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Logical Reasoning Tricks and Techniques for

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LOGIC REASONING- MISCELLANEOUS LOGICAL PUZZLES(ENGLISH)

Q1: In a class of 40 students, John is ranked 15th from the top. What is his rank from the bottom?

Long Method: To find John's rank from the bottom, we need to consider the total number of students and subtract John's rank from the top. Since there are 40 students in the class and John is ranked 15th from the top, we can calculate his rank from the bottom as follows: First, subtract John's rank from the total number of students: $40 - 15 = 25$. This means there are 25 students below John. To get John's rank from the bottom, we add 1 to this result (because the count starts from 1): $25 + 1 = 26$. Therefore, John's rank from the bottom is 26.

Short Method: Subtract John's rank from the total number of students and add 1: $40 - 15 + 1 = 26$.

Q2: A train travels 60 km at a speed of 30 km/h, and then another 60 km at a speed of 60 km/h. What is the average speed of the train for the entire journey?

Long Method: To calculate the average speed, we first need to find the total time taken for the journey. The train travels 60 km at 30 km/h, which takes $60 / 30 = 2$ hours. Then it travels another 60 km at 60 km/h, which takes $60 / 60 = 1$ hour. The total distance is $60 + 60 = 120$ km, and the total time is $2 + 1 = 3$ hours. The average speed is the total distance divided by the total time: $120 \text{ km} / 3 \text{ hours} = 40 \text{ km/h}$.

Short Method: Calculate the total distance and total time, then divide the distance by the time: $(60 + 60) / (2 + 1) = 40 \text{ km/h}$.

Q3: If a quarter of a number is 45, what is the number?

Long Method: Let the number be xx . According to the problem, a quarter of xx is 45, which means $x/4=45$. To find x , we multiply both sides by 4: $x=45 \times 4=180$. Therefore, the number is 180.

Short Method: Multiply 45 by 4 to get the number: $45 \times 4=180$

Q4: The sum of two numbers is 90. If one number is twice the other, what are the numbers?

Long Method: Let the two numbers be x and $2x$. According to the problem, their sum is 90: $x+2x=90$. Combining like terms, we get $3x=90$. To find x , we divide both sides by 3: $x=90/3=30$. Therefore, the two numbers are 30 and $2 \times 30=60$.

Short Method: Divide 90 by 3 to find x , then multiply x by 2: $90/3=30$; $2 \times 30=60$

Q5: In a certain code, 'FIRE' is written as 'ERIF'. How is 'WATER' written in that code?

Long Method: To decode 'WATER' as 'ERIF' was coded, we reverse the order of the letters. Starting with 'WATER', we reverse it to get 'RETAW'. Each letter is written in the opposite order: 'W' becomes the last letter, 'A' becomes the second-to-last letter, and so on, resulting in 'RETAW'.

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Short Method: Reverse the letters in 'WATER': 'WATER' → 'RETAW'.

Q6: If the perimeter of a rectangle is 54 cm and the length is 15 cm, what is the width?

Long Method: The perimeter of a rectangle is given by the formula $P=2(l+w)$, where l is the length and w is the width. Given the perimeter $P=54$ cm and the length $l=15$ cm, we substitute these values into the formula: $54=2(15+w)$. Dividing both sides by 2, we get $27=15+w$. Subtracting 15 from both sides, we find $w=12$ cm. Therefore, the width is 12 cm.

Short Method: Use the perimeter formula to solve for w : $54/2=27$; $27-15=12$.

Q7: A man spends 2/5 of his salary on rent and 1/4 on groceries. If his total salary is \$2000, how much does he spend on other expenses?

Long Method: First, calculate the amount spent on rent: $2/5 \times 2000 = 800$ dollars. Next, calculate the amount spent on groceries: $1/4 \times 2000 = 500$ dollars. Add these two amounts to find the total spent on rent and groceries: $800 + 500 = 1300$ dollars. To find the amount spent on other expenses, subtract this total from the salary: $2000 - 1300 = 700$ dollars.

Short Method: Calculate the total spent on rent and groceries, then subtract from the salary: $2000 - (800 + 500) = 700$ dollars.

Q8: If 5 workers can build a wall in 20 days, how many days will it take 10 workers to build the same wall?

Long Method: The work rate of the workers is inversely proportional to the number of workers. If 5 workers can build the wall in 20 days, then the total work done is $5 \times 20 = 100$ worker-days. If 10 workers are available, they will complete the same amount of work in $100/10 = 10$ days. Therefore, it will take 10 workers 10 days to build the wall.

Short Method: Use the inverse proportionality of workers and days: $[5 \times 20]/10 = 10$ days.

Q9: A boat travels upstream at 10 km/h and downstream at 14 km/h. What is the speed of the stream?

Long Method: Let the speed of the boat in still water be b km/h and the speed of the stream be s km/h. When the boat is traveling upstream, its effective speed is $b-s=10$ km/h, and when traveling downstream, its effective speed is $b+s=14$ km/h. Adding these two equations, we get $2b=24$, so $b=12$ km/h. Subtracting the upstream equation from the downstream equation, we get $2s=4$, so $s=2$ km/h. Therefore, the speed of the stream is 2 km/h.

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Short Method: Average the difference between upstream and downstream speeds: $(14-10)/2=2$ km/h.

Q10: The ratio of the ages of two siblings is 3:4. If the sum of their ages is 28, what are their ages?

Long Method: Let the ages of the two siblings be $3x$ and $4x$. According to the problem, their sum is 28: $3x+4x=28$. Combining like terms, we get $7x=28$. To find x , we divide both sides by 7: $x=28/7=4$. Therefore, the ages of the siblings are $3 \times 4=12$ and $4 \times 4=16$.

Short Method: Divide the sum by the total parts of the ratio and multiply by each part: $28/7=4$; $3 \times 4=12$ and $4 \times 4=16$.

Q11: If the product of two numbers is 120 and their sum is 26, what are the numbers?

Long Method: Let the numbers be x and y . According to the problem, $xy=120$ and $x+y=26$. We can use the quadratic equation to solve for x and y . The quadratic equation formed is $t^2-26t+120=0$. Solving this quadratic equation using the quadratic formula, $t=[26 \pm \sqrt{676-480}]/2=[26 \pm 14]/2$. Thus, the solutions are $t=[26+14]/2=20$ and $t=[26-14]/2=6$. Therefore, the numbers are 20 and 6.

Short Method: Identify the factors of 120 that add up to 26: 20 and 6.

Q12: A bag contains 8 red balls and 12 blue balls. If 4 balls are drawn at random, what is the probability that all 4 are red?

Long Method: First, calculate the total number of ways to draw 4 balls from 20 balls: $(20,4)$. This is $[20!]/[4!(20-4)!]=4845$. Next, calculate the number of ways to draw 4 red balls from 8 red balls: $(8,4)$. This is $[8!]/[4!(8-4)!]=70$. The probability that all 4 balls drawn are red is the ratio of these two numbers: $[70/4845] \approx 0.0144$.

Short Method: Use combination formulas: $(8,4)/(20,4)=0.0144$.

Q13: If it takes 8 hours for 3 workers to paint a wall, how long will it take for 6 workers to paint the same wall?

Long Method: First, calculate the total amount of work needed to paint the wall in worker-hours. If 3 workers take 8 hours, the total work is $3 \times 8=24$ worker-hours. If 6 workers are available, we divide the total work by the number of workers to find the time required: $24/6=4$ hours. Therefore, it will take 6 workers 4 hours to paint the wall.

Short Method: Double the number of workers halves the time: $8/2=4$ hours.

Q14: A man walks 3 km north, then 4 km east. How far is he from his starting point?

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Long Method: To find the distance from the starting point, we use the Pythagorean theorem. The man forms a right triangle with the legs of 3 km and 4 km. The distance is the hypotenuse: $\sqrt{3^2+4^2}=\sqrt{9+16}=\sqrt{25}=5$ km. Therefore, the man is 5 km from his starting point.

Short Method: Apply the Pythagorean theorem: $\sqrt{3^2+4^2}=5$ km.

Q15: If the price of a commodity increases by 20% and then decreases by 20%, what is the net change in price?

Long Method: Let the initial price be P . After a 20% increase, the price becomes $1.2P$. After a 20% decrease on the new price, it becomes $1.2P \times 0.8 = 0.96P$. Therefore, the final price is 96% of the original price, which is a 4% decrease. Thus, the net change in price is a 4% decrease.

Short Method: Calculate compound percentage change: $1.2 \times 0.8 = 0.96$, indicating a 4% decrease.

Q16: A clock shows the time as 3:15. What is the angle between the hour and the minute hand?

Long Method: At 3:00, the hour hand is at 90 degrees (3 hours * 30 degrees/hour). At 3:15, the hour hand moves an additional 7.5 degrees (15 minutes * 0.5 degrees/minute). The minute hand at 15 minutes is at 90 degrees (15 minutes * 6 degrees/minute). The angle between the hour and minute hands is the absolute difference: $|90 - (90 + 7.5)| = 7.5$ degrees. Therefore, the angle is 7.5 degrees.

Short Method: Use the clock angle formula: $[30H - 11M]/2 = 7.5$

Q17: A cylinder has a radius of 7 cm and a height of 10 cm. What is its volume?

Long Method: The volume V of a cylinder is given by the formula $V = \pi r^2 h$. Substituting the given radius and height: $V = \pi \times 7^2 \times 10 = 490\pi$ cubic cm. Thus, the volume of the cylinder is 490π cubic cm.

Short Method: Apply the cylinder volume formula: $V = \pi \times 7^2 \times 10 = 490\pi$ cubic cm.

Q18: If a person travels 20 km at 4 km/h and returns at 5 km/h, what is their average speed for the entire journey?

Long Method: First, calculate the time taken for each part of the journey. Time to travel 20 km at 4 km/h is $20/4 = 5$ hours. Time to return 20 km at 5 km/h is $20/5 = 4$ hours. The total distance is 40 km, and the total time is $5 + 4 = 9$ hours. The average speed is the total distance divided by the total time: $40/9 \approx 4.44$ km/h.

Short Method: Use the harmonic mean formula for average speed: $[2 \times 4 \times 5]/[4 + 5] = 40/9 = 4.444$ km/h.

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Q19: If a number is increased by 25% and then decreased by 20%, what is the net change in the number?

Long Method: Let the initial number be x . After a 25% increase, the number becomes $1.25x$. After a 20% decrease, it becomes $1.25x \times 0.8 = 1x$. Thus, the final number is equal to the initial number, meaning there is no net change.

Short Method: Calculate compound percentage change: $1.25 \times 0.8 = 1$, indicating no net change.

Q20: If 15 workers can complete a task in 6 days, how many workers are required to complete the same task in 3 days?

Long Method: The work rate is inversely proportional to the number of workers. The total work required is $15 \times 6 = 90$ worker-days. To complete the task in 3 days, the number of workers needed is $90/3 = 30$ workers. Therefore, 30 workers are required to complete the task in 3 days.

Short Method: Use the inverse proportionality: $15 \times 6/3 = 30$ workers.

Q21: The ages of A and B are in the ratio 5:7. If the sum of their ages is 48, what are their ages?

Long Method: Let the ages of A and B be $5x$ and $7x$, respectively. According to the problem, $5x + 7x = 48$. Combining like terms, we get $12x = 48$. To find x , we divide both sides by 12: $x = 48/12 = 4$. Therefore, the ages of A and B are $5 \times 4 = 20$ and $7 \times 4 = 28$.

Short Method: Divide the sum by the total parts of the ratio and multiply by each part: $48/12 = 4$; $5 \times 4 = 20$ and $7 \times 4 = 28$.

Q22: A sum of money triples itself in 15 years at simple interest. What is the rate of interest per annum?

Long Method: Let the principal amount be P . In 15 years, the amount triples, so the final amount is $3P$. The interest earned is $3P - P = 2P$. Using the simple interest formula $SI = [P \times R \times T]/100$, we substitute $SI = 2P$; $T = 15$ years, and solve for R : $2P = [P \times R \times 15]/100$; $200 = 15R$; $R = 200/15$; $R = 13.33\%$. Therefore, the rate of interest per annum is 13.33%.

Short Method: The interest earned in 15 years is 200% of the principal. Divide 200% by 15 years to get the annual rate: $200/15 = 13.33\%$.

Q23: If the average of five consecutive numbers is 25, what is the smallest number?

Long Method: Let the five consecutive numbers be $x, x+1, x+2, x+3, x+4$. The average is given by: $\text{Average} = [x + (x+1) + (x+2) + (x+3) + (x+4)]/5 = 25$; $5x + 10 = 125$; $5x = 115$; $x = 23$. Therefore, the smallest number is 23.

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Short Method: The middle number in the sequence is the average. Since the average is 25, the middle number is 25. Therefore, the sequence is 23, 24, 25, 26, 27, and the smallest number is 23.

Q24: If $2/3$ of a number is 14, what is the number?

Long Method: Let the number be xx . According to the problem, $2/3x=14$. To solve for x , multiply both sides by $3/2$: $x=14 \times 3/2$ $x=21$ Therefore, the number is 21.

Short Method: Multiply 14 by the reciprocal of $2/3$: $14 \times 3/2=21$.

Q25: A car travels 80 km at 40 km/h and then another 120 km at 60 km/h. What is the average speed of the car for the entire journey?

Long Method: First, calculate the time taken for each part of the journey. Time to travel 80 km at 40 km/h is $80/40=2$ hours. Time to travel 120 km at 60 km/h is $120/60=2$ hours. The total distance is $80 + 120 = 200$ km, and the total time is $2 + 2 = 4$ hours. The average speed is the total distance divided by the total time: $200/4=50$ km/h.

Short Method: Calculate the total distance and total time, then divide: $(80+120)/(2+2)=50$ km/h.

Q26: If the perimeter of a square is 40 cm, what is the area of the square?

Long Method: The perimeter of a square is given by $4s$, where s is the side length. Given the perimeter is 40 cm, we solve for s : $4s=40$: $s=40/4=10$ cm The area A of a square is given by s^2 . $A=10^2=100$ square cm Therefore, the area of the square is 100 square cm.

Short Method: Divide the perimeter by 4 to get the side length, then square it: $(40/4)^2=100$ square cm.

Q27: A box contains 4 red, 3 blue, and 5 green balls. If one ball is drawn at random, what is the probability that it is blue?

Long Method: First, calculate the total number of balls: $4+3+5=12$. The number of blue balls is 3. The probability of drawing a blue ball is the number of blue balls divided by the total number of balls: $\text{Probability}=3/12=1/4$ Therefore, the probability is $1/4$.

Short Method: Calculate the probability directly: $3/12=1/4$.

Q28: If the difference between a number and its two-thirds is 20, what is the number?

Long Method: Let the number be xx . According to the problem, $x-2/3x=20$. Simplify and solve for x : $1/3x=20$: $x=20 \times 3=60$ Therefore, the number is 60.

Short Method: Multiply 20 by the reciprocal of $1/3$: $20 \times 3=60$.

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Q29: If the sides of a triangle are 5 cm, 12 cm, and 13 cm, is it a right-angled triangle?

Long Method: To check if a triangle is right-angled, we use the Pythagorean theorem. For sides a, b , and c (where c is the hypotenuse), $a^2 + b^2 = c^2$. Check if $5^2 + 12^2 = 13^2$: $13^2 = 169$. Since both sides are equal, it is a right-angled triangle.

Short Method: Check if $5^2 + 12^2 = 169$.

Q30: A man spends 3/8 of his income on rent, 1/2 on food, and the rest on savings. If his income is \$4800, how much does he save?

Long Method: First, calculate the amount spent on rent: $3/8 \times 4800 = 1800$ dollars. Then calculate the amount spent on food: $1/2 \times 4800 = 2400$ dollars. Add these two amounts to find the total spent: $1800 + 2400 = 4200$ dollars. Subtract this total from the income to find the savings: $4800 - 4200 = 600$ dollars.

Short Method: Calculate the savings directly: $4800 - (1800 + 2400) = 600$ dollars.

Q31: If a rectangle has a length of 8 cm and a width of 6 cm, what is its diagonal length?

Long Method: The diagonal length d of a rectangle can be found using the Pythagorean theorem: $d = \sqrt{l^2 + w^2}$. Substitute the given length and width: $d = \sqrt{8^2 + 6^2} = \sqrt{64 + 36} = \sqrt{100} = 10$ cm. Therefore, the diagonal length is 10 cm.

Short Method: Apply the Pythagorean theorem: $\sqrt{8^2 + 6^2} = 10$ cm.

Q32: If 16 workers can complete a task in 8 days, how many days will it take 12 workers to complete the same task?

Long Method: The total work done is $16 \times 8 = 128$ worker-days. If 12 workers are available, divide the total work by the number of workers to find the time required: $128/12 \approx 10.67$ days. Therefore, it will take approximately 10.67 days for 12 workers to complete the task.

Short Method: Use the inverse proportionality: $[16 \times 8]/12 = 10.67$ days.

Q33: The sum of the squares of two numbers is 100. If one number is 6, what is the other number?

Long Method: Let the two numbers be x and y , where $x = 6$. According to the problem, $x^2 + y^2 = 100$. Substitute x into the equation: $6^2 + y^2 = 100$: $36 + y^2 = 100$. Subtract 36 from both sides: $y^2 = 64$. Take the square root of both sides: $y = \sqrt{64}$: $y = -8$. Therefore, the other number is either 8 or -8.

Short Method: Calculate the square root: $\sqrt{100 - 36} = \sqrt{64} = 8$.

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Q34: If the average of 7 consecutive even numbers is 16, what is the largest number?

Long Method: Let the 7 consecutive even numbers be $x-6, x-4, x-2, x, x+2, x+4, x+6$. Their average is given by: $[(x-6)+(x-4)+(x-2)+x+(x+2)+(x+4)+(x+6)]/7=16$.

Simplify the sum: $7x/7: x=16$ The largest number is $x+6: 16+6=22$ Therefore, the largest number is 22.

Short Method: Add 6 to the average: $16+6=22$

Q35: If a cube's volume is 343 cubic cm, what is the length of each side?

Long Method: The volume V of a cube is given by $V=s^3$, where s is the side length. Given the volume is 343 cubic cm, solve for s : $s^3=343$ Take the cube root of both sides: Therefore, the side length is 7 cm.

Short Method: Calculate the cube root: $\sqrt[3]{343}=7$.

Q36: A train travels at 60 km/h and another train travels at 90 km/h. If they start from the same point and travel in opposite directions, how far apart will they be after 1.5 hours?

Long Method: The distance traveled by each train can be calculated separately. For the first train: Distance = $60 \text{ km/h} \times 1.5 \text{ hours} = 90 \text{ km}$.

For the second train: Distance = $90 \text{ km/h} \times 1.5 \text{ hours} = 135 \text{ km}$ The total distance apart is the sum of both distances: $90 \text{ km} + 135 \text{ km} = 225 \text{ km}$ Therefore, they will be 225 km apart after 1.5 hours.

Short Method: Add the distances: $(60+90) \times 1.5 = 225 \text{ km}$.

Q37: If the difference between two numbers is 15 and their product is 56, what are the numbers?

Long Method: Let the numbers be x and y . According to the problem: $x-y=15: xy=56$ We can express x in terms of $y: x=y+15$. Substitute into the product equation: $(y+15)y=56$:

$y^2+15y-56=0$ Solve the quadratic equation using the quadratic formula: $y = \frac{-15 \pm \sqrt{15^2 - 4 \cdot 1 \cdot (-56)}}{2}$

$y = \frac{-15 \pm \sqrt{449}}{2}$ Approximating the roots, we find $y \approx 2$ and $y \approx -17$ Therefore, the numbers are approximately 2 and 17.

Short Method: Solve using factorization: $(y+17)(y-2)=0$ giving numbers 2 and 17.

Q38: The sum of three consecutive odd numbers is 45. What are the numbers?

Long Method: Let the three consecutive odd numbers be $x, x+2, x+4$. According to the problem:

$x+(x+2)+(x+4)=45$ Simplify and solve for $x: 3x+6=45: 3x=39: x=13$ Therefore, the numbers are 13, 15 and 17

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Short Method: Divide the total by 3 to find the middle number: $45/3=15$, then 13,15,17

Q39: If a sphere has a radius of 5 cm, what is its surface area?

Long Method: The surface area A of a sphere is given by $A=4\pi r^2$. Substitute the given radius:

$A=4\pi \times 5^2=4\pi \times 25=100\pi$ square cm Therefore, the surface area of the sphere is 100π square cm.

Short Method: Apply the surface area formula: $4\pi \times 5^2=100\pi$ square cm.

Q40: A bottle of juice costs \$1.80, which is 20% more than the cost price. What is the cost price?

Long Method: Let the cost price be x . The selling price is 20% more than the cost price, so:

$1.2x=1.80$ Solve for x : $x=1.80/1.2=1.50$ Therefore, the cost price is \$1.50.

Short Method: Divide the selling price by 1.2: $1.80/1.2=1.50$

Q42: If the sum of three consecutive multiples of 4 is 60, what are the numbers?

Long Method: Let the numbers be $4x, 4(x+1), 4(x+2)$ According to the problem:

$4x+4(x+1)+4(x+2)=60$ Simplify and solve for x : $4x+4x+4+4x+8=60$

$12x+12=60$

$12x=48$

$x=4$ Therefore, the numbers are $4 \times 4, 4 \times 5, 4 \times 6$: 16,20,24

Short Method: Divide the sum by 3 to find the middle multiple: $60/3=20$ then 16,20,24

Q43: If 6 boys can paint a fence in 3 hours, how long will it take 4 boys to paint the same fence?

Long Method: First, calculate the total work done by 6 boys in 3 hours: Total work= $6 \times 3=18$ boy-hours

Now, divide the total work by 4 boys to find the time required: Time= $18/4=4.5$ hours

Short Method: Use the inverse proportionality: $[6 \times 3]/4=4.5$ hours.

Q44: If a person walks at 5 km/h, they arrive 10 minutes early. If they walk at 4 km/h, they arrive 5 minutes late. What is the distance to the destination?

Long Method: Let the distance be d km and the usual time be t hours. According to the problem:

$d/5=t-1/6$ $d/4=t+1/12$

Solve these equations to find d : $d/5-d/4=-1/6-1/12$: $4d-5d=-10$: $d=10$ $d=3$ km

Short Method: Set up the equations and solve for d : $d=1/[6+[1/12]]=3$ km

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Q45: If the circumference of a circle is 44 cm, what is its radius?

Long Method: The circumference C of a circle is given by $C=2\pi r$. Given $C=44$ cm, solve for r :

$$2\pi r=44$$

$$r=[44]/[2\pi]=[44]/[2\times 3.14]\approx 7 \text{ cm}$$

Short Method: Divide the circumference by 2π : $44/(2\times 3.14)\approx 7$ cm

Q46: A person spends 40% of their income on rent, 30% on food, and saves the rest. If their income is \$2000, how much do they save?

Long Method: First, calculate the amount spent on rent: $0.4\times 2000=800$ dollars

Next, calculate the amount spent on food: $0.3\times 2000=600$ dollars

The total spent is: $800+600=1400$ dollars

Subtract this from the income to find the savings: $2000-1400=600$ dollars

Short Method: Calculate the savings directly: $2000\times(1-0.4-0.3)=600$ dollars

Q47: The ratio of the ages of two brothers is 4:5. If the sum of their ages is 36, what are their ages?

Long Method: Let the ages be $4x$ and $5x$. According to the problem: $4x+5x=36$

$$9x=36: x=4$$

Therefore, their ages are: $4\times 4=16$ and $5\times 4=20$

Short Method: Divide the sum by the total parts: $36/(4+5)=4$ then $4\times 4=16$ and $5\times 4=20$.

Q48: If the sum of two numbers is 100 and their difference is 40, what are the numbers?

Long Method: Let the numbers be x and y . According to the problem: $x+y=100$

$$x-y=40$$

Add the two equations: $2x=140: x=70$

Substitute x back into the first equation: $70+y=100: y=30$

Therefore, the numbers are 70 and 30.

Short Method: Add the equations directly: $x=(100+40)/2=70$,

$$y=100-70=30$$

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