Percent Problems

51 57 67 70 74 75 76 81 87 159 165 172* 178 180 188 253 257 268 276 284* 287 291 293 294 356 357 358

The biggest challenge with percent problems is avoiding the sucker choices. It is easy to misinterpret a question or to make a careless mistake resulting in choosing a plausible but wrong answer – a **sucker choice**. The best way to solve many of these problems is to put the data into a simple table to keep the relationships straight.

51 – See book
57 – See book

67 – There is nice short cut here in the arithmetic. All the tickets were sold except 100 which is 1% of the total 10,000. Do the arithmetic as if all the tickets were sold and the total revenue would be .20 × 10,000 × \$0.50 + .8 × 10,000 × \$2.00 = \$2,000 + \$16,000 = \$18,000. Now you have to subtract off 1% of this amount for the tickets that weren't sold. Or \$18,000 - \$180 = \$17,820. Just don't grab the sucker choice of \$18,000. This is GMAT **speed gift**. Practice enough to recognize it and take it.

70 – This is basically a weighted average of percent defective weighted by the number in each batch that were defective. Therefore, I wrote the problem as

$$\frac{(.05)(120)+(.10)(80)}{120+80}=\frac{14}{200}=\frac{7}{100}=7\%$$

Compare this to the general formula for **weighted averages**:

$$\overline{p}=\frac{\sum_i^n p_i x_i}{\sum_i^n x_i}$$

74 – The only point to keep in mind here is that if the discount is p, then the new price is (1-p). If it had been a percent increase, then the factor would have been (1+p). In this case, the discount of 40% results in a new price of (0.6)(16) = 9.60. Now you have to take the 25% deduction. This can be done as 9.60 – (.25)9.60, but it is faster to multiply by 75%: (.75)9.60, but rather than multiply 9.60 by .75, just multiply by ¾. It is much faster, and the problem is obviously set up for this. (9.60/4)×3 = 2.40×3 = 7.20. You were given two speed gifts.

75 – See book
76 – See book
81 – See book
87 – See book

159 – The speed gift here is to start the arithmetic x = 38500/7 = 5500 and notice that the first digit is 5, look at the answers, notice that there is only one answer that begins with 5. **Mark and go**.

165 – This is an easy problem, but like so many, it takes few second to sort out the data, but hopefully, not too many seconds. They try to confuse you by breaking the number of who fail into those who have taken the prep course and those who have not. This has one purpose – confuse the test taker! It is an indirect way of telling you that 42 people failed the lifesavings test. Now is a good time to review a "**p not p**" percent problem. P not p problems all have the form:

$$px + (1-p)x = x$$

pass	fail	total
.3x	.7x = 42	x

You can write this as .3x + 42 = x, but it is much faster to use the table and immediately go to .7x = 42, x = 420/7, x = 60.

172 – I think this problem is misstated. The answer implies that A and B sell the same amount x. The problem does not state this. On top of that, the answer solves for A = $15,000, which implies that the total would be twice that if both sold $15,000.

178 – See book

180 – This is a two stage "p not p" problem.

Respond		Not Respond
20% T		80% T
Disclose	Not Disclose	
10% of 20% T	90% of 20% T	

Since the total T is 66,000, the answer is 66,000 × .2 × .9 = 18 × 660 = 6600+5280 = 11880. Or 66000×.2 = 13200, 13200-320 = 11880.

188 – This a percent increase problem: 2,976,000 = 1.24x, x = 2,400,000. Notice that the arithmetic is set up for dividing by 1.24. If you need to, you could put this in table format

1q 84	chg	2q 84
x	+24%	2,976K

253 – Straight forward: 35 = 10 + .2x. It is easier to work in 1000's and just remember to express the answer in 1000's. (350-100)/2 = 125K.

257 – This is a compound percent. The first trick is to get the decimals correct. .30 × .15 = .045 not .45. The sucker answer is 40. You are then given a speed gift: 18/(.045) =

18/(9/200) = 2×200 = 400. When ever you see 45% think 45/100 = 9/20. The use of 45% pops up frequently.

268 – This is a good problem with the usual array of sucker choices. The dense wording has to be reduced to the formula 1.2 × x × .8 = 3. You should immediately drop the zeros and start working in millions, especially when that is how the answer is given. We quickly see that x = 3/.96 which implies that x is just a bit larger than 3. 3.6 is clearly too big, so 3.1 must be the answer. Don't waist your time doing the long division. The sucker choice is $2.9 million or just lower than $3 million. Whenever you have to divide by .9x, change it into a multiplication of 1.0y, were the digit y=10-x.

276 – The sucker choice is $1100 by forgetting to calculate the amount remaining rather by subtracting $110 from $1100.

284 – This one is a mind blower. You are looking for a ratio of two numbers and the two numbers are unknown and will remain unknown. The following table might help visualize the problem.

	Exceed Yes	Exceed No	Total
Ticket Yes	.1 T=.8E	0	.1 T
Ticket No	.2 E		.9 T
Total	E	T-E	T

We don't care about most of the table. But seeing it helps to understand how everything fits together. The equation we care about is .1T + .2E = E, but .1T = .8E. The question asks for the percent of motorists who exceeded the speed limit which is E/T. But from the above equation, this is 1/8 or 12.5%. Another wacky question could have been, "What percent of the total motorists who exceeded the speed limit did not get tickets?" This (.20)(E/T) = 2.5%.

287 – This is another classic "p not p" problem

Domestic	Foreign	Total
.97T	.03T = 450K	T = Dom + For

450/.03 = 450×100/3 = 15,000K or 15,000,000. The only challenge here is to keep your decimal places correct. The sucker choices are $1.5 M and $150 M. Another interesting aspect of this answer is that the answer almost assuredly begins with 15 since there are three ways to get it wrong.

291 – See book

293 – This one is pretty simple, but one can easily stumble with the wages which are eventually canceled out. If the old wage is w, then the new wage is 1.25w. If new is the hours after the raise and old is the hours before the raise, the salaries will be equal if

$$\text{new} \times 1.25w = \text{old} \times w$$

the w's cancel, and we are left with the ratio

$$\frac{new}{old} = \frac{1}{1.25}$$

Here is another example of how the test will give you opportunities to save time, but you must be prepared to take advantage of it. You must recall that 1/8 = .125, then 1.25 =10/8, so 1/1.25 = 1/(10/8) = 8/10 = .8 or 80%. You must be willing (and able) to accept these speed gifts. The number of hours should be reduced by 1-.8 = .2 or 20%. Note that, if new is an increase of 25% over old, then old is 80% of new.

294 – You can start out by writing

$$\frac{\frac{x}{50}+\frac{x}{25}}{x}$$

but it is simpler to just focus on the numerator:

$$\frac{x}{50}+\frac{x}{25}=\frac{3x}{50}=\frac{6x}{100}$$

and to realize that when you divide by x to get a percentage, you are left with 6/100 or 6%. Pretty slick hey. It is worth a moment of reflection to think about why 6x/100 is the percent that 6x/100 is of x.

356 – This one can get you in lots-o-ways. First, t decreases rather than increases. Second, it is easy to waste too much time on the approximation of $(1.5)(1.2)(.07)^2$. Notice that .07 × .07 ≈ .5. Then notice that 1.5 × 1.2 = 1.2 + .6 = 1.8. Then ½ of 1.8 is .9. Now what is the change? It is a 10% decrease, which is closest to 12%. Remember, you are working in approximations. The third **gotcha** is selecting the sucker choice of a 12% **increase**, which of course I did the first time. Read those questions carefully!

357 – See book

358 – Here you must save time by simplifying the addition. 35K + 27K ≈ 62; add 9 get 71; add 2 get 73. Then 9/73 ≈ 1/8 = 12.5%. They love to give speed gifts in variations of 1/8!