

SMALL SCHOOL SOLUTIONS: TEACHING MATH 416 AND 436 TOGETHER - ORDERING TOPICS FOR CONVENIENCE

Produced by the following Western Quebec School Board teachers:

John Kordan, Golden Valley School, Val d'Or
Alex Goubko, Noranda School, Rouyn-Noranda
Lawrence McNally, École G. Théberge, Témiscaming
Coordinator: Pat McQuatty, math consultant, WQSB
Facilitator: Carolyn Gould, MEQ

In the academic year 1998 – 1999, the above teachers were granted financial assistance from PDIG funds to release them from their classrooms to meet together with the resource people listed above. They were able to share their frustrations in teaching two math courses at the same time in the same classroom, and to come up with workable solutions to help them manage this assignment.

The following pages outline the solution that these three teachers have developed for the academic year 1999 – 2000. In Western Quebec, two more schools are also using this approach at this time. The main strategy developed was to work out in detail which concepts in both Math 568-416 and Math 568-436 were exactly the same, or slightly different, and to organize to teach these concepts at the same time to both groups. We found that the Statistics sections were identical, but that the Math 416 students could take more time to develop their skills while the Math 436 students could begin their Algebra study. The Geometry concepts are similar enough (with some different demands) that the plan is to teach all of the geometry together, but assign different tasks at some points in the course. There was very little that was common in the Algebra sections (just the systems of equations for linear situations), so most of the algebra will have to be taught separately.

The teaching plan developed for this situation unique to small schools can also be extended to larger schools where some students may be placed in Math 436, but cannot keep up with the demands. If a school can schedule both Math 416 and Math 436 to be taught at the same time, a Math 436 student who has not performed well in the Statistics and Geometry sections could be transferred to Math 416 early in February, and they will not have missed any part of the Math 416 content.

If anyone would like to dialogue about this solution for small schools, please feel free to contact Pat McQuatty at 819 – 776 – 3157, extension 313, or email pmcquatty@wqsb.qc.ca.

TIMELINE FOR TEACHING MATH 536 – 416 AND MATH 536 – 436
IN THE SAME CLASSROOM TO ALL SECONDARY IV STUDENTS

Note that details on content in each section will follow this chart.

% of year (160 days)	Topic	Itinerary
10% or 16 days	Statistics (both groups)	416: itinerary 4 436: reflection 8
Approximate date: September 24		
14% or 23 days	416: Statistics in depth 436: Analytic Geometry	416: itinerary 4 436: reflection 7
Approximate date: October 29		
35% or 56 days	Geometry (both groups)	416: itineraries 2, 5, 6 436: reflections 5, 9
MID-YEAR EXAM: approximate date: February 4		
18% or 29 days (3 days: calculator skills)	416: Variations 436: Functions	416: itinerary 1 436: reflections 1, 4
Approximate date: March 29		
8% or 13 days	Systems of Equations (both groups)	416: itinerary 3 436: reflection 6
Approximate date: April 12		
15% or 24 days	416: systems of equations in depth 436: algebra, factoring	416: itinerary 3 436: reflections 2, 3
Approximate date: May 25		

Please note the following:

The order of teaching was based on time percentage weights. Some may feel that leaving factoring until the end of the year is not appropriate. This outline will be reviewed by our 5 teachers in June 2000.

STATISTICS IN SECONDARY IV

Math 568 – 416 and Math 568 – 436

Math 416: itinerary 4

Math 436: reflection 8

Gathering Data	416 (10%)	436 (4%)
Sample / population Census, poll, study Representative sampling Appropriate sampling methods Sources of bias Comparison of two samples from same population	Topics 1 and 2 Pages 2 – 29 Pop quiz # 9	Topics 1 and 2 Pages 268 – 296 Pop quiz # 21
Measures of Position	416 (14%)	436 (6%)
Central tendency, position, dispersion Quintile, quartile, percentile Determine data value(s) Measures of position to compare data Box and whisker plot Qualitative information	Topics 3, 4 Pages 30 – 59 Pop quiz # 10 Topic 5 Pages 61 – 84 Pop quiz # 11	Topics 3, 4 Pages 297 – 333 Pop quiz # 22 Topic 5 Pages 334 – 362 Pop quiz # 23

TIME FRAME: The Math 416 students do more quantitative activities than the Math 436 students do. Since they have 14% more time to cover the Statistics, we propose that all topics be taught together for 10% of the time, at the pace of the Math 436 students. During the next 14% of time, while the Math 436 students are working on an Algebra topic, the Math 416 students will then go back and do quantitative studies. During the time together, classes can make things like “vocabulary charts” to put up on bulletin boards, so that when the Math 416 students revisit topics, they will have visual reminders of the terms they have been exposed to.

The following outline would be for the 10% of time that the two groups would be taught together.

Gathering Data	– topics 1 and 2	– 4 periods (of 50 minutes)
Measures of Position	– topics 3, 4 and 5	– 12 periods

Topic 1: 1 day (50 minute class)

Topic 2: 3 days

Topic 3: 3 days

Topic 4: 5 days

Topic 5: 4 days

The Appendix offers some extra Statistics activities for Math 416 students.

GEOMETRY IN SECONDARY IV

Math 568 – 416 and 568 – 436

Math 416 itineraries 2, 5 and 5

Math 436 reflections 5, 7 and 9

	Chapter	Topic	Pages	Chapter	Topic	Pages
Isometries in the plane	2	1	74 – 79	5	4	48 – 49
Identifying isometries	2	2	80 – 82	5	4	50 – 54
Describing isometries	2	3	83 – 90	5	4	55 – 63
Composition of isometries	2	4	91 – 104	5	4	64 – 68
Statements of proof	2	5	105 – 114	5	1	6 – 17
Concept of proof	2	6	115 – 123	5	2	18 – 27
Demonstrations	2	7	124 – 141	5	3	28 – 47
Isometric triangles – proof	2	8	142 – 164	5	5	69 – 91
Equivalent figures				5	7	99 – 112
Similar figures	5	1	86 – 98	9	1	364 – 377
Properties of similar figures	5	2	99 – 108	9	2	378 – 387
Similar solids	5	3	109 – 115	5	6	92 – 98
Similar triangles	5	4	120 – 126	9	3	392 – 402
Measures of similar figures	5	5	127 – 146	9	4	403 – 421
Trig ratios	6	1	152 – 160	9	5	422 – 430
Solving right triangles	6	2	161 – 175	9	5	431 – 434
Sine law oblique triangles	6	3	176 – 183	9	5	435 – 442
Cosine law				9	5	443 – 459
Heron's formula	6	4	184 – 198			

Note that for most topics in Geometry, the diagrams and explanations in the text are fairly similar, the diagrams for exercises are often the same, but the level of expectations from the student may differ. In some topics, such as proof, there is a greater divergence and less “match” between texts.

Note that the above order is based on the order in the Math 416 textbook, so the Math 436 students will do more jumping around in their book 2 textbook.

The ministry designates 38% of the year for geometry for Math 416, and 35% for Math 436. We have given 35% to both groups for the sake of convenience.

ALGEBRA IN SECONDARY IV

Math 568 – 416 and 568 – 436

This topic does not have much common ground, with the exception of systems of equations.

The Math 436 students will cover reflection 7, analytic geometry, from late September through October while the Math 416 students revisit Statistics. This leaves reflections 1, 2, 3, 4 and 6 to be covered in the rest of the year, from early February on. The Math 416 students have to cover itineraries 1 and 3 in the same length of time.

While the Math 416 students are covering variations (itinerary 1) the Math 436 students will cover functions (reflections 1 and 4), then the two groups together can study systems of equations, as outlined below. This first pass through the topic for the Math 416 students should not be demanding for them, just regard it as an introduction. They will re-visit this topic while the Math 436 students will work on reflections 2 and 3.

Systems of Equations	Math 416 (21%) Itinerary 3	Math 436 (8%) Reflection 6
Define a linear system, solve with table of values	Pages 176 – 182	Pages 114 – 118
Solve with a graph	193 – 202	119 – 124
Solve by comparison and substitution	202 – 206 comparison 228 – 231 enrichment	125 – 130
Solve by reduction		130 – 133
Parallel and coincident	207 – 210	134 – 138
Linear regression	211 – 218	139 – 140
Workout, quiz	219 – 227	141 – 155
Linear and quadratic: represent, solve graphically and with table of values		156 – 162
Linear and quadratic: comparison and substitution		163 - 170

Note that the Math 416 students should be able to handle a combination of linear and quadratic situations when viewed from a graph or table of values.

APPENDIX

ACTIVITIES FOR STATISTICS IN MATH 416

TEACHER PREPARATION FOR EXTRA STATISTICS ACTIVITIES

Activity 1

Part 1

In the MAPCO binder from the June 1998 implementation session, page 3 in the Statistics section shows 4 “cards” of Kid’s Heights. Make photocopies of this page on different colored sheets of paper, then cut the 4 “cards” out. Each group of 4 students will have one card each, of the same color. The object is to use the different representations to find out information that they are asked. They will not find the answer on their own card, but will have to look at the other cards to find it. It’s a cooperative activity to use as a review of the first 16 days when they were with the Math 436 group.

Part 2

This activity is based on an article in Mathematics Teaching in the Middle School, Volume 5, Number 1, September 1999. Students will need pages 38 and 40. You will find the solutions to the questions on pages 41 and 42.

Activity 2

This activity on random sampling is based on the activity in the MAPCO June 1998 binder on pages 7 to 12 of the statistics section. You will need to photocopy the page that shows the Jellyblubber colony, as well as page 8.

Activity 3

It will help if you have a cooperative gym teacher in your school. The data you gather here can be shared with your Math 514 students when they do correlations.

MATH 416 STATISTICS ASSIGNMENT # 1

Name: _____

Date:

Number of Class Periods:

PART ONE

NOTE: You will need to be in groups of 3 or 4 students for this activity. Each group needs to have a group of 4 cards the same colour. These 4 cards give information about a group of high school students. The same students are represented on all 4 cards. Each card has a question for you to answer, but your answer will be found on someone else's card. Help each other answer all 4 questions. Write your answers here:

Are there more girls or boys in the sample? _____

What is the name of the tallest student? _____

Which group has the greatest spread in heights, females or males? _____

What is the most common height of students in the study? _____

Together in your group of 3 or 4 students, answer the following questions:

Look at the box-and-whiskers plot.

What is the minimum height for the girls? _____ for the boys? _____

The data is more concentrated in quartile _____ for _____ (which group)?

The interquartile range for girls is _____ and for boys is _____

The range for the girls is _____ and for the boys is _____

Look at the stem-and-leaf plot.

State the central tendency for this plot. _____

Look at the height data.

List the names of the students in ascending order of their heights. Mark the four quartiles on your list.

PART TWO

NOTE: You will need a page with home run statistics in order to do this activity.

The home run statistics shows you the home run records for each year from 1950 to 1998. If you do not know the home run leader for 1999, and the number of runs, you can look for this information on the internet.

Answer the questions on pages 38 and 39. Note that for some years, there were two players who scored the same number of record home runs. Be sure to remember to count this data twice.

1. Mark McGuire's team had played _____ games.
Sammy Sosa's team had played _____ games.
2. Use the following proportion to find the number of runs expected:

$$\frac{\text{number of runs hit so far}}{\text{number of games played so far}} = \frac{\text{number of runs expected}}{\text{total number of games (162)}}$$

Mark McGuire:

Sammy Sosa:

Roger Maris:

3. The next date will be _____
4. Record held by _____, _____ longer.
_____ % greater.

6. Mean: _____

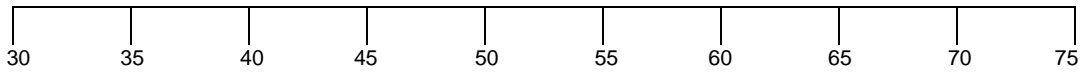
Median: _____

Mode: _____

7. (Show your work)

Mark McGuire's record IS _____ IS NOT _____ an outlier.

8.



9.

MATH 416 STATISTICS ASSIGNMENT # 2

Name: _____

Date:

Number of Class Periods:

You will need: Jellyblubber Colony sheet (face down on your desk)
Worksheet containing dot plot scales.

DETERMINE THE AVERAGE WIDTH OF A JELLYBLUBBER

(measured from left to right across the widest part of its body)

1. Turn over the Jellyblubber Colony sheet, look at it for 10 seconds, then turn it over again. What do you **estimate** is the average width of a jellyblubber?

_____ mm

Choose someone from your class to put the list of estimates on the board. Make a dot plot of the estimates.

2. Turn over the Jellyblubber Colony sheet again. Choose 10 Jellyblubbers which you think are a representative sample of the colony, and **measure** their width in mm. **Calculate** the average length. Put all 10 widths on a second dot plot.
3. Take a SRS of the Jellyblubbers by doing the following:

Generate 10 random numbers on your calculator, by typing the following:

Type in a 3 digit number, then press STO, MATH, use right arrow to go to PRB, #1 rand, ENTER
MATH, right arrow to PRB, #5 randInt(1, 100, 10) ENTER

This will give you a list of 10 random numbers from 1 to 100. They will look like

{ 11 4 67 49 29 ...

You will have to use the right arrow to move over to see the rest of the numbers.

Measure the widths of the Jellyblubbers which have the random numbers on them.

Calculate the average of the widths.

Put these widths on the third dot plot.

4. The actual average width of a Jellyblubber is 19.4 mm.
Which method gave you the best estimate? How accurate was it?
How much spread was there around the correct value?

5. Would you have taken a random sample if you had closed your eyes and
blindly pointed out 10 Jellyblubbers? Why or why not?
Why do you think your samples were so different from the random sample?

MATH 416 STATISTICS ASSIGNMENT # 3

Name: _____

Date:

Number of Class Periods:

You will need: stopwatches, several metre sticks, metre tape to mark a distance of 100 m, graphing calculator

Special instructions:

Do the first part of this activity in gym class.

Work with a partner. Measure your partner's height in cm.

Time your partner to see how long it takes them to run 100 m.

Fill in the table on the next page with everyone's height and running time.

Continue to work in partners, with one of you using the data from the heights, and the other using the data from the running times.

- On a separate sheet of paper, make a stem-and-leaf plot of your data.
- Make a box-and-whisker plot representing your data. You may use your calculator to do this if you like. Use a number line to keep it accurate.

