Check-Up

31

Simplifying ratios

a) A primary school has 405 pupils and 18 teachers. Fill in the missing numbers, without using a calculator: 'In this school there are __ pupils for every 2 teachers, which gives a pupil–teacher ratio (PTR) of __:1.'

b) Use a calculator to find, to one decimal place, the PTR in a school with 790 pupils and 38 teachers, writing the ratio in the form __:1.

c) In a year's Ofsted inspections of primary schools, the arrangements for professional development of staff in 17% of schools were judged to be unsatisfactory. What was the ratio of schools judged unsatisfactory to those judged satisfactory or better in this respect? Use a calculator to express the ratio in the form 1: __, to one decimal place.

Answers to check-up 31

a) 45 pupils for every 2 teachers, so the PTR = 22.5:1.

b) 20.8:1.

c) 17:83 = 1:4.9.

Discussion and explanation of check-up 31

The language and notation of ratios are simply an extension of the ideas of fractions and proportions. But instead of comparing a part with the whole (as in '4 out of 10 teachers attend school assemblies'), we are comparing one quantity or number with another (as in 'for every 4 teachers who attend school assemblies, there are 6 who do not'). In this last example, we could express the *ratio* of those who attend to those who do not attend as 4:6, which is read as 'four to six'. Ratios can be simplified in just the same way as fractions, by cancelling. So, for example 4:6 = 2:3.

Often, to get a feel for a ratio, it is useful to express it as 'one to something' or 'something to one'. So the ratio 2:3 might also be expressed as 1:1.5, meaning 'for every 1 who attends, 1.5 do not attend' or 'the number who do not attend is 1.5 times the number who do'.

In example (a) we have the ratio 405:18. Dividing both by 9, we get the equivalent ratio 45:2, which means '45 pupils for every 2 teachers'. Dividing the 45 by the 2 gives us the ratio as 22.5:1, which means '22.5 pupils per teacher'.

In example (b) we have the ratio 790:38. This does not cancel down easily to a much simpler equivalent form, so I would use a calculator to divide the 790 by 38 and express the ratio as 20.8:1. This means '20.8 pupils for every one teacher'. Of course, it does not mean that every teacher has 20.8 pupils in their class! But it does mean that (approximately) the number of pupils is 20.8 times the number of teachers.

In example (c) we have to compare the 17% judged unsatisfactory with the 83% (100% – 17%) judged satisfactory or better. The ratio is 17:83, meaning 'for every 17 unsatisfactory there were 83 satisfactory or better'. Because the 83 is the larger of the two numbers it makes more sense to divide the 83 by the 17, rather than the 17 by the 83, and thus to express the ratio as 'one to something'. The calculator gives me the ratio as 1:4.9, to one decimal place. This means 'the number of satisfactory or better was about 4.9 times the number of unsatisfactory'.

Summary of key ideas

◆   The language and notation of ratios are used to compare one quantity or number with another.

◆   The ratio 3:7 is read as 'three to seven'.

◆   To say that the ratio of boys to girls is 3:7 means 'for every 3 boys there are 7 girls'.

◆   Ratios can be simplified by cancelling (for example, 36:84 = 3:7, cancelling 12).

◆   Ratios are often expressed as 'one to something' or 'something to one' (for example, 3:7 is approximately 1:2.3 and 85:34 = 2.5:1).

Further practice

31.1 A secondary headteacher's salary is £42,000 and a newly-qualified teacher's salary is £17,500. What is the *difference* in their salaries? Without using a calculator, find and simplify the *ratio* of their salaries. Write this in the form 'something to one'. How much does the headteacher earn for every £1 that the NQT earns?

31.2 After a pay rise of 3.6%, the headteacher's salary is now £43,512 and the NQT's salary is £18,130. What is the difference in their salaries now? Use a calculator to express the ratio of their new salaries in the form 'something to one', to two decimal places.

31.3 After a further flat-rate salary increase of £500 per teacher, the headteacher's salary is increased to £44,012 and the NQT's to £18,630. Now what is the difference in their salaries? And what is the ratio?