

Show Your Work! Explain Your Work! Demonstrate Your Understanding!

The answer to every problem on this page is 36 (or a little variation of 36). But pretend you don't know that! Your job is to *neatly* write out all the steps of a problem and explain your thinking, so someone could learn how to solve a similar problem by looking at your paper. Then to check your understanding, make up a similar problem with different numbers and a different solution, and show how to solve *that*. Choose one problem that interests and challenges you. Don't go on to a second problem until you've done all the steps for your first one. Have fun!

1) Basketball Captains

There are nine kids on the team. For each game two kids get to be captains. How many different pairs of kids can be captains?

2) Biggest Product

What's the biggest product you can get with two numbers that add up to twelve? For example, $2 + 10 = 12$, and $2 \times 10 = 20$, but that's not the biggest!

3) Square = Triangle

The square numbers are 1, 4, 9, 16 ... The triangular numbers are 1, 3, 6, 10.... What's the smallest number bigger than 1 that's on both lists?

4) Ladies First!

Mrs. Ring's algebra class has three girls and three boys. She likes to take them on field trips. She lines up her students in a special way: a girl has to be first, and boys and girls must alternate. How many different ways can she line up the class?

5) Factors

Four has three factors: 1, 2, and 4. Ten has four factors: 1, 2, 5 and 10. What's the smallest number that has nine factors?

6) Lemonade for Charity

Ellen bought two dozen lemons for 15 cents each. She got a big box of sugar for \$2.40. She sold 70 cups of lemonade for 60 cents each. How much money did she earn for charity, after her expenses?

7) Lunches

At Karen's school there are four choices of sandwiches, three choices of drinks, and three choices for dessert. How many different lunches can Karen choose, consisting of one sandwich, one drink, and one dessert?

8) Coins

Bobby has a bunch of nickels and dimes, fifty coins in all. The value of his coins is \$4.30. How many dimes does he have?

9) Other Bases

Here is a number in Base Two: 100100. What does that equal in Base Ten? How would you write the Base Ten number 27 in Base Seven?

10) Perimeter and Area

The length of a rectangle is two inches more than the width. The area is 80 square inches. What is the perimeter?

11) Fractions

Which fraction is bigger, $\frac{4}{9}$ or $\frac{5}{12}$, and how much bigger is it?

12) A Long Ladder

A ladder is 39 feet long and is leaning up against a wall. The foot of the ladder is 15 feet from the wall. How high up the wall is the top of the ladder?

13) A Regular Pentagon

ABCDE is a regular pentagon. What is the angle between the diagonal AC and the side AB?

14) A Regular Polygon

Each angle of a regular polygon is 170 degrees. How many sides does the polygon have?

15) Relatively Prime

12 and 25 are not prime numbers, but they are *relatively prime*. That means they have no common factor other than 1. How many numbers less than 57 are relatively prime to 57? (Another way to ask it, how many numbers less than 57 have a greatest common factor of 1 with 57?)

16) Judi's Round Trip

Judi hopped on her motorcycle and drove to her friend's house at an average speed of 72 mph. (Is that legal?) On the trip back there was a lot of traffic, and her average speed was 24 mph. What was her average speed for the entire round trip?

17) Factors, Part Deux

How many factors does 1440 have?