



Number Operations and Calculation Methods

Age 11+ Level ★★ Worksheet 1

1. Jam and Egg Sandwich

Each different letter in the multiplication on the right stands for a different digit.

Identical letters stand for the same digit.

Work out the value which each letter represents.

$$\begin{array}{r} \text{E G G} \\ \times \quad \text{E} \\ \hline \text{J A M} \end{array}$$

2. So Many Sums

In this addition, each letter stands for a different digit, with *S* standing for 3.

$$\begin{array}{r} \text{S O} \\ + \text{M A N Y} \\ \hline \text{S U M S} \end{array}$$

What is the value of $Y \times O$?

3. Rolling Along the Trail

A pair of dice is thrown and the score is obtained by finding the **product** of the two numbers when they land.

In five throws of both dice:

the second score is 5 more than the first;
the third score is 6 less than the second;
the fourth score is 11 more than the third;
the fifth score is 8 less than the fourth.

What was the score for each of these five throws?

4. Kangaroo Subtraction

In this subtraction, each of the letters K, A, N, G, R and O represents a different digit.

$$\begin{array}{r} \text{K A N} \\ - \text{G A R} \\ \hline \text{O O} \end{array}$$

What is the largest possible value of the number 'KAN'?

5. Operational Decision

Which symbol (+, -, ÷ or ×) should replace $\oplus$ to make the following equation true?

$$1 \times 2 \times (3 \oplus 4 + 5) \times (6 \times 7 + 8 + 9) = 2006$$

These problems are adapted from UKMT (ukmt.org.uk) and WMC (competition.ac) problems.



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Age 11+ Level ★★ Worksheet 2

1. Multiple Choice

In a multiple choice exam, each candidate scores 4 points for every correct answer and loses 1 point for every incorrect answer.

Sarah answers all 100 questions and gets a score of 210 marks.
How many questions did she answer correctly?

2. Adding Tricky Fractions

Can you find the sum without using a calculator?

$$\frac{1}{7} + \frac{1}{8} + \frac{1}{9} + \frac{1}{10} + \frac{1}{11} + \frac{1}{12} + \frac{1}{14} + \frac{1}{15} + \frac{1}{18} + \frac{1}{22} + \frac{1}{24} + \frac{1}{28} + \frac{1}{33}$$

3. See Axes

Each letter in this sum represents a different non-zero digit.

Which digit does X represent?

$$\begin{array}{r} \text{S E E} \\ + \text{S E E} \\ \hline \text{A X E S} \end{array}$$

4. ABC Addition

In this addition, a , b and c each represent a single digit.

What number does abc represent?

$$\begin{array}{r} a \ b \ c \\ + a \ c \ b \\ \hline c \ 4 \ a \end{array}$$

5. Palindromic Milometer

When he began his three hour drive, Alan's milometer reading was 29792 miles, a palindromic number.

At the end of Alan's journey, his milometer reading was another palindromic number.

Given that Alan never broke the speed limit of 75 miles per hour, what was his greatest possible average speed?

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Age 11+ Level ★★ Worksheet 3

1. Quiz Question

There are 81 players taking part in a knock-out quiz tournament. Each match in the tournament involves three players, and only the winner remains in the tournament.

How many matches are required until there is an overall winner?

2. Sum of Ten

The sum of ten distinct positive integers is 100.

What is the largest possible value of any of the ten integers?

3. Filling Morecambe Bay

A notice on Morecambe Promenade reads: "It would take 20 million years to fill Morecambe Bay from a bath tap."

Assuming that the flow from a bath tap is 6 litres per minute, what is the approximate capacity of Morecambe Bay, in litres?

4. Roses and Carnations

Class 7H has collected £56 to buy a bunch flowers for their teacher. Roses cost £3 each and carnations cost £2 each.

Assuming they spend all of their money, how many different possible bunches do they have to choose from?

5. Bookshop

A book costs £3.40 and a magazine costs £1.60.

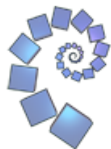
If Clara spends exactly £23 on books and magazines, how many of each does she buy?

6. Product of Fractions

Can you find an efficient way of calculating the product below, without using a calculator?

$$1\frac{2}{3} \times 1.8 \times 1\frac{1}{7} \times 1.75 \times 1\frac{5}{6}$$

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Age 11+ Level ★★ Worksheet 4

1. Birthday Tables

Mark has lots of tables in his (large) house. Each circular table will seat 5 people and each rectangular table will seat 8 people.

At his birthday party there will be 36 people, including himself. Mark wants there to be no empty seats at any of the tables that are used.

How many tables of each type does Mark need to use in order to achieve this? Is this the only possibility?

2. Currency Exchange

Dan has nine 20p coins and his sister Ann has eight 50p coins.

What is the smallest number of coins that must change hands so that Dan and Ann end up with equal amounts of money?

3. Latin Multiplication

I choose three numbers from this number square, including one number from each row and one number from each column. I then multiply the three numbers together.

1	2	3
4	5	6
7	8	9

What is the largest possible product?

4. Product and Sum

Jim rolled some dice and was surprised that the sum of the scores on the dice was equal to the product of the scores on the dice.

One of the dice showed a score of 2, one showed 3 and one showed 5. The rest showed a score of 1.

How many dice did Jim roll?

5. Anti-magic Square

A 4 by 4 "anti-magic square" is an arrangement of the numbers 1 to 16 in a square, so that the totals of each of the four rows and four columns and two main diagonals are ten consecutive numbers in some order.

The diagram shows an incomplete anti-magic square. Can you fill in the missing numbers (1, 2, 8, 15 and 16) to complete it?

4	5	7	14
6	13	3	
11	12	9	
10			

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