BRECKNOCKS MARVELLOUS MENTAL MATHS – KEY SKILLS!

MULTIPLICATION AND DIVISION

Multiply and divide mentally with increasingly large numbers!
Perform mental calculations of increasing complexity – including mixed operations and large numbers!
Identify common factors, common multiples and prime numbers
Explore the order of operations using brackets () ÷ x + -
Use estimation to check answers
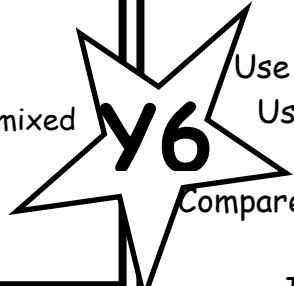
PLACE VALUE AND COUNTING

Read, write, order and compare numbers up to 10, 000, 000 and understand the value of each digit.
Use negative numbers in context and calculate intervals across zero (e.g. the difference between -14 and 23)
Round any whole number to a required degree of accuracy

ADDITION AND SUBTRACTION

Add or subtract mentally with increasingly large numbers!
Perform mental calculations of increasing complexity – including mixed operations and large numbers!
Explore the order of operations using brackets () ÷ x + -
Use estimation to check answers

Y6

FRACTION ACTION!

Use common factors to simplify fractions (e.g. 5/15 = 1/3)
Use common multiples to express fractions in the same denomination
Compare and order fractions including those that are more than 1 (e.g. 6/5)
Identify the value of each digit to 3 decimal places
Multiply and divide numbers by 10, 100 and 1000 giving answers up to 3 decimal places
Multiply 1 digit numbers with up to 3 d.p. by whole numbers (e.g. 0.4 x 2 = 0.8)
Add and subtract some fractions mentally
Recall and use these fraction, decimal & percentages equivalents..

½ = 0.5 = 50%	¼ = 0.25 = 25%	¾ = 0.75 = 75%
1/5 = 0.2 = 20%	2/5 = 0.4 = 40%	4/5 = 0.8 = 80%
1/10 = 0.1 = 10%	1/100 = 0.1 = 1%	1/3 = 0.333 = 33.3%

PRIME NUMBERS!

Know there are 25 primes under 100

2 (1, 2)
3 (1, 3)
5 (1, 5)
7 (1, 7)
11(1, 11)
13 (1, 13)
17 (1, 17)
19 (1, 19)
23 (1, 23)
29 (1, 29)
31 (1, 31)
37 (1, 37)
41 (1, 41)

43 (1, 43)
47 (1, 47)
53 (1, 53)
59 (1, 59)
61 (1, 61)
67 (1, 67)
71 (1, 71)
73 (1, 73)
79 (1, 79)
83 (1, 83)
89 (1, 89)
97 (1, 97)

SQUARE NUMBERS!

| Squares of numbers	Corresponding squares of multiples of 10
1 x 1 = 1	10 x 10 = 100
2 x 2 = 4	20 x 20 = 400
3 x 3 = 9	30 x 30 = 900
4 x 4 = 16	40 x 40 = 1600
5 x 5 = 25	50 x 50 = 2500
6 x 6 = 36	60 x 60 = 3600
7 x 7 = 49	70 x 70 = 4900
8 x 8 = 64	80 x 80 = 6400
9 x 9 = 81	90 x 90 = 8100
10 x 10 = 100	100 x 100 = 10,000
11 x 11 = 121	110 x 110 = 12,100
12 x 12 = 144	120 x 120 = 14,400

HOME LEARNING

Mathletics
Hegarty Maths
Practice SATs Papers and CPG books

VOCABULARY

Brackets: ( ) Symbols used in pairs to group things together.

Difference: The answer when you subtract one number from the other.

Indices: A number multiplied by itself. The smaller number, floating in the air, tells you how many time it's been multiplied by itself. The singular of indices is index.

$$\text{exponent} \atop \text{(or index, or power)}} \searrow 8^2 \atop \text{base} \nearrow$$
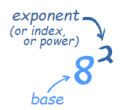
sequence your working out so you solve for one part of the question each time. Equal signs are lined up and the final line should arrive at your final answer. Both examples of BIDMAS (to the right) show layered answers.

Order of Operations: The rules that say which calculation comes first in a question. Orders tell us to follow BIDMAS.

Product: The answer when you multiply numbers together.

Quotient: The answer when you divide one number by another.

Sum: The answer when you add numbers together.

BIDMAS METHOD YEAR 6

Order of Operations

MAIN IDEA

There is a particular order mathematician's follow when a number sentence has more than one operation in it. **BIDMAS** is an acronym for **Brackets**, **Indices**, **Division**, **Multiplication**, **Addition** and **Subtraction**. However, Multiplication and Division as well as Addition and Subtraction are solved in the order in which they appear in a question. For example, **6 x 2 ÷ 4** even though BIDMAS tells us we should divide first, multiplication appears first in the question. So, we find the **product** of 6 and 2 before dividing by 4. Some teachers call it **BODMAS** or **BEDMAS**—**Orders** and **Exponents** mean the same thing as **Indices** so the order of operations is still the same (just called a different name!). Although many of us can do the questions in our heads, it's better form to 'layer' the question as it's more mathematically accurate and it will help you prepare for secondary school algebra.

Different examples of BIDMAS questions

Remember!

Indices mean a number multiplied by itself. So, in this example, 6^3 is 6 multiplied by 6, three times. You can layer indices questions like BIDMAS questions. Note, the jotting of 36 x 6 as I couldn't do it in my head.

VOCABULARY

Common denominator: A multiple that both denominators share. Sometimes they need to be created by multiplying the bottom and top by the same number.

Denominator: The bottom number in a fraction. It shows how many equal parts that the item has been divided into.

Improper fraction : A fraction where the numerator is greater than the denominator. It has a value greater than 1 i.e. 5/4

Multiple: A number that can be divided by another number a certain number of times without a remainder.

Mixed fraction - A number that is made up of a whole number plus a fraction.

Numerator: The top number in a fraction. It shows how many of the equal part someone has.

Ratio: A relationship between two numbers that keeps their proportion the same.

Vinculum: The horizontal line draw between the numerator and denominator.

MAIN IDEA

Remember, when adding fractions, we only ever add the **numerators** together and never the **denominators**. We always need to make sure the denominators are the same so that we can easily combine the different amounts. Sometimes the denominators are different and we have to find a denominator that they both fit into. It is almost always easier to find a larger common **multiple** by using multiplication, rather than dividing into a smaller denominator. In some questions, one of the denominators fits into the other so you only have to change one set of fractions. Other times, they don't easily fit into each other and you have to find a multiple they both fit into. Knowing your times tables is key! Don't forget, whatever you multiply the denominator by, you must also multiply the numerator by the same amount to keep the **ratio** the same.

Adding fractions with denominators that are multiples

$$1\frac{2}{5} + \frac{7}{10}$$

$$\frac{7}{5} + \frac{7}{10}$$

$$\frac{14}{10} + \frac{7}{10}$$

improper fraction

$$\frac{14}{10} + \frac{7}{10} = \frac{28}{10} = 2\frac{8}{10}$$

Remember:

$$2\frac{2}{5} \quad + \quad \frac{12}{5} = 2\frac{2}{5}$$

$(2 \times 5 + 2)$

two whole fives fit in 12, with a remainder of 2

Adding fractions with different denominators

$$1\frac{2}{3} + \frac{3}{4}$$

$$\frac{5}{3} + \frac{3}{4}$$

x4 ⟲ x3

$$\frac{20}{12} + \frac{9}{12}$$

improper fraction

$$\frac{20}{12} + \frac{9}{12} = \frac{29}{12} = 2\frac{5}{12}$$

VOCABULARY

Common denominator: A multiple that both denominators share. Sometimes they need to be create by multiplying the bottom and top by the same number.

Denominator: The bottom number in a fraction. It shows how many equal parts that the item has been divided into.

Improper fraction : A fraction where the numerator is greater than the denominator. It has a value greater than 1 i.e. 5/4

Multiple: A number that can be divided by another number a certain number of times without a remainder.

Mixed fraction - A number that is made up of a whole number plus a fraction.

Numerator: The top number in a fraction. It shows how many of the equal part someone has.

Ratio: A relationship between two numbers that keeps their proportion the same.

Vinculum: The horizontal line draw between the numerator and denominator.

SUBTRACTING FRACTIONS METHOD MAT YEAR

MAIN IDEA

Remember, when subtracting fractions, we only ever subtract the **numerators** and never the **denominators**. We always need to make sure the denominators are the same so that we can easily take one amount away from the other. If the denominators are different, we have to find a denominator that they both fit into. Sometimes one of the denominators fits into but other times you have to find a **multiple** they both fit into. Knowing your times tables is key! It is almost always easier to find a larger common multiple by using multiplication, rather than dividing into a smaller denominator. Don't forget, whatever you multiply the denominator by, you must also multiply the numerator by the same amount to keep the **ratio** the same.

Subtracting fractions with denominators that are multiples

Remember:

Subtracting fractions with different

VOCABULARY

Denominator: The bottom number in a fraction. It shows how many equal parts that the item has been divided into.

Fraction: A part of a whole. A common fraction is made up of a numerator and a denominator.

Improper fraction : A fraction where the numerator is greater than the denominator. It has a value greater than 1 i.e. 5/4

Mixed fraction - A number that is made up of a whole number plus a fraction.

Numerator: The top number in a fraction. It shows how many of the equal part someone has.

Of: It means multiplication in mathematics.

Vinculum: The horizontal line drawn between the numerator and denominator.

Whole number: A counting number which is complete and not including any fractions of amount i.e. 2 is a whole number, 2.3 is not.

MULTIPLYING FRACTIONS METHOD MAT YEAR 6

MAIN IDEA

Multiplication is the most straightforward operation when working with fractions. Once they've been lined up, you can really simply 'multiply across' with no conversions necessary. Remember, every whole number has a secret $\frac{1}{1}$ hiding under it. This will help you when multiplying a fraction to a whole number. There are three difficulty levels of multiplying fractions. See all below.

A fraction multiplied by a fraction

$$\frac{2}{5} \times \frac{4}{6}$$

proper fraction so leave it as is

$$\frac{2}{5} \times \frac{4}{6} = \frac{8}{30}$$

A fraction multiplied by a whole number

$$\frac{2}{5} \times 4$$

$$\frac{2}{5} \times \frac{4}{1}$$

improper fraction

$$\frac{2}{5} \times \frac{4}{1} = \frac{8}{5} = 1\frac{3}{5}$$

A mixed fraction multiplied by a fraction

$$2\frac{2}{5} \times \frac{2}{3}$$

improper fraction

$$\frac{12}{5} \times \frac{2}{3} = \frac{24}{15} = 1\frac{9}{15}$$

Remember:

$$x \ 2\frac{2}{5} \ +$$

(2 x 5 + 2)

$$\div \frac{12}{5} = 2\frac{2}{5}$$

two whole fives fit in 12, with a remainder of 2

Steps to Success

A fraction multiplied by a fraction

1) Write the calculation.

2) Multiply straight across (numerator x numerator, denominator x denominator) to get your final answer.

3) If the answer is an improper fraction, turn it back into a mixed.

A mixed fraction multiplied by a fraction

1) Write the calculation.

2) Convert the mixed fraction into an improper one (look at the remember box for help).

3) Multiply straight across (numerator x numerator, denominator x denominator) to get your final answer.

4) If your answer is an improper fraction, convert it back to a mixed fraction.

A fraction multiplied by a whole number

1) Write the calculation.

VOCABULARY

Denominator: The bottom number in a fraction. It shows how many equal parts that the item has been divided into.

Improper fraction: A fraction where the numerator is greater than the denominator. It has a value greater than 1 i.e. 5/4

Mixed fraction - A number that is made up of a whole number plus a fraction.

Numerator: The top number in a fraction. It shows how many of the equal part someone has.

Reciprocal: The flipped inverse of the original fraction so that when both are multiplied together, they equal 1. i.e. 3/2 is the reciprocal of 2/3.

Unit fraction: A fraction with a numerator of 1.

Vinculum: The horizontal line drawn between the numerator and denominator.

Whole number: A counting number which is complete and not including any fractions of amount i.e. 2 is a whole number, 2.3 is not.

DIVIDING FRACTIONS METHOD MAT YEAR 6

MAIN IDEA

Dividing fractions is very similar to multiplying fractions. In fact, we cannot divide fractions without multiplying them! In Year 6, we divide a fraction by a whole number. Don't forget that any whole number is $\frac{}{1}$ and the reciprocal is the flipped, upside-down version of a fraction. When we flip the fraction into the reciprocal, we also flip the sign into multiplication. Then, we just multiply across!

A fraction multiplied by a whole number

$$\frac{2}{5} \div 3$$

$$\frac{2}{5} \div \frac{3}{1}$$

$$\frac{2}{5} \times \frac{1}{3} \quad \text{(reciprocal)}$$

$$\frac{2}{5} \times \frac{1}{3} = \frac{2}{15}$$

A mixed fraction multiplied by a fraction

$$2\frac{2}{5} \div 3$$

$$\frac{12}{5} \div \frac{3}{1}$$

$$\frac{12}{5} \times \frac{1}{3} \quad \text{(reciprocal)}$$

$$\frac{12}{5} \times \frac{1}{3} = \frac{12}{15}$$

Remember:

$$2\frac{2}{5} \qquad +$$

$$(2 \times 5 + 2)$$

Steps to Success

A fraction divided by a whole number

1) Write the calculation.

2) Make the whole number a fraction over 1.

3) Flip the newly created fraction into it's **reciprocal**. This creates a **unit fraction**.

4) When you flip into the reciprocal, also flip the division sign into its inverse, multiplication.

5) Multiply straight across (numerator x numerator, denominator x denominator) to get your final answer.

A mixed fraction divided by a whole number

1) Write the calculation.

2) Convert the mixed fraction into an improper one (look at the 'Remember' box for help).

3) Make the whole number a fraction over 1.

3) Flip the newly created fraction into it's **reciprocal**. This creates a **unit fraction**.

PERCENTAGE METHOD MAT UKS2

Partitioning Percent for Understanding

Columnar addition: To add vertically, in columns, by lining up the place value columns.

Decimal: The full stop included in a non-whole number i.e. 9.4 -> . the decimal.

Double/Doubling: To multiply a number by two; to have two groups of the same amount.

Grand total: A final total reached by adding together other total amounts.

Half/Halving: To divide a number by two.

Partition: Breaking a multi-digit number into its place value columns.

Percent: The literal definition means 'out of 100'. A process that works with numbers so they are out of 100 and can be compared.

Powers of 10: Numbers that can be formed by multiplying 10 by itself. 10, 100, 1000, 10 000 are examples. When multiplying or dividing by a **power of 10**, you can shift the decimal rather than calculate a total.

MAIN IDEA

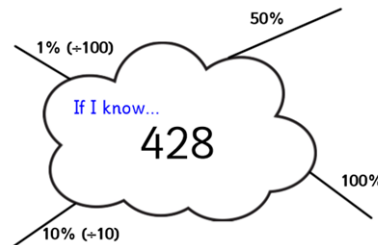We can make percentages from any numbers. Just by looking at a number, you can see what 100%, 50%, 10% and 1% of a number are. Once you know those, you can easily unlock any percentage. We use powers of ten and a combination of multiplication and addition to help us work out any percent.

Remember this cloud:

$$23\% \text{ of } 428 =$$

10% x 2   1% x 3

$$10\% = 42.8 \times 2$$
$$20\% = \boxed{85.6}$$

$$1\% = 4.28 \times 3$$
$$3\% = \boxed{12.84}$$

$$85.60$$
$$+12.84$$
$$23\% = 98.44$$

1) Remember your percentage cloud and the percents you can find just by looking.

2) Write the calculation and partition the percent into tens and ones.

3) Write the number sentence under each partitioned number to help you get the correct final percent.

4) Find 10% (divide by 10) and multiply it by the partitioned tens. Box up the answer and label it the new percentage.

5) Find 1% (divide by 100) and multiply it by the partitioned ones. Box up the answer and label it the new percentage.

6) Use columnar addition to add the two boxed-up percentages together, making sure to line up the decimals. Use zeros as place holders, if needed.

7) The sum is the percent you were asked to find.

Note: Here, we found 10% and

VOCABULARY

Decimal: The full stop included in a non-whole number i.e. 9.4 -> **.** is the decimal.

Of: It means multiplication in mathematics.

Percent: The literal definition means 'out of 100'. A process that works with numbers so they are out of 100 and can be compared.

Powers of 10: Numbers that can be formed by multiplying 10 by itself. 10, 100, 1000, 10 000 are all examples. When multiplying or dividing by a **power of 10**, you can shift the decimal rather than calculate a total.

Product: What the answer is called when you multiply numbers together. i.e. 6 x 2 = 12 (12 is the product).

Whole number: A counting number which is complete and not including any fractions of amount i.e. 2 is a whole number, 2.3 is not.

Efficient Percent Calculation

MAIN IDEA

Now we know percent is out of 100, we can use this quick and efficient method of calculating percentages. We can also use our knowledge of Powers of Ten to quickly divide the number to make it 'out of 100.'

Quick Cuts

Some percentages of amount we can do mentally.

Remember these shortcuts to help.

1% = divide by 100

2% = double 1% of a number

10% = divide by 10

20% = double 10% of a number

50% = divide by 2 (half the number)

25% = half the number and half it again (divide by 4) i.e. 25% of 48, half of 48 = 24, half of 24 = 12.

Method

$$23\% \text{ of } 428 =$$

$$\frac{23 \cancel{\%} \times 428}{100} =$$

$$\frac{23}{100} = 0.23$$

```
      1 2
    4 2 8
  x 0.2 3
  1 2¹8 4
+ 8 5 6 0
  9 8.4 4
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Steps to Success

1) Write out the calculation.

2) Recall percent means, 'out of 100' so scribble out the % sign and make the number a fraction out of 100.

3) Divide the number by 100 (in the Powers of 10 method).

4) Remember 'of' in numeracy means multiplication. Change the 'of' to a multiplication sign.

5) Multiply the new, decimal number and the number from the question, remembering to put the whole number on top of the decimal.

NOTE—do not line up the decimal places in multiplication.

6) The product is the percent you were asked to find.