

# Math Teacher Attitudes, Skills, & Knowledge Survey (M-TASKS)

## Directions to Teacher:

Please respond to the following items by marking the best answer on your answer sheet using a #2 pencil. Please do not write on this survey. Use scratch paper if necessary. If you do not understand what is being asked in an item, please ask the survey administrator for clarification.

Please do not use a calculator.



Arizona Collaborative for Excellence in the Preparation of Teachers  
Supported by the National Science Foundation under Grant DUE-0084434  
April, 2001

1. Which best describes your race or ethnic background?

- A. American Indian
- B. Asian/Pacific Islander
- C. Hispanic
- D. Black
- E. White

Different teachers have described very different teaching philosophies to researchers. For each of the following pairs of statements, indicate a letter choice which best describes your own beliefs compared to each of the statements in a given pair. The closer your beliefs are to a particular statement, the closer the letter choice you indicate. *Please indicate only one letter choice for each set.*

2.

"I mainly see my role as a facilitator. I try to provide opportunities and resources for my students to discover or construct statements for themselves."

A B C D E

"Investigation is very nice, but students really won't learn the subject unless you go over the material in a structured way. It's my job to explain, to show students how to do the work, and to assign specific practice."

3.

"The most important part of instruction is the content of the curriculum. The content is the field's judgment about what students need to be able to know and do."

A B C D E

"The most important part of instruction is that it encourages 'sense making' or thinking among students. Content is secondary."

Use the following key to indicate to what degree you agree with items 4 – 7.

A. strongly agree   B. agree   C. don't know   D. disagree   E. strongly disagree

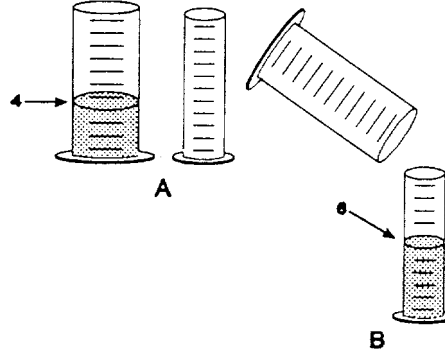
4. I prefer starting with students' own ideas and topics, suggesting where they can find information or resources, without having to direct their questions and provide all the answers myself.
5. Students should help establish criteria on which their work will be assessed, because they are responsible for their own learning.
6. It is very important for my students to share their work with others, because others can learn from what they do.
7. Instruction should be built around problems with clear, correct answers, and around ideas that most students can grasp quickly.

Use the following key to indicate to what degree you agree with items 8 – 19.

A. strongly agree   B. agree   C. don't know   D. disagree   E. strongly disagree

8. The central goal of science is to explain natural phenomena.
9. Hypotheses are derived from controlled observations of nature.
10. A hypothesis is an educated guess of what will be observed under certain conditions.
11. A conclusion is a statement of what was observed in an experiment.
12. Hypotheses/theories cannot be proved to be true beyond any doubt.
13. Hypotheses/theories can be disproved beyond any doubt.
14. To be scientific, a hypothesis must be testable.
15. To test a hypothesis, you need a prediction.
16. Current scientific theories portray nature more accurately than those they replaced.
17. Scientists think that atoms exist primarily because they have seen them through powerful microscopes.
18. New discoveries depend mostly on luck.
19. Hypothesis formation involves creativity.

20. To the right are drawings of a wide and a narrow cylinder. The cylinders have equally spaced marks on them. Water is poured into the wide cylinder up to the 4th mark (see A).



This water rises to the 6th mark when poured into the narrow cylinder (see B). Water is now poured into the *wide* cylinder up to the 6th mark. How high would this water rise if it were poured into the empty narrow cylinder?

21. because

- A. to about 8
- B. to about 9
- C. to about 10
- D. to about 12
- E. none of these answers is correct

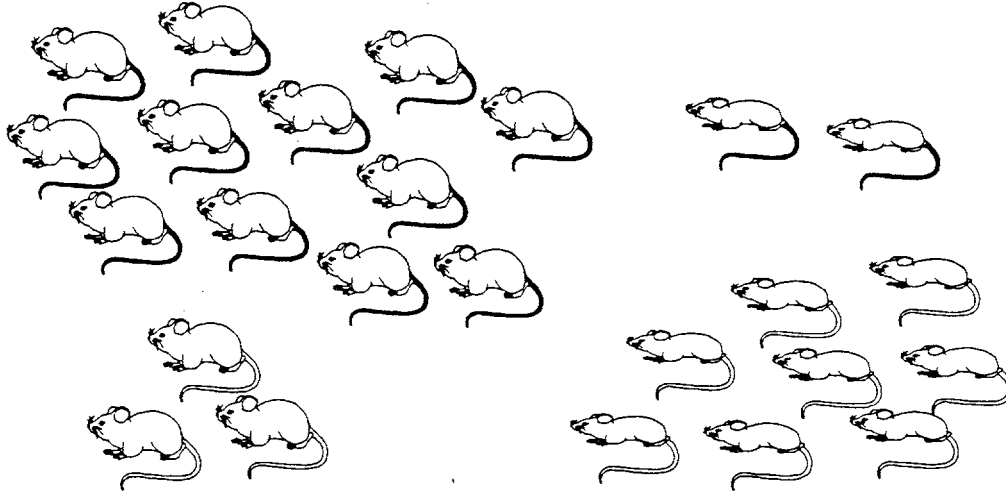
22. Water is poured into the narrow cylinder (described in item 18 above) up to the 11th mark. How high would this water rise if it were poured into the empty wide cylinder?

- A. to about  $7 \frac{1}{2}$
- B. to about 9
- C. to about 8
- D. to about  $7 \frac{1}{3}$
- E. none of these answers is correct

23. because

- A. the ratios must stay the same.
- B. one must actually pour the water and observe to find out.
- C. the answer can not be determined with the information given.
- D. it was 2 less before so it will be 2 less again.
- E. you subtract 2 from the wide for every 3 from the narrow.

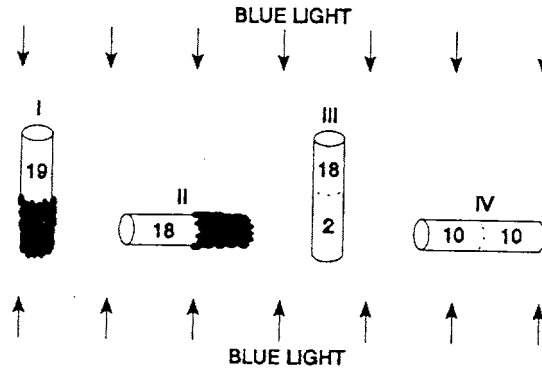
24. Farmer Brown was observing the mice that live in his field. He discovered that all of them were either fat or thin. Also, all of them had either black tails or white tails. This made him wonder if there might be a link between the size of the mice and the color of their tails. So he captured all of the mice in one part of his field and observed them. Below are the mice that he captured.



Do you think there is a link between the size of the mice and the color of their tails?

- A. appears to be a link
  - B. appears not to be a link
  - C. can not make a reasonable guess
25. because
- A. there are some of each kind of mouse.
  - B. there may be a genetic link between mouse size and tail color.
  - C. there were not enough mice captured.
  - D. most of the fat mice have black tails while most of the thin mice have white tails.
  - E. as the mice grew fatter, their tails became darker.

26. Twenty fruit flies are placed in each of four glass tubes. The tubes are sealed. Tubes I and II are partially covered with black paper; Tubes III and IV are not covered. The tubes are placed as shown. Then they are exposed to blue light for five minutes. The number of flies in the uncovered part of each tube is shown in the drawing.



These data show that these flies respond to (respond means move to or away from):

- A. blue light but not gravity
  - B. gravity but not blue light
  - C. both blue light and gravity
  - D. neither blue light nor gravity
27. because
- A. some flies are in both ends of each tube.
  - B. the flies need light to see and must fly against gravity.
  - C. the flies are spread about evenly in Tube IV and in the upper end of Tube III.
  - D. most flies are in the lighted end of Tube II but do not go down in Tubes I and III.
  - E. most flies are in the upper end of Tube I and the lighted end of Tube II.

28. A vehicle with its windows rolled up is traveling down the road at 50 miles an hour. Two balloons are inside. One balloon is hanging straight down from the ceiling by a string. The other balloon is also attached to a string but is floating straight up (see figure). When the driver slams on the brakes, the hanging balloon swings forward and the floating balloon swings backward.

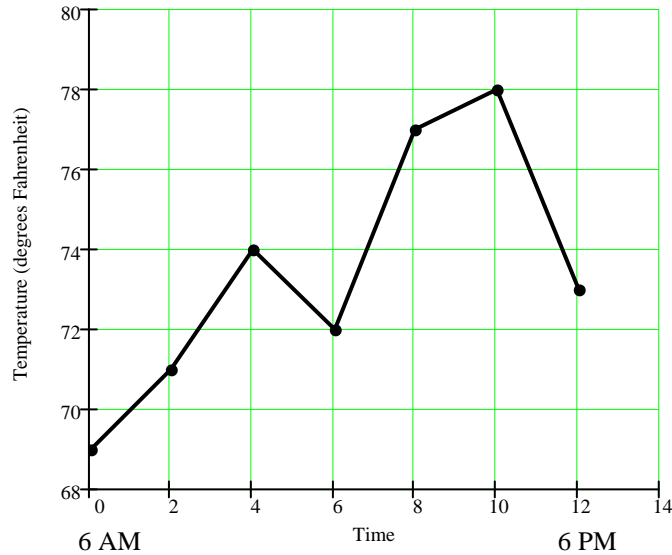


This observation raises an interesting question: Why did the hanging balloon go forward while the floating balloon went backward? Here is a possible explanation: The hanging balloon is relatively heavy; so its momentum carried it forward when the vehicle stopped. The floating balloon, being lighter than air and having less momentum, went backward because as the vehicle stopped, the heavier air molecules inside the vehicle rushed forward and piled up at the front. Thus, the piled-up air molecules at the front pushed harder on the front side of the balloon than the relatively fewer air molecules on the balloon's backside. Thus, the balloon was pushed backward.

Suppose you have two balloons just like those in the vehicle, a large airtight chamber on wheels, and a vacuum pump (a pump that can extract air from airtight chambers). What experiment using these materials would test the possible explanation?

- A. Suck the air out of the chamber. Because air does not weigh anything, nothing will happen to either balloon.
  - B. Attach the two balloons inside the chamber. Extract the air. Push the chamber and then stop it.
  - C. Replicate the experiment using the vehicle just as before so that you have a controlled experiment.
  - D. Place the balloons in the chamber and set it in motion. Then stop it and use the pump to extract the air.
  - E. The hanging balloon is heavier so it will swing with the momentum. The floating balloon is lighter so it falls back.
29. What result of your experiment would show that the explanation is probably wrong?
- A. The momentum will carry the heavier balloon forward.
  - B. The two balloons each do something different.
  - C. If both balloons moved in the direction of the vacuum at the same pace and stopped at the same time, then it does not matter if there are molecules pushing on the balloons.
  - D. The balloons would go backward.
  - E. The floating balloon goes backward.

30. According to the graph below, what is the approximate average rate of change in temperature from 10 AM to 4 PM?

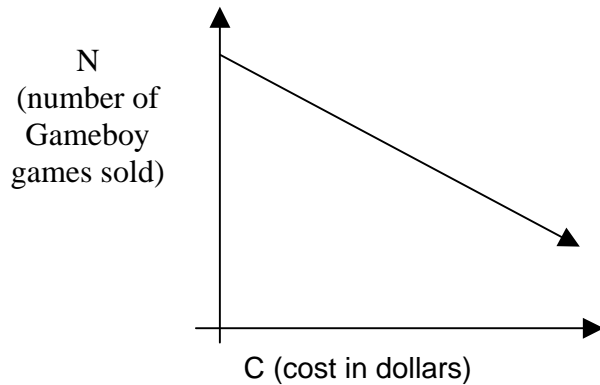


*Note that time = 0 corresponds to 6:00 a.m.*

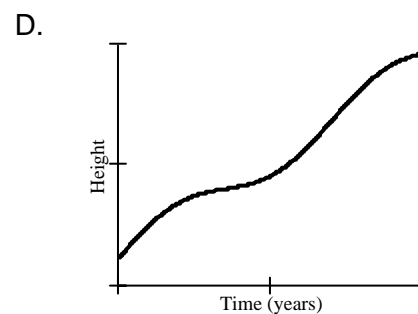
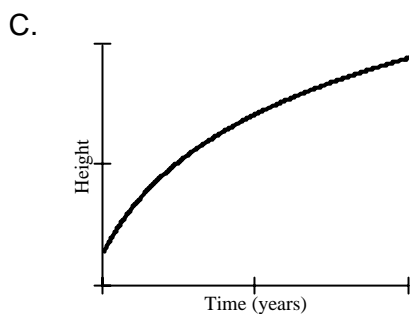
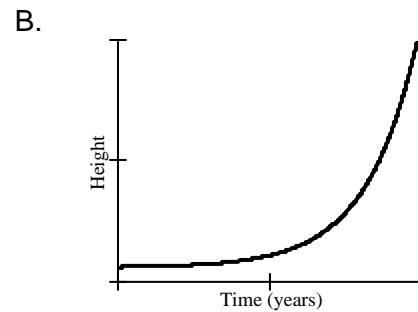
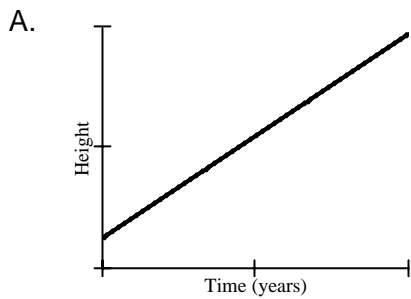
- A. 1 degree per hour  
B.  $\frac{3}{2}$  degree per hour  
C.  $-\frac{2}{3}$  degree per hour  
D.  $\frac{2}{3}$  degree per hour
31. Luis mixed 6 ounces of cherry syrup with 53 ounces of water to make a cherry-flavored drink, Martin mixed 5 ounces of the same cherry syrup with 42 ounces of water. Who made the drink with the stronger cherry flavor and by how much?
- A. Luis by 1 ounce  
B. Luis by about 0.6%  
C. Martin by 1 ounce  
D. Martin by about 0.6%



32. What does the slope of the line represent in this problem if C is the cost in dollars and N is the number of Gameboy handheld games sold?



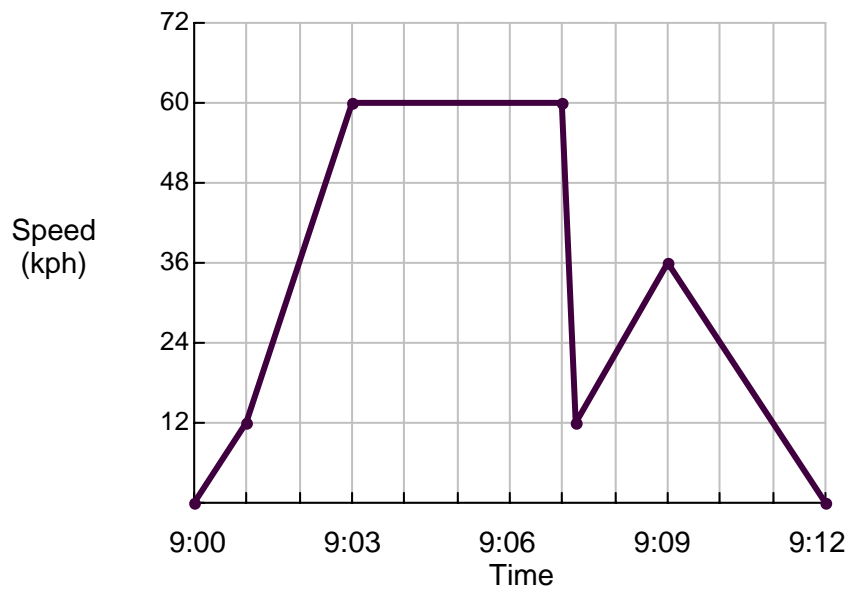
- A. Cost in dollars  
 B. Number of Gameboy games sold  
 C. Decreased cost in dollars per number of Gameboy games sold  
 D. Number of Gameboy games sold per dollar increase
33. Which of the following graphs best show the relationship between the height of a person and his/her age from birth to thirty years.



34. Experts say that 25% of all serious bicycle accidents will involve head injuries and that, of all head injuries, 80% are fatal. What percentage of all bicycle accidents involve fatal head injuries?
- A. 16%
  - B. 20%
  - C. 55%
  - D. 105%

Use the following situation to answer questions 35 and 36.

35. Kelly went for a drive in her car. During the drive a cat ran in front of the car. Kelly slammed on her brakes and missed the cat. Slightly shaken, Kelly decided to return home by a shorter route. The graph below is a record of the car's speed during the drive.



What is the maximum speed of the car during the drive?

- A. 36 kph
  - B. 12 kph
  - C. 72 kph
  - D. 60 kph
36. What time was it when Kelly slammed on the brakes to avoid the cat?
- A. Approximately 9:01
  - B. Approximately 9:03
  - C. Approximately 9:07
  - D. Approximately 9:09

37. A car has a fuel tank that holds 35 liters of fuel. The car consumes 7.5 liters of fuel for each 100 km driven. A trip of 250 km is started with a full tank of fuel. How much fuel remained in the tank at the end of the trip?
- A. 16.25 liters
  - B. 17.65 liters
  - C. 18.75 liters
  - D. 23.75 liters

Use the following table to answer questions 38 and 39.

Time Card Name: J. Jasmine	Number of Hours	Average Hourly Wage	Total Daily Earnings
Mon. 10:00 a.m. – 3:00 p.m.	5	5.50	27.50
Tues. 9:00 a.m. – 4:00 p.m.	7	5.50	38.50
Wed. 3:00 p.m. – 7:00 p.m.	4	5.75	23.00
Thurs. 2:00 p.m. – 8:00 p.m.	6		
Fri. 5:00 p.m. – 10:00 p.m.	5	6.00	30.00

38. According to the information above, what is the average hourly wage for Thursday's earnings if the total earnings for the five days were \$153.50?
- A. \$ 5.75
  - B. \$ 6.25
  - C. \$ 19.83
  - D. \$ 25.58
39. The hourly wage rate changes at some hour during the day. At what time does the hourly wage rate change?
- A. 3:00 PM
  - B. 4:00 PM
  - C. 5:00 PM
  - D. 8:00 PM