

FDPs

Dinner cost \$230 including a 15% tip.  
How much was dinner without the tip?

g

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$$(10^4)(0.000001) =$$

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Percents

**Answer: \$200**

If \$230 includes the cost of the dinner plus an additional 15%, then it is 115% of the cost of the dinner, so  $230 = (115/100)x$ .

$$\frac{100}{115} \times 230 = \frac{115x}{100} \times \frac{100}{115} \quad 200 = x$$

g

ManhattanGMAT Fractions, Decimals & Percents Strategy Guide

Percents

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Powers of 10

**Answer: 0.01 or  $10^{-2}$**

An easy shortcut when dealing with powers of 10 is to simply move the decimal over the same number of units as the exponent. In this case, the exponent is 4, so we move the decimal to the right 4 places. Alternatively, .000001 can be rewritten as  $10^{-6}$ , and  $(10^4)(10^{-6}) = 10^{-2}$ .

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Digits & Decimals

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Which number is closest to 7% of 1,440?

- a) 50
- b) 75
- c) 100



The original price of an iPhone® was increased by 25%. A sale brought the price of the iPhone® back down to its original price. The sale reduced the new price of the iPhone® by what percent?



### Benchmark Values

**Answer: c) 100**

We can save time by estimating. 1,440 is approximately 1,400, which is  $14 \times 100$ . 7% of  $(14)(100) = (7/100)(14)(100) = 7 \times 14 = 98$ . This is a slight underestimate, so answer choice c) must be correct.



### Percents

**Answer: 20%**

Start with a smart number. Assume the price of the iPhone® is \$100. 25% of 100 is 25, so the increased price was \$125. We know the sale then reduced the price of the phone to its original price, \$100, so the sale reduced the price by \$25, because  $125 - 100 = 25$ . The percent decrease is the difference in prices divided by the original price.  $25/125$  reduces to  $1/5$ , which is 20%.



Which fraction is greater in each pair?

$$\frac{5}{8} \text{ or } \frac{6}{10} ?$$

$$\frac{132}{300} \text{ or } \frac{89}{170} ?$$

g

$$\frac{1,863,471}{626,502} \approx$$

- a) 3
- b) 4
- c) 5
- d) 30
- e) 35

g

## Compare Fractions

Answer:  $\frac{5}{8}$

and

$$\frac{89}{170}$$

For the first set of fractions, we can cross multiply and compare the numerators.

$$\begin{array}{r} 50 \quad 48 \\ \swarrow \quad \searrow \\ \frac{5}{8} \quad \frac{6}{10} \end{array} \quad 50 \text{ is greater than } 48,$$

so  $\frac{5}{8}$  is greater.

For the second set of fractions, estimate.  $\frac{132}{300}$  is less than half, whereas  $\frac{89}{170}$  is more than half.  $\frac{89}{170}$  is thus larger.

g

## Heavy Division Shortcut

Answer: a) 3

We are only asked for an approximate answer, so use the heavy division shortcut.

$$\frac{\cancel{1,863,471}}{\cancel{626,502}} \approx \frac{18}{6} \approx 3$$

g

A bag of jellybeans contains 4 flavors: watermelon, cherry, orange and pear.  $\frac{1}{4}$  of the jellybeans are watermelon,  $\frac{1}{3}$  are cherry,  $\frac{1}{6}$  are orange, and the rest are pear. What percent of the jellybeans are pear?



What is 35% of 120?



### FDP Connections

**Answer: 25%**

First we need to find out what fraction of the jellybeans are not pear flavored. We have to add the fractional amounts of the other flavors. The common denominator is 12, so

$\frac{3}{12} + \frac{4}{12} + \frac{2}{12} = \frac{9}{12} = \frac{3}{4}$ . Thus,  $1 - \frac{3}{4} = \frac{1}{4}$  of the jellybeans must be pear.  $\frac{1}{4}$  expressed as a percent is 25%.



### Benchmark Values

**Answer: 42**

Although 35% of a number is not easy to find without some calculation, 10% and 5% are usually easier.

$$35\% = 3 \times 10\% + 5\%$$

10% of 120 is 12 and 5% is half of 10%, so 5% of 120 is 6.

$$3 \times (12) + 6 = 36 + 6 = 42$$



What is the units digit of  $(2^7)(7^4)(5^6)$ ?



Is the statement sufficient?

Last year, John earned a combined \$150,000 from his salary and bonus. This year, the amount he earned from salary was the same percentage of his total earnings as it was last year. How much was John's salary this year?

1) Last year, John earned twice as much from his salary as he did from his bonus.



### Units Digit

**Answer: 0**

Although you could multiply everything out, that is too time-consuming. Notice that  $2 \times 5 = 10$ . That means the units digit is 0. Anything multiplied by 0 is 0, so we know that the units digit of the final product will be 0.



### Percents

**Answer: Insufficient**

We do have enough information to determine the amount John earned from salary and from bonus **last** year. (\$100,000 comes from salary and \$50,000 from bonus.) But we are only told that the same percentage of his total earnings this year came from salary. Lacking the actual amount of salary, bonus, or total earnings, we do not have enough information to answer the question. The statement is insufficient.



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21,267 is approximately what percent of  $10^6$ ?

- a) 0.2%
- b) 2%
- c) 20%



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Which of the following is closest to 23% of  $41/60$  of 240 rounded to the nearest integer?

- a) 24    b) 39    c) 52    d) 68



FDPs

Benchmark Values

**Answer: b) 2%**

Use benchmark values to estimate.  $10^6 = 1,000,000$ . Finding 1% is the same as dividing by 100, so 1% of  $10^6$  is  $10^4$  or 10,000. Since 21,267 is a little more than twice 10,000, so 21,267 is approximately 2% of  $10^6$ . You could also use heavy division to estimate your answer:

$$\frac{21,267}{10^6} = \frac{\cancel{21,267}}{1,000,000} \approx 2\%$$



FDPs

Estimation

**Answer: b) 39**

The answer choices are far apart, so we can save time by estimating.  $41/60$  is close to  $40/60$ , which is  $2/3$ .  $240 \times 2/3 = 160$ . 23% is close to 25%. To calculate 25% of a number, just divide by 4.  $160/4$  is 40. The best answer is b) 39.



$$\frac{(57)(10^3)(0.001)}{(10^4)(10^{-2})} =$$

g

Is the statement sufficient?

The combined revenue for a company for 2006 and 2007 was \$700,000. What percent of the combined revenue was earned in 2006?

1) Revenue dropped 25% from 2006 to 2007.

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## Powers of 10

**Answer: 0.57**

First, change 0.001 to  $10^{-3}$ . Now, combine the terms on the top and the bottom.

$$(10^3)(10^{-3}) = 10^0 = 1$$

$$(10^4)(10^{-2}) = 10^2$$

We are left with  $\frac{(57)(1)}{(10^2)}$ . To divide by  $10^2$ , just move the

decimal to the left 2 places. 57 becomes 0.57.

g

## Percents

**Answer: Sufficient**

Let's label the revenue for 2006 as  $x$  and the revenue for 2007 as  $y$ . From the question, we know that  $x + y = 700,000$ . From the statement, we know that revenue dropped 25% from 2006 to 2007, which means the revenue from 2007 is only 75% of the revenue for 2006. Thus  $0.75x = y$ . We can substitute this into the original equation to find  $x + (0.75x) = 700,000$  and solve for  $x$ .

g

The price of a television increased from \$180 to \$216. What is the percent increase in the price?



What percent of  $1.5 \times 10^7$  is 4,500,000?



### Percent Change

**Answer: 20%**

Percent change is equal to change divided by original value. The change is  $216 - 180 = \$36$ . The original price is \$180.  $36/180$  reduces to  $1/5$ , which is the same as 20%.



### Benchmark Values

**Answer: 30%**

$1.5 \times 10^7 = 15,000,000$ . We can use benchmark values to estimate. 10% of 15,000,000 is 1,500,000. This is too small. But notice that 1,500,000 is  $1/3$  of 4,500,000, so if we triple 10% of 15,000,000, we'll have our answer. Therefore, 4,500,000 is 30% of  $1.5 \times 10^7$ .



Is the statement sufficient?

What is the units digit of  $9^x$ ?

1)  $x$  is a prime number.



The price of a refrigerator is increased by 50%. It then goes on sale, with the new sale price equaling 75% of the original price. The sale price is what percent of the increased price?



**Answer: Insufficient**

When trying to find the units digit of a number, ignore all the other digits in a number.  $9^1 = 9$ ,  $9^2 = 81$ ,  $9^3 = 729$ ,  $9^4 = 6,561$ . The units digit of 9 raised to the first four powers is 9, 1, 9, 1, etc. We see that the pattern repeats: odd exponents yield a units digit of 9, while even exponents yield a units digit of 1. We know that  $x$  is prime. Although all other primes are odd, 2 is even. Thus we cannot determine the units digit, and the statement is insufficient.



**Answer: 50%**

When solving word problems involving percents, it's usually helpful to pick 100 as your starting value. If the price is increased by 50%, the new price is \$150. The sale reduces the price to 75% of the original price. \$100 is the original price, so the sale reduces the price to \$75. The question asks what percent the sale price is of the increased price.  
 $75/150 = 1/2 = 50\%$ .



What is the units digit of  $(5^3)(7^2)(3^2)$ ?



Is the statement sufficient?

Carla earns a base salary of \$30,000 plus 10% commission on her total sales revenue exceeding \$50,000. How much did she make on commission this year?

1) If her total sales revenue had been 25% higher, her commission would have been 20% higher.



### Last Digit

**Answer: 5**

When solving for the units digit of a number, you can ignore all the other digits.

$5^3 = 125$ . Drop the other digits and keep the 5.

$7^2 = 49$ . Drop the other digits and keep the 9.

$3^2 = 9$ . Keep the 9.

$5 \times 9 = 45$ . Keep the 5.

$5 \times 9 = 45$ .

The units digit is 5.



### FDP Connections

**Answer: Sufficient.**

First, label total commission  $c$  and total sales revenue  $r$ . The key is to realize that we have 2 different ways to express the relationship between our two variables. From the question, we know that  $c = 0.1(r - 50,000)$ . From the statement, we know that  $1.2c = 0.1(1.25r - 50,000)$ . We know that we have 2 linear equations relating our 2 variables, so we will get one unique solution.

For extra practice, what is the value of  $c$  and  $r$ ?

