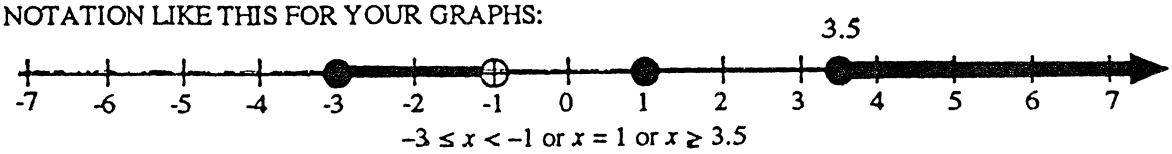
ROUND I: Graphing on a number line

DRAW THE GRAPH FOR EACH PROBLEM ON THE NUMBER LINE PROVIDED.
SPECIFY ANY NON-INTEGER ENDPOINTS.
USE NOTATION LIKE THIS FOR YOUR GRAPHS:



$-3 \le x < -1$ or $x = 1$ or $x \ge 3.5$

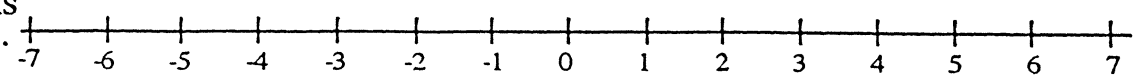
1. $15 \ge 2(3x-5)-4(3x-1)$

2. $-2 \le 3x+10$ and $5 > 2x-3$

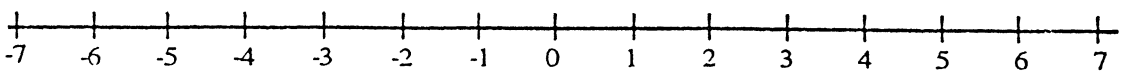
3. $4+3\left|2(x-3)+5\right| \ge 13$

ANSWERS

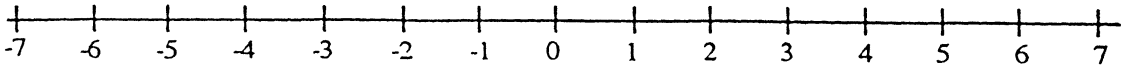
(1 pt.) 1.



(2 pts) 2.



(3 pts) 3.



Algonquin, Shepherd Hill, Westborough

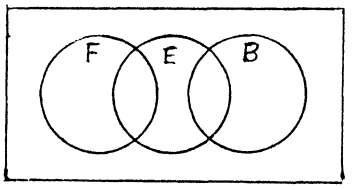
February 7, 2001 WOCOMAL Freshman Meet

ROUND II: Set theory

ALL ANSWERS MUST BE IN SIMPLEST EXACT FORM

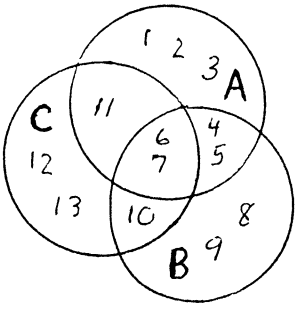
$\bar{S}$ denotes the complement of set S

1. On the Venn diagram like this in the answer section shade
   $(F \cup B) \cap E$



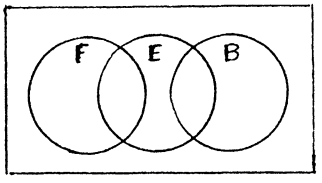
2. In a group of 87 people, 58 have brown hair, 63 have brown eyes, and 49 have both brown hair and brown eyes. How many have neither brown hair nor brown eyes?

3. Sets A, B, and C have elements as shown in the Venn diagram and the universe is their union. Specify
   $\overline{[A \cap (B \cup C)]} \cap [A \cup (B \cap C)]$
   by a list of its elements.



ANSWERS

(1 pt) 1.



(2 pts) 2. _____

(3 pts) 3. { _____ }

Algonquin, Bancroft, Burncoat

ROUND III: Operations on numerical fractions, decimals, percents, and percentage word problems

ALL ANSWERS MUST BE IN SIMPLEST EXACT FORM

1. Consider the product of the repeating decimals $.\overline{3}$ and $.\overline{6}$.
   If it is also one repeating digit, state that digit. Otherwise answer "not single digit".

2. Evaluate $\left[\dfrac{.\overline{6}+\frac{1}{6}}{\frac{4}{5}-0.3} \div \dfrac{\frac{2}{3}}{\frac{4}{5}}\right]^2$.

3. If 35% of books are well-written, 40% of books are interesting, and 80% of books that are well-written are not interesting, then what percent of books are neither well-written nor interesting?

ANSWERS

(1 pt) 1. _____

(2 pts) 2. _____

(3 pts) 3. _____

Bromfield, St. John's, South

ROUND IV: Techniques of counting and probability

EACH ANSWER MUST BE EXPRESSED AS ONE POSITIVE INTEGER OR AS A REDUCED FRACTION

1. With a random digit generator, each digit from 0 to 9 has an equal chance of occuring on any one operation. Two digits are generated. What is the probability that the second digit is the same as the first?

2. In how many ways can a 6 question true-false quiz be responded to if it is permissible to leave questions unanswered?

3. In how many ways can 5 students line up on a toboggan if one is timid and will not go in the first position?

ANSWERS

(1 pt) 1. _____

(2 pts) 2. _____

(3 pts) 3. _____

Bartlett, Bromfield, St. John's

February 7, 2001 WOCOMAL Freshman Meet

TEAM ROUND: Topics of previous rounds and open

ALL ANSWERS MUST BE IN SIMPLEST EXACT FORM AND ON THE SEPARATE TEAM ANSWER SHEET 3 points each

1. Graph: $2x+8 \le -x+11 \le 3x+7$

2. Draw a Venn diagram to illustrate 3 sets, A, B, and C, so that A and B are disjoint, $A \subset C$, $B \subset C$, and $\overline{A \cup B} \cap C \neq \phi$.

3. In a drivers ed class, 70% of the students got their license on the first try. Of those remaining, 80% got their license on the second try. If 12 students got their license on the second try, how many had to try a third time?

4. What is the theoretical probability, expressed as a reduced fraction, that in a family with 3 children there will not be exactly 2 boys? Assume that boys and girls are equally likely.

5. Upon substituting the 4 digits 1,3,8, and 9 for the 4 letters in the addition example following (different digits for different letters), find the largest possible sum.

   BAD + MAD + DAM

6. Write a formula for y in terms of x which gives the following pairs of values:

x	-2	-1	0	1	2	3
y	-11	-7	-3	1	5	9

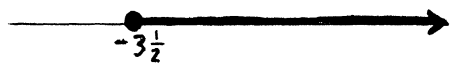
7. Starting from 14 there is one definite process that can be used on each number to get the next number. Explain that process in words and state the 7th number.

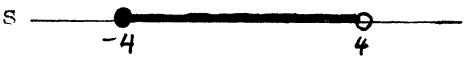
   14, 19, 29, 40, 44, 52, ...

8. Using the current common year numbering system, a child was born in 1 BC. How old was he on his birthday in 1 AD?

Doherty, Hudson, Millbury, Notre Dame, St. John's. Shrewsbury, Tahanto

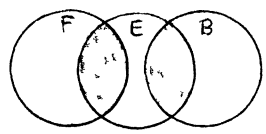
ROUND I — # line graphs

1. 1 pt 

2. 2 pts 

3. 3 pts 

ROUND II — sets

1. 1 pt 

2. 2 pts 15

3. 3 pts {1, 2, 3, 10} any order

ROUND III — fractions decimals %

1. 1 pt 2

2. 2 pts 4

3. 3 pts 32 %

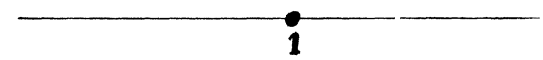
ROUND IV — counting probab

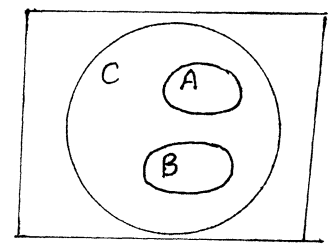
1. 1 pt $\frac{1}{10}$

2. 2 pts 729

3. 3 pts 96

TEAM ROUND 3 pts each

1. 

2. 

Need A and B separate, both inside C, and some C that is neither A nor B

3. 3

4. $\frac{5}{8}$

5. 2056

6. $Y = 4x - 3$

7. 7th number 59
Explain Add the digits of each number, or their sum, to that number to get the next number.
Different number with explanation . . .? Test it, check with officials.

8. 1 year
↑ may omit

February 7, 2001 WOCOMAL FRESHMAN MEET BRIEF SOLUTIONS

ROUND I

1 $15 \geq 6x - 10 - 12x + 4$

$6x \geq -21 \Rightarrow x \geq -\frac{21}{6} = -3\frac{1}{2}$

2. $-12 \leq 3x$ and $8 > 2x$

$-4 \leq x$ " $4 > x$

Combine to $-4 \leq x < 4$

3. $3|2x-6+5| \geq 9$

$|2x-1| \geq 3$

$2x-1 \geq 3$ or $2x-1 \leq -3$

$x \geq 2$ " $x \leq -1$

ROUND II

1 Points in either F or B and at the same time also in E

2

	B hair	not	
B eyes	49	9	58
not	14	15	29
	63	24	87

Fill in "outside" first

Subtract

3. $B \cup C = \{4,5,6,\ ,13\}$

$A \cap (B \cup C) = \{4,5,6,7,11\}$

$\overline{A \cap (B \cup C)} = \{1,2,3,8,9,10,12,13\} = D$

$B \cap C = \{6,7,10\}$

$A \cup (B \cap C) = \{1,2,3,4,5,6,7,10,11\} = E$

Ans $= D \cap E = \{1,2,3,10\}$

ROUND III

1 $.\overline{3} = \frac{1}{3}$ and $.\overline{6} = \frac{2}{3}$ Product $= \frac{2}{9} = .\overline{2}$

2. $\left[\frac{\frac{2}{3}+\frac{1}{6}}{\frac{4}{5}-\frac{3}{10}} \cdot \frac{\frac{4}{5}}{\frac{2}{3}}\right]^2 = \left[\frac{\frac{5}{6}}{\frac{5}{10}} \cdot \frac{4}{5}\ \frac{3}{2}\right]^2 = \left[\frac{5}{6} \cdot \frac{10}{5} \cdot \frac{6}{5}\right]^2$

$= \left[\frac{10}{6} \cdot \frac{6}{5}\right]^2 = 2^2 = 4$

ROUND III cont

3.

	int 20%	not int 80%	%
well wr	7	28	35
not well wr	33	32	65
%	40	60	100

Like Round II 2

ROUND IV

1. Ten equally likely second digits, exactly one of which is the same as the first

2. 3 possible responses for each of 6 questions gives $3^6 = 729$ ways

3 $4 \cdot 4 \cdot 3 \cdot 2 \cdot 1 = 96$

TEAM ROUND

1 $2x + 8 \leq -x + 11$ and $-x + 11 \leq 3x + 7$

$3x \leq 3$ " $4 \leq 4x$

$x \leq 1$ " $1 \leq x$

Combined $x = 1$ so just one point

2. See answer page. The last condition requires that A∪B not "fill up" C

3 80% or $\frac{4}{5}$ of those remaining = 12.

Divide by 4 to get $\frac{1}{5}$, the rest, = 3

4 8 equally likely possibilities

BBB✓ BGB GBB GGB✓

BBG BGG✓ GBG✓ GGG✓

of which 5 do not have exactly 2 boys

5 Put 1 for A so each number is > 300. D has most influence, so let D = 9, M next, = 8 and B = 3 $319 + 819 + 918 = 2056$

6 Constant differences so linear: $y = mx + b$ and $b = -3$ Use any other (x, y) pair for m

7 See answer page

8. No year zero, so consecutive years