

# How do you Know What Your Students Know?

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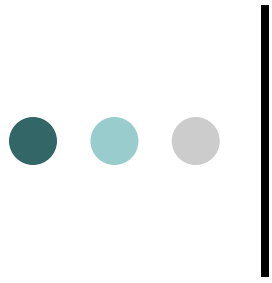
NCTM, Philadelphia, April 27, 2012





## Mini Book

- Stack 4 strips of construction paper.
- Slide them the “long way” so that their ends overlap with a gap of  $\frac{1}{2}$ ” – 1”.
- Place a large paperclip at about  $\frac{1}{3}$  and  $\frac{2}{3}$  of the length of your fanned strips.
- Fold the strips in half (a “hamburger fold”) and pinch the midpoint (do not fold completely).
- Cut your fanned strips in half along your crease— you may wish to create a tab, curve, or jagged edge.
- Unclip each half and align the straight ends.
- Staple. You have created 2 books.



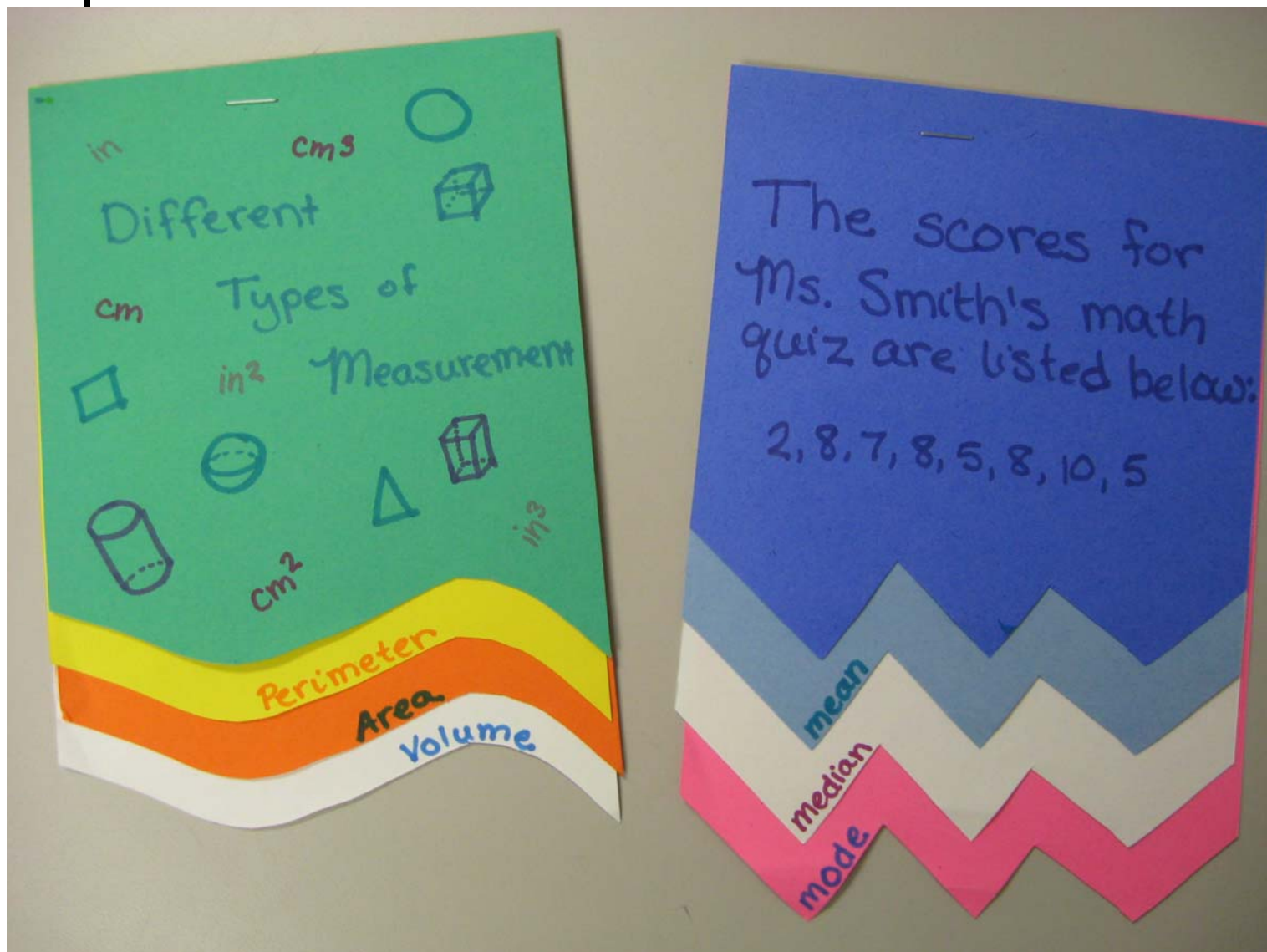
## Mini Book

Cover/Page 1: Your Name and School

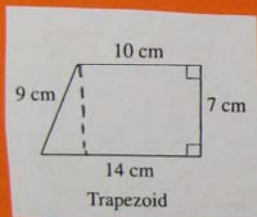
Below that: Sketch or describe two images that come to your mind when you think about mathematics.

“ When I think about mathematics I see...”

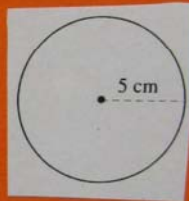
# ● ● ● Possible Mini Book Uses...



Area is measured using square units and the area of a region is the number of nonoverlapping square units that covers the region  
Ex.



$$A = 10 \times 7 + \frac{1}{2} \times 4 \times 7 = 84 \text{ cm}^2$$



$$A = \pi \cdot 5^2 = 25\pi \text{ cm}^2$$

Area  
Volume

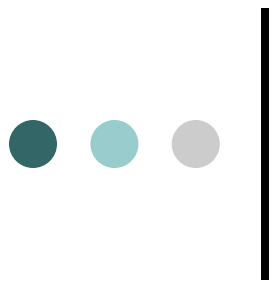
The value exactly in the middle of an ordered set of numbers is the median. Arranging the

quiz scores:

2, 5, 5, 7, 8, 8, 8, 10

With an even number of scores, the median is defined as the mean of the middle two scores, here that is 7.5

median  
mode



## Mini Book

Page 2:

What forms of assessment are you currently using? Consider assessments at these levels:

- classroom
- school
- district
- state
- national



# Purposes of Mathematics Assessment

- Diagnostic

What does this student understand about the concept or procedure?

What aspects of problem solving are causing difficulty?

- Instructional Feedback

What do students know about the material presented?

Can students apply their learning to new situations?

Do students understand the connections among ideas?





# Purposes of Mathematics Assessment

- Grading

How well has this student understood and integrated the material?

How prepared is this student to proceed to the next grade level?

- Generalized Mathematical Achievement

How does the general mathematical capability of this student compare with others or with a national norm?

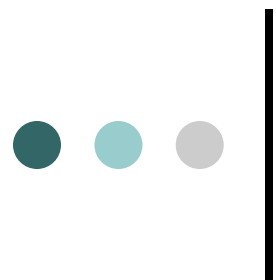
- Program Evaluation





# Myths About Mathematics Assessment

- Learning mathematics means mastering a fixed set of basic skills; therefore mathematics tests should focus on whether students have mastered these basic skills.
- Objective multiple-choice tests are the best way to measure the most important ideas in mathematics.



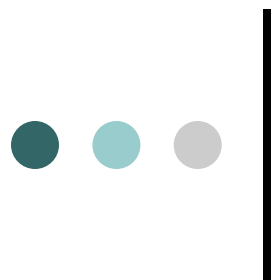
# Common Core Standards for Mathematical Practice

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively .
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.



# What is This Thing?





# Myth about Mathematics Assessment

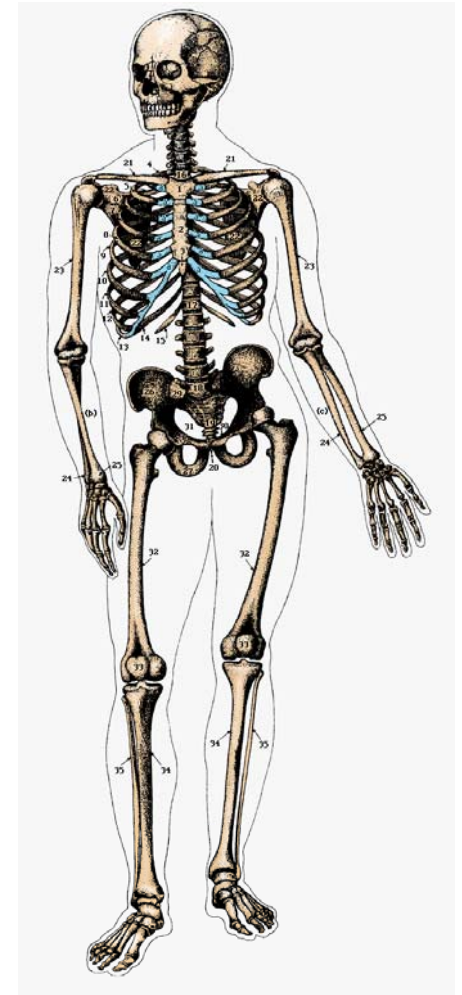
- There is almost always a single right answer to a mathematics problem.

Reply:

“Problems with single correct answers seldom occur outside of school” (p. 5)

- Female:  $h = 61.412 + 2.317F$

- Find the height of a female victim whose femur is 40 centimeters.
- Find the height of a male victim whose femur is 49 centimeters.

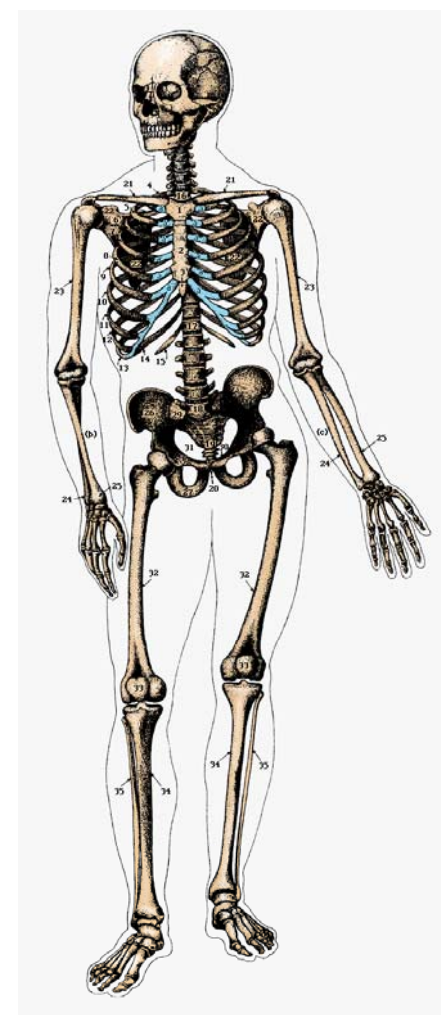


# “Open Task”

- A forensic scientist wants to calculate the height of a murder victim from the length of a victim’s femur (thigh bone). Over the years the scientist has compiled data about deceased males and females.
- The scientist would like you to use the provided data and estimate the height of a male with femur length 49 cm. and the height of a female with femur length 44 cm.

	MALES	
	Femur (cm)	Height (cm)
Subject A	51	183
Subject B	46	173
Subject C	47	178
Subject D	56	193
Subject E	42	165
Subject F	56	198
Subject G	53	185

	FEMALES	
	Femur (cm)	Height (cm)
Subject H	42	156
Subject I	49	175
Subject J	39	147
Subject K	45	168
Subject L	42	160
Subject M	54	183
Subject N	39	152





# “Closed Tasks”

**1. Donald priced six personal Compact Disc (CD) players. The prices are shown below.**

**\$21.00, \$23.00, \$21.00, \$39.00, \$25.00, \$31.00**

**What is the median price?**

- A \$21.00                      B \$24.00                      C \$27.00                      D \$30.00**

**2. The box below shows the number of kilowatt-hours of electricity used last month at each of the houses on Harris Street.**

**620, 570, 570, 590, 560, 640, 590, 590, 580**

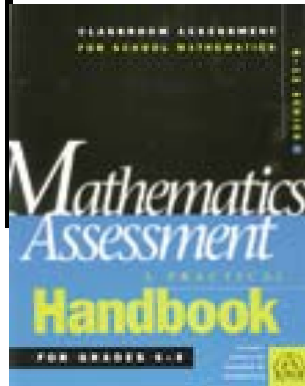
**What is the mode of these data?**

- A 560                      B 580                      C 590                      D 640**

**3. Rico’s first three test scores in biology were 65, 90, and 73. What was his mean score?**

- A 65                      B 73                      C 76                      D 90**





## Jump Rope

Mrs. Leonard and Mrs. Banister teach sixth-grade mathematics in Pittsburgh. Their classes decided to have a jump rope contest. Students were to jump as many times as they could without stopping or tripping on the rope. The results of each class are given in the tables below.

Mrs. Leonard said that her class did better in the contest. Mrs. Banister disagreed and said her class did better. Mr. Mann, another sixth-grade teacher, looked at the data and said that they both had a mathematical reason for their argument.

**MRS. LEONARD'S CLASS**

Student	Score
A. C.	78
A. M.	20
O. T.	2
S. G.	39
M. I.	28
P. T.	29
T. C.	57
D. T.	7
H. A.	8
J. R.	15
C. S.	16
W. T.	16
J. A.	26
M. T.	9
A. T.	18
C. W.	48

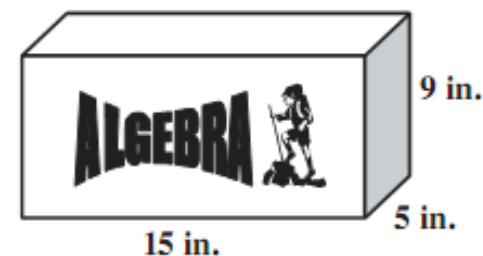
**MRS. BANISTER'S CLASS**

Student	Score
M. R.	
M. O.	
K. L.	
T. S.	
G. M.	
I. P.	
C. D.	
T. H.	
A. J.	
R. C.	4
S. W.	32
T. J.	31
A. M.	28
T. S.	20
T. R.	21
W. S.	30

1. What mathematical reasoning could Mrs. Leonard use to say that her class was better?
2. What mathematical reasoning could Mrs. Banister use to say that her class was better?
3. Using mathematics, write a paragraph for the student newspaper that will convince the students and both teachers which class you believe did better. You should produce a visual display of the data to help prove your point.



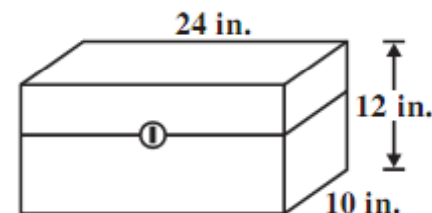
# “Closed Tasks”



1. What is the volume of the shoebox shown above in cubic inches ( $\text{in}^3$ )?

- A 29    B 75    C 510    D 675

2. Gina is painting the rectangular tool chest shown in the diagram below. If Gina paints only the outside of the tool chest, what is the total surface area, in square inches ( $\text{in}^2$ ), she will paint?

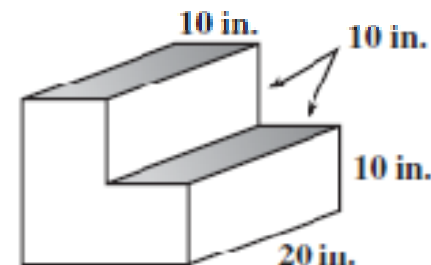


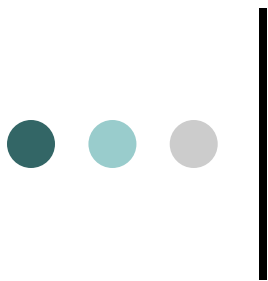
- A 368    B 648    C 1296    D 2880

3. The short stairway shown below is made of solid concrete. The height and width of each step is 10 inches (in.). The length is 20 inches.

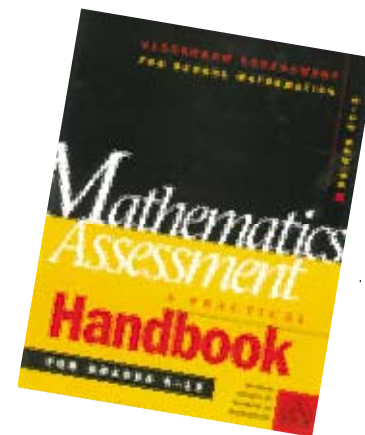
What is the volume, in cubic inches, of the concrete used to create this stairway?

- A. 3000                      B. 4000  
C. 6000                      D. 8000



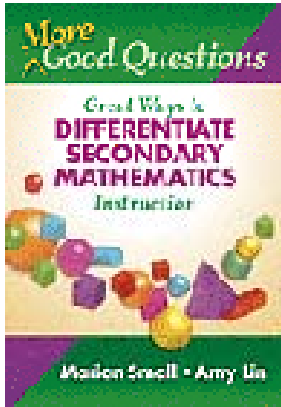


## *Box It!*



Box It! Company receives a rush order to ship 500 boxes without lids. The boxes must hold more than three cubic feet. The company has an extra supply of  $5' \times 3'$  sheets of cardboard on hand. You are the company's on-site mathematician. Your task is to send a directive to the machine operators on how to set the machine to produce boxes with the minimum amount of waste. You are also required to send a full report to the vice-president of operations showing all details required to enable you to make the directive.

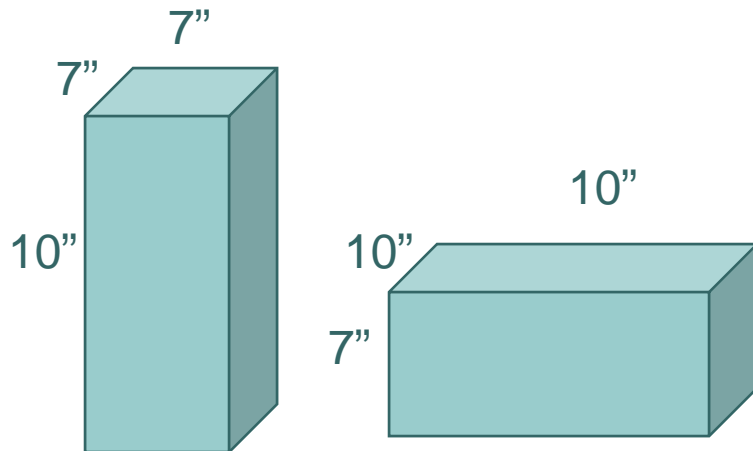
Developed by the teachers of Jessamine County High School in Nicholasville, Kentucky. Reprinted with their permission.



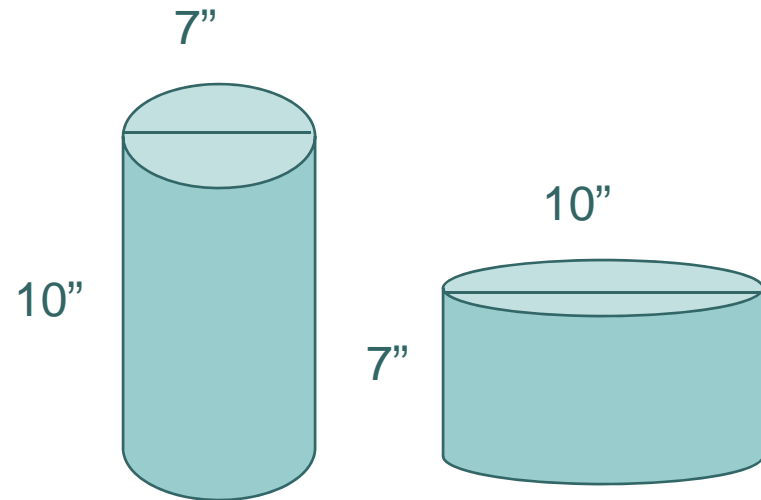
# Another Way to OPEN Questions...

Compare the surface areas and volumes of the two shapes.

Option 1:



Option 2:





# Myth about Mathematics Assessment

- In the classroom, only the teacher can adequately evaluate a student's progress.

Reply:

“Students who develop a habit of self-assessment will also develop their potential for continued learning.”

(p. 6)

• • • | solve

$$2(x-10)-(12x-4)=20$$



# Making the Grade

You are working with an algebra class. You have been doing a review of basic algebra and applications of algebra to solving word problems.

Grade the provided sample student work on a 10-point scale as if these were problems on a quiz or exam. Record your scores.



1. Solve  $2(x-10) - (12x-4) = 20$

Student A:

$$2(x-10) - (12x-4) = 20$$

$$2x-20-12x+4 = 20$$

$$-10x-16 = -26$$

$$-10x = 42$$

$$\boxed{x = -4.2}$$

Student B:

$$2(x-10) - (12x-4) = 20$$

$$2x-10-12x-4 = 20$$

$$-10x-14 = 20$$

$$-10x = 34$$

$$x = \frac{-34}{10} = \underline{\underline{-3\frac{2}{5}}}$$

Student C:

$$2(x-10) - (12x-4) = 20$$

$$2x-20-12x+4 = 20$$

$$-10x-16 = 20$$

$$-10x = 36$$

$$x = \frac{-36}{10}$$

$$x = -3 + \frac{3}{5} = -2\frac{2}{5}$$

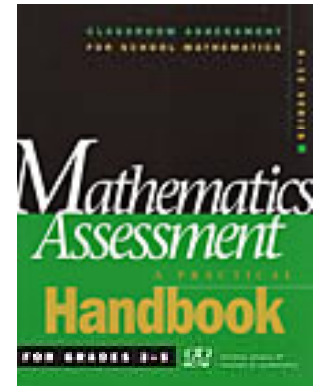
$$\boxed{x = -2\frac{2}{5}}$$



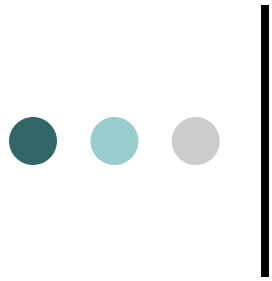
# Myth about Mathematics Assessment

- Alternative forms of assessment are less objective than traditional forms of testing and simply the latest fad in ducking educational accountability.

# Logistical Tips From Teachers...



- Introduce assessment techniques one at a time, so that you and the students won't feel overwhelmed.
- Observe or think about only a few students a day.
- Don't score every paper every time.
- Look at a single aspect of all papers for the day – for example, check for complete explanations on Monday and organizing information on Tuesday.
- Make sure scoring schemes or rubrics are easy to use and clear to students and parents.
- Accept the fact that there will never be enough time.
- Have students pre-assess their papers before turning them in.
- Borrow from other teachers or books– problems, rubrics, manipulatives, or other ideas.



## Mini Book

Page 4: Reflect on your learning this morning by completing this statement:

“The most interesting thing I learned this morning is...”