TEACHER SUGGESTIONS AND ANSWERS

PURPOSE:
This booklet is intended to provide your students with interesting problems to think about on those days when your lesson plans do not quite cover the class period—days when there’s not enough time for another lesson or for the students to get a good start on their homework assignment but there’s too much time left over just to waste.

GENERAL INFORMATION:
There are three collections of problems in this series, all of which are available in both booklet and duplicating master form:

CLASSROOM QUICKIES - Book 1
CLASSROOM QUICKIES - Book 2
CLASSROOM QUICKIES - Book 3

The title—CLASSROOM QUICKIES—is meant to imply that within 2-10 minutes, each problem can be thoroughly presented and the students can start thinking about its solution. But for many problems, the students will not find the solutions within this time.

None of the problems is hard to understand. But solving them is sometimes a different matter, since they range from easy to hard. Each of the three collections of problems has some problems in each range of difficulty but, for the most part, the hard problems in Book 3 require more thought than those in Book 2, and the hard problems in Book 2 require more thought than those in Book 1.

In general, it is suggested that you NOT give your students the answers to these problems. Students have been known to work for days, even weeks and months, to solve some of these problems.

ANSWERS:
1. a. Other solutions are possible. Let E = explorer no. 1; G = guide for explorer no. 1; etc. Five round trips are needed: 1) E and G go; E comes back. 2) E and G go; E comes back. 3) E and G go; E comes back. 4) E and G go; E comes back. Finally, G and E go. 2. It is not possible for George to qualify. An average speed of 240 kph is a distance of 4 km per minute, which means a total time of only 30 seconds for the entire 9 km. But George used up his 30 seconds during the first km (120 kph is 2 km/hour, or 1 km in 30 seconds), so he has no time left in which to travel the second km. 3. Take a checker out of the box labeled "RB." If the checker is red, then this box is the "RB" box. (The boxes are labeled incorrectly, so you know it is not the "RB" box. The checker is red, so the box can't be the "BB" box.) This leaves only the "RB" and the "BB" boxes to find. One of the boxes you did not open is labeled "BB" but you know it is incorrectly labeled, so it must be the "BB" box. Then the third box is the "BB" box. (If the checker you looked at is black instead of red, the same kind of reasoning applies.) 4. a. Various answers are possible. 51 = (5 x 5) + (5 x 5) + 5/5 + 5/5 52 = 55 + 5 + 5 53 = 55 + 5 + 5 54 = 55 + 5/5 + 5/5 + 5/5 55 = 55 + 5 + 5 56 = 55/5 + 5/5 57 = 55 + 5 + 5 58 = 55 + 5/5 59 = 55 + 5 + 5/5 + 5/5 + 5/5 5. a. There are four solutions: 1. Add, 10, 20, 30, 40, and 50. 2. Subtract, 10, 20, 30, 40, and 50. 3. Multiply, 10, 20, 30, 40, and 50. 4. Divide, 10, 20, 30, 40, and 50. 6. Knowledge of addition, subtraction, multiplication, and division is required. 7. Knowledge of fractions is required. 8. If you were to divide by 0, you would get 0. 9. Note: Various answers are possible. 10. Old geometry teacher never dies. They just go off on tangents. 11. a. Suppose it doesn't balance. Take one ball from each pan and put it aside. (Keep track of which ball came from which pan.) Now take one of the remaining two balls in each pan and switch it to the other pan. Either the scale balances, or it doesn't.

10. Choose any six balls. Place three in each pan of the scale. Either the scale balances, or it doesn't:

- a) Suppose it doesn't balance. Take one ball from each pan and put it aside. (Keep track of which ball came from which pan.)
- b) Suppose it doesn't balance. Take one ball from each pan and put it aside. (Keep track of which ball came from which pan.)

12. a. Suppose it doesn't balance. Then the odd ball is one of the two switched. See "third weighing" below.
- b) Suppose the pan positions have switched. Then the odd ball is one of the two switched. See "third weighing" below.
- c) Suppose it balances. Then the odd ball is one of the two removed from the pans. See "third weighing" below.

Third weighing: Choose one of the two balls in question, and take all the other balls out of the pan. Put the ball you chose in one pan, and put a normal ball in the other pan. If the scale balances, the odd ball is the one you did not choose. If the scale doesn't balance, the odd ball is the one you chose. In this case, you know whether it is heavier or lighter because of the position the pan was in when that ball was weighed.

b. Suppose it balances. Then the odd ball is one of the two not weighed.

13. a. Choose one, and remove from the pans five of the six balls weighed. Put the ball you chose in the other pan. If the scale doesn't balance, the odd ball is the one you chose. In this case, it took only two weighings. If the scale balances, the odd ball is the one you didn't choose. Remove one ball from the pan, and put the remaining ball in. You know whether it is heavier or lighter because of the position of the pans.

14. a. He buys 11 sheep, 19 pigs, and 70 chickens.

15. a. Take the number to be tested and chop off the last two digits.

16. I would have been a genius if only I had had more brains.
17. Let m = the number of the month, d = the day of the month, y = the last two digits of the year. Then (using the same numbers as the problem used) the results are: 1. m = 24m + 34m + 13 4. 264m
+ 13 = 1000m + 325 5. 100m + d + 125 6. 100m + d + 125 = 200m + 2d + 250 8. 200m + 2d + 210 9. 500m + 2d + 210 = 1000m + 100d + 10500 10. 10000m + 100d + y + 10500
11. 10000m + 100d + y This shows that the month was moved four digits to the left, the day of the month was moved two digits to the left, and the year was left as entered. 19. Take one coin from the first stack, two from the second, three from the third, and so on. You now have a total of 1 + 2 + 3 + ... + 15 = 120 coins. Put them on the scale all at once. Each good coin weighs 2 grams, so the total weight would be 240 grams if all were good. But some of them are counterfeit, so the total will not be 240 grams. You have only one coin from the first stack, so if this is the counterfeit stack, the total will be 240 - 1/3 grams. If the second stack is counterfeit, the total will be 240 - 2/3 grams (because you included two coins from the second stack). And so on. Alternate solution: Do the same as above, except put one of the stacks aside completely, leaving 14 stacks to consider. This gives you 106 coins to weigh. If the weight is 210 grams, then the counterfeit stack is the stack set aside. Otherwise, the counterfeit stack is found in the same way as in the solution above. 20. Note: Various answers are possible.

81 = 55 + (5 × 5) + 5/5
83 = 55 + 5 + 55 + 5
85 = 55 + (5 × 5) + (√5 × √5)
87 = 6(5 × 5 × 5) - 5
89 = (5 + 5 - 5) / 5 or 89 = 5 × 5 + 5 - 5/5
90 = 55 + 5 + 5 + (5 × 5)

21. Unless each bottle started out with only one teaspoonful of flavoring in it, there is the same amount of lemon in the vanilla as there is vanilla in the lemon. We reason this way: Let | be a total of flavoring in each bottle. After the first transfer, the vanilla bottle contained 1 + 1 teaspoonful of mixture, of which 1 is vanilla and 1 is lemon. The bottle was shaken well, so the mixture was distributed evenly. So each teaspoonful was 1/2 teaspoon of vanilla and 1/2 teaspoon of lemon. So the cook put 1/2 teaspoonful of vanilla in the lemon bottle. But the cook also put 1/2 teaspoonful of lemon in the vanilla mixture. Therefore, each bottle of flavoring contains 1/2 teaspoonful of the other flavoring. 22. In you know the ratio of lemon to vanilla to be 2:1, it is possible to mix the flavors in a 3-to-1 ratio, and then dilute them to a 1-to-1 ratio. This ensures that both flavors are present in equal proportions. 23. Since you have three bottles, each containing a different flavoring, you can use a similar approach to mix the flavors. Mix the flavors in a 2-to-1 ratio, and then dilute them to a 1-to-1 ratio. This ensures that both flavors are present in equal proportions. 24. The answers here refer to the square numbers in the figure at the right. (For example, square 2 at the right has a value of 14 in the problem square.) Aside from the usual combinations of four squares which total 34, the square numbers in the figure here which total 34 in the problem square are: 1,2,6,10, 1,2,11,13, 1,2,15,16, 1,3,6,10, 1,3,8,10, 1,3,10,11, 1,3,14,16, 2,4,12,16, 2,4,13,16, 2,5,7,14, 2,5,12,15, 2,6,11,15, 2,6,13,15, 2,6,14,16, 2,6,15,16, 2,7,10,15, 2,7,11,16, 2,8,10,12, 2,8,11,12, 2,8,13,14, 2,9,11,14, 2,9,12,15, 2,9,13,15, 3,4,7,10, 3,4,9,10, 3,4,11,12, 3,5,8,10, 3,5,9,11, 3,6,8,10, 3,6,9,11, 3,7,10,11, 3,7,10,12, 3,8,9,10, 3,8,10,12, 3,8,11,12, 3,8,12,13, 4,6,7,12, 4,6,7,13, 4,6,8,10, 4,6,9,11, 4,6,10,12, 4,6,11,13, 4,6,12,14, 4,6,13,14, 4,6,14,15, 4,6,15,16, 4,7,10,11, 4,7,11,12, 4,7,12,13, 4,7,13,14, 5,6,9,10, 5,6,9,11, 5,6,10,11, 5,6,11,12, 5,6,13,14, 5,7,10,12, 5,7,11,13, 5,7,12,14, 5,7,13,14, 5,8,10,12, 5,8,11,13, 5,8,12,14, 5,9,10,11, 5,9,11,12, 5,9,12,13, 5,9,13,14, 5,10,11,12, 5,10,12,13, 5,10,13,14, 6,7,10,11, 6,7,11,12, 6,8,9,11, 6,8,10,12, 6,9,11,12, 6,10,12,13, 7,8,9,10, 7,8,10,11, 7,8,11,12, 7,9,10,12, 7,9,11,13, 7,10,11,12, 7,11,12,13, 8,9,10,11, 8,9,10,12, 8,9,11,12, 9,10,11,12, 9,10,12,13, 9,11,12,13, 10,11,12,13, 10,12,13,14.

25. Note: Various answers are possible.

91 = 5(5 + 5) - 5/5
92 = (5 × 5) + 5/5
93 = (5 × 5) + 5/5
94 = (5 × 5) - 5/5
95 = (5 × 5) + 5/5
96 = (5 × 5) - 5/5
97 = (5 × 5) + 5/5
98 = (5 × 5) - 5/5
99 = (5 × 5) + 5/5
100 = (5 × 5) + 5/5

26. D'you see anyone here? Yes, I see you here. D'you see anyone else here? Yes, I see a real beauty. 27. 14. (There are nine 1 x 1 squares, four 2 x 2 squares, and one 3 x 3 square.)

**ANSWERS TO GEOMETRY FUNS:**
1. secant 2. triangle 3. parallelogram 4. ratio 5. parallels 6. collinear
7. right triangle 8. complementary angles 9. circular reasoning 10. converse
11. corresponding sides 12. minor arc 13. major arc 14. proportion 15. theorem
16. equilateral.
1.

Three explorers and their native guides started out together. They planned to split up later. They came to a river full of piranha. There was a boat at the shore which would hold only two people at once. Each explorer thought his own guide was the best of the three, so he did not want his guide near any other explorer unless he himself was also present.

How could all six people get across the river safely?
2.

In order to qualify for an auto race, a car must complete two km at an average speed of 240 kph. The car of Bernie George, a famous driver, has carburetor trouble during the first km and averages only 120 kph. How fast must George drive the second km in order to qualify for the race?
3.

Six checkers are placed in three boxes: two red are in a box labelled “RR”; two black are in a box labelled “BB”; a red and a black are in a box labelled “RB”.

Someone comes along and mixes up the labels so that none of the boxes is correctly labelled now.

How can you tell, by taking only one checker out of one of the boxes (and without looking at any of the other checkers), the correct content of all three boxes?
4.

Write the numbers 51 through 60 using exactly six 5's. You are allowed to use any mathematical symbols you know.

Examples:

\[ 1 = \frac{555}{555} \]

\[ 2 = \frac{\sqrt[5]{55}}{5} + \frac{5}{5} \]

\[ 3 = \frac{5}{5} + \frac{5}{5} + .5 + .5 \]

\[ 4 = \frac{5 \times 5 - \sqrt{5 \times \sqrt{5}}}{5} \]
5.

Which one of the following words does not belong in the list, and why? — bacon, beetle, cat, dressing, hairless, lantern, lawyer, muffin, puzzle, roulette, setter
6.

You have 25 coins which have a total value of $1.00. What are the coins, and how many of each do you have?
7.

HOW WELL DO YOU FOLLOW DIRECTIONS?

1. Print the words INTELLIGENCE TEST.
2. Between every other letter (first and second, second and third, etc.), insert (in order) the letters of the words YOU ARE VERY SMART.
3. Exchange the sixth and ninth letters.
4. Start counting from the right-hand end. Move the fourth and fifth letters to the last and next-to-last positions, respectively.
5. Cross out the letters of the word "learn" in the order they appear.
6. Cross out the letters of the word "master" in the order they appear.
7. Insert the letter "D" between the ninth and tenth letters.
8. Start counting from the right-hand end. Move the second and fourth letters to the tenth and eleventh positions, respectively.
9. Cross out the word "steer."
10. Exchange the first and last letters.
11. Exchange the second letter and the next-to-last letter.
12. Cross out all letters which appear twice, except "E."
13. Counting from the right-hand end, cross out the first and third letters.
15. Change the fifth letter to "W."
16. Move the second letter to the right-hand end.

What do you have now?
8.

PROOF THAT $1 = 2$

Let $a = b$. Now multiply both sides by $b$.

Then $ab = b^2$. Next, subtract $a^2$ from both sides.

Then $ab - a^2 = b^2 - a^2$. Now factor both sides.

Then $a(b - a) = (b + a)(b - a)$. Now divide both sides by $b - a$.

Then $a = b + a$.

Now suppose $a = 1$. Then $b = 1$ (from the first line), so $1 = 1 + 1$, or $1 = 2$.

What's wrong?
9.

Write the numbers 61 through 70 using exactly six 5's. You are allowed to use any mathematical symbols you know.

Examples:

1 = \frac{555}{555}

2 = \frac{-5}{\sqrt[5]{5^5}} + \frac{5}{5}

3 = \frac{5}{5} + \frac{5}{5} + .5 + .5

4 = \frac{5 \times 5}{5} - \frac{\sqrt{5} \times \sqrt{5}}{5}
10.

Use the letters underneath to fill in the chart so that words are formed and the quotation makes sense. A shaded space in the chart shows the end of a word. (The end of a line in the chart is not necessarily the end of a word.)
11.

You have 8 balls, all of which look exactly the same. Seven of these weigh the same, and one is either heavier or lighter than the others. You have a balance scale. Tell how you can find the odd ball in at most three weighings, and explain how you can decide whether the odd ball is heavier than the others, or whether it is lighter than the others.
12.

A farmer buys 100 live animals for $100. How many of each does he buy if chicks are 10¢ each, pigs are $2 each, and sheep are $5 each?
13.

TEST FOR DIVISIBILITY BY 4

When a number is written in the usual way, almost everyone knows that the number is divisible by 2 if and only if its last digit is divisible by 2.

A less well-known test for divisibility is that a number (again, written in the usual way) is divisible by 4 if and only if its last two digits form a number divisible by 4.

Example: Is 3578946 divisible by 4? No, since the number 46 is not divisible by 4.

Example: Is 3578964 divisible by 4? Yes, since the number 64 is divisible by 4.

Why does this test of divisibility work?
14.

Can you place the letters A, B, C, and D in the chart below so that no letter appears twice in any row, in any column, or in any diagonal? (For example, if B is in the second row of the first column, then B cannot be in the first, second, or third row of the second column.)
15.

Write the numbers 71 through 80 using exactly six 5's. You are allowed to use any mathematical symbols you know.

Examples:

1 = \frac{555}{555}

2 = \frac{\sqrt{5} \times 5}{5} + \frac{5}{5}

3 = \frac{5}{5} + \frac{5}{5} + .5 + .5

4 = \frac{5 \times 5}{5} - \frac{\sqrt{5} \times \sqrt{5}}{5}
16.

Use the letters underneath to fill in the chart so that words are formed and the quotation makes sense. A shaded space in the chart shows the end of a word. (The end of a line in the chart is not necessarily the end of a word.)
17.

Art, Brian, Carl, and Dom each went on a total of four dates with four different girls. The second time, Art dated Effie, and Carl dated Francine. The third time, Brian dated Hattie, and Dom dated Georgia. The fourth time, Carl dated Georgia, and Dom dated Francine.

For each of the four times, tell which girl dated which boy.

HINT: To help solve the problem, use the chart below, filling in the body of the chart with the girls' names.

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Art</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brian</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carl</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dom</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
18.

YOUR BIRTHDATE

1. Write the number of the month in which you were born.


5. Subtract 200.

6. Add the day of the month you were born.

7. Multiply by 2.

8. Subtract 40.

9. Multiply by 50.

10. Add the last two digits of the year you were born.


The result is a number telling (from left to right) the month, day of the month, and year you were born. Why does it work?
19.

You have fifteen stacks of coins, and they all look the same. Fourteen of the stacks are all good coins. Each good coin weighs 2 grams. In one stack, all the coins are counterfeit, and each coin weighs 2-1/10 grams.

You have only a pointer scale which you will be allowed to use exactly once. (You may not put some coins on and then do something such as adding or deducting or exchanging some coins in order to get another reading.)

How can you weigh the coins to find out which stack contains the counterfeit coins?
20.

Write the numbers 81 through 90 using exactly six 5’s. You are allowed to use any mathematical symbols you know.

Examples:

\[ 1 = \frac{555}{555} \]
\[ 2 = \frac{\sqrt[5]{5^5}}{5} + \frac{5}{5} \]
\[ 3 = \frac{5}{5} + \frac{5}{5} + .5 + .5 \]
\[ 4 = \frac{5 \times 5}{5} - \frac{\sqrt{5} \times \sqrt{5}}{5} \]
21.

A cook has two bottles of liquid flavoring, one of vanilla, and the other of lemon. Both bottles contain the same amount of liquid. Absent-mindedly, he measures out one teaspoonful of lemon, pours it into the vanilla bottle, and shakes the vanilla bottle well. Then, realizing what he has done, he tries to make up for it by measuring one teaspoonful of the mixture now in the vanilla bottle, and he pours this into the lemon bottle.

Is there now more lemon in the vanilla, or is there more vanilla in the lemon?
22.

Use the letters underneath to fill in the chart so that words are formed and the quotation makes sense. A shaded space in the chart shows the end of a word. (The end of a line in the chart is not necessarily the end of a word.)
23.

You have a 10-liter jug and a 3-liter jug. Both containers are unmarked. You need exactly 5 liters of water. How can you get it, if a water faucet is handy?
24.

This is a magic square. That is, each row totals 34, each column totals 34, and each diagonal totals 34.

How many other combinations of four squares can you find here which total 34? (For example, the middle two in the top row and the middle two in the bottom row total $14 + 15 + 2 + 3 = 34$.)

\[
\begin{array}{c|c|c|c}
1 & 14 & 15 & 4 \\
\hline
8 & 11 & 10 & 5 \\
\hline
12 & 7 & 6 & 9 \\
\hline
13 & 2 & 3 & 16 \\
\end{array}
\]
25.

Write the numbers 91 through 100 using exactly six 5's. You are allowed to use any mathematical symbols you know.

Examples:

1 = \frac{555}{555}

2 = \frac{5\sqrt{55}}{5} + \frac{5}{5}

3 = \frac{5}{5} + \frac{5}{5} + .5 + .5

4 = \frac{5 \times 5 - \sqrt{5} \times \sqrt{5}}{5}
26.

Read the symbols and figure out the message.

Example: Message: K, U R YY.
Solution: Kay, you are wise.

D-U C N-E-1 E-R?
E-S, I C U E-R.
D-U C N-E-1 LL E-R?
E-S, I C R E-L B-U-T.
27.

How many squares are here?
GEOMETRY PUNS

1. What do we call a song sung by passengers on an ocean liner?
2. What is the appropriate thing to say to encourage an angle who wants to give up?
3. How did the hippie describe the coplanar nonintersecting lines to his grandmother?
4. What did the man named Raymond call his new movie theater?
5. How did people describe the two women named Lillian who were close friends?
6. When the boss wanted to see Leonard in his office right away, what did he say to his secretary?
7. What do we call a triangle who is never wrong?
8. About a man who was always trying to find ways to flatter the boss, another said, "Oh, he's always looking for _____________."
9. What kind of illogical thinking is used by a circle?
10. What do we call poetry written by a prisoner?
11. What did the mother say to the father when the baby, Cora, kept beating her hands against her ribs?
12. What is a little rainbow called?
13. What is a big rainbow called?
14. What do we call the amount of food a professional football star gets?
15. How did the lisper who liked his steak rare tell his wife to cook his steaks?
16. Joe and Al were sign painters who worked for the same company. Joe was unhappy because Al always seemed to be issued better equipment. He finally got fed up one day and told Al, "I'm going to insist that the company give me some different equipment, because I want an _____________________."