**Basic Notations:**

1. z is x less than y.
2. The sum of 5, 6 and a.
3. If n is greater than m, the positive difference between twice n and m.
4. The ratio of 4q to 7p is 5 to 2.
5. The product of a decreased by b and twice the sum of a and b.
6. A quarter of the sum of a and b is 4 less than a.
7. Double the ratio of z to a plus the sum of z and a equals z minus a.
8. If $500 were taken from F’s salary, then the combined salaries of F and G will be double what F’s salary would be if it were increased by a half of itself.
9. The sum of a, b and c is twice the sum of a minus b and a minus c.
10. The sum of y and 9 decreased by the sum of x and 7 is the same as dividing x decreased by z by 7 decreased by x.
11. The 2010 population was 10 percent greater than 2009 population.
12. The cost a camera x is 20 dollars more than the cost of camera y.

**Speed Distance Time**

1. It took Ellen 6 hours to ride her bike a total distance of 120 miles. For the first part of the trip, her speed was constantly 25 miles per hour. For the second part of her trip, her speed was constantly 15 miles per hour. For how many miles did Ellen travel at 25 miles per hour?
2. David drove to work at an average (arithmetic mean) speed of 45 miles per hour. After work, David drove home at an average speed of 60 miles per hour. If David spent a total of 2 hours commuting to and from work, how many miles does David drive to work?
3. While driving from A-ville to B-town, 4Harriet drove at a constant speed of 115 kilometers per hour. Upon arriving in B-town, Harriet immediately turned and drove back to A-ville at a constant speed of 135 kilometers per hour. If the entire trip took 5 hours, how many minutes did it take Harriet to drive from A-ville to B-town?
4. A-town and B-ville are connected by a straight, 420-mile road. At noon, Atu left A-town for B-ville, and Brek left B-ville for A-town. If Atu travels at 56 miles per hour and Brek travels at 49 miles per hour, how many miles apart will Atu and Brek be 1 hour before they meet?
5. For the first 5 hours of a trip, a plane averaged 120 kilometers per hour. For the remainder of the trip, the plane travelled an average speed of 180 kilometers per hour. If the average speed for the entire trip was 170 kilometers per hour, how many hours long was the entire trip?
6. Scott starts jogging from point X to point Y. A half-hour later his friend Garrett who jogs 1 mile per hour slower than twice Scott's rate starts from the same point and follows the same path. If Garrett overtakes Scott in 2 hours, how many miles will Garrett have covered? (Give your answer to the nearest thousandth)
7. If a meteor travels at 180 kilometers per minutes, how many meters will it travel in 7 seconds?
8. If a car travels at 45 miles per hour, how many minutes will it take to travel 60 miles?
9. If Jasmine drives for 2 hours at an average speed of 40 miles per hour, and then drives for 3 hours at an average speed of 60 miles per hour, what is her average speed for her entire trip?
10. Yoshi travels from Town A to Town B at an average speed of 20 miles per hour, and then he immediately returns to Town A at an average speed of 80 miles per hour. What is Yoshi's average speed for the entire trip?
11. Ata and Carl both departed Town A at noon. Ata traveled at 100km/hr and Carl at 75 km/hour. If Ata arrived in Town B 1 hour earlier than Carl, what is the distance, in Kilometers, from Town A to Town B?
12. Yolanda and Bob are 42 miles apart. At noon, they begin walking towards each other. If Bob's walking speed is 3 miles per hour, and Yolanda's walking speed is 4 miles per hour, how many hours will it take before they meet?
13. At noon, Sabi and Gwyn leave from the same location and head towards Town A. If Sabi travels at 40 miles per hour, and Gwyn travels at 30 miles per hour, how far apart will they be in 4 hours?

**Work Rate**

1. Reserve tank 1 is capable of holding z gallons of water. Water is pumped into tank 1, which starts off empty, at a rate of x gallons per minute. Tank 1 simultaneously leaks water at a rate of y gallons per minute (where x > y). The water that leaks out of tank 1 drips into tank 2, which also starts out empty. If the total capacity of tank 2 is twice the number of gallons of water actually existing in tank 1 after one minute, does tank 1 fill up before tank 2 given that ?
2. Pump A can empty a pool in A minutes, and pump B can empty the same pool in B minutes. Pump A begins emptying the pool for 1 minute before pump B joins. Beginning from the time pump A starts, how many minutes will it take to empty the pool?
3. Tom, working alone, can paint a room in 6 hours. Peter and John, working independently, can paint the same room in 3 hours and 2 hours, respectively. Tom starts painting the room and works on his own for one hour. He is then joined by Peter and they work together for an hour. Finally, John joins them and the three of them work together to finish the room, each one working at his respective rate. What fraction of the whole job was done by Peter?
4. Working together, 7 identical pumps can empty a pool in 6 hours. How many hours will it take 4 pumps to empty the same pool? (Give your answer to one decimal place rounded to the nearest tenth)
5. Working alone, pump A can empty a pool in 3 hours. Working alone, pump B can empty the same pool in 2 hours. Working together, how many minutes will it take pump A and pump B to empty the pool?
6. If Rama can paint a certain house in 6 days and Trudy can paint the same house in 12 days, how many days will it take them to paint the house if they work together?
7. Working alone, Pump A can empty a certain pool in 40 minutes. Working together, pump A and pump B can empty the pool in 24 minutes. Working alone, how many minutes will it take pump B to empty the pool?
8. If 4 men or 7 boys (each with identical rates) can finish a task in 29 days then how long would it take 12 men and 8 boys to finish the same task?

**Age Questions**

1. 7 years ago, Samir was 3 times as old as Deepak. In 4 years, Samir will be twice as old as Deepak. What is Deepak’s present age?
2. The sum of Abbie's age and Iris's age is 42 years. 11 years ago, Abbie was three times as old as Iris. How old will Abbie be in 2 years?
3. Soo is 8 years older than Marco. In four years, Soo will be twice as old as Marco. How old is Soo now?
4. Avi is 11 years older than Ryena. If the sum of their ages is 73 years, how old is Ryena?
5. Larry is 5 years older than Moe, and curly is twice as old as Larry. If the sum of their ages is 95, how old is Larry?
6. Liam's age is 5 years more than twice Gita's age. Zoe's age is 13 years less than 10 times Gita's age. If Zoe is 3 times as old as Liam, how old is Liam?
7. In 12 years, Murray will be 4 times as old as he is now.

Column A: Number of years until Murray is 8 times as old as he is now

Column B: 24

1. Gerry is three times as old as Pat.

Quantity A: Gerry's age 20 years ago

Quantity B: Pat's age in 12 years

1. Today, Bill is thirteen times as old as Pete. In nine years, Bill will be four times as old as Pete. How old will Pete be 2 years from today?
2. 2k years ago Frank was 3k years old. In k years Frank's age, in years, will be?
3. Lou has three daughters: Wen, Mildred, and Tyla. Three years ago, when Lou was twice as old as Tyla, he was thirty years older than Mildred. Now, he is forty-seven years older than Wen. In four years, Wen will be half as old as Tyla. What is Lou’s, Wen’s, Mildred’s and Tyla’s combined age?

**Mixture Questions**

1. One cup of nuts that contains exactly half peanuts and half cashews is added to a bowl of nuts that is exactly one-third peanuts, one third cashews, and one third almonds. This results in a three-cup mixture of nuts. What fraction of the new nut mixture is peanuts?
2. Solution Y is 40 percent sugar by volume, and solution X is 20 percent sugar by volume. How many gallons of solution X must be added to 150 gallons of solution Y to create a solution that is 25 percent sugar by volume?
3. Solution X is 30% salt by volume and Solution Y is 70% salt by volume. If 300 milliliters of solution X is combines with 200 ml of solution Y, the resulting solution will be what percent salt?
4. A flask contains 160 ml of solution that is 25% alcohol by volume. How much pure alcohol must be added to the flask so that the resulting solution is 60% alcohol by volume?
5. To create paint with a certain shade of gray, one must combine 2.016 liters of black paint with every one liter of white paint. Approximately how many liters of white paint must be combined with 350 liters of black paint to create the certain shade of gray? (give your answers to the nearest tenth)

**Double Matrix Questions**

1. At a certain university, 60% of the professors are women, and 70% of the professors are tenured. If 90% of the professors are women plus tenured then what percent of the men are tenured?
2. At a certain company, 30 percent of the male employees and 50 percent of the female employees have an MBA. If 40 percent of the employees are female, what percent of the employees do not have an MBA?
3. In country Z, 10% of the people do not have a university diploma but have the job of their choice, and 25% of the people who do not have the job of their choice have a university diploma. If 40% of the people have the job of their choice, what percent of the people have a university diploma?
4. A parking lot contains 80 vehicles. Each vehicle is either a car or a truck, and each vehicle is either red or green. 35 vehicles are red, and 60 vehicles are cars. If there are 9 green trucks how many red cars are there?

**Venn Diagram**

1. In a group of 50 students, 31 are taking French, 17 are taking Spanish, and 10 are taking neither French nor Spanish. How many students are taking both French and Spanish?
2. In a group of 40 people, 15 have visited Iceland and 23 have visited Norway. If 11 people have visited both Iceland and Norway, how many people have visited neither country?
3. In a group of 100 students, 40 take Physics, 60 take Sociology and 80 take Music. 7 students take physics and sociology, 46 take sociology and music, and 36 take physics and music. If 6 students take all 3 courses, how many students take none of the courses?

**Simple & Compound Interest**

1. Karin gave Jony $1250 on compound interest for 2 years at 4% per annum. How much loss would Karin have suffered had she given it to Jony for 2 years at 4% per annum simple interest?
2. Carmen wants to open a special savings account through her work. If Carmen invests $7,000 at 6 percent simple annual interest in January, and no other money is added to or removed from the account, which of the following is true? Indicate all that are true.
3. At the end of April, Carmen will have earned $105 in interest.
4. At the end of the year, Carmen will have earned $420 in interest.
5. At the end of six months, Carmen will have earned $35 in interest.
6. At the end of three months, Carmen will have $7,105 in the account.
7. The price of Mabel's car, not including interest, is 12 percent more than the price of Rose's car. Combined, Mabel and Rose's cars cost $53,000. If Mabel's car loan interest rate was 5.20 percent, what was the total cost of Mabel's car, including interest?
8. Ann invested a certain sum of money in a bank that paid simple interest. The amount grew to $240 at the end of 2 years. She waited for another 3 years and got a final amount of $300. What was the principal amount that she invested at the beginning?
9. Peter invested a certain sum of money in a simple interest bond whose value grew to $300 at the end of 3 years and to $400 at the end of another 5 years. What was the rate of interest in which he invested his sum? (Give your answer to the nearest tenth)
10. Find the least number of complete years in which a sum of money put out at 25% compound interest will be more than double of itself?

**Miscellaneous questions**

1. It takes 1 pound of flour to make y cakes. The price of flour is w dollars for x pounds. In terms of w, x and y, what is the dollar cost of the flour required to make 1 cake?
2. Appleton’s population is 400 greater than Berryville’s population. If Berryville’s population were reduced by 900 people, then Appleton’s population would be 3 times as large as Berryville’s population. What is Berryville’s current population?
3. Nina has exactly enough money to purchase 6 widgets. If the cost of each widget were reduced by $1.25, then Nina would have exactly enough money to purchase 8 widgets. How much money does Nina have?
4. Three friends are buying a gift for a friend. Declan contributes 4 dollars more than 1/4 the cost of the gift, Ed contributes 1 dollar less than 1/3 the cost of the gift, and Frank contributes the remaining 22 dollars. What is the cost of the gift?
5. In order to qualify for the year-end tennis tournament, Sam must win at least 60 percent of his matches this year. Presently Sam has won 14 of his 18 matches. Of Sam’s 13 matches remaining in the year, what is the least number that he must win in order to qualify for the year-end tournament?
6. A certain taxi charges $0.85 for the first ½ mile and $0.25 for every ½ mile after that. The total cost of a trip was $8.85

Column A: The trip's distance in miles

Column B: 16

1. Lee purchased $280 worth of widgets. Some of the widgets cost $1.50 each, and the other widgets cost $2.50 each. If Lee purchased 5 times as many $1.50 widgets as $2.50 widgets, how many widgets did Lee purchase altogether?
2. Whenever Art Dealer sells a sculpture, he earns a 20 percent commission on the first $12,000 of the sale price plus 15 percent of the sale price in excess of $12,000. If Art earned a $3,900 commission on the sale of a certain sculpture, what was the sale price?
3. Having received his weekly allowance, John spent 3/5 of his allowance at the arcade. The next day he spent one third of his remaining allowance at the toy store, and then spent his last $0.80 at the candy store. What is John's weekly allowance?
4. In the first week of last month, Company X realized an average wholesale profit of $5304 per day from the sale of q units of Product Y. Which of the following CANNOT be the difference between Product Y’s sale price and cost per unit?
5. $3
6. $4
7. $7
8. $11
9. $51
10. During 2005, a company produced an average of 2,000 products per month. How many products will the company need to produce from 2006 through 2008 in order to increase its monthly average for the period from 2005 through 2008 by 200% over its 2005 average?
11. 148,000
12. 172,000
13. 200,000
14. 264,000
15. 288,000
16. The ratio by weight, measured in pounds, of books to clothes to electronics in Jorge's suitcase initially stands at 8 to 5 to 3. Jorge then removes 4 pounds of clothing from his suitcase, thereby doubling the ratio of books to clothes. Approximately how much do the electronics in the suitcase weigh, to the nearest pound?
17. If Ken's salary was 20% higher, it would be 20% less than Lorena's. If Lorena's salary is $60,000, what is Ken's salary?
18. Greta's salary is x thousand dollars per year, and she receive a y% raise. Annika's salary is y thousand dollars per year, and she receives an x% raise. x and y are positive integers.

Column A: The dollar amount of Greta's raise

Column B: The dollar amount of Annika's raise

1. If 35% of the acreage of a national forest was destroyed in a wildfire, and the remainder regenerates at a rate of 10% a year, after how many years, assuming no further losses, will the forest exceed its original acreage? 5
2. Garrette spends 50% of his income on rent, utilities and insurance and 20% on food. If he spends 30% of the remainder on video games and has no further expenditures, what percent of his income is lets after all the expenditures?
3. A certain dealership has a total of 100 vehicles consisting of cars and trucks. Half of the cars are used, and one-third of the trucks are used. If there are 42 used vehicles altogether, how many trucks are there?
4. A certain store sells apples for $0.75 each and bananas for $0.5 each. Lila bought 20 pieces of fruit consisting of apples and bananas only. If the total cost of her purchase was $13.00, how many apples did Lila buy?
5. 3 students combined their money to buy a gift for their teacher. Maya contributed 7 dollars more than one-third the cost of the gift. Clara contributed 10 dollars less than half the cost of the gift. Tom contributed 20 percent of the cost of the gift. What is the cost of the gift?
6. The rate of a certain chemical reaction is directly proportional to the square of the concentration of chemical A present and inversely proportional to the concentration of chemical B present. If the concentration of chemical B is increased by 100 percent, which of the following is closest to the percentage change in the concentration of chemical A required to keep the reaction rate unchanged?
7. 100 % decrease
8. 50 % decrease
9. 40 % decrease
10. 40 % increase
11. 50 % increase