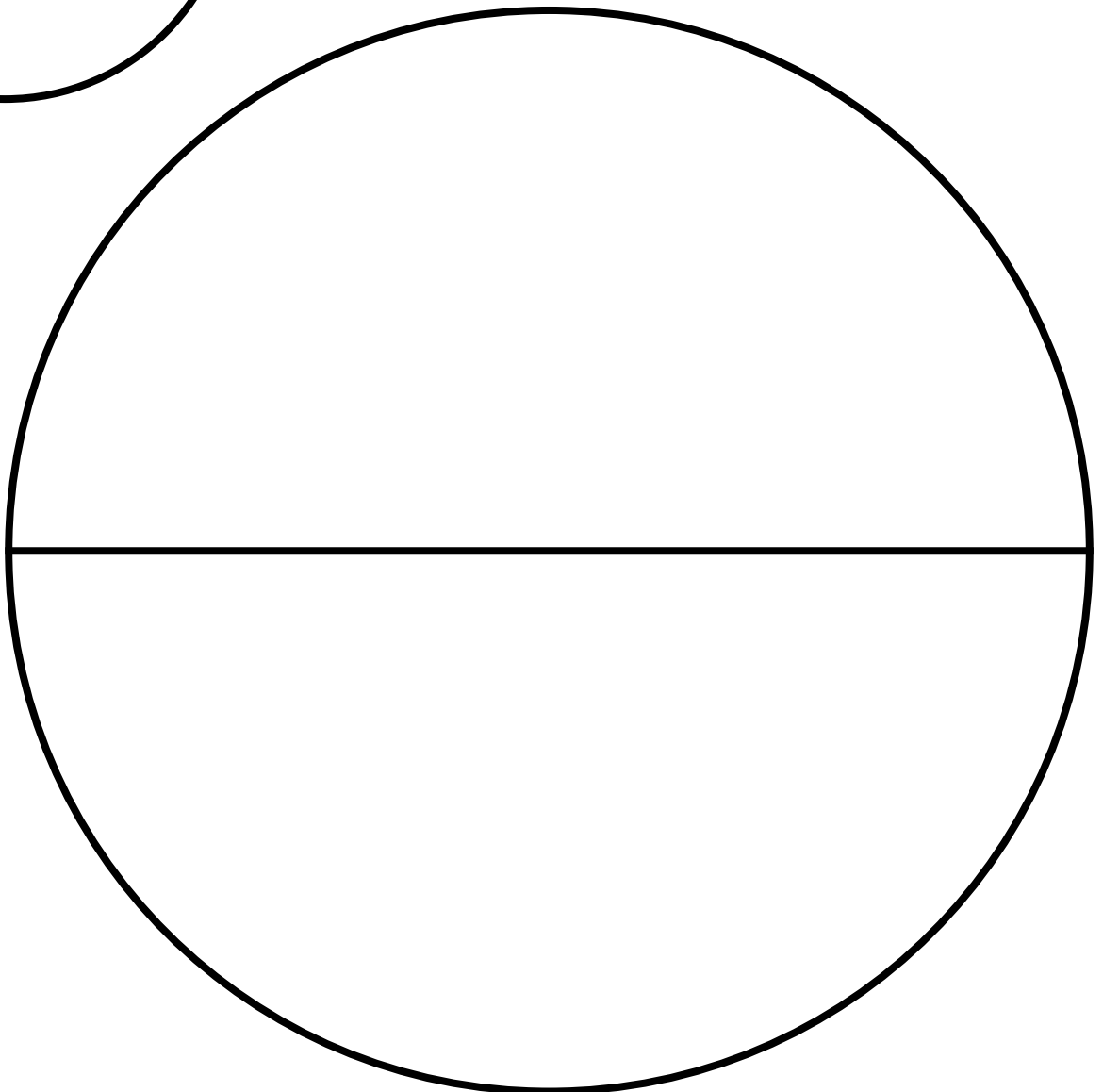
CIRCULUS
AROUND

SET A: THE DIAMETERS OF THE FOLLOWING

CIRCLES ARE 1.5 IN., 2 IN., AND 2.5 IN.:

CIRCULUS
AROUND

SET B: THE DIAMETERS OF THE FOLLOWING

CIRCLES ARE 2.5 IN., 6 IN., AND 6.5 IN.
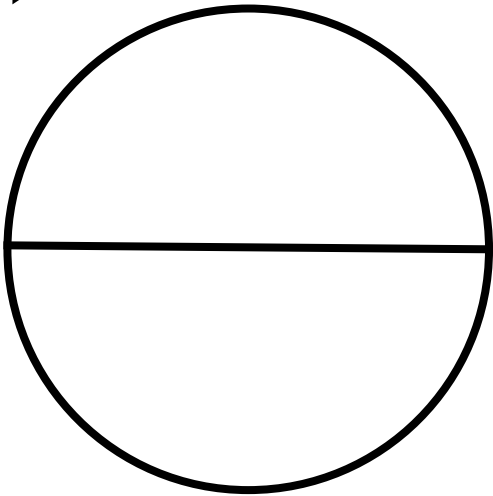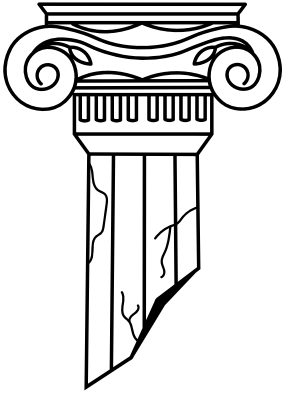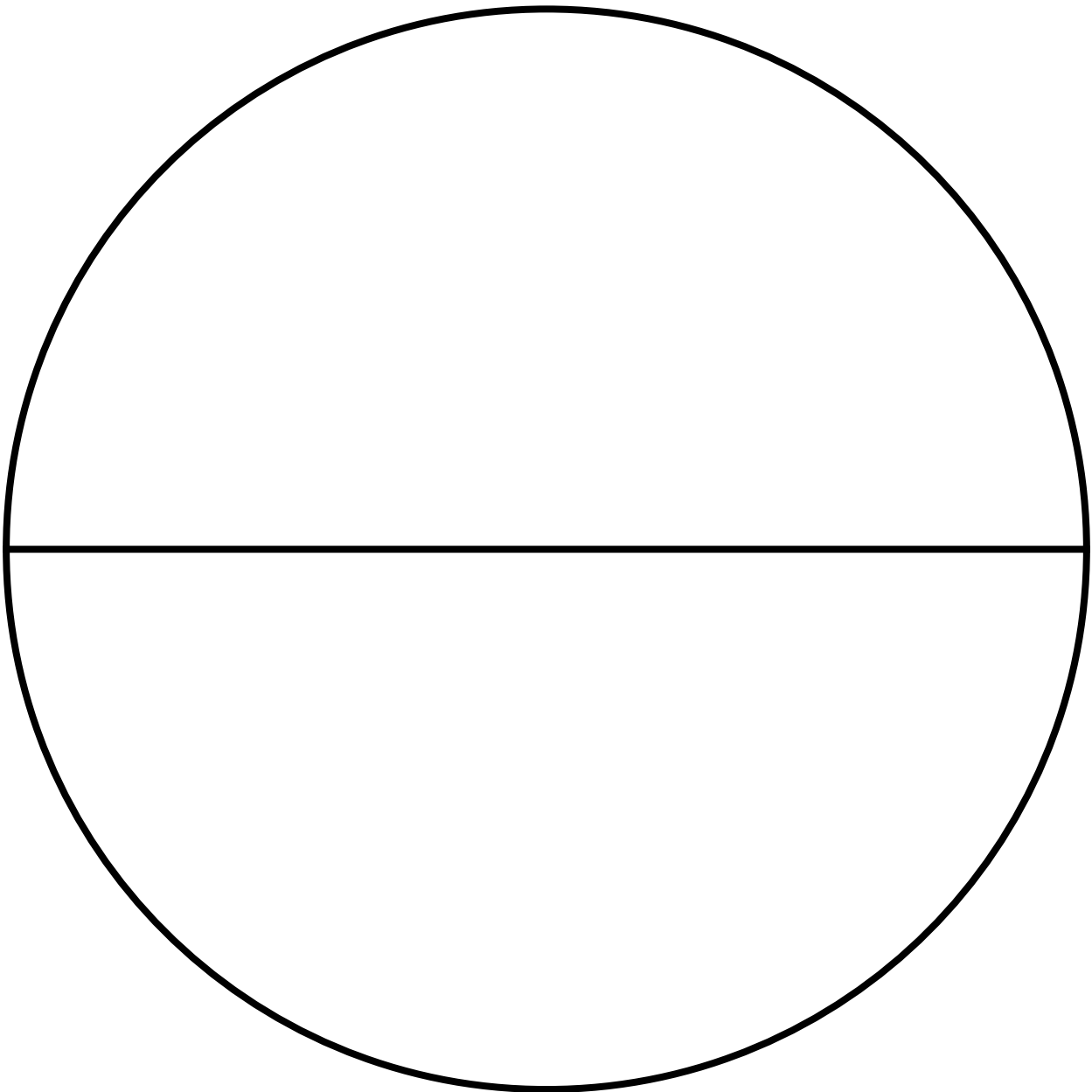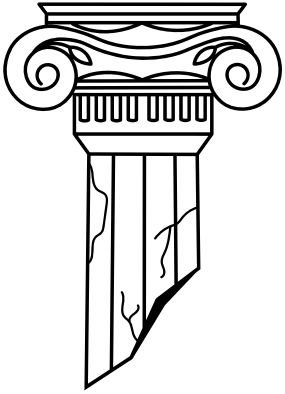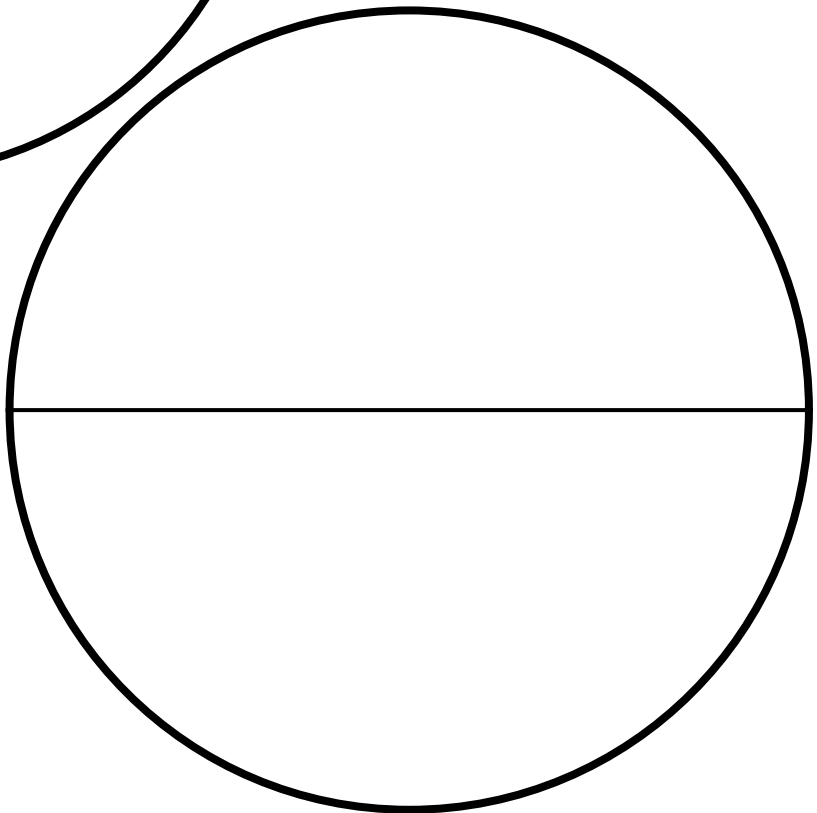
CIRCULUS AROUND

SET B: THE DIAMETERS OF THE FOLLOWING

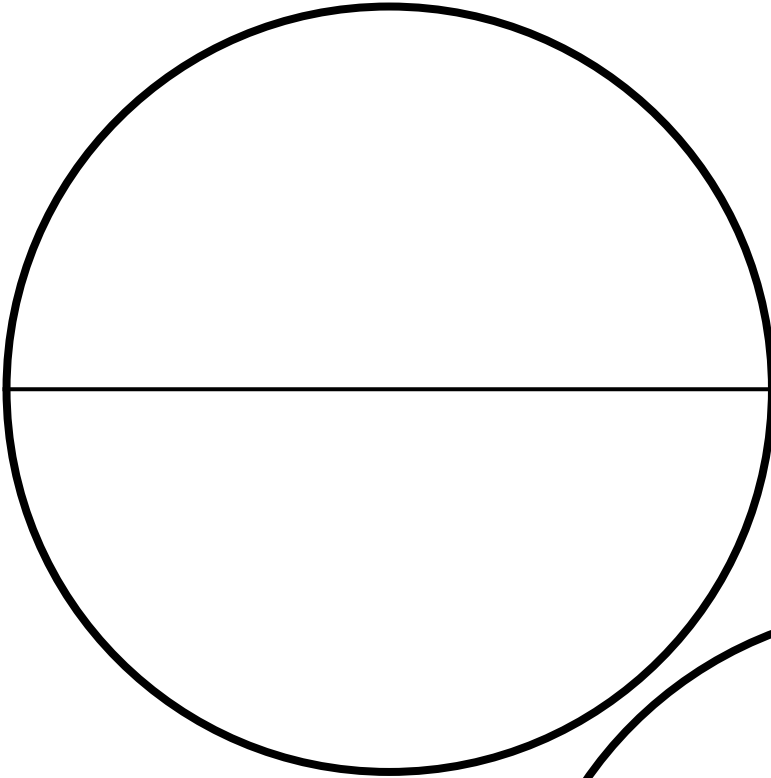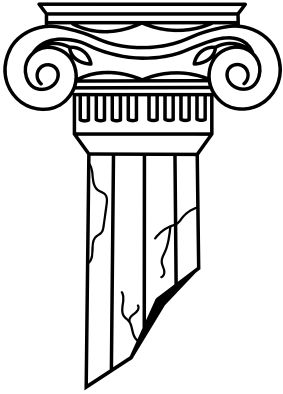**CIRCLES ARE 2.5 IN., 6 IN., AND 6.5 IN.**

CIRCULUS
AROUND

SET C: THE DIAMETERS OF THE FOLLOWING

CIRCLES ARE 4 IN., 4.2 IN., AND 5.8 IN.
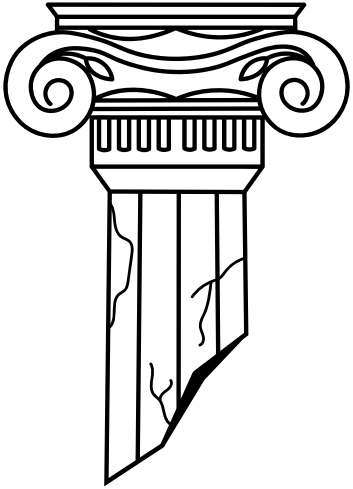
CIRCULUS
AROUND

SET C: THE DIAMETERS OF THE FOLLOWING

CIRCLES ARE 4 IN., 4.2 IN., AND 5.8 IN.
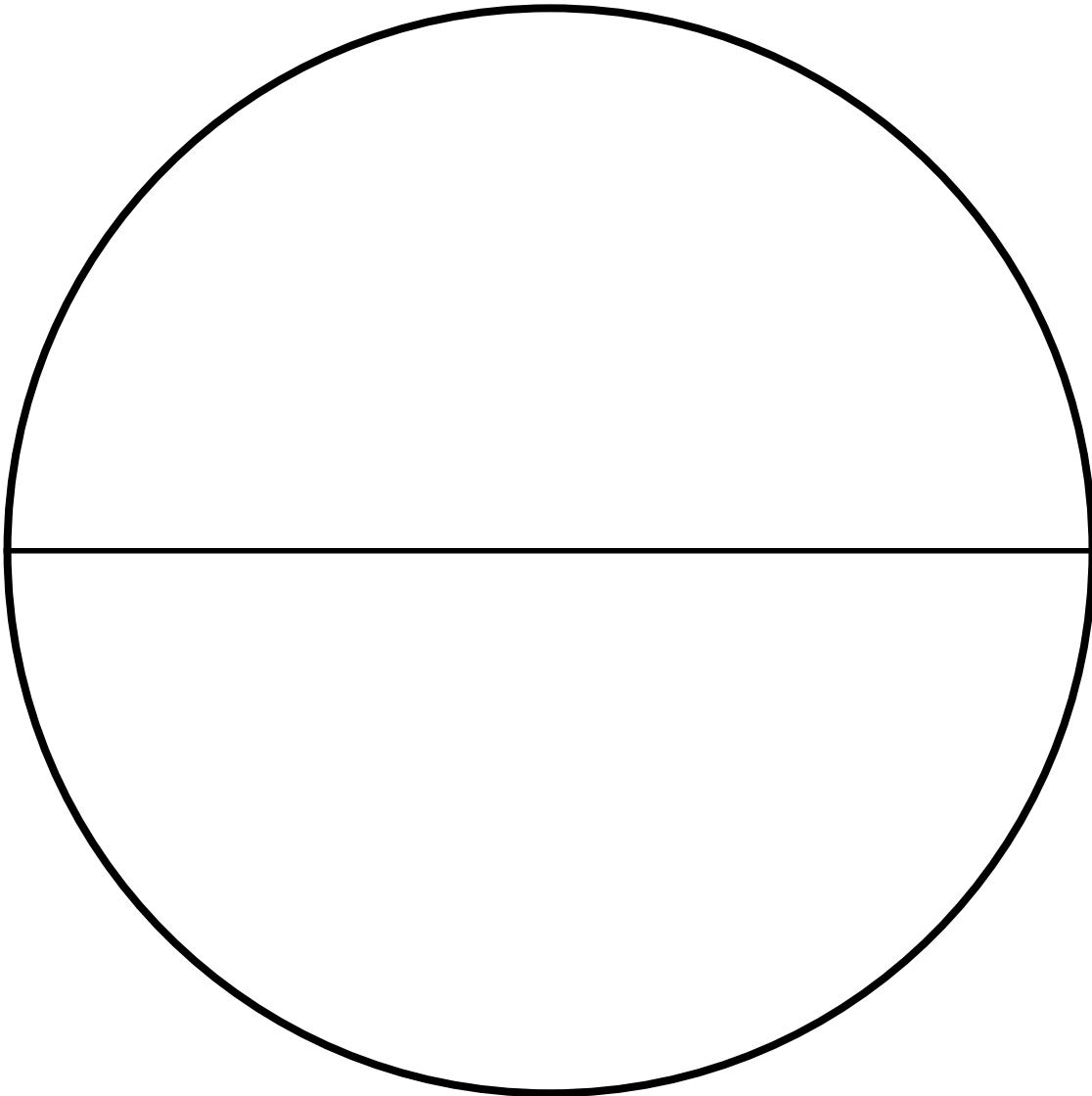
CODEX BREAKER

PROBLEM SCORING: 2 POINTS POSSIBLE

DIRECTIONS:

EACH COLOR REPRESENTS A UNIQUE, POSITIVE INTEGER. SOLVE THE PUZZLE BY DETERMINING WHAT VALUE CORRESPONDS TO EACH COLORED CIRCLE.

(blue) × (purple) ÷ (green) = 4

(green) × (blue) ÷ (purple) = 16

(green) ÷ (purple) = 2

(blue) + (purple) + (purple) = 14

(green) + (red) + (red) + (green) = 20

(blue) ÷ (red) = (gold)

SOLUTION:

(blue) (green) (purple) (red) (gold)
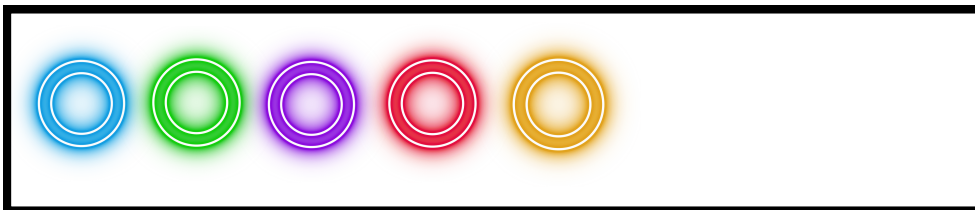
WHEN YOU HAVE SOLVED THIS PROBLEM, GO TO HISTORIC **ROOM 1016** TO PRESENT YOUR SOLUTION TO THE MASTER TEACHER.

BE PREPARED TO JUSTIFY YOUR SOLUTION.
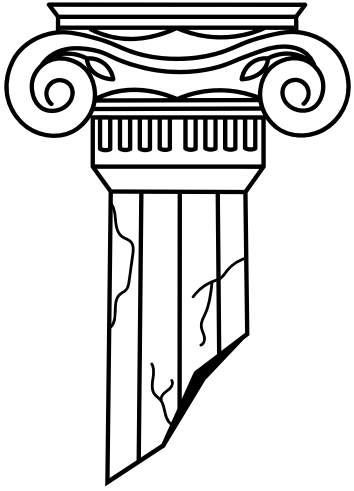
DEFECTUS:
CRACKED CLOCK

PROBLEM SCORING: 2 POINTS POSSIBLE
PART A: 1 POINT
PART B: 1 POINT (YOU WILL GET PART B WHEN YOU CORRECTLY ANSWER PART A).

PART A:

AN ANALOG CLOCK FALLS OFF THE WALL AND CRACKS INTO TWO PIECES. THE NUMBERS ON EACH PIECE ADD UP TO THE SAME TOTAL.

DETERMINE HOW THE CLOCK CRACKED.

YOU WILL GET PART B WHEN YOU CORRECTLY ANSWER PART A.

WHEN YOU HAVE SOLVED THIS PROBLEM, GO TO HISTORIC **ROOM 1066** TO PRESENT YOUR SOLUTION TO THE MASTER TEACHER.

BE PREPARED TO JUSTIFY YOUR SOLUTION.
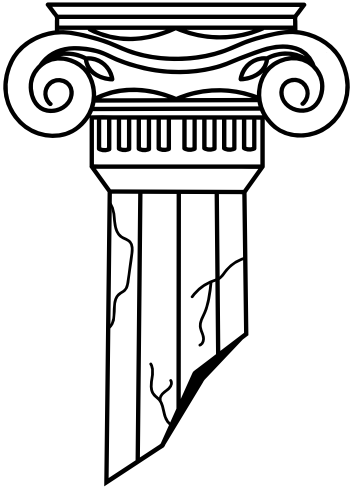
DEFECTUS: DAMAGED DARTBOARD

PROBLEM SCORING: 2 POINTS POSSIBLE
PART A: 1 POINT
PART B: 1 POINT (YOU WILL GET PART B WHEN YOU CORRECTLY ANSWER PART A).

PART B:

CAN YOU SPLIT A DART BOARD IN TWO PIECES SO THAT ONE SECTION'S NUMBERS ADD UP TO DOUBLE THE NUMBERS OF THE OTHER?

WHEN YOU HAVE SOLVED THIS PROBLEM, GO TO HISTORIC **ROOM 1066** TO PRESENT YOUR SOLUTION TO THE MASTER TEACHER.

BE PREPARED TO JUSTIFY YOUR SOLUTION.
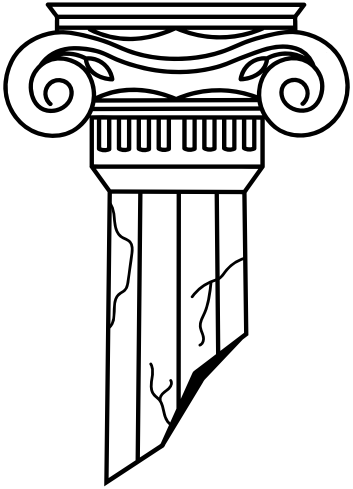
GLADIATOR GAMES

PROBLEM SCORING: 2 POINTS POSSIBLE

DIRECTIONS:

WHICH GLADIATOR WILL WIN THIS TOURNAMENT BASED ON THE RESULTS SO FAR?
FILL IN THE BLANKS WITH THE COLOR WINNER FOR EACH TOURNAMENT LEVEL.

WHEN YOU HAVE SOLVED THIS PROBLEM, GO TO HISTORIC **ROOM 1065** TO PRESENT
YOUR SOLUTION TO THE MASTER TEACHER.

BE PREPARED TO JUSTIFY YOUR SOLUTION.

MEGA-SUM-PRODUCT
PYRAMID
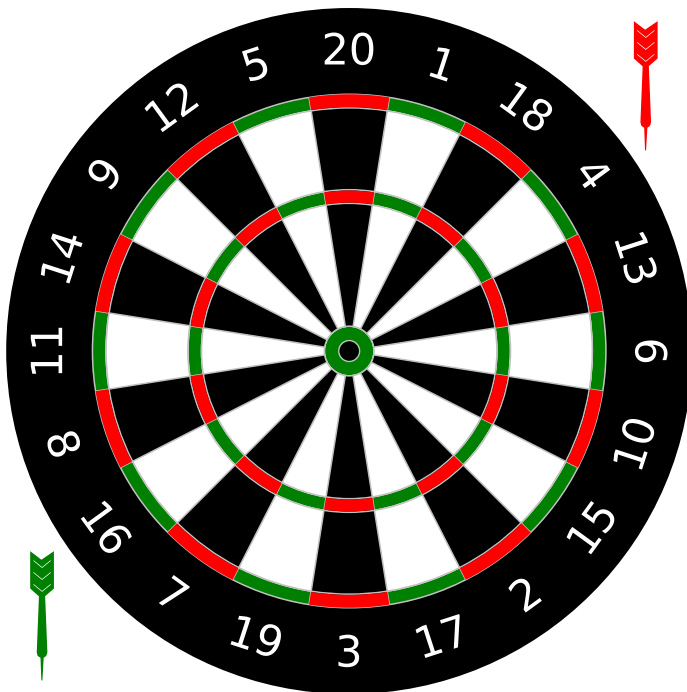
PROBLEM SCORING: 4 POINTS POSSIBLE
PART A: 1 POINT
PART B, OPTION 1: 1 POINT OR
PART B, OPTION 2: 3 POINTS

PART A: DIRECTIONS

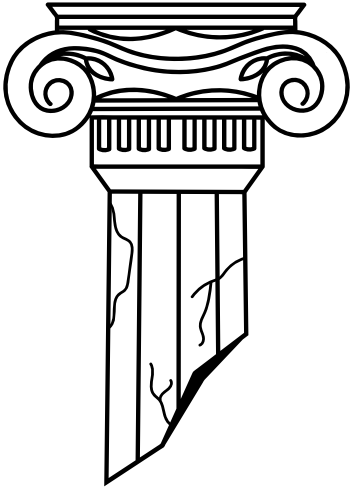THE CENTER ROW DICTATES THE REST OF THE NUMBERS IN THE GRID. WORKING UPWARDS, TWO ADJACENT NUMBERS MULTIPLY TO GIVE THE NUMBER IN THE BOX ABOVE. WORKING DOWNWARDS, TWO ADJACENT NUMBERS ADD TO GIVE THE NUMBER IN THE BOX BELOW!

IF WE SELECT 3, 2, AND 6 FOR THE MIDDLE ROW, WE GENERATE THIS:

```
        72
     6     12
  3     2     6
     5     8
        13
```

NOW, IT'S YOUR TURN. COMPLETE THE PYRAMID BELOW:

```
       1296

   a     b     c

       25
```

WHEN YOU HAVE SOLVED THIS PROBLEM, GO TO HISTORIC **ROOM 1064** TO PRESENT YOUR SOLUTION TO THE MASTER TEACHER.

YOU WILL GET PART B WHEN YOU CORRECTLY SOLVE PART A.

BE PREPARED TO JUSTIFY YOUR SOLUTION.

MEGA-SUM-PRODUCT
PYRAMID
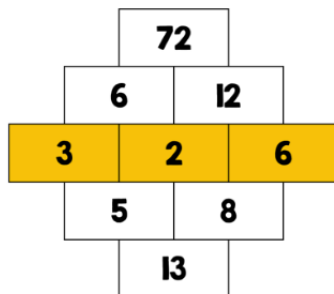
PROBLEM SCORING: 4 POINTS POSSIBLE
PART A: 1 POINT
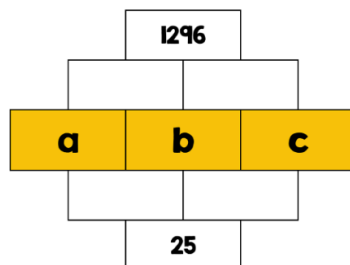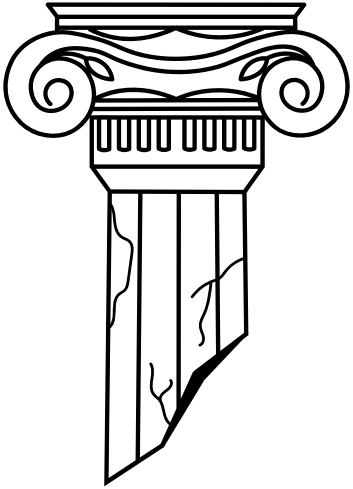PART B, OPTION 1: 1 POINT OR
PART B, OPTION 2: 3 POINTS

PART B DIRECTIONS:

OPTION 1: COMPLETE THE PYRAMID BELOW FOR **ONE POINT**:

```
        16875

  a      b      c

        58
```
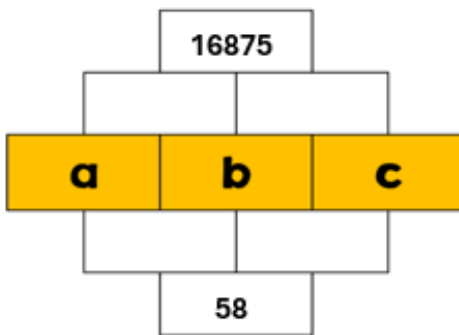
OPTION 2: COMPLETE THE PYRAMID BELOW FOR **THREE POINTS**:
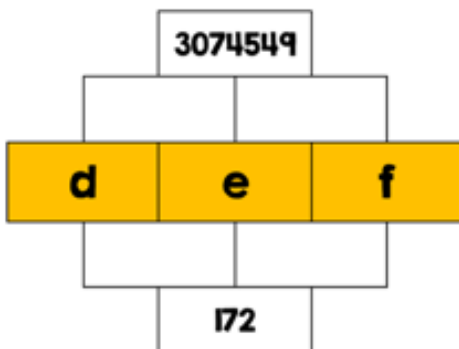
```
       3074549

  d      e      f

        172
```

WHEN YOU HAVE SOLVED THIS PROBLEM, GO TO HISTORIC **ROOM 1064** TO PRESENT YOUR SOLUTION TO THE MASTER TEACHER.

BE PREPARED TO JUSTIFY YOUR SOLUTION.

MIRA, MIRA'

PROBLEM SCORING: 3 POINTS POSSIBLE
PART A: 1 POINT
PART B: 2 POINTS

PART A: USING A MIRA, FIND THE COORDINATES OF THE IMAGE OF POINT D OVER THE LINE:

$$y = 4x - 2$$

WHEN YOU HAVE SOLVED THIS PROBLEM, GO TO HISTORIC **ROOM 1059** TO PRESENT YOUR SOLUTION TO THE MASTER TEACHER.

BE PREPARED TO JUSTIFY YOUR SOLUTION.
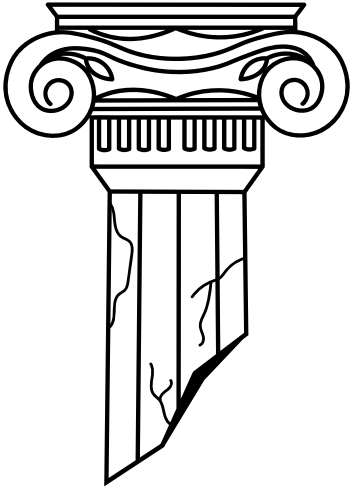
MIRA, MIRA'

PROBLEM SCORING: 3 POINTS POSSIBLE
PART A: 1 POINT
PART B: 2 POINTS

PART B: FIND THE LINE WHERE YOU WOULD PLACE THE MIRA FOR POINT B TO BE THE REFLECTION OF POINT A. WRITE THE EQUATION OF THIS LINE.
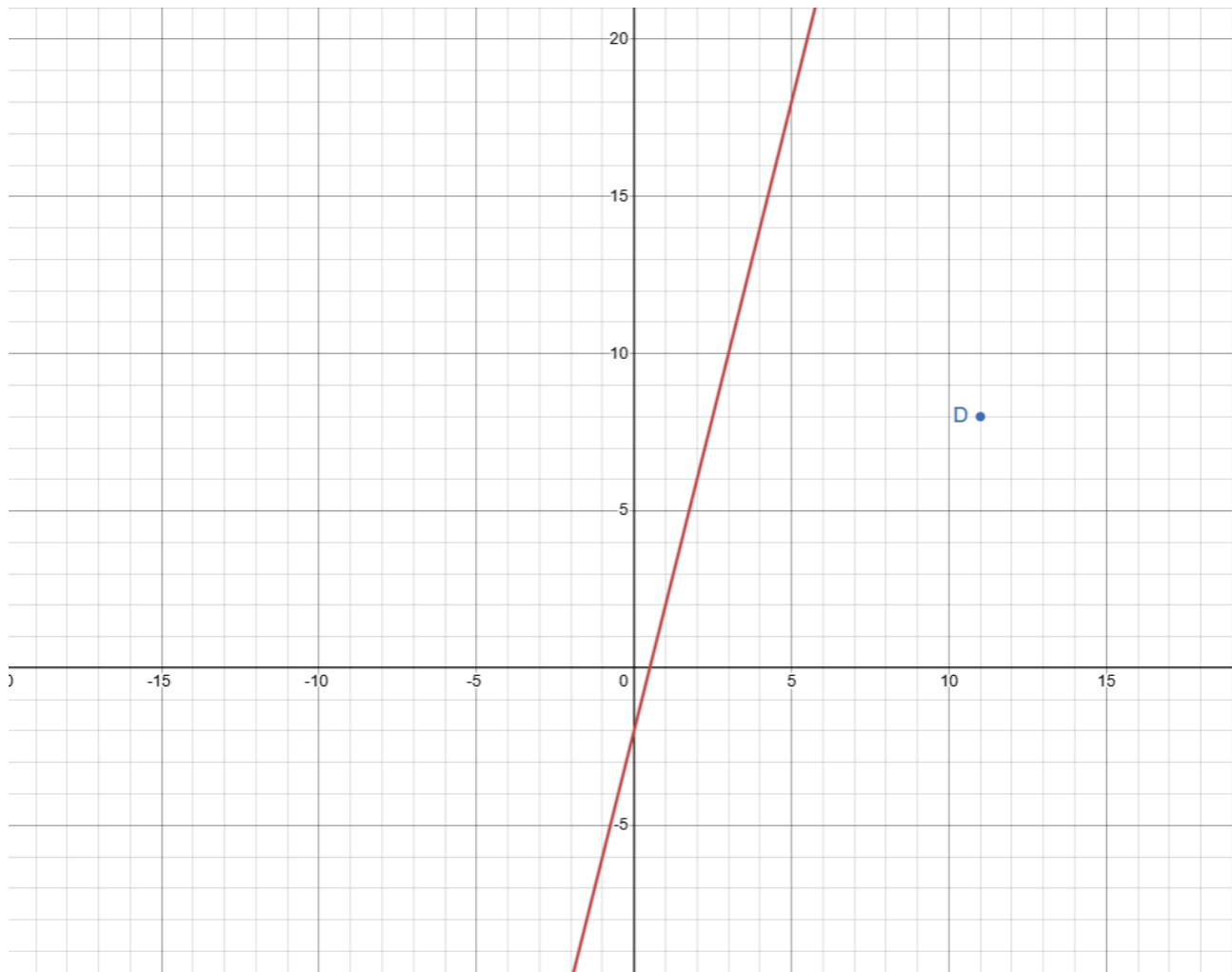

WHEN YOU HAVE SOLVED THIS PROBLEM, GO TO HISTORIC **ROOM 1059** TO PRESENT YOUR SOLUTION TO THE MASTER TEACHER.

BE PREPARED TO JUSTIFY YOUR SOLUTION.
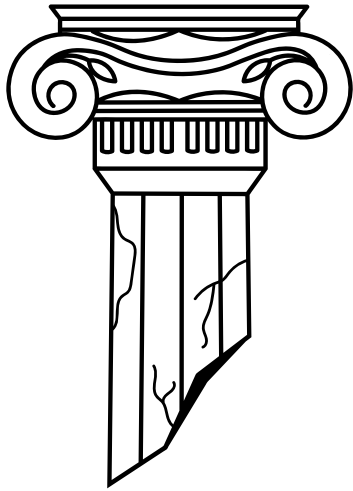
PAINTED PRISMS

PROBLEM SCORING:
2 POINTS POSSIBLE
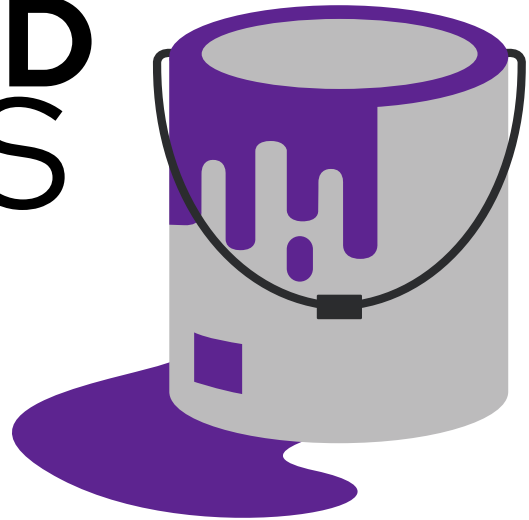
DIRECTIONS:

YOU SPENT A LONG TIME BUILDING A RECTANGULAR PRISM WITH SNAP CUBES. YOUR LITTLE BROTHER DROPPED YOUR SPECIAL RECTANGULAR PRISM IN A BUCKET OF PURPLE PAINT. NOW, ALL THE FACES ARE PAINTED THE SAME COLOR. FOR THE FOLLOWING QUESTIONS, ASSUME THAT YOUR PRISM IS SOLID.

HOW MANY OF THE INDIVIDUAL CUBES IN THE 3 BY 4 BY 5 PRISM HAVE:

- 0 FACES PAINTED PURPLE?
- 1 FACE PAINTED PURPLE?
- 2 FACES PAINTED PURPLE?
- 3 FACES PAINTED PURPLE?
- 4 FACES PAINTED PURPLE?

ORGANIZE YOUR ANSWER SO THAT IT IS EASY TO READ AND MAKES SENSE.

WHEN YOU HAVE SOLVED THIS PROBLEM, GO TO HISTORIC **ROOM 1015** TO PRESENT YOUR SOLUTION TO THE MASTER TEACHER.
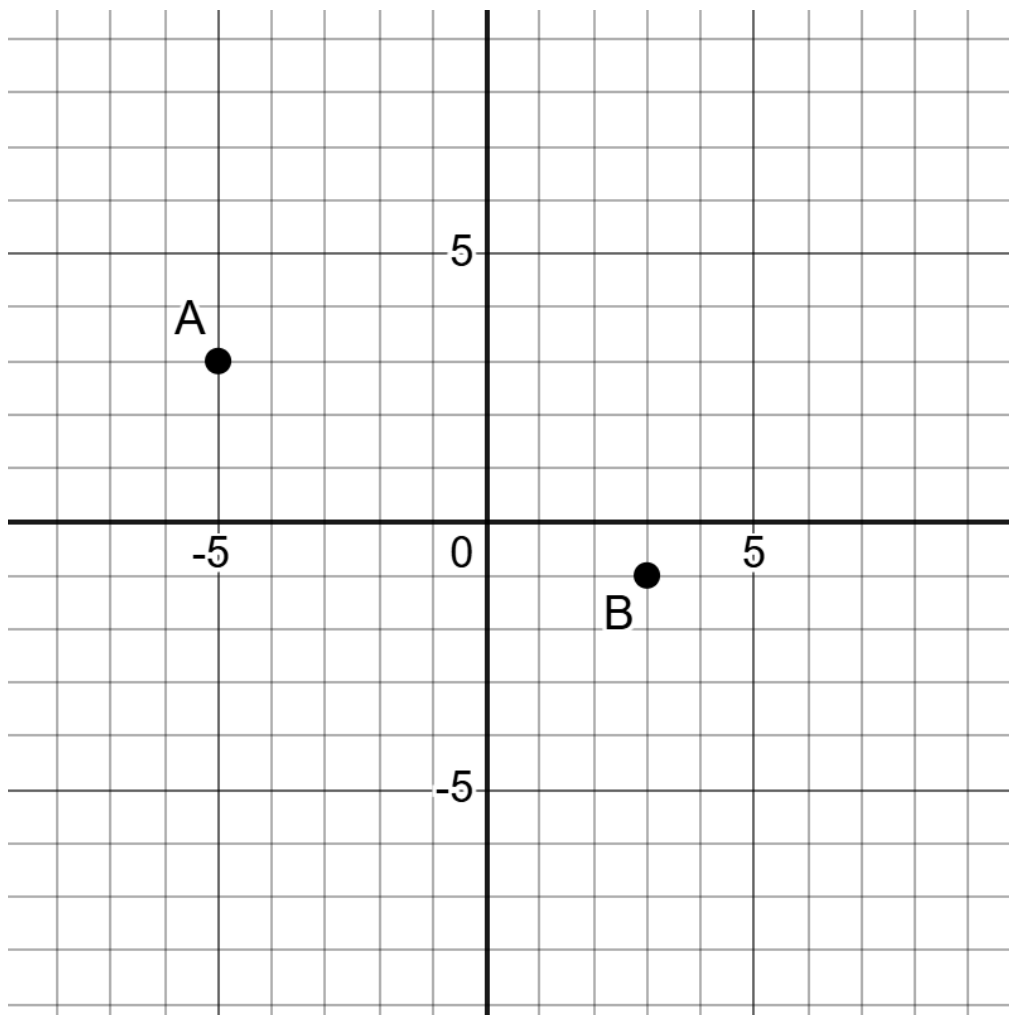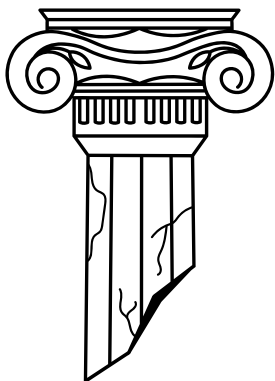
BE PREPARED TO JUSTIFY YOUR SOLUTION.

SKYSCRAPERS

Directions:

1. Complete the grid so that every row and column contain the numbers 1 to size *n* of an *n* by *n* grid.
2. Every row and column contain each number only once.
3. The clues tell you how many skyscrapers you can see in that direction.
4. You can't see a shorter skyscraper behind a taller one.
5. This puzzle has exactly one correct answer.

Imagine standing around the edges. the numbers tell you how many skyscrapers you can see. You might be able to see any number from 1 up to the size of the grid.

Here are examples of how the clues help you see the skyscrapers:

SKYSCRAPERS

PROBLEM SCORING: 4 POINTS POSSIBLE
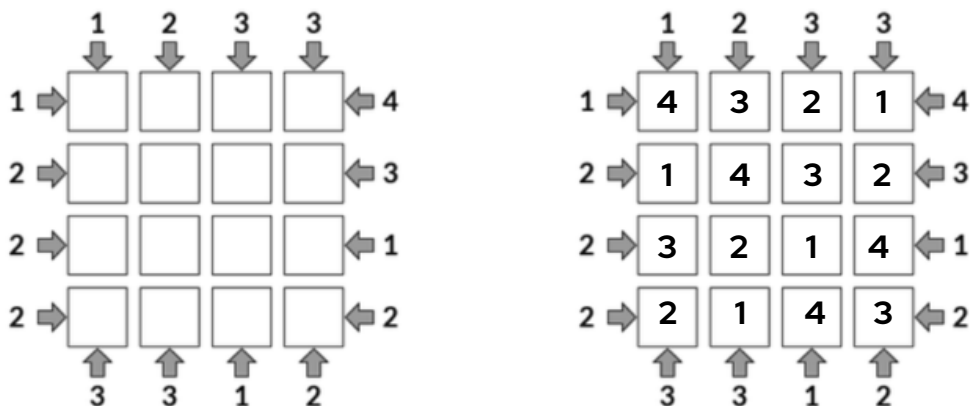PART A, SET ONE: 1 POINT
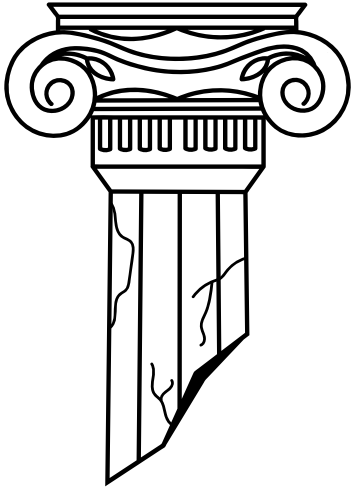PART B, SET TWO: 2 POINTS, OR,
PART C, SET THREE: 3 POINTS

PART A, SET ONE:
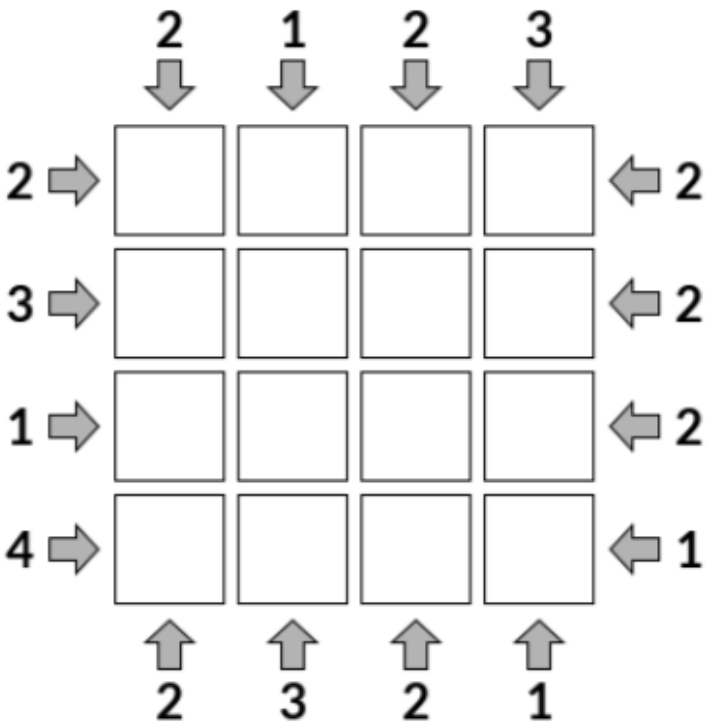
```
        2   1   2   3
        ↓   ↓   ↓   ↓
     ┌───┬───┬───┬───┐
2 →  │   │   │   │   │  ← 2
     ├───┼───┼───┼───┤
3 →  │   │   │   │   │  ← 2
     ├───┼───┼───┼───┤
1 →  │   │   │   │   │  ← 2
     ├───┼───┼───┼───┤
4 →  │   │   │   │   │  ← 1
     └───┴───┴───┴───┘
        ↑   ↑   ↑   ↑
        2   3   2   1
```

WHEN YOU HAVE SOLVED THIS PROBLEM, GO TO HISTORIC **ROOM 1014** TO PRESENT YOUR SOLUTION TO THE MASTER TEACHER.

BE PREPARED TO JUSTIFY YOUR SOLUTION.
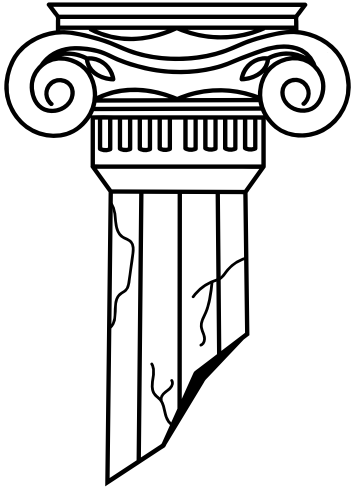
SKYSCRAPERS

PART B:
YOU MUST CHOOSE TO COMPLETE SET TWO OR SET THREE. YOU WILL NOT BE GIVEN CREDIT FOR BOTH. NOTICE THE POINT DIFFERENCE BETWEEN THE TWO SETS.

SET TWO:

	2	2	1	2	3	
3						2
3						2
1						3
2						4
3						1
	3	2	2	3	1	

SET THREE:

	3		2	2		
						1
3						
	5		3			

WHEN YOU HAVE SOLVED THIS PROBLEM, GO TO HISTORIC **ROOM 1014** TO PRESENT YOUR SOLUTION TO THE MASTER TEACHER.

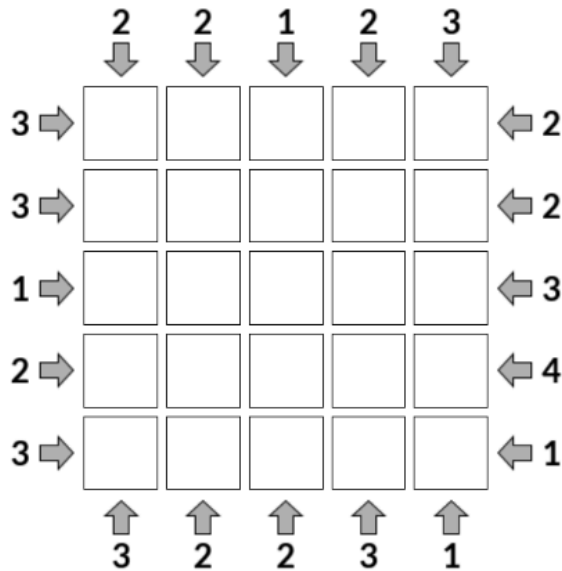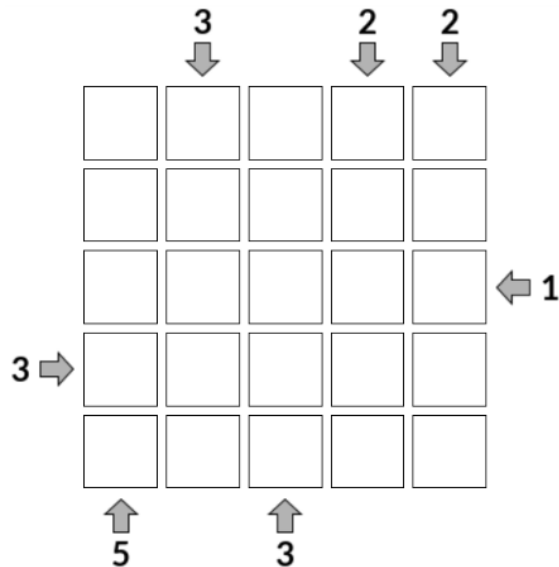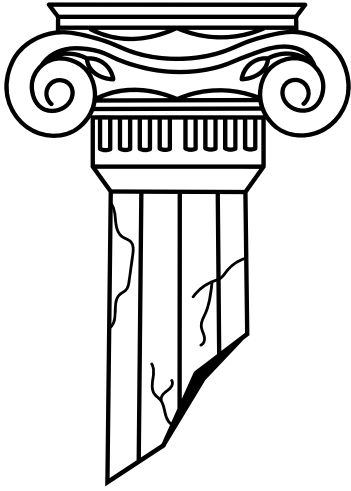*BE PREPARED TO JUSTIFY YOUR SOLUTION.*

SCISSMA
XXV

PROBLEM SCORING:
2 POINTS POSSIBLE

DIRECTIONS:

SPLIT THE NUMBER 25 INTO POSITIVE INTEGERS SO THAT THE NUMBERS SUM TO 25.

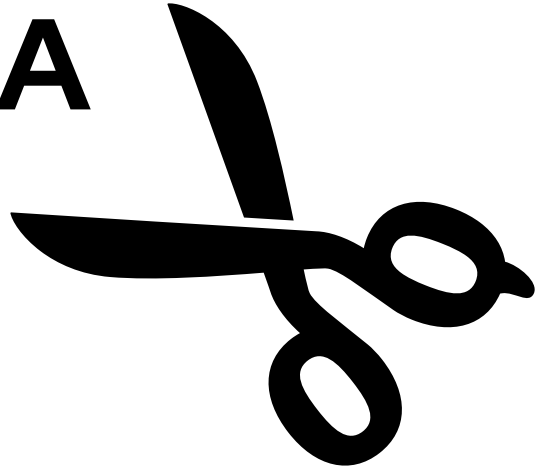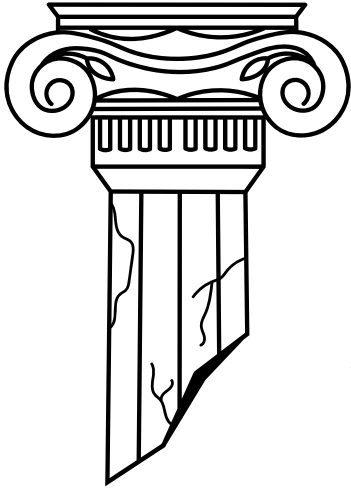WHAT IS THE LARGEST PRODUCT YOU CAN CREATE USING THOSE NUMBERS?

WHEN YOU HAVE SOLVED THIS PROBLEM, GO TO HISTORIC **ROOM 1013** TO PRESENT YOUR SOLUTION TO THE MASTER TEACHER.

BE PREPARED TO JUSTIFY YOUR SOLUTION.
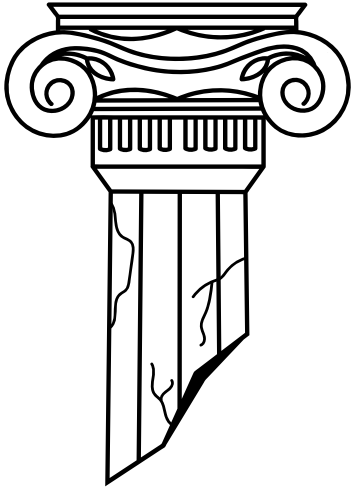
THE PHILATELIST

DIRECTIONS:

SAMESH HAD SOME UNITED STATES AND FOREIGN STAMPS. THE RATIO OF U.S. STAMPS TO THE NUMBER OF FOREIGN STAMPS WAS 3:4. HE BOUGHT 21 MORE U.S. STAMPS AND THE RATIO BECAME 9:8.

HOW MANY FOREIGN STAMPS DID SAMESH HAVE?
HOW MANY U.S. STAMPS DID SAMESH HAVE IN THE END?

WHEN YOU HAVE SOLVED THIS PROBLEM, GO TO HISTORIC **ROOM 1063** TO PRESENT YOUR SOLUTION TO THE MASTER TEACHER.

BE PREPARED TO JUSTIFY YOUR SOLUTION.

TIE BREAKER: RACING RADICALS

DIRECTIONS:

USING THE NUMBERS 1-9 *ONE TIME* ONLY, FILL IN THE BLANKS SO THAT THE EQUATIONS ARE TRUE.

$$\sqrt{\square\,\square} = \square$$

$$\square < \sqrt{\square\,\square} < \square$$

WHEN YOU HAVE SOLVED THIS TASK,

IF YOU ARE ON THE **FIRST FLOOR**, GO TO THE ATRIUM (WHERE THE PRINTING PRESS IS LOCATED) AND GIVE THIS PAPER TO THE TIE BREAKER OFFICIAL.

IF YOU ARE ON THE **SECOND FLOOR**, GO TO THE STUDENT LOUNGE AND GIVE THIS PAPER TO THE TIE BREAKER OFFICIAL.

SCHOOL: _____

TIME STAMP:_____