3 Chapter Divisions, Percentage Calculations and Ratio Comparisons

CALCULATING DECIMAL VALUES FOR DIVISION QUESTIONS USING PERCENTAGE CALCULATIONS

I have chosen to club these two together because they are actually parallel to each other—in the sense that for any ratio we can calculate two values—the percentage value and the decimal value. The digits in the decimal value and the percentage value of any ratio would always be the same. Hence, calculating the percentage value of a ratio and the decimal value of the ratio would be the same thing.

How do you calculate the percentage value of a ratio?

PERCENTAGE RULE FOR CALCULATING PERCENTAGE VALUES THROUGH ADDITIONS

Illustrated below is a powerful method of calculating percentages. In my opinion, the ability to calculate percentage through this method depends on your ability to handle 2 digit additions. Unless you develop the skill to add 2 digit additions in your mind, you are always likely to face problems in calculating percentage through the method illustrated below. In fact, trying this method without being strong at 2-digit additions/subtractions (including 2 digits after decimal point) would prove to be a disadvantage in your attempt at calculating percentages fast.

This process, essentially being a commonsense process, is best illustrated through a few examples:

Example What is the percentage value of the ratio: 53/81?

Solution The process involves removing all the 100%, 50%, 10%, 1%, 0.1% and so forth of the denominator from the numerator.

Thus, 53/81 can be rewritten as: (40.5 + 12.5)/81 = 40.5/81 + 12.5/81 = 50% + 12.5/81

= 50% + (8.1 + 4.4)/81 = 50% + 10% + 4.4/81

= 60% + 4.4/81

At this stage you know that the answer to the question lies between 60 – 70% (Since 4.4 is less than 10% of 81)

At this stage, you know that the answer to the calculation will be in the form: 6*a*.*bcde* ….

All you need to do is find out the value of the missing digits.

In order to do this, calculate the percentage value of 4.4/81 through the normal process of multiplying the numerator by 100.

Thus the % value of $\frac{4.4}{81} = \frac{4.4 \times 100}{81} = \frac{440}{81}$

[Note: Use the multiplication by 100, once you have the 10% range. This step reduces the decimal calculations.]

Thus $\frac{440}{81}$ = 5% with a remainder of 35

Our answer is now refined to 65.*bcde*. (1% Range)

Next, in order to find the next digit (first one after the decimal) add a zero to the remainder;

Hence, the value of '*b*' will be the quotient of

b Æ 350/81 = 4 Remainder 26

Answer: 65.4*cde* (0.1% Range)

c Æ 260/81 = 3 Remainder 17

Answer: 65.43 (0.01% Range)

and so forth.

The advantages of this process are two fold:

(1) You only calculate as long as you need to in order to eliminate the options. Thus, in case there was only a single option between 60–70% in the above question, you could have stopped your calculations right there.

(2) This process allows you to go through with the calculations as long as you need to.

However, remember what I had advised you right at the start: Strong Addition skills are a primary requirement for using this method properly.

To illustrate another example:

What is the percentage value of the ratio $\frac{223}{72}$?

223/72 Æ 300 – 310% Remainder 7

700/72 Æ 9. Hence 309 – 310%, Remainder 52

520/72 Æ 7. Hence, 309.7, Remainder 16

160/72 Æ 2. Hence, 309.72 Remainder 16

Hence, 309.7222 (2 recurs since we enter an infinite loop of 160/72 calculations).

In my view, percentage rule (as I call it) is one of the best ways to calculate percentages since it gives you the flexibility to calculate the percentage value up to as many digits after decimals as you are required to and at the same time allows you to stop the moment you attain the required accuracy range.

Of course I hope you realize that when you get 53/81 = 65.43 % the decimal value of the same would be 0.6543 and for 223/72, the decimal value would be 3.097222.

The kind of exam that the CAT is, I do not think you would not need to calculate ratios beyond 2 digits divided by 2 digits. In other words, if you are trying to calculate 5372/8164, you can take an

approximation of this ratio as 53/81 and calculate the percentage value as shown in the process above. The accuracy in the calculation of 53/81 instead of 5372/8164 would be quite sufficient to answer questions on ratio values that the CAT may throw up in Quantitative Aptitude for even in Data Interpretation questions.

RATIO COMPARISONS

CALCULATION METHODS related to RATIOS

(A) Calculation methods for Ratio comparisons:

There could be four broad cases when you might be required to do ratio comparisons:

The table below clearly illustrates these:

	Numerator	*Denominator*	*Ratio*	*Calculations*
Case 1	Increases	Decreases	Increase	Not required
Case 2	Increases	Increases	May Increase or Decrease	Required
Case 3	Decreases	Increases	Decreases	Not required
Case 4	Decreases	Decreases	May Increase or Decrease	Required

In cases 2 and 4 in the table, calculations will be necessitated. In such a situation, the following processes can be used for ratio comparisons.

1. The Cross Multiplication Method

Two ratios can be compared using the cross multiplication method as follows. Suppose you have to compare

12/15 with 15/19

Then, to test which ratio is higher cross multiply and compare 12 × 19 and 15 × 17.

If 12 × 19 is bigger the Ratio 12/17 will be bigger. If 15 × 17 is higher, the ratio 15/19 will be higher.

In this case, 15 × 17 being higher, the Ratio 15/19 is higher.

Note: In real time usage (esp. in D.I.) this method is highly impractical and calculating the product might be more cumbersome than calculating the percentage values.

Thus, this method will not be able to tell you the answer if you have to compare $\frac{3743}{5624}$ with $\frac{3821}{5783}$

2. Percentage Value Comparison Method

Suppose you have to compare: $\frac{173}{212}$ with $\frac{181}{241}$

In such a case just by estimating the 10% ranges for each ratio you can clearly see that —

the first ratio is > 80% while the second ratio is < 80%

Hence, the first ratio is obviously greater.

This method is extremely convenient if the two ratios have their values in different 10% ranges.

However, this problem will become slightly more difficult, if the two ratios fall in the same 10% range.

Thus, if you had to compare $^{173}/_{212}$ with $^{181}/_{225}$, both the values would give values between 80 – 90%. The next step would be to calculate the 1% range.

The first ratio here is 81 – 82% while the second ratio lies between 80 – 81%

Hence the first ratio is the larger of the two.

Note: For this method to be effective for you, you will first need to master the percentage rule method for calculating the percentage value of a ratio. Hence if you cannot see that 169.6 is 80% of 212 or for that matter that 81% of 212 is 171.72 and 82% is 173.84 you will not be able to use this method effectively. (This is also true for the next method.) However, once you can calculate percentage values of 3 digit ratios to 1% range, there is not much that can stop you in comparing ratios. The CAT and all other aptitude exams normally do not challenge you to calculate further than the 1% range when you are looking at ratio comparisons.

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3. Numerator Denominator Percentage Change Method

There is another way in which you can compare close ratios like 173/212 and 181/225. For this method, you need to calculate the percentage changes in the numerator and the denominator.

Thus:

173 Æ 181 is a % increase of 4 – 5%

While 212 Æ 225 is a % increase of 6 – 7%.

In this case, since the denominator is increasing more than the numerator, the second ratio is smaller.

This method is the most powerful method for comparing close ratios—provided you are good with your percentage rule calculations.

(B) Method for calculating the value of a percentage change in the ratio:

PCG (Percentage Change Graphic) gives us a convenient method to calculate the value of the percentage change in a ratio.

Suppose, you have to calculate the percentage change between 2 ratios. This has to be done in two stages as:

$$\text{Original Ratio} \xrightarrow[\text{numerator}]{\text{Effect of}} \text{Intermediate Ratio} \xrightarrow[\text{Denominator}]{\text{Effect of}} \text{Final Ratio}$$

Thus if 20/40 becomes 22/50

Effect of numerator = 20 Æ 22(10% increase)

Effect of denominator = 50 Æ 40(25% decrease) (reverse fashion)

Overall effect on the ratio:

$$100 \xrightarrow[\substack{\text{Numerator}\\\text{Effect}}]{10\%\uparrow} 110 \xrightarrow[\substack{\text{Denominator}\\\text{Effect}}]{25\%\downarrow} 82.5$$

Hence, overall effect = 17.5% decrease.