

WT

Everyone in a certain office orders a cup of coffee. The ratio of cappuccinos to lattes to espressos ordered is 1:2:3. If there are 60 people in the office, how many cups of each type of coffee were ordered?

g

WT

The average of 177, 176, 189 and  $x$  is 180. What is  $x$ ?

g

WT

### Unknown Multiplier

**Answer: 10 cappuccinos, 20 lattes, 30 espressos**

Using the unknown multiplier, we can set up the equation  $1x + 2x + 3x = 60$ . Solving for  $x$ , we find that  $x = 10$ , and then we can apply that multiple to each element in the proportion.

g

ManhattanGMAT Word Translations Strategy Guide

Ratios

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1

WT

### Balancing Method

**Answer: 178**

A shortcut to dealing with averages is to focus on how much above or below the average every number in the set is. Then, we can “balance” this difference in the final term. In this example, 177 is 3 below the average, 176 is 4 below the average, and 189 is 9 above the average.

$-3 -4 +9 = +2$ , so the fourth number must be 2 *below* the average to balance it out. 178 is 2 below 180.

g

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Statistics

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2

**WT**

Which is the correct expression?

The phone call pricing for a long distance company is as follows: \$5.00 for the first minute, and \$0.15 for every additional minute. After 10 minutes, the price drops to \$0.10 per minute. How much does a 17 minute phone call cost, in dollars?

- a)  $5 + 10(0.15) + 7(0.10)$
- b)  $5(10) + 0.15 + 7(0.10)$
- c)  $5 + 9(0.15) + 7(0.10)$

g

**WT**

In a round of miniature golf, the probability that Jasper will get a hole in one is  $\frac{1}{13}$ . The probability that Cornelius will get a hole in one is  $\frac{1}{12}$ . What is the probability that neither of them will get a hole in one on the next hole?

g

**WT**

## Algebraic Translations

**Answer: c)  $5 + 9(0.15) + 7(0.10)$**

We know that the first minute costs \$5.00. The next 9 minutes (not 10 – don't forget to subtract out the first minute!) will be charged at the rate of \$0.15 per minute. After that, the next 7 minutes will be charged at the rate of \$0.10 per minute.

g

**WT**

## Probability

**Answer:  $\frac{11}{13}$**

If Jasper has a  $\frac{1}{13}$  chance of getting a hole in one, that means he has a  $\frac{12}{13}$  chance of not getting it. Similarly, Cornelius has an  $\frac{11}{12}$  chance of not getting the hole in one. Because we want the probability of Jasper not getting the hole in one AND Cornelius not getting the hole in one, we

multiply the probabilities:  $\frac{12}{13} \times \frac{11}{12} = \frac{11}{13}$ .

g

WT

Which of the following changes to a set of at least 3 consecutive positive integers will result in a list whose median and mean are different?

- a) Every number in the list is tripled
- b) Every number in the list has 12 added to it
- c) Every number in the list is squared

g

WT

Initially, the ratio of potbellied pigs to carrots in a room had been 1:60. After the potbellied pigs ate most of the carrots, though, the new ratio was 3:1. If there were 6 potbellied pigs in the room, how many carrots did they eat, total?

g

WT

### Evenly Spaced Sets

**Answer: c) every number in the list is squared**

As long as a set of numbers is evenly spaced, its average will equal its median. The changes described in answer choices a) and b) would keep the numbers in the lists equally spaced. Only answer choice c) would change the spacing.

g

WT

### Ratios

**Answer: 358 carrots**

From the first ratio, we know that there were originally 360 carrots, since  $1/60 = 6/360$ . The second ratio tells us that the potbellied pigs only left 2 carrots uneaten, since  $3/1 = 6/2$ . We can calculate that  $360 \text{ carrots} - 2 \text{ uneaten carrots} = 358 \text{ carrots}$ .

g

WT

Sean is 15 years older than Eric. In 6 years Sean will be twice as old as Eric. How old is Eric?

- a) 9
- b) 14
- c) 24

g

WT

Is the statement sufficient?

Two sets, A and B, have the same number of elements and the same median. Which set has the higher average?

1) In Set A, 75% of the numbers are greater than or equal to the median. In Set B, 50% of the numbers are greater than or equal to the median.

g

WT

### Using the Answer Choices

**Answer: a) 9**

An alternative approach to setting up equations and solving for the appropriate variable is to use the answer choices to help you. To demonstrate using the right answer, we begin by assuming that Eric is 9. From the first sentence, we know that Sean is 24. In 6 years, Eric will be 15 and Sean will be 30. 30 is indeed 2 times 15, so we know that 9 is the right answer.

For this type of question, using the answer choices is an alternate approach to setting up the equations. To do very well on the GMAT, it's important to know how to setup and solve the algebra, but you should also have other tools available to you.

g

WT

### Median and Mean

**Answer: Insufficient**

Although both sets have the same number of elements, it is important to remember that the median only tells you the middle number in the list. It tells you nothing about the distribution of the other numbers in the list.

For added practice, create two pairs of sets A and B. In one set, have the average of A be higher than the average of B. In the other, have the average of B be higher than the average of A.

g

**WT**

Jeff, completed a 40 mile circuit around the city. He jogged at a constant speed of 5 mph, Then Jeff completed the same circuit again, but this time he biked at a constant speed of 20 mph. What was Jeff's average speed for the total trip?

g

**WT**

Is the statement sufficient?

Eight participants in a psychology experiment are given different amounts of money at the beginning of the experiment. Will the average amount of money each participant has at the end of the experiment be higher than, lower than, or equal to the average that each participant had at the beginning of the experiment?

1) Half of the participants are asked to give 20% of the original money back, while the other half are given an additional 25%.

g

**WT**

Average Speed

**Answer: 8 mph**

To calculate average speed, you need the total distance traveled and the total time spent traveling. The distance is straightforward. Jeff traveled 40 miles twice, for a total distance of 80 miles. If we divide distance by speed, we find that it took him  $40/5 = 8$  hours to jog the circuit, while it took him  $40/20 = 2$  hours on the bike, for a total time of 10 hours.

Finally, the average speed is the total distance divided by the total time:

$$\frac{80\text{miles}}{10\text{hours}} = 8\text{ mph.}$$

g

**WT**

Mean

**Answer: Insufficient**

It's important to remember that the average does not give us any information about any individual number in the set. We only know the percent by which all the values were changed, but we don't know the distribution of the money among the participants. Without that information, we have no way of knowing what effect those changes will have on the average after the experiment. The statement is insufficient.

For added practice, assign sets of payouts to each of the participants that result in the average amount increasing. Then, assign payouts that result in the average amount decreasing.

g

**WT**

Greg and Liz are currently 350 miles apart. They begin driving toward each other, Greg driving 60 mph and Liz driving 40 mph. How long will it take until they meet?

g

**WT**

### Combined Rates

**Answer: 3.5 hours**

When dealing with two objects moving toward each other, we can simplify the calculations by adding the rates together. If Greg is moving 60 mph and Liz is moving 40 mph, then together they are traveling 100 miles per hour relative to one another. At that speed, they will collectively travel 350 miles in 3.5 hours, because  $T = (350 \text{ miles}) / (100 \text{ mph}) = 3.5$ .

g

**WT**

Which is the correct expression for this problem?

8 students have been chosen to play for PCU's inter-collegiate basketball team. If every person on the team has an equal chance of starting, what is the probability that both Tom and Alex will start? (Assume 5 starting positions)

a)  $\frac{3!3!}{8!}$       b)  $\frac{6 \times 5 \times 4}{8 \times 7 \times 6 \times 5 \times 4}$       c)  $\frac{6!}{8 \times 7 \times 6 \times 5 \times 4}$

$\frac{5!3!}{8!}$

g

**WT**

### Combinatorics/Probability

**Answer: a)**  $\frac{3!3!}{8!}$

$\frac{5!3!}{8!}$

There are two tasks in this problem: determine how many different combinations there are of all the players (denominator) and determine how many of those combinations include two specific players (numerator). For the total number of combinations, there are 8 people to choose from, and each person is either starting or not starting. Thus there is one group of 5 and one group of 3. To calculate how many combinations include both Tom and Alex, we assume that they are on the team, and that means we are now choosing among 6 people for the remaining 3 spots on the team, while there are still 3 people not on the team.

g

**WT**

5 people in a company earn an average salary of \$50,000. If 2 of the employees earn an average of \$65,000, what is the average salary of the remaining 3 employees?

*Solve using the “balancing” method*

g

**WT**

10 years ago Tina was half as old as Ron will be 7 years from now. Which equation correctly represents this relationship?

a)  $(1/2)(T - 10) = (R + 7)$

b)  $(T - 10) = (1/2)(R + 7)$

g

**WT**

### Balancing Method

**Answer: \$40,000**

One approach to this problem is to balance the “overs” and the “unders.” The 2 employees making \$65,000 each make \$15,000 more than the mean, for a total of \$30,000 over the mean. That means the remaining 3 employees need to make a combined \$30,000 under the mean. Distribute that amount evenly, and the remaining salaries average out to \$10,000 below the mean, or \$40,000.

g

**WT**

### Algebraic Translations

**Answer: b)  $(T - 10) = (1/2)(R + 7)$**

When translating sentences into equations, one of the easiest mistakes to make is to put the multiplier in the wrong place. Take the time to verify that it is where it should be. In this case, if Tina’s age 10 years ago was half what Ron’s age will be in 7 years, we need to multiply Ron’s age by  $1/2$  to make them equal.

Don’t forget to use the parentheses!

g

**WT**

Jerry and Ross decide to have a footrace. They run 1,000 meters. Jerry runs 5 meters per second, and Ross runs 4 meters per second. Halfway through the race, Jerry realizes he is ahead and stops running for one full minute before finishing the race at the same speed. Who wins the race?

g

**WT**

What is the average of 3,456, 3,463, 3,470, 3,477, and 3,484?

g

**WT**

## Rates &amp; Work

**Answer: Ross wins**

First, calculate how long it will take Ross to finish the race.  $T = D/R$ .  $T = (1,000 \text{ m})/(4\text{m/s}) = 250 \text{ s}$ . To make the calculations simpler for Jerry, add 60 seconds to the total time to take into account the minute he spent not running.  $T = (1,000 \text{ m})/(5 \text{ m/s}) + 60 \text{ s} = 260 \text{ s}$ . Ross finishes the race in less time.

g

**WT**

## Evenly Spaced Sets

**Answer: 3,470**

Any time a list is composed of evenly spaced numbers, the average will equal the median. In this case, all the numbers in the list are spaced 7 units apart. The median is 3,470, and the average is also 3,470.

g

**WT**

Is the statement sufficient?

6 girls are added to a class, bringing the ratio of girls to boys to 1:1. How many students are in the class?

1) The original ratio of girls to boys was 2:3.

g

**WT**

Car A travels east at 60 mph. Car B is 45 miles behind Car A and also travels east at 75 mph. How long will it take Car B to catch up with Car A?

g

**WT**

### Unknown Multiplier

**Answer: Sufficient**

Begin with the unknown multiplier. If the original ratio of boys to girls is 2:3, then the original number of girls is  $2x$  and the original number of boys is  $3x$ . After 6 girls are added, the

new ratio is 1:1, so we can write the equation  $\frac{2x + 6}{3x} = \frac{1}{1}$ .

Thus  $x = 6$ , and we can use that value to determine how many students are in the class. The statement is sufficient.

g

**WT**

### Combined Rates

**Answer: 3 hours**

When solving a combined rates problem with 2 objects moving in the same direction, we can ignore their actual speeds and focus only on the difference between their speeds. Car B is going 15 mph faster than Car A. That means it will catch up to Car A at a rate of 15 mph. Car B is currently 45 miles behind Car A, and  $R \times T = D$ , so  $(15 \text{ mph}) \times T = 45 \text{ miles}$ . Solving for  $T$  gives us  $T = 3 \text{ hours}$ .

g

**WT**

A shipping company charges  $5 + 10/y^2$  dollars per package shipped by a customer over a given month, where  $y$  is the number of packages shipped that month by the customer. If a customer spends \$51 one month on shipping, which equation will correctly solve for the number of packages shipped that month by the customer?

- a)  $5y + 10 = 51$
- b)  $5 + 10/y = 51$
- c)  $5y + 10/y = 51$

**g****WT**

Jeff can build a doghouse in 6 hours. Kevin can build the same doghouse in 3 hours. How long will it take them, working together, to build 1 doghouse?

**g****WT**

### Algebraic Translations

**Answer:** c)  $5y + 10/y = 51$

We know that  $y$  represents the number of packages shipped by the customer in the month, and  $5 + 10/y^2$  is the shipping cost per package for that customer. Therefore, the product of these two terms must equal 51:

$$(y)(5 + 10/y^2) = 51$$

$$5y + 10/y = 51$$

For added practice, what is the value of  $y$ ? Try choosing integers that make sense.

**g**

ManhattanGMAT Word Translations Strategy Guide

Algebraic Translations

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19

**WT**

### Combined Work

**Answer:** 2 hours

Whenever you are told how long it takes a person to complete a task, a great first step is to turn that information into a rate. In an  $R \times T = W$  equation, we can think of completing the task as doing 1 unit of work. If it takes Jeff 6 hours to build the doghouse, then his rate is  $1/6$  of the doghouse per hour. Similarly, Kevin's rate of work is  $1/3$  of the doghouse per hour. When we combine their rates (because they're working together), we see that they complete  $1/2$  of the doghouse every hour, because  $1/6 + 1/3 = 1/2$ . At that rate, they will complete the doghouse in 2 hours.

**g**

ManhattanGMAT Word Translations Strategy Guide

Rates & Work

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20

**WT**

In the World's Strongest Man competition, Olav Gundersson managed to pull a truck a total distance of 85 ft combined in two tries. On his second try, he pulled the truck 10 ft more than half the distance he pulled the truck on his first try. How far did he pull the truck on his first try?

- a) 45 ft   b) 50 ft   c) 55 ft   d) 60 ft   e) 65 ft

g

**WT**

Is the statement sufficient?

John and Fawn, each drinking at a constant pace, can finish a case of soda together in 12 hours. How fast can John, drinking alone, finish the case?

- 1) It would take John 10 more hours to finish the case drinking alone than it would for Fawn to finish the case.

g

**WT**

### Using the Answer Choices

**Answer: b) 50 ft**

We can set this problem up and solve algebraically. We know that the sum of the two tries equals 85 feet, and the second try is 10 more than half the first try. Let's use  $x$  to represent the first try and  $y$  to represent the second try:

$$x + y = 85$$

$$y = 10 + 0.5x$$

$$x + (10 + 0.5x) = 85$$

$$1.5x = 75$$

$$x = 50$$

g

**WT**

### Combined Rates

**Answer: Sufficient**

The key to this problem is to realize that we have 3 variables, and 3 equations describing their relationships. The 3 variables are **1)** the rate at which John drinks, ( $r_1$ ) **2)** the rate at which Fawn drinks, ( $r_2$ ) and **3)** the time it takes John to drink the case of soda ( $t$ ). The 3 equations are:

**1)**  $r_1 + r_2 = 1/12$

**2)**  $r_1 \times t = 1$

**3)**  $r_2 \times (t - 10) = 1$

With 3 equations and 3 variables, we will be able to solve for unique values for each variable. The statement is sufficient.

g

**WT**

Is the statement sufficient?

A bag contains ping pong balls, each with a number written on it. The average of all the numbers is 50. Some of the ping pong balls are removed. What is the average of the numbers on the balls still remaining in the bag?

- 1) One third of the ping pong balls are removed from the bag, and the average of the numbers written on those balls is 20.

g

**WT**

At a farmer's market, one stall is selling mangos, kumquats and rutabagas. The ratio of mangos to kumquats is 5:4, and the ratio of kumquats to rutabagas is 3:7. Which of the following could be the number of kumquats?

- a) 28      b) 36      c) 42      d) 49

g

**WT**

## Weighted Averages

**Answer: Sufficient**

Although we don't know how many ping pong balls are in the bag, we can modify the weighted averages formula to help us answer this question. The weighted average equals the sum of the weights times the data points, divided by the sum of the weights. Thus,

$$\frac{\left(\frac{1}{3}\right)20 + \left(\frac{2}{3}\right)x}{\frac{1}{3} + \frac{2}{3}} = 50.$$

We can solve for  $x$ , which will equal the

average of the remaining numbers. The statement is sufficient.

g

**WT**

## Ratios

**Answer: b) 36**

A common hidden constraint of word problems involving ratios is that the actual number of items must be an integer. For instance, it would not make sense in this context to have  $5 \frac{1}{3}$  mangos. The correct answer will be a multiple of both 4 and 3, based on the ratios involving kumquats.

For added practice, if there are 36 kumquats, how many mangos and rutabagas are there?

g

**WT**

Is the following statement sufficient?

In 2006, John paid 4% state taxes on his gross income. How much state tax did he pay in 2007?

1) The state tax increased to 5% of income in 2007, and his gross income increased 20% in 2007.

g

**WT**

Is the statement sufficient?

Train A and Train B are 500 miles apart and are traveling towards each other at constant speeds. They meet in 5 hours. How fast is Train A going?

1) If Train B were going twice as fast, the two trains would meet in 4 hours.

g

**WT**

## Algebraic Translations

**Answer: Insufficient**

For these types of word problems, it is important to translate the information into variables and try to write equations about the variables/unknowns. In this problem, we can proceed as follows:

$TaxRate_{2006} = 4\%$ , and the rephrased question is:  
What is  $TaxRate_{2007} \times Income_{2007}$ ?

The statement tells us that  $TaxRate_{2007} = 5\%$  and that  $Income_{2007} = 1.2 \times Income_{2006}$ , but we do not know the value of  $Income_{2006}$ .

g

**WT**

## Combined Rates

**Answer: Sufficient**

First, label the speed of Train A as  $R_A$  and the speed of Train B as  $R_B$ . When dealing with objects moving towards each other, we can add their rates, so  $(R_A + R_B) \times (5 \text{ hrs}) = 500 \text{ miles}$ . From the statement, we also know that  $(R_A + 2R_B) \times (4 \text{ hrs}) = 500 \text{ miles}$ . We have 2 equations and 2 variables, so we can solve for the speed of Train A (75 mph). The statement is sufficient.

g