

MFD Selected Sample Problems

Number Sense -Mental Math: In this event, students are presented with a number of arithmetic problems written on cards. They use a wide variety of mental math strategies and number sense skills. Students are allowed several seconds to solve the problem mentally and write the answer on a score sheet. Then the next problem is given. Students work individually, then scores for each team are added together for a team score.

- | | |
|---------------------------|---------------------------------|
| 1. $360 - 299 =$ | 8. $3.00 - 1.49 =$ |
| 2. $2.70 > 23.0$ (T or F) | 9. $5 \times 100 =$ |
| 3. $630 + 300 =$ | 10. $31 \times 4 =$ |
| 4. $1/4 > 2.5$ (T or F) | 11. $311 - 111 =$ |
| 5. $732 \times 20 =$ | 12. $-5 > -12$ (T or F) |
| 6. $-6 > +2$ (T or F) | 13. $-4 + (-3) =$ |
| 7. $24/6 =$ | 14. Round to nearth tenth 34.68 |

Number Sense-Estimation: Teams travel to several estimation stations where they must work together to agree on estimates for a variety of questions. Stations are designed to measure a variety of estimation skills, including area, perimeter, volume, quantity, etc. Teams are scored on the difference between their estimates and the actual value.

AS A TEAM, ESTIMATE THE ANSWERS TO EACH OF THE FOLLOWING QUESTIONS. YOU HAVE 15 MINUTES TO COMPLETE ALL TASKS.

1. How many chalk erasers high is the door in this classroom? Note: See the eraser taped to the door to see which way it is turned for measuring.
1. _____
2. How many beans will it take to fill the small container? Note: See the large container filled with beans.
2. _____
3. Based upon the windows in this room, how many windows long is the blackboard?
3. _____
4. Using the cup at your desk, how many cups of water would it take to fill the large container, without the beans in it?
4. _____
5. How many feet long would a string be that goes around the edge of the room?
5. _____

Algebra & Functions: Students are presented with a series of problems to test teams' skills in algebraic thinking. Teams work together to solve one set of problems and receive a group score.

1. Fourteen clothespins are placed on a clothesline at 7-foot intervals. How far is it from first to the last?

1. _____

2. In a make-believe horse race between five famous horses,

- a. Citation finished one length ahead of Seattle Slew.
- b. Spectacular Bid finished ahead of Citation, but behind Secretariat.
- c. Man-O-War finished four lengths ahead of Seattle Slew and one length behind Spectacular Bid.

Which horse finished in third place?

2. _____

3. Suppose Ξ is mathematical operation that is defined this way:

If A and B are any numbers, the $A \Xi B = (A + B) \times (A - B)$.

For example, $6 \Xi 2 = (6 + 2) \times (6 - 2) = 32$

What is the number Z that makes $10 \Xi Z$ equal to 36?

3. _____

4. Three positive numbers add to a sum of 28. The highest number is 6 more than the middle number. The lowest number is 8 less than the middle number. What are the three numbers?

4. _____

5. What are A & B if they can only be digits from 1-9?

$\begin{array}{r} AB \\ \times \quad A \\ \hline BAA \end{array}$

5. _____

Mathematical Reasoning: Students are presented with a series of problems that utilize a variety of mathematics reasoning strategies. Teams are provided with any manipulatives needed, which they use to solve one set of problems. Teams turn in on paper and receive a group score.

1. When Tammy puts her marbles into groups of 5, she has 1 marble left over. When she puts her marbles into groups of 6, she has a marble left over. She has less than 40 marbles. How many marbles does she have? How do you know?

1. _____

2. On a 24-question test, Professor Zucchini gave 5 points for each correct answer and took off 7 points for each wrong one. Homer answered all the questions and came up with zero for his score. How many did he get right? Why is your answer reasonable?

2. _____

3. Rachel rode her bicycle uphill at 8 miles per hour for three hours. Then she rode downhill at 12 miles per hour for 1 hour. During the same 4 hours, George drove his car at a constant speed along the same route as Rachel. How fast did George drive? Show how you checked your answer.

3. _____

Measurement & Geometry: This event attempts to explore a variety of different concepts in Measurement and Geometry. Teams are given instructions and materials to build an object for a specific purpose. Teams may be judged in several areas: creativity, how well they accomplish the task, conservation of materials, strength of object, durability, etc. Students will be given the judging criteria when presented with the task.

During the Measurement and Geometry Construction Derby, each team is given supplies and asked to construct something according to certain criteria. The following is an example of a construction topic:

Each team will be given 400 toothpicks, a small bag of mini-marshmallows, 3 feet of masking tape, and 2 pairs of scissors, and a protractor. Using only these materials, follow these directions:

- The team may use only the materials provided to build a tower.
- The tower must be free-standing. It may not be held up, or lean against a wall.
- The tower must contain at least 4 equilateral triangles, 4 isosceles triangles, 2 squares and 1 right angle.
- After measuring their own tower in centimeters, and writing their answer on a worksheet, the tower must be brought up to be measured by judges, using the assistance of members of competing teams. This means they must be transportable or easy to rebuild at the measuring site.
- The winner will be the highest free-standing tower that meets all criteria.
- Extra points will be given to: other team judges who get within 1.5 cm of the height the team reported, a height that has been verified by the adult judge.

Statistics, Data Analysis and Probability: This event attempts to explore a variety of different concepts in Statistics and Probability. Teams are given several problem situations and need to use their understanding to best find solutions. Teams may be judged in several areas: accuracy; manner or display of data; conclusions or observations based upon data. Here are several examples of the types of problems that participating teams may face:

1. In a jar there are 9 chips numbered 1 through 9. Write is the probability (in a fraction form) that:
 - a. An even number will be drawn in a single draw? _____
 - b. A number greater than 3 will be drawn? _____

Now, using the jar given to you and drawing out chips, write down your results for 27 draws.

Tally the draws below, then compare what you actually find out to what you expected.

Odd		Even

--	--	--

2. The following group of birthday months for 2 classes are given. Find the median and mode of each class and compare them. Which class has more birthdays during the first 6 months?

Class A	Class B
1, 8, 4, 6, 2, 7, 7, 9, 10, 10, 2, 12, 4, 8, 7, 9, 9, 3, 1, 9, 11, 12, 6, 9, 8, 9, 8, 5, 9,	2, 3, 8, 9, 9, 5, 4, 1, 12, 7, 9, 5, 7, 5, 4, 11, 8, 3, 5, 2, 4, 5, 9, 1, 2, 11, 3, 5, 6, 6,

3. Plot the following points on the graph paper given, and draw lines from point to point. What shape is created? (3,1), (9,7), (3,7), (9,1), (6,10), (3,1)

1995 Mental Math

1. $150 - 70 =$

2. $30 + 40 - 10 - 60 =$

3. $400 \times 9 =$

4. $87 + 8 + 3 =$

5. $413 - 203 =$

6. $23 \times 5 =$

7. $65 + 27 =$

8. $90 - 40 + 30 - 10 - 20 =$

9. $6,000 \times 9 =$

10. $125 + 75 =$

11. $2400 \div 30 =$

12. $357 - 135 =$

13. $256 \times 2 =$

14. $729 - 209 =$

15. $721 \div 7 =$

16. $256 \div 256 =$

17. $247 + 399 =$

18. $5,600 \div 700 =$

19. $575 - 64 =$

20. $25 \times 12 =$

21. $10 \times 162 =$

22. $2,400 + 560 =$

23. $535 \times 2 =$

24. $3,300 + 621 =$

25. $5 \times 64 =$

26. double 95

*27. $60 + 2,000 + 100 + 1,200 =$

28. $475 - 98 =$

*29. $\$20 - \$13.98 =$

30. $2,700 \div 30 =$

31. $1740 - 340 =$

32. $8,000 - 6,000 - 300 =$

*33. 6 at $\$4.99 =$

34. $5,000 - 200 =$

*35. $\$25 \times 16 =$

36. $625 \times 4 =$

*37. $299 + 450 =$

38. $1,000 \div 50 =$

39. $390 - 200 =$

40. $525 \div 5 =$

CONSTRUCTION DERBY 2001

Proctor Directions and Materials List

PROCTOR MATERIALS NEEDED

- Tape Measures
- Landing Target Sheet
- Garbage Bags, white and black

STUDENT MATERIALS NEEDED

- Airplane Kit
- 1 Pencil
- 1 Team Directions
- 1 Team Score Sheet
- 1 Airplane Design Sheet

After all teams have arrived, pass out student materials, Team Directions, Team Score Sheet and Airplane Design Sheet.

Read the following instruction to the students: "Let's review the directions together." Ask students to read the Team Directions sheet silently as you read it aloud. Then explain how scoring will be recorded on Team Score Sheet. Explain how they must do their design plan first before beginning to construct. They may not change Design Sheet or paper choice after they have started to construct. Collect pencil.

Ask the students: "Are there any questions?" Then say: "Don't forget, your team will receive one score for this competition. Relax. You will have 20 minutes to draw and complete your airplane. Be sure to write your team information on all sheets." Take a deep breath. ...Begin!"

HAVE FUN!

CONSTRUCTION DERBY 2001

Proctor Directions and Materials List

After 15 minutes, give a five-minute warning. At the end of 20 minutes the teams are to stop working. Each team brings their plane to the front of the room with their papers.

Flight Time

The team member who is flying the plane must stand behind the tape. One proctor watches Landing Target, while the other proctor measures distance of flight.

They fly once for distance and once for accuracy.

Please write on score sheet:

- Type of paper used to make the airplane
- If airplane looks like design
- Flight distance in centimeters
- Number on Landing Site

Collect all planes, Team Scores, Team Design Sheets and team directions.

Collect all unused material, put all planes in trash bag. Save the winning plane in white plastic bag.

School _____

District _____

Grade Level _____

CONSTRUCTION DERBY 2001

Type of paper we think we will use:

First Choice: _____ 4 points

Second Choice: _____ 3 points

Third Choice: _____ 2 points

Fourth Choice: _____ 1 point

Airplane Design Sheet

Estimation 2001

Activities and Directions to Students

Students will participate in the Estimation competition directly following the Mental Math Activity. Each team will need one answer sheet (4th grade pink, 5th grade green, and 6th grade blue). One proctor will uncover the stations while the other is reading student instructions. The stations are set up according to the following information:

STATION 1: Perimeter

Question: Using the map of California, estimate the perimeter of the state using the unit of measurement indicated (a small star) on the map.

STATION 2: Surface Area

Question: Estimate, in square centimeters, the surface area of the cone.

STATION 3: Weight

Question: How many grams does a cup full of clips weigh?

STATION 4: Number

Question: Estimate the number of "planets" in "Orion's jar."

STATION 5: Liquid Volume

Question: How many milliliters of water will fill the container?

STATION 6: Cubic Volume

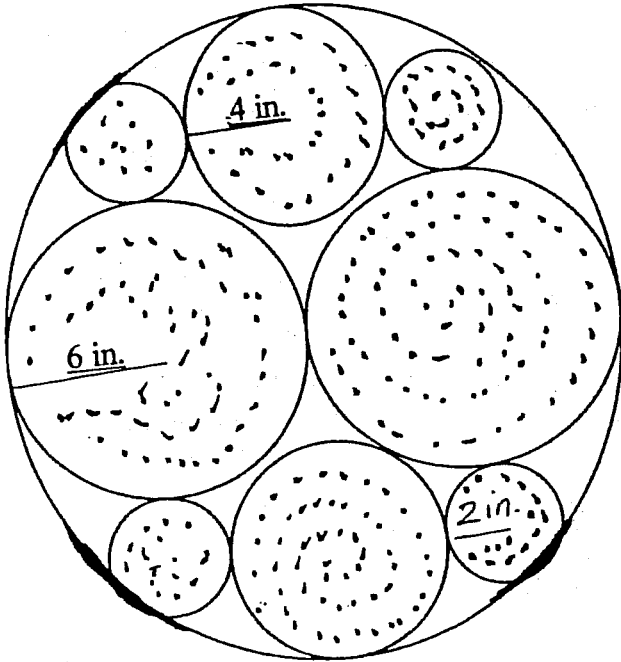
Question: How many cubic inches do the tissue box and fruit can hold added together?

Directions to Students

Proctors, please announce: "You will now participate in the team estimation activity. Teams will have **18** minutes to complete all the estimation problems. (Allow 3 minutes per station.) During this time your team will rotate around the room to view all six estimation problems. Please stay together at one station until I give the signal to rotate. Read each question carefully, and work together to pick the best answer. **Be sure that the answer for each station is written next to the correct number on your answer sheet.**"

When time is up, ask each team to move away from the stations. One proctor will collect the answer sheets, while the other covers the stations in preparation for the next session.

3. What is the total area of the shaded parts and the total area of the unshaded part in the figure below? Remember, the area of a circle = $3.14 \times \text{radius}^2$.



Answer 3a. What is the total area of the shaded part inside the large circle? _____

Answer 3b. What is the total area of the unshaded part inside the large circle? _____

4. On Saturday afternoon Tracy went to the mall with her sister. There were three times as many people in the Pizza Stop as in T-Shirt Madness. There were three fewer people in the T-shirt store than in the Toy Fair. There were two fewer people in the Toy Fair than in the Cookie Cottage. There were eight more people in the Cookie Cottage than in There's Bears. Five people were in There's Bears. How many people were in each store?

There's Bears _____

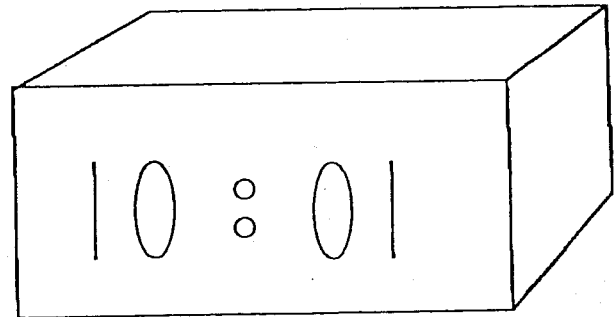
Pizza Shop _____

T-Shirt Madness _____

Toy Fair _____

Cookie Cottage _____

5. On a digital clock, how many times does the clock face show consecutive numbers (such as 1, 2, and 3)?
List all possible answers below.



Answer 5: _____

6. Shape Puzzle

- a. Each shape is a different color, red, yellow, blue, and green
- b. All the shapes are different
- c. The red shape is a circle
- d. The blue shape doesn't have right angles
- e. The yellow shape is a square
- f. The 3 large shapes each have 4 straight sides
- g. One shape is small

What are the shapes, sizes, and colors in this puzzle?

Answer 6:

Size	Shape	Color

7. My brother, Michael loves to go shopping. As soon as he gets his clothing allowance, he heads for the nearest store. Yesterday he got his usual amount of money and went to buy jeans. In that store he spent half of his money and three dollars more. Then he went to buy a shirt and in that store, he spent half of his remaining money and two dollars more. After that, he had only five dollars left. How much did he start with?

Answer 7: _____

8. A group of 21 people went to the county fair either in a stagecoach or in buggies. Later the same stagecoach and buggies brought them back. On the trip to the fair, 9 people rode in the stagecoach and 3 people rode in each buggy. On the return trip, 4 people rode in each buggy. How many people rode in the stagecoach on the return trip?

Answer 8: _____

9. As a special treat for the crew to celebrate their first Fourth of July in space, the cook of the space ship Star Quest is going to make real pancakes for breakfast instead of the usual artificial food which they eat. He calculates that he will need exactly 49 pounds of flour. But the flour only comes in three- and five-pound bags, and he is not allowed to use just part of a bag. Show how he can get the exact amount of flour that he needs. Show three solutions.

Answer 9a: _____

Answer 9b: _____

Answer 9c: _____

10. A chime clock strikes 1 chime at one-o'clock, 2 chimes at two-o'clock, 3 chimes at three-o'clock, and so on. What is the total number of chimes that the clock will strike in a twelve-hour period?

Answer 10: _____

11. Francisco was raising African spotted mice. They were unusual in that every two months the female had exactly two babies – a male and a female. When these babies were two months old, they had their first babies and continue to have them every two months after that. Francisco began with one pair of spotted mice on January 1, 1980, and his parents made him sell all that he had on January 2, 1982, just after more babies were born. Since none of the mice had died, he had quite a few. How many?

Answer 11: _____

12. A camera and case together cost \$100. If the camera costs \$90 more than the case, how much does the case cost?

Answer 12²_____

13. Domingo arrived at work and went behind the sandwich counter at the north end. As he faced out over the counter, north was to his right, south to his left. While he was standing at the north end, a customer ordered a sandwich. Domingo went through these steps:
- 3 feet to his left to pick up bread
 - 2 feet to his right to put the bread on a plate
 - 4 feet to his left to pick up mayo and pickles
 - 2 feet to his left to pick up knife and spoon
 - returned to where the bread was on the plate
 - turned around and got the salami out of the refrigerator
 - put the sandwich together
 - 3 feet to the left to serve the customer
 - 4 feet to the left to get a beverage for the customer
 - give the beverage to the customer

How many feet did Domingo travel in all?

Answer 13²_____

14. When I open my mathematics book, there are two pages that face me. If the product of the two page numbers is 1806, what are the two page numbers?

Answer 14: _____

15. Study the arrangement of integers and write the next three rows.

<u>A</u>	<u>B</u>	<u>C</u>	<u>D</u>
	1	2	3
6	5	4	
	7	8	9
12	11	10	
	13	14	15
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

In which column do these numbers belong?

a.	80
b.	121
c.	207
d.	348

Answer 15 a. _____
 Answer 15 b. _____
 Answer 15 c. _____
 Answer 15 d. _____

16. Tom and Tillie are 60 miles apart, bicycling toward each other on the same road. Tillie rides 12 miles per hour and Tom rides 8 Miles per hour. In how many hours will they meet?

Answer 16: _____

17. Amy can mow a lawn that measures 600 square yards in $1\frac{1}{2}$ hours. At this rate, how many minutes would it take her to mow a lawn that measures 600 square feet?

Answer 17: _____

18. A 100-lb block of cheese is cut into smaller blocks that each weighs $1\frac{1}{4}$ pounds. Each small block is then sold for \$3.75. What is the total selling price for all the small blocks of cheese?

Answer 18: _____

19. Jayne runs a souvenir shop. Complete the third column.

Name of Item	Jayne's Cost	Jayne's Price	Profit Per One Item (Price-cost)	Number of Items Sold This Week
Brass deer	\$1.50	\$3.19		28
Card collection	\$0.62	\$1.29		41
Souvenir pen	\$1.00	\$2.79		56
Snow bubble	\$0.60	\$1.49		25

How much profit in all does Jayne make from the snow bubbles that she sold this week?

Answer 19: _____

20. Alice, Delia, Gwen, and Sara went to the park. Each girl had \$10.00. They each bought a ride ticket and something to eat. No girl went on the same ride as any of the others. What did each girl buy to eat?

Ferris Wheel \$3.50	Merry-go-round \$2.00	
Pony Ride \$2.50	Train Ride \$3.75	
Soda \$1.00	Ice Cream \$2.10	Fruit Bar \$1.75

Answer 20 _____

Change each girl got:	
Alice	\$5.75
Delia	\$5.90
Gwen	\$4.50
Sara	\$4.40

1. Alice _____
2. Delia _____
3. Gwen _____
4. Sara _____

