

# Preparation for Industrial Careers in Mathematical Sciences (PIC Math)

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What employers  
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# How would you solve this research problem?

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## Another data science problem from industry:

**Background:** The Field Museum is the science museum in Chicago. They implemented a crowdsourcing project designed to classify a large sample of microscopic plants, and obtained hundreds of thousands of pieces of data. While most of the crowdsourced data were usable, some were not.



## Another data science problem from industry:

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**Problem:** Come up with criteria for determining what data are usable and what data should be rejected.

**Imagine a course based on solving such problems**

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# That course is PIC Math!

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**Preparing students for  
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## **Components:**

- ▶ summer 3-day faculty training workshop
- ▶ spring semester course for students
- ▶ student research conference

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- ▶ over 100 industrial partners have provided research problems and consultants

## Student comments:

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- ▶ Female student at SUNY Geneseo: “This was the first experience I had ever had with real world math, and although at times it was a little bit messy, I feel I gained so many valuable skills in problem solving and working with a team. This opportunity was truly a stepping-stone for my career in mathematics.”

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- ▶ Male student at Winona State Univ: “In the PIC course we struggled a lot just getting the data to a useable status which has taught me to never expect anything to be nice and pretty. In the PIC course we worked as a team while you set deadlines that may or may not have been realistic. That is exactly the same scenario in my job now.”

## Student comments (cont):

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- ▶ Female student at Virginia State Univ (HBCU): “The PIC math helped me get my first job. The experience of successfully working in groups, and problem solving were key components in my interview. When asked about leading, and how I worked well with others, I used the PIC math as a prime example.”



# Faculty comments:

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## Faculty comments:

- ▶ Elly Farnell, Kenyon College: “Students in my courses have now gained valuable experience in team-based research on open-ended problems that have an immediate impact in a real-world setting. Two teams of students have published their work in SIURO, and the students and I have given talks on campus to the broader community and to the Parents Advisory Council, which ultimately led to a feature article on the school webpage.”

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- ▶ Tom Wakefield, Youngstown State Univ: “The students were so committed to the project and excited to work on a problem with practical implications that they continued to meet with the YPD over the summer as the YPD trained the officers in the implementation of the students’ recommended beats. The new beats went into effect in January 2016.”

# Commercial break . . .

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**Commercial break . . .**

## **What the employers have said**

**They want math students, because of their**

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- ▶ think of problems in a different way

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# What the employers have said

**They recommend that students should**

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# What the employers have said

## They recommend that students should

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## They recommend that students should

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## They recommend that students should

- ▶ learn to code
- ▶ develop good communication skills
- ▶ do an undergraduate research project or a summer internship



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## They recommend that students should

- ▶ learn to code
- ▶ develop good communication skills
- ▶ do an undergraduate research project or a summer internship
- ▶ have background in another discipline (statistics, computer science, biology, chemistry, economics)

# Back to our regular programming . . .

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## Logistics:







# Resources for teaching the course

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The screenshot shows the MAA 100 website with a navigation menu on the left and a main content area. The main content area is titled "Course Resources" and includes sections for "Sample Course Syllabi and Schedules", "Sample Research Problems from Industry", "Sample Student PIC Math Presentations", and "Preparing Your PIC Math Oral Presentations". A "PICMath" logo is visible in the top right of the content area.

- ▶ Syllabus and course schedule
- ▶ Written research problems from industry
- ▶ Videos of industry mathematicians explaining a research problem
- ▶ Videos of professors explaining the solution to a research problem
- ▶ Student papers solving the research problem
- ▶ Videos of students presenting their research

# Sample research problems

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## Youngstown State University

Students analyzed police beats based on 2014 crime data and proposed new beats that distributed the policeworkload more equally.



## Manhattan College

Students analyzed data from Animal Care Centers in NYC for 2012 – 2015 to identify population demographics that affect pet abandonment rates.



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**Over 100 industry partners have provided problems and a consultant who helps the students. These partners include:**

- ▶ Field Museum of Chicago
- ▶ Coca Cola
- ▶ Habitat for Humanity
- ▶ Colorado Dept of Transportation
- ▶ Heart Artery and Vein Center of Fresno
- ▶ Los Alamos National Lab
- ▶ Greensboro NC Police Dept
- ▶ Massachusetts General Hospital
- ▶ City of Kansas City
- ▶ AIG Insurance
- ▶ National Security Technologies
- ▶ Applied Geographics
- ▶ Water Utility Group
- ▶ Sandia National Lab

# 3-day summer faculty workshop

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# 3-day summer faculty workshop

**Discussion topics:**

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# Thank you!

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# Thank you!

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