

THE MATHEMATICAL PROBLEM

This is an intermediate level worksheet and is suitable for children from class 6 upwards

Instructions

Keep a few sheets of paper ready to write your answers. If you are making any specific assumptions, write them down. If there are more than one solutions, write them down and explain your reasoning.

Activities

1. A public library had a stock of one lakh books as on 31 March 2015. On 1 April 2015, 99 books were issued. How many books were left at the end of the day on 1 April 2015?

Ram got very confused while solving the above problem because of the number of 0s involved. Can you think of an alternate method that would make it easier to do the calculation?

2. Arjun had to pay Arvind an amount of Rs. 236. Write down at least five ways in which this amount can be paid using currency notes of only Rs. 100, Rs. 10 and Rs. 1. You are not allowed to use Rs. 100 and Rs. 10 one time each. So of the five ways that you will write down, one should not have the Rs. 100 note and another should not have the Rs. 10 note.

No	Description of the method	Condition
1		None
2		None
3		None
4		Hundred Rupee note not to be used
5		Ten rupee note not to be used

3. Write a word problem for which the answer should be $5-3=2$. Make sure you use the word "more" while writing the problem.
4. A merchant buys 23 swings to be installed in various schools for Rs. 24,242. What is the cost of each swing?
5. On Shyam's birthday, his father gives him eight imported chocolates to share with his friends. Since the chocolates are expensive, he also tells Shyam to give half a chocolate to each friend. How many friends can he share the chocolates with? Write the mathematical expression for this problem. (A mathematical expression is of the form $2+3$ or $5-2$.)
6. Show by folding a paper triangle that the sum of the 3 angles is a straight angle.
7. Demonstrate with a diagram that the fraction $\frac{3}{5}$ has the same value as $\frac{6}{10}$.
8. Which of the word problems given below describes the operation $8-3$:
- Leela had 8 pencils, while her sister Sheela had 5. Who had more pencils and how many more?
 - Leela had 8 chocolates. She gave 3 to Sheela and another 3 to Ashok. How many chocolates does Leela have with her now?
 - Arjun got 8 marks in his math class test. Ashok got 3 marks less than him. How many marks did Ashok get in the math class test?

- d. On his birthday, Partha visited a doughnut shop which sold doughnuts in boxes of 8 each. He asked for 3 boxes for taking away. How many doughnuts he did he take away?
- e. Gopal had 8 crayons with him. He gave 5 to his brother. How many crayons does he have now?
- f. The Principal called all 8 math teachers for a discussion. Her room had only 3 chairs. How many more chairs would be required to seat all her teachers?

Problems which CAN be represented by 8-3	Problems which CANNOT be represented by 8-3

9. In the representations of $\frac{5}{8}$, given below, which ones are correct?

a) b) c)

d)

e)

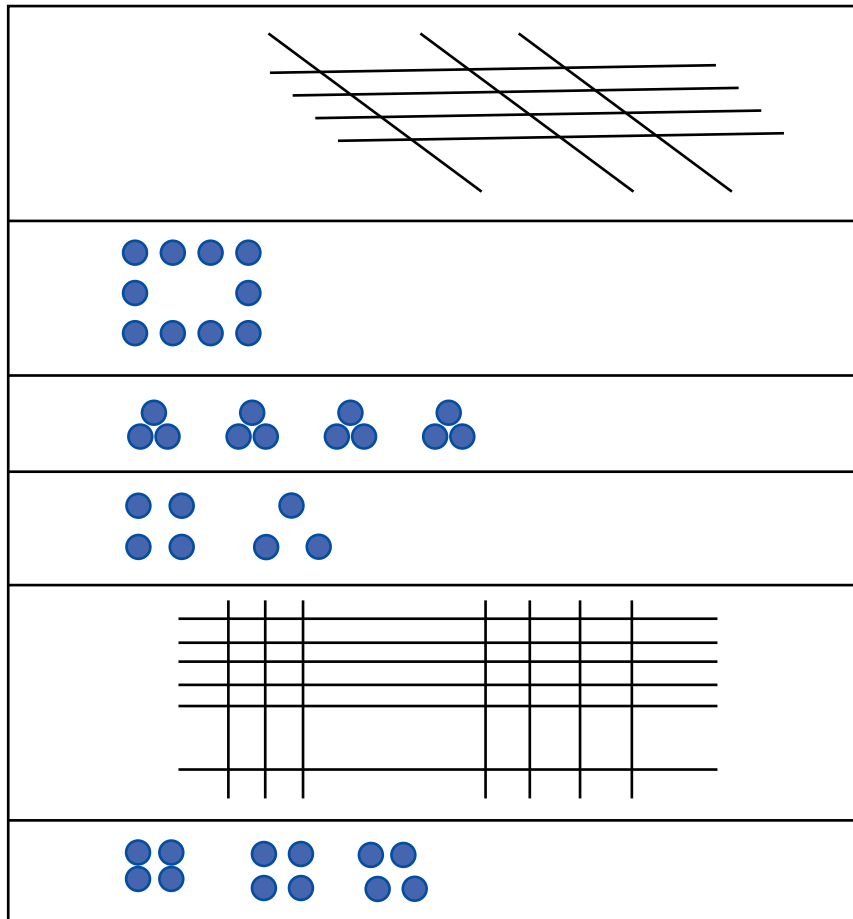
Equal to $\frac{5}{8}$	Not equal to $\frac{5}{8}$

10. Using the 9 digits from 1 to 9, without repetition, form three 3 digit numbers. (Here is an example: 245, 178, and 369).
- Form the 3 numbers such that their total is the maximum possible.
 - Write at least 2 other problems like the above which have the same total.
 - Write a problem so that the total is the minimum possible.

11. A class has 15 boys and 25 girls. Describe the situation using 3 mathematical statements each using one of the operations/ideas given below. An example is provided for addition.

No	Operation	Math statement
1	Addition	The total number of students in the class is $15 + 25 = 40$.
2	Fraction	
3	Ratio	
4	Subtraction	

12. Which of the different pictures given below represent the idea that $3 \times 4 = 12$.



13. On a Sunday, Kartik takes his bicycle from home for a ride. After 4 kms one of the tyres gets punctured. He then pushes the bike for 3 kms. How far away from home is he?

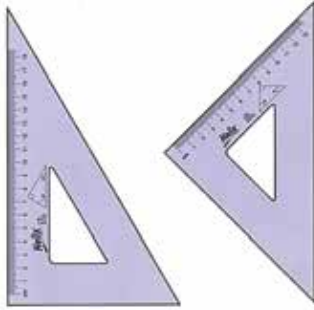
14. The math teacher asked students to make 3 groups and write word problems for representing the mathematical statement $\frac{1}{2} + \frac{1}{3}$. The following problems were submitted by 3 groups.

- Ram and Shyam are brothers. Their father bought a cake for Christmas and gave them half the cake to share. Ram gave one third of his share to Shyam. What is the total amount of cake (expressed as a fraction) that Ram and Shyam ate?
- Ram and Shyam are brothers. Their father bought a cake for Christmas and gave half the cake to Ram. Of the remaining cake he gave one third to Shyam. What is the total amount of cake (expressed as a fraction) that Ram and Shyam ate?
- Ram and Shyam are brothers. Their father bought 2 cakes for Christmas. He gave half of the first cake to Ram and one third of the second cake to Shyam. What is the total amount of cake (expressed as a fraction) that Ram and Shyam ate?

According to you, which of the above word problems is correct? If you think they are wrong, give your reasons why you consider them wrong.

15. Given below are pictures of a pair of set squares. Using both or either of the set squares draw the following angles: 60, 75, 80, 90, 100, 105 and 120.

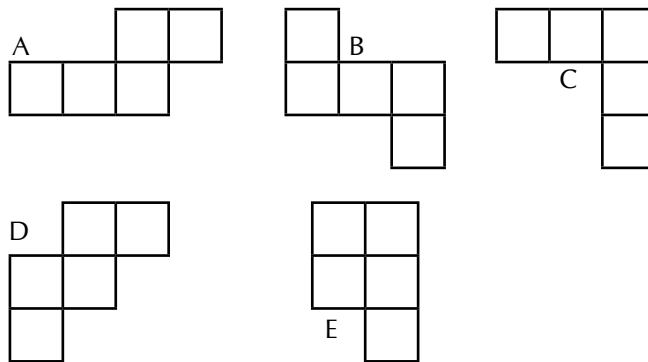
You are provided only one pair of set squares. Find out which angles can be drawn and which cannot be drawn.



Write your answers in the table given below

Angles which can be drawn	Angles which cannot be drawn

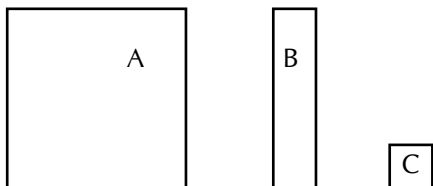
16. Given below are 5 pentaminoes. (Pentaminoes are shapes made of 5 equal squares joined by at least one of their sides). Find the pentaminoes which can be folded to form a square box open on one side. No cutting or pasting is allowed. Folding can be done only along the lines which are shown.



17. Cut a rectangle from a chart paper or cardboard (about 20 cm X 15 cm should be fine). Cut along the diagonal so that you get two equal right angled triangles. Join these two right angles by their sides in as many ways as possible to get either a three sided shape (triangle) or a four sided shape (quadrilateral). You cannot fold, cut or overlap the two right angled triangles. Draw the rectangle accurately and cut the triangles carefully so that they join nicely.

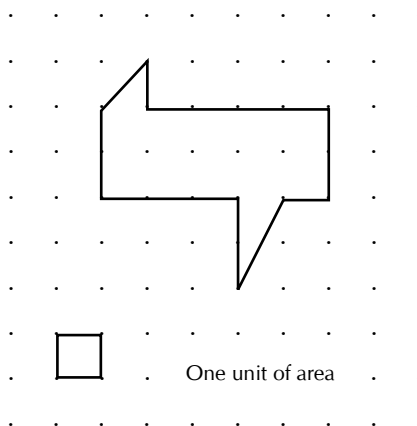
- How many shapes did you manage get? How many were triangles and how many were quadrilaterals?
- Write down the names of the triangles or quadrilaterals, if you know them.
- In all these shapes some properties are changing and some are not changing. Can you tell which of the properties are not changing?
- If you think some of the properties are changing write about the change.

18. You are provided with many sets of the following materials cut from cardboard. A is a big square. B is a rectangle such that 10 pieces of B will fit into A. C is a small square such that 10 pieces of C will fit into B. Use the above materials to visually represent 278 and 1.75. For each of the representations, indicate the number of A, B, and Cs used and state any assumptions you have made.



Number	Describe arrangement in terms of the number of A, B, and Cs used	State assumptions, if any
278		
1.75		

19. Given below is a shape drawn by joining points in a “square dotted” sheet. Find the area of the shape in terms of “area units”. Assume 1 unit of area as the smallest square which can be drawn by joining any 4 points.

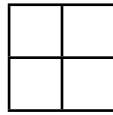


20. Take three thin broomsticks about 20 cms long. But imagine that the broom sticks are very long on either end. Lay these three sticks on a table surface in as many different ways as possible. (You will understand the meaning of ‘different’ when you do this activity. If you find the above difficult, first try with only two sticks)

- Describe each of the patterns briefly with words that you may have learnt in geometry class.
- Describe how each pattern is different from the others.
- How many patterns did you ultimately make?

Such figures are called plane figures as they are made on a plane (flat) surface and the study of such figures or shapes is called Plane Geometry.

21. Given below is a 4X4 magic square with some numbers filled in.
- It uses all numbers between 1 and 16 without repetition.
 - The numbers are arranged such that the sum of all rows, columns, and diagonals is 34. This is the reason it is called a magic square.
 - In addition, numbers in any 4 squares which themselves form a bigger square (example shown below), is also 34.



Complete the magic square. It is also called a “Diabolic” magic square since it has many other patterns of 4 squares which also add up to 34.

Can you figure out why the “magic” total is 34?

15		3	
	5	16	
	11		7
1			

22. Nakul and Sahdev are twins, each studying in section A and B of class 9. For their birthday, Nakul invites 3 of his teachers and Sahdev invites 4. If all the invited teachers agree to come to the party, how many plates of refreshments have to be kept ready for the teachers?

23. You know that $1 \times 2 + 3 \times 4 = 14$. It has been written using the below given conditions.

- You have to use digits 1, 2, 3, and 4 in **that order only**.
- You can use any of the operators $+$, $-$, \times , \div or $\sqrt{\quad}$ between the numbers.

Your task is to write at least 2 mathematical expressions, similar to the one above, whose result will be 10.

24. Indians have always loved mathematics and there were many mathematicians apart from Srinivasa Ramanujan. One such mathematician was D N Kaprekar who passed away in 1986. Try out a famous math procedure he wrote and find out why the procedure is famous.

- Take any 4 digit number.
- Write the largest number that can be written using the 4 digits of your number. Call it L.
- Write the smallest number that can be written using the 4 digits of the above number. Call it S.
- Find the difference between L and S. Call the number R.
- Use the 4 digits of R and repeat steps b, c, and d.
- Continue the procedure (you may have to do it five or six times) until you get a surprise end.
- Write your discovery briefly in your own words.

25. Numbers make interesting patterns in combination with other numbers and operations. Mathematics is the study of such patterns. Three steps of one such pattern are given below.

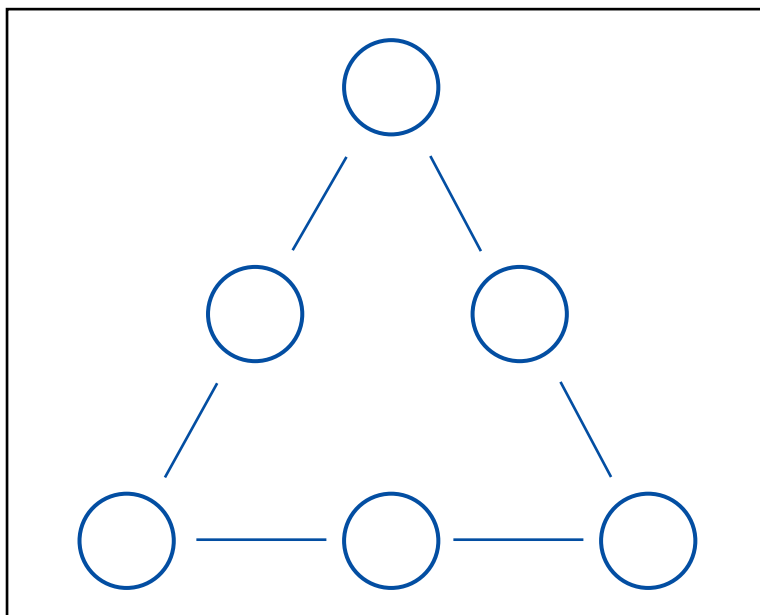
$$1 \times 8 + 1 = 9$$

$$12 \times 8 + 2 = 98$$

$$123 \times 8 + 3 = 987$$

Study the pattern and continue the pattern until the number marked in red reaches 9? You can also try and check with a calculator if the pattern is giving the correct results.

26. Magic triangle



Here is a triangle created with 6 cells with 3 cells on each side. Fill the 6 cells with numbers from 1 to 6, using each number only once. Write the sum of the three numbers of each side.

- Write the numbers in such a way that the total of the cells on all three sides of the triangle is same.
- Try to get at least one more solution with a different total.
- How many solutions are you able to get?

The author is a former Principal of Reliance School, Jamnagar. Despite starting out in the corporate world, the author has had a successful 24 years in the field of education. His areas of interest are primary mathematics, school leadership, and quality in education. He can be reached at <sundaram48@yahoo.com>.

The author would like to thank S Jayasree for her constructive feedback of the worksheet.

Note: There is a well thought out reason behind the problems given in this worksheet. Brief explanations for each problem will be given in the May-June 2015 (Physics special) issue of Teacher Plus. Don't forget to look them up.