Introduction: Math Circle at SDSU

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Agenda:

1. PURPOSE of THIS MATH CIRCLE (I think)

(a) what is math good for in today's world?

(b) have fun doing math applications using math we already know.

2. INTRODUCTIONS (what do you want out of this meeting)

3. MODELING LONDON RIOTS (today's applied math activity)

4. FEEDBACK (your feedback on today & what to do next month?)

Please get coffee refills, etc at anytime.

Why Is Math So Vital In Today's World?

MECHANICALS AND MECHANICAL ENGINEERING:
how to get a woman to the moon
how to drop a bomb
strength of materials
how to build a skyscraper
how to build an airplane
how to build an autopilot; system control
acoustics & sonar

ELECTRICITY AND MAGNETISM:
power generation
the electromagnetic spectrum
satellite imagery
radio wave propagation
radar
levitating trains
energy tools & weapons

ELECTRICAL ENGINEERING:
circuits, how they work & why they're useful
electric power distribution and control
signal processing
communications and modulation
laptops, tablets, & smart phones

COMPUTER ENGINEERING:
computer vision
machine learning
cyber crime & cyber warfare

CHEMISTRY AND CHEMICAL ENGINEERING:
electron orbits & QM
molecules and materials?
chemical bonds and design of drugs
control of chemical reactions & products

MATHEMATICAL BIOLOGY:
mechanics of living things & tissue
physiology
cellular biology
cell differentiation (Turing paper)
mathematical ecology
environmental studies & human development
bioinformatics

Why Is Math So Vital In Today's World?

ECONOMICS:
models of the economy
supply & demand
micro-econ
macro-econ
controlled growth & harvest
developing countries
welfare economics
interacting economic systems
sustainable development

BUSINESS:
data analysis
decision making
optimal pricing
predicting demand
optimizing production & distribution
cost analysis
competition & games
monopolies and oligopolies
information
bargaining & negotiation

FINANCE:
interest
present value
stock market & Wall Street, Black-Sholes eqn
financing a start-up

INSURANCE AND RISK:
risk analysis
actuarial science
social & government applications of risk analysis

DATA SCIENCE:
data into information

DATA FUSION:
detection, identification, and tracking
situation assessment
threat assessment
resource allocation
optimal planning

What Math Is In Our Future?

Nuclear power generation

Efficient power distribution & use

Levitating & high speed trains

Self-driving cars

More & better mega-structures

Improved WiFi and communication technologies

More & better mechanical medical options

More & better chemical medical options

More competitive business practices

More competitive financial & investment practices

More business reliance on ‘sophisticated’ accounting

More individual reliance on (professional) financial planning

More & better gov’t policy options, based on better models (BBM)

More & better negotiation options in areas of conflict, BBM

More & better military options in areas of conflict, BBM

Math at NIWC?

Lots of EE & CE, but also

Data & Information Fusion

(for business, military, policy, & negotiation):

1. **Objects (detect, identify, track)**
2. **Situation assessment**
3. **Threat assessment**
4. **Optimal sensor management & response**