A Blueprint for Student Success on High-Stakes Tests: A Plan from the Rice University School Mathematics Project

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Dr. Anne Papakonstantinou
Director
apapa@rice.edu

Mr. Richard Parr
Associate Director of Curricular and Instructional Programs
rparr@rice.edu

Rice University School Mathematics Project
http://rusmp.rice.edu

RUSMP provides support for teachers to advance the type and direction of mathematics instruction and learning to increase student success.

RUSMP's Definition of Student Success

- Conceptual understanding
- Problem-solving skills
- Confidence

for

- Success on state-mandated high-stakes assessment
- Desire to enroll and succeed in higher-level mathematics courses

RUSMP's Definition of Student Success

- Multi-faceted
- Grounded in theories of learning as a social, student-centered experience that engages students in strong mathematics explorations that are aligned with students' learning styles

Effective Instructional Practice

Active student engagement in rigorous, student-centered mathematical experiences is an important precursor to and aspect of student success.

How do lessons learned regarding student success inform the greater K-12 mathematics community?

RUSMP provides teachers with mechanisms to prepare their students for state assessments in creative ways which promote higher-order thinking.

National Science Foundation
Rice University Mathematics Leadership Institute (MLI)

Partnership among:

- Two Houston-area school districts
  - Aldine ISD
  - Houston ISD
- Three Rice University Departments
  - Computational and Applied Mathematics
  - Mathematics
  - Statistics

MLI Goals

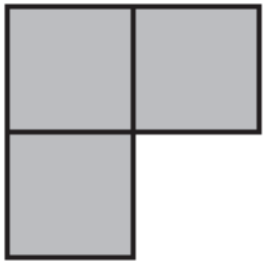
- Develop a cadre of lead teachers in mathematics.
- Provide mathematics content and pedagogical support.
- Develop highly-qualified mathematics teachers.
- Ensure that ***all*** high school students have access to challenging mathematics courses.
- Impact the instructional practices of mathematics faculty, post-docs, and graduate students.

MLI Structure

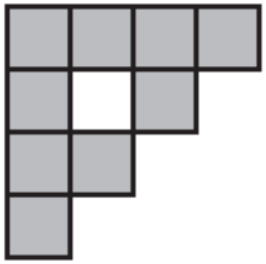
- Two Summer Leadership Institutes
- Academic-Year meetings and support
- Support to attend conferences, coaching institutes, advanced certification courses
- Resources

The first 4 stages of a certain fractal are shown below.

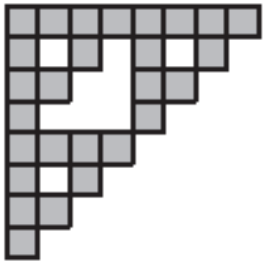
Stage 1



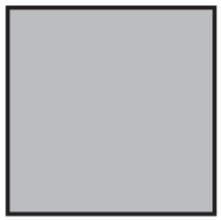
Stage 2

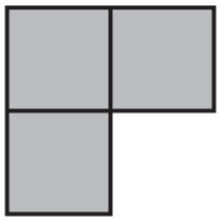


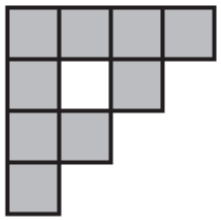
Stage 3

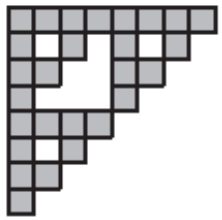


Stage 4


Stage 1


Stage 2


Stage 3

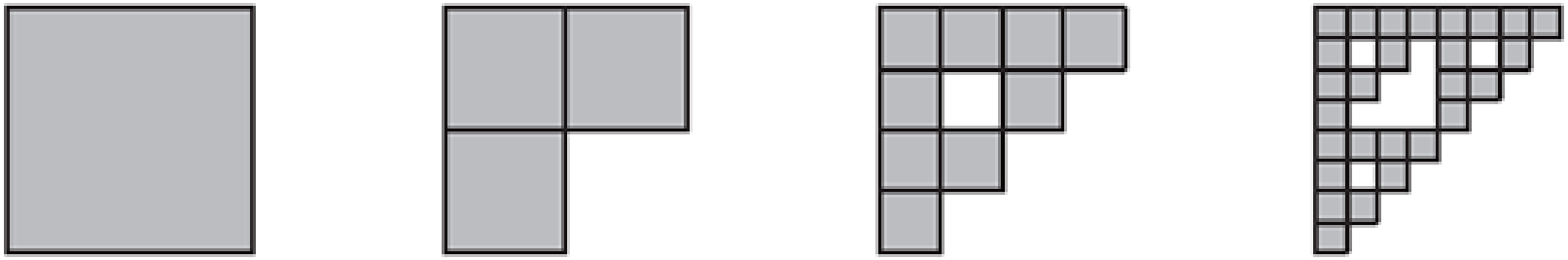

Stage 4

- In the table below, record the number of shaded squares for the first five stages.

Stage	1	2	3	4	5
Number of Shaded Squares					

- Graph the data from the table above.
- If the pattern continues, how many shaded squares are there in Stage 7? in Stage 20?
- Write a rule relating the stage number to the number of shaded squares at that stage.

The first 4 stages of a certain fractal are shown below.



Stage 1 Stage 2 Stage 3 Stage 4

In each stage after the first, each square is divided into 4 squares, and then the bottom right square is removed. If the pattern continues, how many shaded square units will Stage 5 contain?

F 243

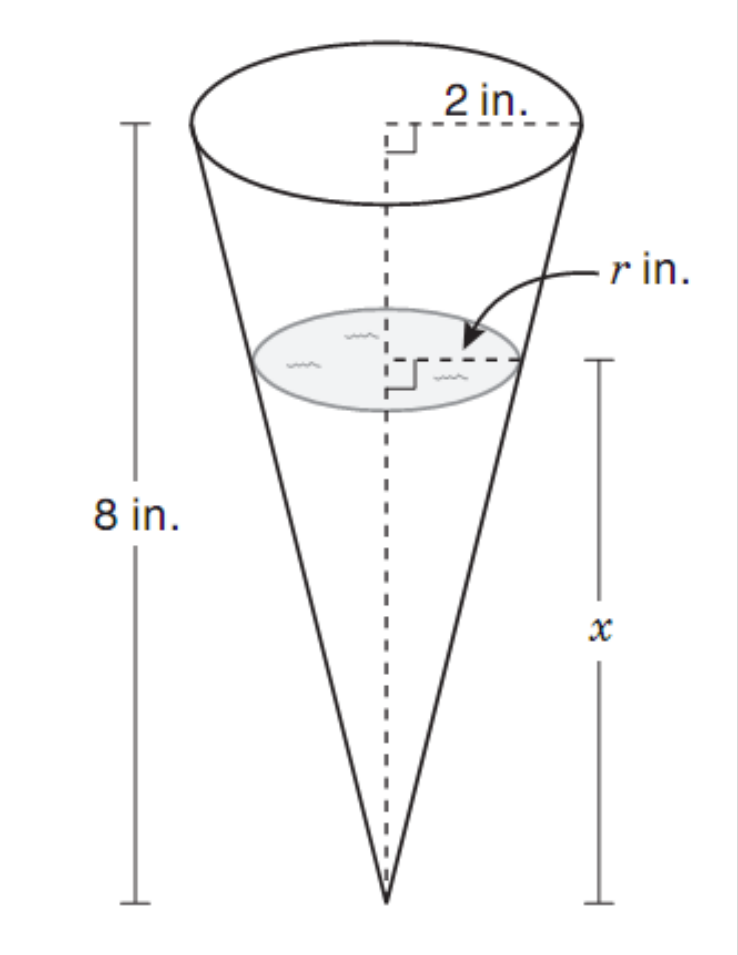
G 54

H 81

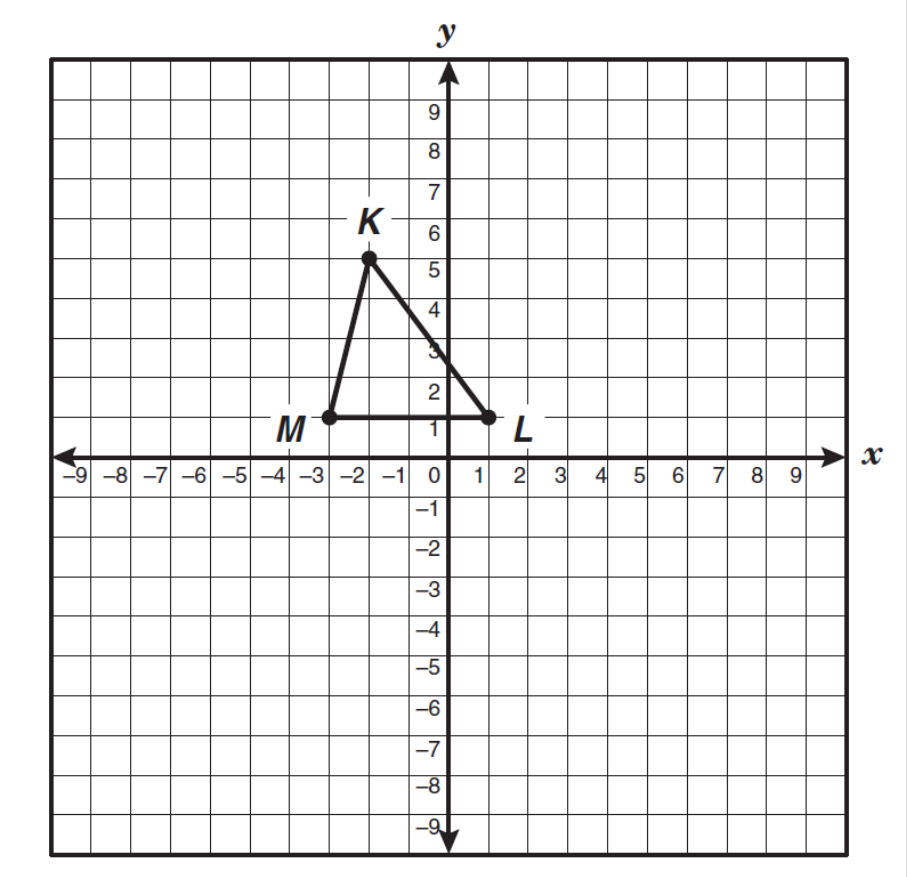
J 27

Texas Assessment of Knowledge and Skills
Spring 2006, Exit Level

The figure below shows a conical cup containing water.



Max drew a triangle on the coordinate plane shown below.



Laneitre is trying to figure out the heights of 3 people. Here are the facts she knows.

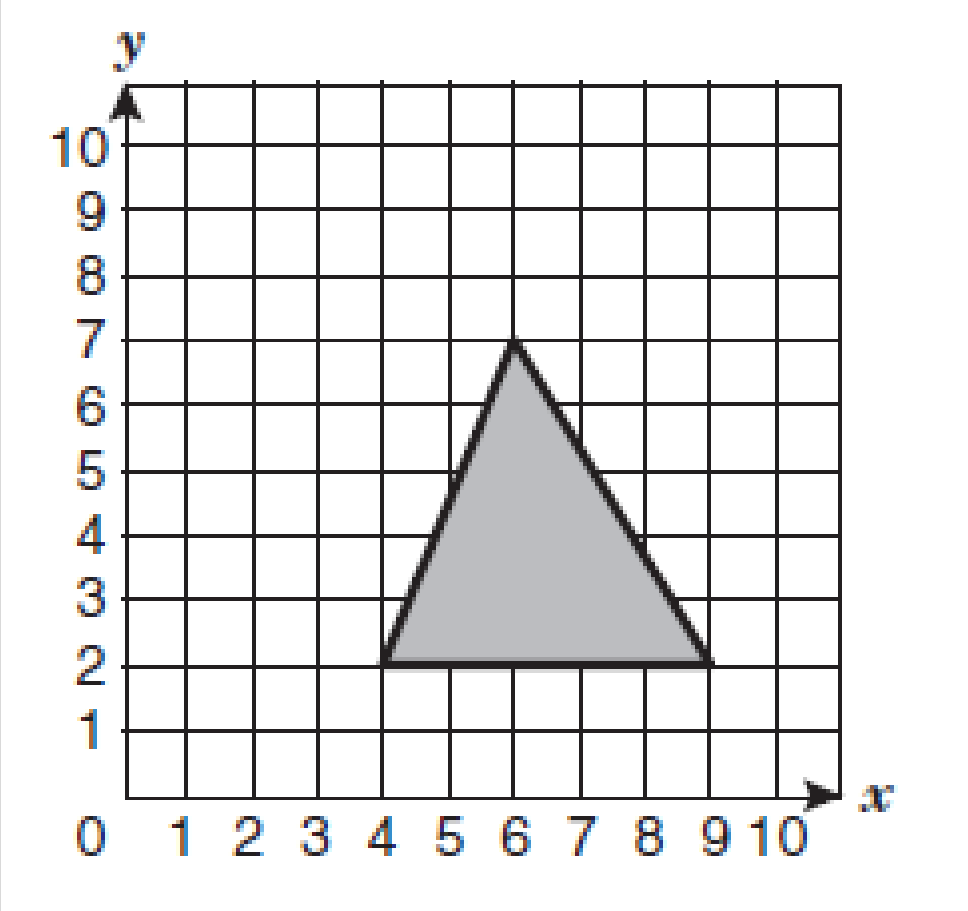
- The sum of the heights of these 3 people is 17 feet 5 inches.
- The shortest person is 5 feet 4 inches tall.
- The other 2 people differ in height by 3 inches.

The table below shows the total number of pictures that can be taken with different numbers of rolls of film.

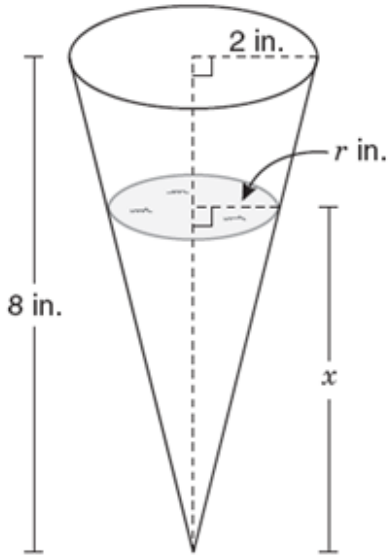
Camera Pictures

Number of Rolls of Film	5	8	11	14
Total Number of Pictures	120	192	264	336

Look at the shaded triangle on the coordinate grid below.



The figure below shows a conical cup containing water. The water depth can be represented by x, and the area of the water surface can be represented by A. As the water depth changes, the area of the water surface changes, as shown in the table below.



Water Depth (inches)	Area of Water Surface (square inches)
1	$\frac{\pi}{16}$
2	$\frac{\pi}{4}$
3	$\frac{9\pi}{16}$
4	π
8	4π

Which equation best represents the relationship between the area of the water surface and the water depth?

F $A = \frac{\pi(2x-1)^2}{16}$ in.^{2}

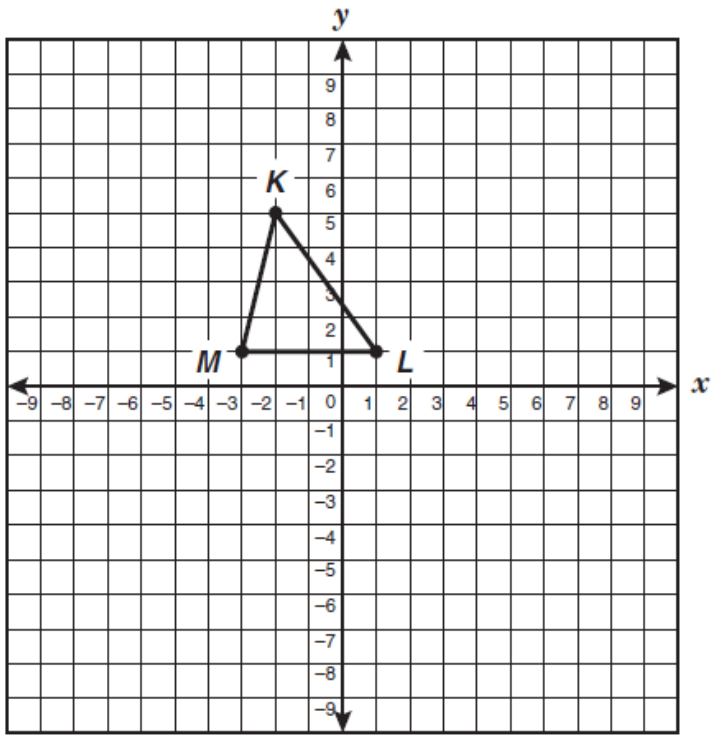
G $A = \frac{\pi x}{2}$ in.^{2}

H $A = \frac{\pi x^2}{16}$ in.^{2}

J $A = \frac{\pi x}{16}$ in.^{2}

Texas Assessment of Knowledge and Skills
Spring 2006, Exit Level

Max drew a triangle on the coordinate plane shown below.



Which of the following best represents the coordinates of the vertices of ΔKLM?

A $(-2, 5), (1, 1), (-3, 1)$

B $(-2, 5), (1, 1), (1, -3)$

C $(5, -2), (1, 1), (1, -3)$

D $(5, -2), (1, 1), (-3, 1)$

Texas Assessment of Knowledge and Skills
Spring 2006, Grade 7

Laneitre is trying to figure out the heights of 3 people. Here are the facts she knows.

- The sum of the heights of these 3 people is 17 feet 5 inches.
- The shortest person is 5 feet 4 inches tall.
- The other 2 people differ in height by 3 inches.

How tall is the tallest person?

A 5 feet 4 inches

B 5 feet 11 inches

C 6 feet 2 inches

D 12 feet 1 inch

Texas Assessment of Knowledge and Skills
Spring 2006, Grade 7

The table below shows the total number of pictures that can be taken with different numbers of rolls of film.

Camera Pictures

Number of Rolls of Film	5	8	11	14
Total Number of Pictures	120	192	264	336

Which of the following statements best describes the relationship between the number of rolls of film and the total number of pictures?

F The total number of pictures equals the number of rolls of film times 24.

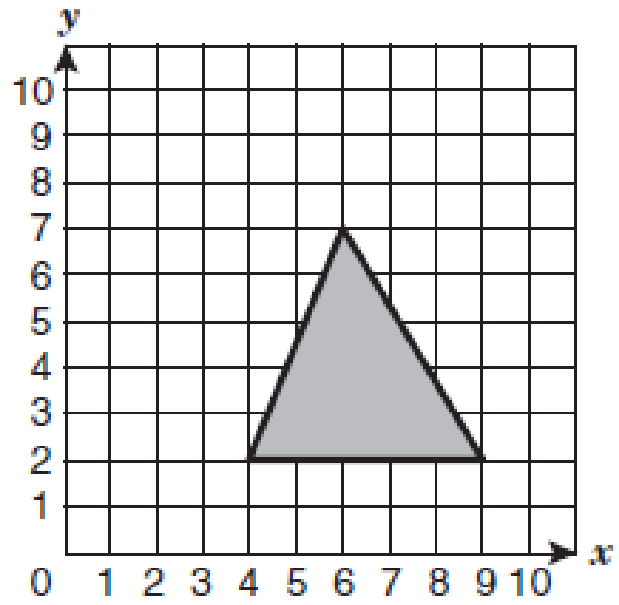
G The total number of pictures equals the number of rolls of film divided by 8.

H The total number of pictures equals the number of rolls of film times 120.

J The total number of pictures equals the number of rolls of film divided by 5.

Texas Assessment of Knowledge and Skills
Spring 2009, Grade 5

Look at the shaded triangle on the coordinate grid below.



Which of the following ordered pairs is located inside the triangle?

A (6, 3)

B (8, 5)

C (3, 6)

D (5, 8)

Texas Assessment of Knowledge and Skills
Spring 2009, Grade 5

Systemic Changes Needed to Establish High-Quality Professional Learning Communities

- Common planning time for teachers
- Adequate class time for students to discover and explore for the sake of learning

Systemic Changes Needed to Establish High-Quality Professional Learning Communities

- Administrative support to improve student behavior, student learning, and student success
- Structure for accountability
- More remediation for struggling students

Lessons Learned

The top-down structure and site-based management approach in some school districts makes it difficult for teachers to openly and effectively advocate for instructional changes on their campuses.