

# Maths Knowledge Organiser

## Year 8 Number



### Calculations and properties of numbers

#### Rounding

0-4 round down  $45\underline{2}$  to nearest 10 = 450  
 5-9 round up  $375\underline{6}4$  to nearest 100 = 37600  
 $4.\underline{8}93$  to nearest whole = 5

#### Adding/subtract decimals

Line up the decimal  $56.9 + 3.88 = 60.78$

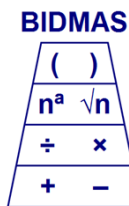
$$\begin{array}{r} 56.90 \\ + 3.88 \\ \hline 60.78 \end{array}$$

Same with subtraction  $65 - 3.2 = 61.8$

$$\begin{array}{r} 65.0 \\ - 3.2 \\ \hline 61.8 \end{array}$$

#### BIDMAS

We have to calculate sums in the correct order, following BIDMAS



$(15 - 3 \times 2^2) + 7$   
 $(15 - 3 \times 4) + 7$   
 $(15 - 12) + 7$   
 $(3) + 7$   
 10

#### Powers

$4^2$  means  $4 \times 4$   
 $5^3$  means  $5 \times 5 \times 5$   
 So  $7^2 = 49$  meaning  $\sqrt{49} = 7$   
 So  $5^3 = 125$  meaning  $\sqrt[3]{125} = 5$

We can simply powers  
 Multiplying add powers  
 $\rightarrow 4^5 \times 4^3 = 4^8$   
 Dividing subtract powers  
 $\rightarrow 7^{11} \div 7^4 = 7^7$   
 Brackets multiply powers  
 $\rightarrow (4^8)^3 = 4^{24}$

#### Negative numbers

Adding a negative  $\rightarrow$  Subtract  
 Subtracting a negative  $\rightarrow$  Add  
 Multiplying/dividing a positive and negative number  $\rightarrow$  negative answer  
 Multiplying/dividing a negative and negative number  $\rightarrow$  positive answer

#### Multiplying numbers

Use long multiplication or grid method  $127 \times 34$

Long multiplication:

$$\begin{array}{r} 127 \\ \times 34 \\ \hline 508 \\ 3810 \\ \hline 4318 \end{array}$$

Don't forget the red zero

Grid method

|    |      |     |     |      |
|----|------|-----|-----|------|
| x  | 100  | 20  | 7   |      |
| 30 | 3000 | 600 | 210 | 3810 |
| 4  | 400  | 80  | 28  | 508  |
|    |      |     |     | 4318 |

Split number up and multiply to add totals

#### Multiples

Are essentially the numbers times tables  
 Multiples of 7 are 7,14,21,28,35,42,...

#### Factors

Are numbers that divide exactly into another. They generally come in pairs.  
 Factors of 20 are 1,20,2,10,4 and 5.

#### Highest common factors (HCF)

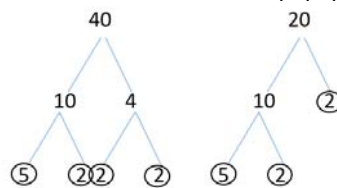
Is the largest same factor of more than one number. The HCF of 25 and 30 is 5.

#### Lowest common multiple (LCM)

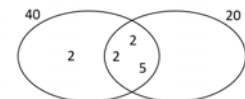
The smallest number in more than one numbers times table. The LCM of 4 and 6 is 12

#### Prime factors, HCF/LCM

Split a number into any 2 numbers which make number above, circle prime numbers  
 Prime numbers – 2,3,5,7,11,13,17,19,23,29...



$40 = 2^3 \times 5$       $20 = 2^2 \times 5$



HCF = middle  
 $2 \times 2 \times 5 = 20$   
 LCM = All numbers  
 $2 \times 2 \times 2 \times 5 = 40$

# Maths Knowledge Organiser

## Year 8 Number

Fractions decimals and percentages



### Multiplying decimals

Ignore decimal then return it into answer

$$3.2 \times 4.12 \rightarrow 32 \times 412 = 13184$$

$$3.2 \times 4.12 = 13.184$$

### Ordering decimals

Ensure you use zero place holders

$$0.5 \quad 0.05 \quad 0.005$$

$$0.500 \quad 0.050 \quad 0.005$$

In order  $\rightarrow$  0.005, 0.05, 0.5

### Simplifying fractions

Pick a common factor and divide

$$\frac{45}{60} \rightarrow \div 5 \rightarrow \frac{9}{12} \rightarrow \div 3 \rightarrow \frac{3}{4}$$

### Fraction to decimals

$$\frac{5}{8} \rightarrow 5 \div 8 \rightarrow 8 \overline{) 5.000} \rightarrow 0.625$$

### Fraction of an amount

Divide by the denominator and multiply by the numerator

$$\frac{2}{5} \text{ of } 65 \rightarrow 65 \div 5 = 13 \rightarrow 13 \times 2 = 26$$

### Mixed number $\leftrightarrow$ improper fractions

$$2\frac{3}{5} = \frac{2 \times 5 + 3}{5} = \frac{13}{5}$$

$\frac{44}{3}$  how many 3's go into 44? 14

$$\text{So } \frac{44}{3} = 4\frac{2}{3}$$

### Writing fractions and percentages

10 tokens in a bag, 4 are red.

$$\text{Fractions red} \rightarrow \frac{4}{10} = \frac{2}{5}$$

$$\text{Percentage red} \rightarrow \frac{2}{5} = \frac{40}{100} = 40\%$$

### Dividing decimals

Ensure you are dividing by a whole number and use the bus stop method

$$3.8 \div 0.8 \rightarrow \times \text{ both number by } 10 \rightarrow 38 \div 8$$

$$8 \overline{) 38.00} \begin{array}{l} 04 \cdot 75 \\ \underline{32} \phantom{00} \\ 60 \phantom{0} \\ \underline{56} \phantom{0} \\ 40 \end{array}$$

### Rounding

$$4.8\text{B} \text{ to one decimal place} = 4.8$$

$$0.56\text{Z} \text{ to two decimal places} = 0.57$$

$$1.999\text{8} \text{ to three decimal places} = 2.000$$

Significant figures – non zero digits

$$0.030\text{Z} \text{ to one significant figure} = 0.03$$

$$0.030\text{7} \text{ to two significant figures} = 0.31$$

### Ordering and comparing fractions

Make denominator the same

$$\frac{1}{3} \frac{2}{5} \frac{1}{10} \rightarrow \frac{10}{30} \frac{12}{30} \frac{3}{30} \text{ In order } \frac{1}{10} \frac{1}{3} \frac{2}{5}$$

### Adding and subtract fractions

Make denominator the same

$$\frac{4}{5} + \frac{2}{3} = \frac{12}{15} + \frac{10}{15} = \frac{22}{15} = 1\frac{7}{15}$$

### Multiplying and dividing fractions

When dividing, flip second fractions and multiply

To multiply just multiply top and bottom numbers

$$\frac{2}{3} \div \frac{1}{5} = \frac{2}{3} \times \frac{5}{1} = \frac{10}{3} = 3\frac{1}{3}$$

### Fraction, decimals and percentages

$$32\% \rightarrow \frac{32}{100} \rightarrow \frac{8}{25}$$

$$\frac{5}{8} \rightarrow 5 \div 8 \rightarrow 8 \overline{) 5.000} \rightarrow 0.625$$

$$32\% \rightarrow 32 \div 100 = 0.32$$

$$0.6 \rightarrow 0.6 \times 100 = 60\%$$

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## Year 8 Number



### Percentages

#### Percentage of an amount

$$10\% \rightarrow \div 10$$

$$1\% \rightarrow \div 100$$

$$34\% \text{ of } 120$$

$$10\% = 12$$

$$10\% = 12$$

$$10\% = 12$$

$$1\% = 1.2$$

$$1\% = 1.2$$

$$1\% = 1.2$$

$$1\% = 1.2$$

$$34\% = 40.8$$

To increase/decrease work it out then add/subtract it from original amount.

#### Standard form

A scientific way of writing large/small numbers  $a \times 10^b$

$$450200 = 4.502 \times 10^5$$

To the power of 5 as there are 5 numbers after the first

$$0.00507 = 5.07 \times 10^{-3}$$

To the power of -3 as there are 3 zeros at the start

#### Calculate with standard form

Simply turn back into normal numbers, calculate and turn back

#### Estimation

Round all number to 1 decimal place and calculate

$$\frac{345 \times 82}{0.56} \rightarrow \frac{300 \times 80}{0.5} \rightarrow \frac{24000}{0.5} \rightarrow 48000$$

#### Reciprocals

The reciprocal of a number is what you need to multiply it by to get 1, or you flip the

$$\text{number } 5 \rightarrow \frac{1}{5} \quad \frac{2}{3} \rightarrow \frac{3}{2} \quad 2.4 = 2\frac{2}{5} = \frac{12}{5} \rightarrow \frac{5}{12}$$

#### Percentage multipliers

Calculate the percentage and divide by 100

To find 45%  $\rightarrow$  **1.45**

To increase by 9%  $\rightarrow 100+9 = 109 \rightarrow$  **1.09**

To decrease by 14.5%  $\rightarrow 100-14.5 = 85.5 \rightarrow$  **0.855**

#### Repeat percentage change

Change percentage to decimal and multiply

Increase 450 by 30% then decrease by 12%

$$130\% \rightarrow 1.3 \quad 88 \rightarrow 0.88$$

$$450 \times 1.3 \times 0.88 = 514.8$$

#### Compound interest

Is the same as repeat percentage but there is a shortcut. I invest £4000 in bank account which earns 4% interest for 7 years.

$$4000 \times 1.04^7 = \mathbf{5263.73}$$

#### Reverse percentages

We divide by the multiplier.

An object has increased in size by 7% to 53.5kg

$$53.5 \div 1.07 = \mathbf{50kg}$$

#### Percentage change

$$\frac{\text{difference}}{\text{original}} \times 100$$

This is the same for percentage profit and loss

#### Recognising terminating and recurring decimals

If the denominator is written as a product of prime factors and only includes 2s and 5s, its terminating.

$$\begin{array}{r}
 127 \\
 \times 34 \\
 \hline
 508 \\
 3810 \\
 \hline
 4318
 \end{array}$$

|    |      |     |     |      |
|----|------|-----|-----|------|
| x  | 100  | 20  | 7   |      |
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