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QUANT

DI Approximation & Percentage Change

eBook

Table of Contents

Chapter 1: Mastering Calculations and Approximations.

You must read the options along with the question. The extent to which you will do calculations, depend upon how far your options are. If the options are close, you need to do exact calculations. If the options are far, then approximation will work. That's why; you must glance through options after reading the question and only then start solving questions.

Use of this technique requires the ability to judge whether options are close or far. There is no set method for this. This judgement develops by practice and conscious effort to decide whether options are far or near.

Break-up method of Subtraction

a) Calculate: 512 – 289

Although what we asked here is relatively simple, most of you would opt to write in order to find the answer. Just adopt a simple approach. Take one completely rounded number, which falls between these two numbers e.g. 500. The first no. is 12 more than that and the second number is 211 less than that. Thus the difference between the two numbers happens to be 12 + 211 = 223.

b) Solve: 857 – 532

In this case, the best way is 800 – 500 = 300 and 57 – 32 is 25. Thus the answer happens to be 325.

But always keep in mind one thing especially in the case of both of the examples discussed above, the writing part was just to convey the method to you. If you do not make a habit of doing this mentally writing it down will not help you out much in the long run.

c) Solve: 321.43 – 169.59

Sol: 321 + 0.43 – (170 – 0.41) = 151.84

Chapter 2: Break-up method of Multiplication

a) Solve: 42 × 7

42 can be broken up as (40 + 2).
So, (40 + 2) × 7 = 280 + 14 = 294
42 is broken in such way that multiplication becomes easy.
We could have broken it as 39 + 3 also, but multiplying 39 with 7 is not easy. So, 42 is broken as 40 + 2 since solving 40 × 7 and 2 × 7 is much easier.

b) Solve: 89 × 12

= (90 – 1) × 12 = 1080 – 12 = 1068
Or = 89 × (10 + 2) = 890 + 178 = 1068.
So, you can break any number, but as you must have observed breaking 89 makes it easier as compared to breaking 12. This quality of knowing which number to break develops with practice.

c) Solve: 236 × 23

= 236 × (20 +3) = 4720 + 708 = 5428.

Chapter 3: Calculating Percentages when number is required

Terminology: Formula for %age is

% = (number / base) × 100.
So, if you have to calculate 20 as % of 50, you will solve it by = (20/50) × 100 = 40 where 20 is the number, 50 is the base and 40 is the %.

We will follow this terminology throughout this course.

When a number needs to be calculated, mostly use of a formula can be a lengthy process. Let's explore a shortcut. For this shortcut, remember how to calculate 10 %, 1 % and 0.1 %. Calculating these three percentages is the simplest thing that you can do with numbers. You do not have to write anything for this.
You just move the decimal place for 10% one place, for 1% two places and for 0.1% three places and so on.
So, 10% of 2456 = 245.6, 1% of 2456 = 24.56, .1% of 2456 = 2.456
So now, let's see a shortcut. Because these percentages are easy to calculate, you should try to break any percentage given in the form of these three percentages.

a) Solve: 20 % of 2456.
20% can be broken as 2 × 10% ⇒ 10% is 245.6.
⇒ So, 20% = 2 × 245.6 = 491.2

b) Solve: 22 % of 2456
22 can be broken as 2 × 10% + 2 × 1%
⇒ 2 × 245.6 + 2 × 24.5 = 491.2 + 49 = 540.2

c) Solve: 74 % of 2456
74% can be broken as 7 × 10% + 4 × 1%
⇒ 7 × 245.6 + 4 × 24.5 = 1719.2 + 98 = 1817.2.

Here for the same question alternately you should have thought that 74% = 75% - 1%. Why you should think like this is because 75% = 3/4. Thus you can calculate 2456 × 3/4 = 1842. Subtract from this 1% i.e. 24.56 and you get 1817.4.
You must have observed in these examples, that % is broken in such manner that 1 get all things as 10%, 1%, or .1% etc.

d) Solve: 48 % of 314
48% can be broken as
5 × 10% - 2 × 1%
⇒ 5 × 31.4 - 2 × 3.1
⇒ 157 - 6.2 = 150.8

Kindly notice the breakup here in these questions. 48% can be broken as 4 × 10% + 8 × 1%. But we know multiplying with 8 is tougher than multiplying by 2. So, we broke 48% as 5 × 10% - 2 × 1%.
Here for the same question alternately you should have thought that 48% = 50% - 2%. Why you should think like this is because 50% = 1/2. Thus you can calculate 314 × 1/2 = 157. Subtract from this 2% i.e. 6.28 and you get 150.8.

e) Solve: 26 % of 924.
= 2 × 92.4 + 6 × 9.2 $\Rightarrow$ 184.8 + 55.2 $\Rightarrow$ 240

Here for this question, you should have thought that 26% = 25% + 1%. Why you should think like this is because 25% = 1/4. Thus you can calculate 924 × 1/4 = 231. Add in this 1% i.e. 9.24 and you get 240.2.
Here the objective of doing it in two ways is very simple. This is because fractional values of the decimals and percentages are very important and one method which is the best for one kind of question may not be the best for another question. Thus having calculative strengths i.e. tables, squares, cubes and fractions with you is very important.

Chapter 4: Calculating Percentages when % is required

a) Solve: 15 is what % of 40.

For solving this type of questions also, we use the basic break-up method, i.e., we use 10%, 1% and 0.1% of base

⇒10% of 40 is 4. So, 30% will be 3 × 4 =12.

⇒15 can be written as 12+3 where 12 is 30% of 40.

⇒1% of 40 is .4. So, 7% will be 2.8.

⇒15 can be further written as 12(30%) + 2.8(7%) + .2.

So, 15 will be slightly more than 37% of 40. Don't worry if the method is not very clear now. It will take time to understand. Let's see the method again with detail notes.

First be clear that the exam you are going to take is a multiple choice exam and you do not have to write the exact answer, rather you have to choose the right answer from the choices given. Simply see that 10% of 40 is 4, thus 40% of 40 will be 16, whereas you only require 15, thus it can very well be stated that the answer is close to 40%, but is slightly less than that.

b) Solve : 26 is what % of 120.

⇒10% of 120 = 12 so, 20% will be 24.
(we calculate 20% as it takes us near to 26)
⇒26 = 24 + 2
(Here 24 we got from above)
⇒ 1% of 120 = 1.2 so, 2% will be 2.4

(We calculate 2% as it takes us near to 2, the remainder above). So, 26 = 24 (20%) + 2 (2% approx.) = 22% approx.

Here we knowingly took simple numbers to explain the method and we wrote too much just to explain the method. But once you have understood this method, you can calculate big & complex numbers without writing much.

Alternately 10% is 12, and 20% will be 24. The required no. is 26, thus can be stated that the answer is close to 20% but is slightly more than that.

c) Solve: 37.4 is what % of 237
7.4 = 23.7 (10%) + 14.4 (6%) - 0.7 (.3%) = 15.7% (app.)
This is the maximum writing you need to do once you have mastered this method. Let's see the calculations in detail. 23.7 (10%) is clear to you by now. 1% of 237% is 2.37%. We can round this off to 2.4. So 6% will be 14.4 ⇒ 23.7 (10%) + (6% approx.) =

38.1 (16% approx.). But we need to calculate 37. So, subtract .7 that is approximately. 3 %.

Alternately 10% is 23.7, and thus 5% will be 11.8. Thus the sum of these two becomes 35.5 and 1% of the number is 2.37, which will make the total more than 37.4. Thus the answer is slightly less than 16%.

d) Solve: 556.7 is what % of 797

Following the alternate method here 10% is 79.7 and 70% will be 555. The answer is close to 70%, but is slightly more than that.

Chapter 5: Calculating fractions

Though we can solve fractions by the break-up method, some fractions can be solved by rounding off or approximations also. Let's see

Solve: 12 / 61
Here 61 can be written as 60.
So, 12 / 61 becomes 12 / 60 = 1 /5 = .2
But 0.2 isn't the actual answer. It is the approximate answer. The actual answer will be different from 0.2. But the question is whether more than 0.2 or less than 0.2.
Since we decreased the denominator, the actual answer will be less than the approximate answer.
So the actual answer will be something like 0.18 or 0.19.
Some points which help to get the approximate answer:
If the denominator is increased, then the actual answer is more than the approximate answer.
If the denominator is decreased, then the actual answer is less than the approximate answer.
If the numerator is increased, then the actual answer is less than the approximate answer.
If the numerator is decreased, then the actual answer is more than the approximate answer.

Chapter 6: Converting ratios to decimals

For converting ratios into decimals, we use the same break-up method discussed earlier.

Convert 116:177 into decimals.

Here, you need to divide 116 by 177. Use the break-up method for decisions.

116 / 177 = 106 (60%) + 10 (6%approx.) = 66% = 0.66

However, instead of using the break-up method you can use rough approximations also. So, 116 / 177 can be rewritten as 116 / 180 = .65. As the denominator was increased, so the actual expression will be more than .65.

Change of units

1 lakh has five zeroes = 1, 00,000

1 crore has seven zeroes = 1, 00,00,000

The British system of units works with the help of three zeroes.

1 thousand has 3 zeroes.

1 million has six zeroes = 1,000,000

1 billion has nine zeroes = 1,000,000,000

So, 1 million = 10 lakhs

So, 1 billion = 1000 million or 100 crores.

1 Km = 1000 m.

1 m. = 100 cm.

1 inch = 2.5 cm.

1 foot = 12 inch = 30 cm.

1 yard = 3 foot.

Chapter 7: Percentage Change (10 to 1 Approach)

We need to calculate 21% of 578. A good approximation of a percentage change can be done using the 10 to 1 approach. In the 10 to 1 approach, one starts by calculating the rounded off values representing 10% and 1% of the number. Now 10% of 578 is 58 (rounded off) and 1% is 6 (rounded off).

Now we can calculate any percentage of this number by using 10% and 1%

To calculate 21% of this number, we start by getting 20%, which is 10% × 2 = (58 × 2) = 116. We now add 1% i.e. 6 in this and get the answer as 122.

To calculate 19%, we subtract 1% from 20% and get the answer as 116 – 6 = 110.

Now let's say a problem requires us to calculate 52% of 281. Its 10% is 28 and 1% is 3, both being rounded up values. First, we find 50% of this number i.e. 140 (half of the number) and then 2% of this will be added in this i.e. 6 to get the answer as 146.

Knowledge of percentage change is also important for cracking data interpretation questions. The

formula that we use for percentage change from P to Q is: 100 × (Q − P)/P. In the pressure of an exam, especially when we are working with larger numbers, we take more time when we write. So let's try to do this mentally.

We have to find the percentage change from 271 to 353. Here the difference between the two numbers are 82 and 10% of the base value i.e. 271 is 27. How many 27s can fit into 82? Three times of 27 is 81. Hence it is approximately 30%.

Let us take another example, say find percentage change from 911 to 938. The difference between the two is 27. In this case, 10% is 91 and 1% is 9. Multiplying 9 by 3 we get 27. Hence percentage change is 3%.

To conclude, the 10 to 1 approach can be used to calculate percentage change mentally, thereby saving precious time in an exam!

Example 1. What is the percentage change from 256 to 280?

1. 2.789%
2. 15.302%
3. 9.375%
4. 11.471%

Sol. The difference between 256 and 280 is 24. In this case, 10% of 256 is 25. Hence, percentage change is less than or nearer to 10%. Therefore, only 3rd option satisfies.

Example 2. What is the percentage change from 291 to 310?

1. 2.789%
2. 6.529%
3. 15.417%
4. 25.136%

Sol. The difference between 291 and 310 is 19. In this case, 10% of 291 is 29.1 and 5% of 291 is 14.5. Also, 1% of 291 is 2.91 and 2% of 291 is 5.82. Now, 5% +2%= 7% (14.5 + 5.82=20.32). Hence, percentage change is slightly less than 7%. Therefore, only 2nd option satisfies.

Example 3. What is the percentage change from 576 to 689?

1. 8.791%
2. 19.610%
3. 13.178%
4. 45.789%

Sol. The difference between 576 and 689 is 113. In this case, 10% of 576 is 57.6. Multiplying 57.6 by 2 we get approx. 114. Hence, percentage change is

slightly less than 20%. Therefore, only 2nd option satisfies.

Example 4. What is the percentage change from 372 to 542?

1. 45.698%
2. 39.78%
3. 65.789%
4. 25.798%

Sol. The difference between 372 and 542 is 170. In this case, 100% of 372 is 372 and 50% of 372 is 186. Also 1% of 372 is 3.72 and Multiplying 3.72 by 4 we get approx 14. Now, 50%-4%= 46% (186-14= 172). Hence, percentage change is slightly less than 46%. Therefore, only 1st option satisfies.

Example 5. What is the percentage change from 698 to 912?

1. 55.781%
2. 49.213%
3. 24.712%
4. 30.659%

Sol. The difference between 698 and 912 is 214. In this case, 10% of 698 is 69.8. Multiplying 69.8 by 3 we get approx. 209. Hence, percentage change is slightly greater than 30%. Therefore, only 4th option satisfies.

Example 6. What is the percentage change from 113 to 395?

1. 290.68% 2. 225.10%
3. 249.55% 4. 200.25%

Sol. The difference between 113 and 395 is 282. Multiplying 113 by 2 we get 226. In this case, 50% of 113 is 56.5. Now, 200% +50%= 250% (226+56.5=282.5).Hence, percentage change is slightly less than 250%. Therefore, only 3rd option satisfies.

Example 7. What is the percentage change from 98 to 275?

1. 180.612% 2. 160.01%
3. 280.612% 4. 225.16%

Sol. The difference between 98 and 275 is 177. Multiplying 98 by 2 we get 196. Hence, percentage change is less than or nearer to 200%. Therefore, only 1st option satisfies.

Example 8. What is the percentage change from 72 to 578?

1. 802.78% 2. 650.231%

3. 702.778% 4. 714.175%

Sol. The difference between 72 and 578 is 506. Multiplying 72 by 7 we get 504. Hence, percentage change is greater than and nearer to 700%. Therefore, only 3rd option satisfies.

Example 9. What is the percentage change from 524 to 26?

1. -75.167% 2. -95.038%
3. -101.203% 4. -80.273%

Sol. From initial to final, values are decreasing so that answer will be negative. The difference between 524 and 26 is 498. In this case, 10% of 524 is 52.4 and 5% of 524 is 26.2. Now, 100% -5%= 95% (524-26.2=497.8). Hence, percentage change is greater than and nearer to 95%. Therefore, 2nd option satisfies.

Example 10. What is the percentage change from 816 to 164?

1. -79.901%
2. -85.791%
3. -65.123%
4. 79.90%

Sol. From initial to final, values are decreasing so that answer will be negative. The difference between 816 and 164 is 652. In this case, 10% of 816 is 81.6 and Multiplying 81.6 by 2 we get 163.2. Now, 100% - 20%= 80% (816-163.2 = 652.8). Hence, the percentage change is slightly less than and nearer to 80%. Therefore, 1st option satisfies.

Chapter 8: Decimals and Fractions to be remembered

You get many questions in the exams based on Percentage, Profit, Interest etc. in which you have to calculate, say 87.5 % of 800, 58.33 % of 2400 etc. Calculating these values with the help of traditional methods is time-consuming. If you have the fraction approach, you can crack these easily i.e., and if you know that 87.5 % is just $\frac{7}{8}^{th}$ of the number and 58.33 % is $\frac{7}{12}^{th}$ of the number, then it becomes easy to calculate.

% age	Fraction		% age	Fraction
50 %	$\frac{1}{2}$		$55\frac{5}{9}$ %	$\frac{5}{9}$
$33\frac{1}{3}$ %	$\frac{1}{3}$		$77\frac{7}{9}$ %	$\frac{7}{9}$
$66\frac{2}{3}$ %	$\frac{2}{3}$		$88\frac{8}{9}$ %	$\frac{8}{9}$
25 %	$\frac{1}{4}$			
75 %	$\frac{3}{4}$		$9\frac{1}{11}$ %	$\frac{1}{11}$
20 %	$\frac{1}{5}$		$18\frac{2}{11}$ %	$\frac{2}{11}$
40 %	$\frac{2}{5}$		$27\frac{3}{11}$ %	$\frac{3}{11}$
60 %	$\frac{3}{5}$		$36\frac{4}{11}$ %	$\frac{4}{11}$
80 %	$\frac{4}{5}$		$45\frac{5}{11}$ %	$\frac{5}{11}$
			$54\frac{6}{11}$ %	$\frac{6}{11}$

$16\frac{2}{3}\%$	$\frac{1}{6}$		$63\frac{7}{11}\%$	$\frac{7}{11}$
$83\frac{1}{3}\%$	$\frac{5}{6}$		$72\frac{8}{11}\%$	$\frac{8}{11}$
$14\frac{2}{7}\%$	$\frac{1}{7}$		$81\frac{9}{11}\%$	$\frac{9}{11}$
			$90\frac{10}{11}\%$	$\frac{10}{11}$
$12\frac{1}{2}\%$	$\frac{1}{8}$			
$37\frac{1}{2}\%$	$\frac{3}{8}$		$8\frac{1}{3}\%$	$\frac{1}{12}$
$62\frac{1}{2}\%$	$\frac{5}{8}$		$41\frac{2}{3}\%$	$\frac{5}{12}$
$87\frac{1}{2}\%$	$\frac{7}{8}$		$58\frac{1}{3}\%$	$\frac{7}{12}$
			$91\frac{2}{3}\%$	$\frac{11}{12}$
$11\frac{1}{9}\%$	$\frac{1}{9}$		$6\frac{2}{3}\%$	$\frac{1}{15}$
$22\frac{2}{9}\%$	$\frac{2}{9}$		$6\frac{1}{4}\%$	$\frac{1}{16}$
$44\frac{4}{9}\%$	$\frac{4}{9}$		5%	$\frac{1}{20}$

Anything doubles to increase by 100 % and becomes 200 %. Anything trebles to increase by 200 % and becomes 300 % and so on.