

Essential Skills: Numeracy

Rounding Off

Suppose you have two paint suppliers whose prices you want to compare.

One sells a 5 litre can of paint for £7.99 and the other a 7.5 litre tin of the same stuff for £10.49

Which offers the better buy?

You could find the answer in several ways, but one way would be to find the cost per litre for each tin: divide the cost by the number of litres

$$\text{Tin A: } 7.99 \div 5 = 1.598$$

$$\text{Tin B: } 10.49 \div 7.5 = 1.3986666667$$

Tin A thus costs nearly £1.60 per litre and tin B £1.40 per litre, so tin B is the better buy, all else being equal.

What we have done here is rounded off our calculator display to the nearest penny. Rounding off is a very important skill and it has to be done properly.

When you round off a number, you **do not change its size**.
You simply **show less detail**.

In the next examples we will be rounding off to the nearest whole number, or the nearest ten, or the nearest hundred and so on. We will be rounding to one significant figure, this being shown by the first digit from the left.

Example 1.2a

Round off the number 6.8 to one significant figure.

[This means round it off to the nearest whole number, because the first digit is the 6, which is in the units' column.]

Solution:

The number 6.8 means '6 and a bit' and the problem is to decide if the 'bit' is big enough to push the number up to the next whole number (=7), or if the 'bit' isn't big enough and we have to leave it at 6

Half-way between 6 and 7 is 6.5, and 6.8 is clearly beyond that.

So the answer is 7

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Example 1.2b

Round off the number 83 to one significant figure.

[This means round it off to the nearest ten, because the first digit is the 8, which is in the tens column.]

Solution:

The number 83 means '80 and a bit', so is the 'bit' big enough to push us towards the next ten up (=90), or is it too small and will leave us on 80?

Half-way between 80 and 90 is 85, and 83 is below this half-way point, so the answer is 80

Example 1.2c

Round off the number 2,346 to one significant figure.

[This means round it off to the nearest thousand, because the first digit is the 2 which is in the thousands column.]

Solution:

The number 2,346 means 'two thousand and a bit'. Half-way between 2,000 and the next thousand up (3,000) is 2,500

2,346 does not reach 2,500, so the answer remains at 2,000

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1.2 Exercise

1. Round off these numbers to the nearest whole number:

(a) 4.7 (b) 6.9 (c) 8.6 (d) 3.12

2. Round these off to the nearest ten:

(a) 41 (b) 28 (c) 73 (d) 58.7

3. Round these off to the nearest hundred:

(a) 327 (b) 806 (c) 386 (d) 893.123

4. Round these off to the nearest thousand:

(a) 3,842 (b) 6,503 (c) 9,670 (d) 14,312

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Rounding off to n decimal places

Sometimes the answer to a division calculation is exact, and this is always true if you are dividing by 2, 4, 8, 16, etc., or by 5, 10, 20, and by some other numbers. Sometimes we are just lucky!

e.g.

$$75 \div 4 = 18.75 \text{ exactly}$$

$$87.3 \div 16 = 5.45625 \text{ exactly}$$

$$197.3 \div 5 = 39.46 \text{ exactly}$$

$$854.34 \div 5.8 = 147.3 \text{ exactly}$$

But usually the answer goes on forever, for instance $158 \div 13 = 12.1538461...$
And this can go on forever so we would normally round off to a certain number of decimal places.

To count how many decimal places a number has, you count all the digits after the point:

e.g.

12.37 has 2 decimal places

0.0081 has 4 decimal places

5.873 has 3 decimal places

186 has none, since it is a whole number

To round off a number to a number of decimal places we use a similar procedure to the one illustrated in Examples 1.2a–1.2c, here shown in a shortened version...

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Example 1.2d

Round off the number 12.692 to 1 decimal place.

Solution:

- Step 1 Imagine a line drawn after the first decimal place 12.6|92
- Step 2 The digit after this line is a 9, which is MORE THAN 5
- Step 3 The digit BEFORE this line goes UP 1, making the answer 12.7

Example 1.2e

Round off 5.3748 to 2 decimal places.

Solution:

- Step 1 Imagine a line drawn after the second decimal place 5.37|48
- Step 2 The digit after this line is a 4, which is LESS THAN 5
- Step 3 The digit BEFORE this line stays UNCHANGED,
so the answer is 5.37

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Example 1.2f

Look at these and ask yourself why each one is correct.

12.483 to 2 d.p. becomes 12.48 0.0876 to 3 d.p. becomes 0.088

7.2789 to 1 d.p. becomes 7.3 5.699 to 2 d.p. becomes 5.70
(not 5.7 which has 1 d.p.)

3.85001 to 1 d.p. becomes 3.9 11.96 to 1 d.p. becomes 12.0 (not 12)

NB If the digit after 'the imaginary line' is EXACTLY 5 and no more, then the normal procedure is to proceed as if it were in fact more than 5. For example, to round 4.375 to 2 decimal places, since 4.375 is exactly half-way between 4.37 and 4.38 you technically have the choice of both options, but the accepted convention is to go for 4.38

Example 1.2g

Calculate $\frac{3}{7}$ of 312 metres, and round off the answer to 3 decimal places.

Solution:

The top number of the fraction multiplies, the bottom number of the fraction divides, so key in the following sequence:

$3 \times 312 \div 7 =$ and the display shows 133.71429 . . .

The cut-off is between the 4 and the 2. Since 2 is less than 5 the 4 stays.
Answer: 133.714 m

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1.2B Exercise

1. Round these off as required:

(a) 5.832 to 2 d.p.

(b) 0.0562 to 2 d.p.

(c) 13.9418 to 3 d.p.

(d) 2.9371 to 1 d.p.

(e) 6.9501 to 1 d.p.

(f) 0.8749 to 2 d.p.

(g) 187.64 to 0 d.p.

(h) 179.6050 to 1 d.p.

(i) 2.3991 to 2 d.p.

(j) 0.59999 to 3 d.p.

2. Calculate these, and round off each answer to 3 decimal places:

$\frac{3}{7}$ of £16.23

$\frac{5}{9}$ of 164 km

$\frac{11}{12}$ of 9.74 tonnes

$\frac{1}{3}$ of 2.96 litres