Knowledge Organiser: Year 9 Maths; Decimals and Place Value (Part 1)

Rounding Numbers

You need to be able to use 3 different rounding methods.
We'll do decimal places first, but there's the same basic idea behind all three.

Decimal Places (d.p.)

To round to a given number of decimal places:

If you're rounding to 2 d.p. the last digit is the second digit after the decimal point.

1. Identify the position of the 'last digit' from the number of decimal places.
2. Then look at the next digit to the right — called the decider.
3. If the decider is 5 or more, then round up the last digit.
   If the decider is 4 or less, then leave the last digit as it is.
4. There must be no more digits after the last digit (not even zeros).

EXAMPLE: What is 21.84 correct to 1 decimal place?

21.84 = 21.8

LAST DIGIT to be written (1st decimal place because we're rounding to 1 d.p.)

DECIDER

The LAST DIGIT stays the same because the DECIDER is 4 or less.

EXAMPLE: What is 39.7392739 to 2 decimal places?

39.7392739 = 39.74

LAST DIGIT to be written (2nd decimal place because we're rounding to 2 d.p.)

DECIDER

The LAST DIGIT rounds UP because the DECIDER is 5 or more.

Watch Out for Pesky Nines

If you have to round up a 9 (to 10), replace the 9 with 0, and add 1 to digit on the left.

EXAMPLE: Round 48.897 to 2.d.p:

48.897 → 48.990 → 48.90 to 2 d.p.

LAST DIGIT

DECIDER

The question asks for 2 d.p. so you must put 48.90 not 48.9.

Ordering Decimals

1) Do the whole number bit first, then the bit after the decimal point.
2) With numbers between 0 and 1, first group them by the number of 0s at the start. The group with the most 0s at the start comes first.

EXAMPLE: Write these numbers in order, from smallest to largest:

11.9 13.56 7.143 11.6 7.7 2.6 8.91

1) First order them by the whole number bit from smallest to largest.

2.6 7.143 7.7 8.91 11.9 11.6 13.56

2) If two numbers have the same whole number bit, then order them by the size of the decimal.

2.6 7.143 7.7 8.91 11.6 11.9 13.56

In decimals, like in whole numbers, the value of the digits decreases from left to right.

0.256

tenths hundredths thousandths

EXAMPLE: Write these numbers in order, from smallest to largest:

0.1 0.022 0.53 0.0011 0.027 0.023 0.0023

1) These are all between 0 and 1, so group them by the number of 0s at the start:

2 initial 0s: 0.0011 0.0023
1 initial 0: 0.022 0.027 0.023
no initial 0s: 0.1 0.53

2) Once they're in groups, just order them by comparing the first non-zero digits.
(If the first non-zero digits are the same, look at the next digit along instead.)

0.0011 0.0023 0.022 0.023 0.027 0.1 0.53

Multiplying by 10, 100, etc.

This stuff is easy peasy — I'm sure you'll have no problem flying through this page.

1) To Multiply Any Number by 10

Move the decimal point ONE place BIGGER and if it's needed, ADD A ZERO on the end.

E.g. 1.6 × 10 = 16
6213 × 10 = 62130
672.12 × 10 = 6721.2

2) To Multiply Any Number by 100

Move the decimal point TWO places BIGGER and ADD ZEROS if necessary.

E.g. 3.5 × 100 = 350
78 × 100 = 7800
3.7734 × 100 = 377.34

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Dividing by 10, 100, etc.

This is pretty easy stuff too. Just make sure you know it — that's all.

1) To Divide Any Number by 10

Move the decimal point ONE place SMALLER and if it's needed, REMOVE ZEROS after the decimal point.

E.g. $32.2 \div 10 = 3.22$

$6541 \div 10 = 654.1$

$4200 \div 10 = 420.\not{0} = 420$

2) To Divide Any Number by 100

Move the decimal point TWO places SMALLER and REMOVE ZEROS after the decimal point.

E.g. $333.8 \div 100 = 3.338$

$160 \div 100 = 1.6\not{0} = 1.6$

$1729 \div 100 = 17.29$

Multiplying Decimals

1) Start by ignoring the decimal points. Do the multiplication using whole numbers.
2) Count the total number of digits after the decimal points in the original numbers.
3) Make the answer have the same number of decimal places.

EXAMPLE: Work out 3.2×1.8 This is worked out on page 7.

1) Do the whole-number multiplication: $32 \times 18 = 576$
2) Count the digits after the decimal points: 3.2 × 1.8 has 2 digits after the decimal points — so will the answer.
3) Give the answer the same number of decimal places: $3.2 \times 1.8 = 5.76$

Standard Form

Standard form (or 'standard index form') is useful for writing very big or very small numbers in a more convenient way. A number written in standard form must always be in exactly this form:

$$A \times 10^n$$

This number must always be between 1 and 10. (The fancy way of saying this is $1 \leq A < 10$)

This number is just the number of places the decimal point moves.

Standard horse

Three Rules for Standard Form

1) The front number must always be between 1 and 10.
2) The power of 10, n, is how far the decimal point moves.
3) n is positive for BIG numbers, n is negative for SMALL numbers.
(This is much better than rules based on which way the decimal point moves.)

Three Important Examples

1 Express 259 000 in standard form.

1) Move the decimal point until 259 000 becomes 2.59 ($1 \leq A < 10$).
2) The decimal point has moved 5 places so n = 5, giving: 10^5.
3) 259 000 is a big number so n is +5, not −5.

2.59000 = 2.59×10^5

2 Express 0.00335 in standard form.

1) The decimal point must move 3 places to give 3.35 ($1 \leq A < 10$). So the power of 10 is 3.
2) Since 0.00335 is a small number it must be 10^{-3}, not 10^{+3}.

0.00335 = 3.35×10^{-3}

3 Write these numbers in order from smallest to largest:

2.25×10^4 7.98×10^{-4} 6880 3.12×10^4 6.75×10^3 0.000134

1) First convert all the numbers into standard form.
$6880 = 6.88 \times 10^3$ $0.000134 = 1.34 \times 10^{-4}$
2) Now group the numbers with the same power together and order them based on the power.
7.98×10^{-4} 1.34×10^{-4} 6.88×10^3 6.75×10^3 2.25×10^4 3.12×10^4

Rounding Errors and Estimating

"Estimate" doesn't mean "take a wild guess", so don't just make something up...

If you're given a rounded value and asked to find a range of values that the actual value could have been, remember:

Whenever a value is rounded to a given unit the actual value can be up to HALF THE ROUNDING UNIT bigger or smaller.

EXAMPLE: Between which two values could these rounded values lie?

		Half the rounding unit	Smallest value	Biggest value
a)	70 to the nearest 10	10 ÷ 2 = 5	70 − 5 = 65	70 + 5 = 75
b)	1100 to the nearest 100	100 ÷ 2 = 50	1100 − 50 = 1050	1100 + 50 = 1150
c)	9.2 to 1 d.p.	0.1 ÷ 2 = 0.05	9.2 − 0.05 = 9.15	9.2 + 0.05 = 9.25
d)	99 to 2 s.f.	1 ÷ 2 = 0.5	99 − 0.5 = 98.5	99 + 0.5 = 99.5
e)	1.14 to 3 s.f.	0.01 ÷ 2 = 0.005	1.14 − 0.005 = 1.135	1.14 + 0.005 = 1.145

The biggest value doesn't actually round to the rounded value (it rounds up) — it's called the upper limit. You can show this if you give the range of values as an inequality (see p37). E.g. in part c) above the range of the possible x values would be $9.15 \leq x < 9.25$.

Estimating

When you're estimating just follow this simple rule:

1 significant figure is usually easiest.

Round everything off to nice convenient numbers and then work out the answer.

EXAMPLE: Estimate the value of $\frac{63.26 \times 13.12}{16.9}$.

Round each number to 1 s.f and do the calculation with the rounded numbers.

$$\frac{63.26 \times 13.12}{16.9} \approx \frac{60 \times 10}{20} = \frac{600}{20} = 30$$

$\approx$ means 'approximately equal to'.

How do we use Knowledge Organisers in Mathematics?

How can you use knowledge organisers at home to help us?

- **Retrieval Practice:** Read over a section of the knowledge organiser, cover it up and then write down everything you can remember. Repeat until you remember everything.
- **Flash Cards:** Using the Knowledge Organisers to help on one side of a piece of paper write a question, on the other side write an answer. Ask someone to test you by asking a question and seeing if you know the answer.
- **Mind Maps:** Turn the information from the knowledge organiser into a mind map. Then reread the mind map and on a piece of paper half the size try and recreate the key phrases of the mind map from memory.
- **Sketch it:** Draw an image to represent each fact; this can be done in isolation or as part of the mind map/flash card.
- **Teach it:** Teach someone the information on your knowledge organiser, let them ask you questions and see if you know the answers.

How will we use knowledge organisers in Mathematics?

Knowledge organisers will be used before I complete a Learning Check or Common Assessment. I will spend part of the lesson looking over each of the key topics of the half term before completing the Learning Check or Common Assessment.
I will also use these at home to complete my own independent learning and revision of these key topics.

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