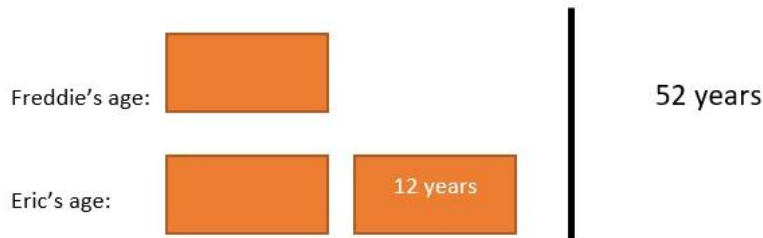
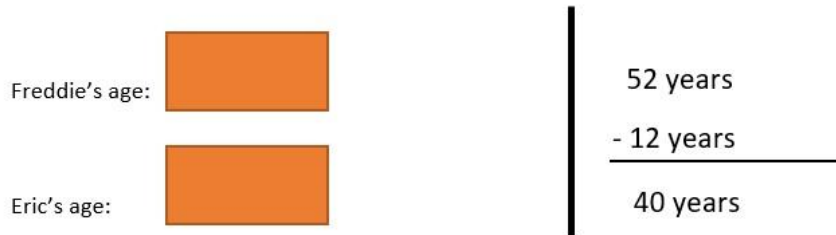


1 . Answer: B  
Explanation:

Using diagram:



Subtract 12 years from 52 so that only two units is left in the left side of the model:



Divide 40 years by 2:

$$40 \div 2 = 20 \text{ years}$$

Then, Freddie is 20 years old.

Meanwhile, Eric is  $20 + 12 = 32$  years old.



## Numerical Ability Answer key

## Set 3: Word Problems

Using algebraic expression:

Let  $x$  be Freddie's age

Since Eric is 12 years older than Freddie, then Eric's age can be expressed as  $x + 12$

The sum of the ages of Freddie and Eric is 52. Thus,

$$x + (x + 12) = 52$$

$$2x + 12 = 52$$

$$2x = 40$$

$$x = 20$$

Freddie is 20 years old.

To determine how old is Eric, we substitute  $x = 20$  to  $x + 12$

$$x + 12$$

$$(20) + 12 = 32$$

Therefore, Eric is 32 years old.

### 2. Answer: D

#### Explanation:

We let  $x$  be Mark's age five years ago. Since five years ago, Pat is 15 years younger than Mark, then we can express Pat's age five years ago as  $x - 5$ .

To obtain their ages in the current year, we just add 5 to the expressions representing the ages of Mark and Pat.

In solving age problems such that the ages are given in the current year and in previous years (past), it is helpful for us to use a table to organize the ideas.

	PAST	Present (+ 5 years)
Pat	$x - 15$	$x - 10$
Mark	$x$	$x + 5$

This year, Mark's age is twice Pat's age. Thus, we are now going to focus on the respective ages of Pat and Mark in the present. If Mark's age is  $x + 5$  in the present, then this is equal to twice of Pat's age in the present which is  $2(x - 10)$ .

$$x + 5 = 2(x - 10)$$



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**To God be the glory!**

$$\begin{aligned}x + 5 &= 2x - 20 \\x - 2x &= -5 - 20 \\-x &= -25 \\x &= 25\end{aligned}$$

Looking from the table,  $x$  represents Mark's age five years ago. Thus, Mark was 25 years old five years ago. To determine Pat's age five years ago, we substitute  $x = 25$  to  $x - 15$ .

$$\begin{aligned}x - 15 \\(25) - 15 &= 10\end{aligned}$$

Five years ago, Pat was 10 years old.

### 3. Answer: A

**Explanation:** In solving work problems, it is important to remember the relationship between the rates it takes to finish a task if the persons will work alone and the rate it takes to finish the same task if these persons will work together.

$$\frac{t}{\text{rate of person A}} + \frac{t}{\text{rate of person B}} = 1$$

In the formula above,  $t$  represents the time it takes to finish the task if persons A and B work together.

Now, let's apply this formula to the problem.

It takes 2 hours for Sylvia to finish the task.

Meanwhile, it takes 3 hours for Mike to finish the same task.

We need to find the time it takes to finish the task if Sylvia and Mike work together. We let this time be  $t$ .

We can use the formula above to solve for  $t$ .

$$\frac{t}{\text{rate of Sylvia}} + \frac{t}{\text{rate of Mike}} = 1$$

$$\frac{t}{2} + \frac{t}{3} = 1$$

Now that we have set up the equation, we just need to solve for the value of  $t$ .

Multiplying both sides of the equation by the least common denominator (which is 6).

$$\frac{t}{2} + \frac{t}{3} = 1$$
$$6\left(\frac{t}{2} + \frac{t}{3}\right) = 6(1)$$

Simplifying the equation:

$$3t + 2t = 6$$
$$5t = 6$$
$$t = \frac{6}{5}$$

Thus, it takes  $\frac{6}{5}$  hours to finish the task if Mike and Sylvia work together. We just need to convert  $\frac{6}{5}$  hours to decimal form to find the correct answer among the given choices.

$$\frac{6}{5} = 1.20 \text{ hours}$$

**4. Answer: A**

**Explanation:** Let  $x$  be Luke's age. Since Paul's age is twice Luke's age, then Paul's age can be expressed as  $2x$ . To determine their ages in 8 years (future), we just need to add 8 to the expressions representing their ages.

Again, we can use a table to organize the ideas involved in this problem:

	Present	Future (+ 8 years)
Luke	$x$	$x + 8$
Paul	$2x$	$2x + 8$
Sum of ages		88

In eight years, the sum of Luke's and Paul's ages is 88.

$$(x + 8) + (2x + 8) = 88$$

$$\begin{aligned}3x + 16 &= 88 \\3x &= 88 - 16 \\3x &= 72 \\x &= 24\end{aligned}$$

Looking at the table,  $x$  represents Luke's age in the present. Thus, Luke is 24 years old this year.

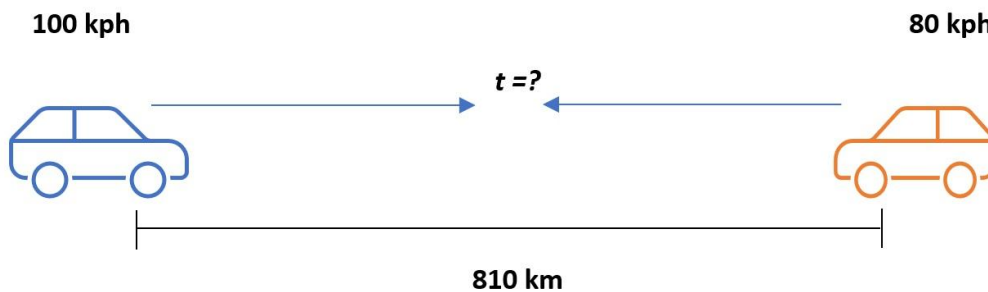
Meanwhile, to find Paul's age in the present, we just substitute  $x = 24$  to  $2x$ .

$$2x = 2(24) = 48$$

### 5. Answer: B Explanation:

Let's start by providing an illustration to the problem.

Two cars are 810 km apart. One car moves 100 kph and the other moves 80 kph. We need to determine how many hours it takes for these cars to meet each other



Based on the diagram, the respective distance covered by each car when they meet each other has a sum of 810 km.

Let  $t$  be the number of hours it takes for these cars to meet each other.

We create a table so that we can easily summarize the ideas involved in this problem. Recall that  $distance = rate \times time$

	Rate (in kph)	Time (in hours)	Distance
Car 1	100	$t$	$100t$
Car 2	80	$t$	$80t$
Total			$180t = 810$

The respective distance covered by each car  $t$  hours are  $100t$  and  $80t$ .

The sum of these distances is  $180t$ .

From our diagram, we saw that the total distance covered by the cars when they meet is 810 km.

Thus, we have  $180t = 810$

Now, we will solve for  $t$ .

$$180t = 810$$

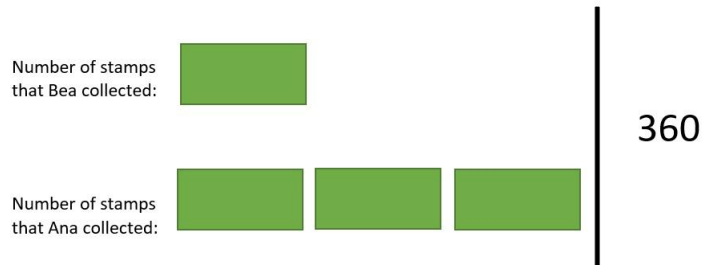
$$t = 4.5$$

Then, the cars will meet after 4.5 hours.

**6. Answer: C**

**Explanation:**

*Using diagram:*



There are 4 units, so we need to divide 360 by 4:

$$360 \div 4 = 90$$

Thus, Bea collected 90 stamps.

Meanwhile, Ana collected  $3 \times 90 = 270$

*Using algebraic method:*

Let  $x$  be the number of stamps that Bea collected.

Since Ana collected thrice the number of stamps that Bea collected, then we can express the number of stamps that Ana had collected as  $3x$ .

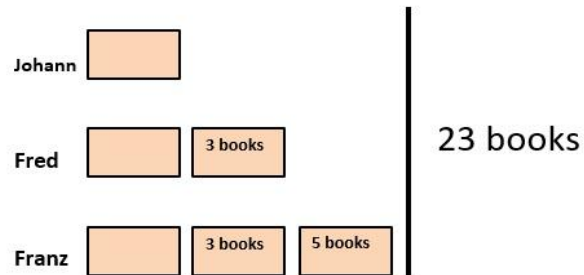
The sum of their collected stamps is 360. Thus,

$$\begin{aligned}x + 3x &= 360 \\4x &= 360 \\x &= 90\end{aligned}$$

Since  $x$  represents the number of stamps collected by Bea. Thus, Bea collected 90 stamps. Meanwhile, Ana collected  $3(90) = 270$  stamps.

**7. Answer: B**

**Explanation:** *Using diagram:*



Subtract 11 books from 23 books.



We have 3 units remaining. To find the value of each units remaining, we divide 12 by 3:

$$12 \div 3 = 4$$

Thus, each unit is equal to 4 books.

Johann received 4 books from Claude.

Fred received  $4 + 3 = 7$  books from Claude.

Franz received  $4 + 3 + 5 = 12$  books from Claude.

*Using algebraic method:*

Let  $x$  be the number of books that Johann received from Claude.

Fred received 3 more books than Johann, then Fred has  $x + 3$  books from Claude.

Franz received 5 more books than Fred, then Franz has  $(x + 3) + 5$  books from Claude.

The total number of books that Claude gave to his friends is 23.

Thus,

$$x + (x + 3) + ((x + 3) + 5) = 23$$



Simplifying the equation and solving for  $x$ :

$$\begin{aligned}3x + 11 &= 23 \\3x &= 23 - 11 \\3x &= 12 \\x &= 4\end{aligned}$$

$x$  represents the number of books that Johann received from Claude, then Johann has 4 books. To determine how many books that Franz received, we substitute  $x = 4$  to  $(4 + 3) + 5$

$$(x + 3) + 5 = ((4) + 3) + 5 = 12$$

Franz received 12 books from Claude.

**8. Answer: A**

**Explanation:**

We construct a table presenting the ages of Patty and Cindy in the past, present, and future.

We start assigning variables to the ages of Patty and Cindy in the past. Let  $x$  be Cindy's age seven years ago. Then, Patty's age is  $2x$  (since her age is twice of Cindy's age seven years ago)

Therefore, to get their respective ages in the present, we just add 7 years to their respective ages in the past.

Moreover, to find their ages five years from present, we then have to add 12 years to their respective ages in the past.

The sum of their ages in the future is 66.

	<b>Past</b>	<b>Present (+7 years)</b>	<b>Future (+ 12 years)</b>
Cindy	$x$	$x + 7$	$x + 12$
Patty	$2x$	$2x + 7$	$2x + 12$
Total			$3x + 24 = 66$

Finally, we have to solve the equation in the lowermost part of the table indicating the total of the ages of Cindy and Patty.

$$3x + 24 = 66$$

$$3x = 42$$

$$x = 14$$

The problem asked us to find Cindy's and Patty's age in the present. Looking at the "present" column of our table, we just substitute  $x = 14$  to the expressions on that column.

$$\text{Cindy: } x + 7 = (14) + 7 = 21$$

$$\text{Patty: } 2x + 7 = 2(14) + 7 = 35.$$

Thus, Cindy is 21 years old and Patty is 35 years old in the present.

**9. Answer: A**

**Explanation:** The distance from City A to City B can be computed by determining the distance covered by the car throughout its trip given that it is moving at a rate of 60 kph.

Recall that  $distance = rate \times time$

The car left City A at 8:30 AM and reached City B at 10:45 AM, then the car's travel time is 2 hours and 15 minutes or  $2\frac{15}{60} = 2\frac{1}{4}$  hours.

Therefore, we have  $r = 60$  and  $t = 2\frac{1}{4}$

To find the distance from City A to City B:

$$distance = rate \times time$$

$$distance = 60 \times 2\frac{1}{4}$$

$$distance = 60 \times \frac{9}{4}$$

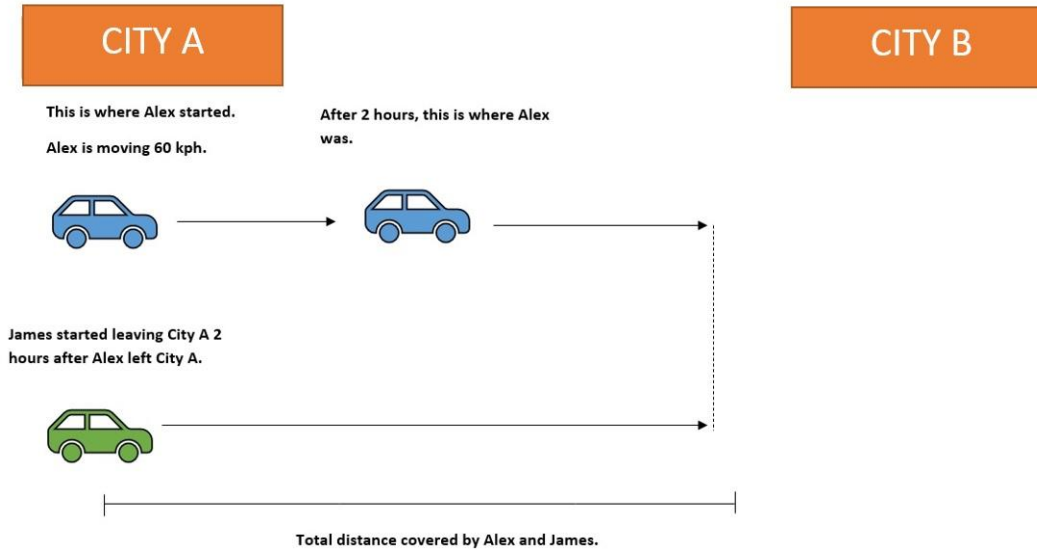
$$distance = \frac{540}{4} = 135 \text{ km}$$

Thus, the distance from City A to City B is 135 km.

**10. Answer: B**

**Explanation:**

Let's start by providing an illustration for this problem.



From the illustration, the broken line represents the place where James already reached Alex and can now overtake him. At the broken line, the distance covered by James and Alex is already equal. Thus, James will overtake if they already covered equal distances.

Let  $t$  be the time in hours of James overtaking Alex.  
Meanwhile, let  $t + 2$  be the time in hours of Alex where James is overtaking him.

	Rate (in kph)	Time (in hours)	Distance (in km)
James	80	$t$	$80t$
Alex	60	$t + 2$	$60(t + 2)$

James can overtake Alex if they have equal distances covered. Thus,

$$\begin{aligned}
 80t &= 60(t + 2) \\
 80t &= 60t + 120 \\
 20t &= 120
 \end{aligned}$$

$$t = 6$$

Thus, James will overtake Alex in 6 hours.

**11. Answer: C**

**Explanation:** Recall that given the rates of two persons working a certain task alone, the time it takes for them to finish the task if they work together is given by:

$$\frac{t}{\text{rate of person A}} + \frac{t}{\text{rate of person B}} = 1$$

Where  $t$  is the time it takes for persons to finish the task by working together.

We can apply this formula to this problem.

Jessie can finish decorating the room in 4 hours. Meanwhile, if Catherine helps Jessie, they can finish decorating the room in  $\frac{4}{3}$  hours. Thus, we have  $t = \frac{4}{3}$ . Using the formula above

$$\frac{t}{\text{rate of Jessie}} + \frac{t}{\text{rate of Catherine}} = 1$$

We substitute  $t = \frac{4}{3}$  and let  $x$  be the rate of Catherine:

$$\frac{\frac{4}{3}}{4} + \frac{\frac{4}{3}}{x} = 1$$

Multiplying both sides of the equation by  $4x$ :

$$4x\left(\frac{\frac{4}{3}}{4} + \frac{\frac{4}{3}}{x}\right) = 4x(1)$$
$$\frac{4}{3}x + \frac{16}{3} = 4x$$

Simplifying and solving for  $x$ :

$$\frac{4x + 16}{3} = 4x$$
$$12x = 4x + 16$$
$$8x = 16$$
$$x = 2$$

Thus, Catherine can decorate the room alone in 2 hours.

**12. Answer: D**

**Explanation:**

Let  $x$  be the time it takes for Rachel to finish the task.

Then, Celine can finish the same task in  $x - 3$  (we deduct 3 from  $x$  since Celine is faster than Rachel and needs less time).

If Celine and Rachel work together, they can finish the same task in 2 hours.

Recall that:

$$\frac{t}{\text{rate of person A}} + \frac{t}{\text{rate of person B}} = 1$$

Fitting the formula to our problem, we have:

$$\frac{2}{\text{rate of Celine}} + \frac{2}{\text{rate of Rachel}} = 1$$

$$\frac{2}{x-3} + \frac{2}{x} = 1$$

Now, we are going to simplify the equation above and solve for  $x$ :

$$\begin{aligned}\frac{2x + 2(x-3)}{x(x-3)} &= 1 \\ 2x + 2(x-3) &= x(x-3) \\ 2x + 2x - 6 &= x^2 - 3x \\ 4x - 6 &= x^2 - 3x \\ 0 &= x^2 - 7x + 6 = 0 \\ (x-6)(x-1) &= 0 \\ x &= 6 \text{ and } x = 1\end{aligned}$$

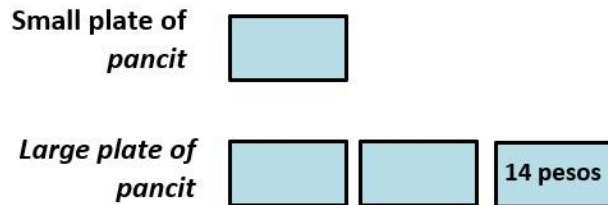
We will reject  $x = 1$  as a solution since we have  $x - 3$  and  $1 - 3 = -2$ . Thus,  $x = 1$  is an extraneous solution.

Since  $x$  represents the time it takes for Rachel to finish the task. Then, Rachel can finish the task in 6 hours. Meanwhile, Celine can finish the same task in 3 hours ( $6 - 3 = 3$ ).

**13. Answer: D**

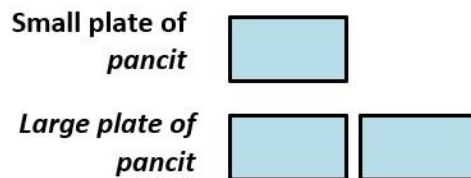
**Explanation:**

Using diagram



104

*Subtract 14 pesos from 104.*



104

- 14  
-----  
90

*There are 3 units remaining. Thus, we divide 90 by 3:*

$$90 \div 3 = 30$$

*This means that each unit is equal to Php 30.00.*

*An order of small plate of pancit is Php 30.00.*

*Meanwhile, a large plate of pancit is  $2(30) + 14 = 60 + 14 = \text{Php } 74.00$ .*

*Using algebraic method:*

Let  $x$  be the price of a small plate of *pancit*.

Let  $2x + 14$  be the price of a large plate of *pancit*.

If you order a small plate and a large plate of *pancit*, you have to pay Php 104.00:

$$x + (2x + 14) = 104$$

$$\begin{aligned}3x + 14 &= 104 \\3x &= 90 \\x &= 30\end{aligned}$$

Then, a small plate of *pancit* costs Php 30.00.

To determine the price of a large plate, we substitute  $x = 30$  to  $2x + 14$ .

$$2(30) + 14 = 60 + 14 = 74$$

**14. Answer: C**

**Explanation:**

We can still apply the formula or technique we used in the previous work problems (but in this case we are dealing with pipes and not people).

$$\frac{t}{\text{rate of pipe A}} + \frac{t}{\text{rate of pipe B}} = 1$$

where  $t$  is the time it takes for two pipes to fill the tank if they are both open.

Pipe A can fill the tank alone in 45 minutes. We expressed this as a fraction of hour:  $\frac{45}{60}$  or  $\frac{3}{4}$

Pipe B can fill the tank alone in 50 minutes. We expressed this as a fraction of hour:  $\frac{50}{60}$  or  $\frac{5}{6}$

Using the formula above:

$$\begin{aligned}\frac{t}{\text{rate of pipe A}} + \frac{t}{\text{rate of pipe B}} &= 1 \\ \frac{t}{\frac{3}{4}} + \frac{t}{\frac{5}{6}} &= 1\end{aligned}$$

Solving for the value of  $t$ :

$$\begin{aligned}\frac{4}{3}t + \frac{6}{5}t &= 1 \\ \frac{20t + 18t}{15} &= 1 \\ 20t + 18t &= 15 \\ 38t &= 15 \\ t &= \frac{15}{38}\end{aligned}$$

**15. Answer: A**

**Explanation:**

Cess sold 45 *suman* in the afternoon. It was stated that Cess sold thrice as much *suman* in the morning than in the afternoon. Thus, Cess sold  $3 \times 45 = 135$  *suman* in the morning.

Therefore, Cess sold  $45 + 135 = 180$  *suman* that day.

If each *suman* costs Php 15.00, then the total earnings of Cess from selling *suman* is:  
 $15 \times 180 = \text{Php } 2700$

**16. Answer: B**

**Explanation:**

Let  $x$  be the age of the child in the present.

Since, the sum of the ages of the child and his father is 40, then we can express the age of the father as  $40 - x$ .

Now, we will express the respective ages of the child and his father in 8 years.

	Present	Future (+8 years)
Child	$x$	$x + 8$
Father	$40 - x$	$(40 - x) + 8 = 48 - x$

In eight years, the child will be 24 years younger than his father. It means that the age of the child in eight years is equal to the age of his father in 8 years minus 24.

$$(x + 8) = (48 - x) - 24$$

$$(x + 8) = (24 - x)$$

$$2x = 16$$

$$x = 8$$

Since  $x$  represents the age of the child in the present, then the child is 8 years old in the present.

**17. Answer: C**

**Explanation:**



Let  $x$  be Sheila's age.

Bianca's age is 11 more than twice Sheila's age. Then, Bianca's age can be represented as  $2x + 11$ .

Now, we will express the respective ages of Sheila and Bianca 7 years ago.

	Present	Past (- 7 years)
Sheila	$x$	$x - 7$
Bianca	$2x + 11$	$2x + 11 - 7 = 2x + 4$

Seven years ago, the sum of their ages was 29. Thus,

$$\begin{aligned}(x - 7) + (2x + 4) &= 29 \\ 3x - 3 &= 30 \\ 3x &= 33 \\ x &= 11\end{aligned}$$

Since  $x$  represents the age of Sheila in the present. Sheila is 11 years old in the present.

To find the age of Bianca in the current year, we just substitute  $x = 11$  to  $2x + 11$ .

$$2(11) + 11 = 33$$

**18. Answer: A**

**Explanation:**

The revenue from bus fare can be expressed as:

$$\text{Revenue} = (\text{number of passengers going to City P})(35) + (\text{number of passengers going to City Q})(62)$$

There are 20 passengers going to City Q and a revenue of 2290:

$$\text{Revenue} = (\text{number of passengers going to City P})(35) + (20)(62)$$

Let  $x$  be the number of passengers to City P:

$$\begin{aligned}2290 &= (x)(35) + (20)(62) \\ 2290 &= 35x + 1240 \\ 2290 - 1240 &= 35x \\ 1050 &= 35x \\ x &= 30\end{aligned}$$

Thus, there are 30 passengers going to City P.

**19. Answer: D**

**Explanation:**

Let  $x$  be Beatris' age fourteen years ago. Fourteen years ago, Mica was 9 years older than Beatris. Then, we can express Mica's age fourteen years ago as  $x + 9$ .

Now, we will express the respective ages of Mica and Beatris in the present.

	Past	Present (+14 years)
Beatris	$x$	$x + 14$
Mica	$x + 9$	$x + 9 + 14 = x + 23$

In the present, the sum of the ages of Beatris and Mica is 75. Thus,

$$\begin{aligned} (x + 14) + (x + 23) &= 75 \\ 2x + 37 &= 75 \\ 2x &= 38 \\ x &= 19 \end{aligned}$$

$x$  represents Beatris' age fourteen years ago. Then, Bea was 19 years old fourteen years ago.

**20. Answer: C**

**Explanation:**

Let's start by providing an illustration for the problem



Based on the illustration, the sum of the distances covered by the faster and the slower car is 435 km.

Let  $x$  be the rate of the slower car. Then,  $x + 5$  is the rate of the faster car.

	<b>Rate</b>	<b>Time</b>	<b>Distance</b>
Faster car	$x + 5$	3	$3(x + 5)$
Slower car	$x$	3	$3x$

Since the sum of the distances covered by the cars is 435 km. Then,

$$3(x + 5) + 3x = 435$$

Solving for the value of  $x$ :

$$3x + 15 + 3x = 435$$

$$6x + 15 = 435$$

$$6x = 420$$

$$x = 70$$

Since  $x$  represents the rate of the slower car, then the rate of the slower car is 70 kph.

Meanwhile, the rate of the faster car can be obtained by substituting  $x = 70$  to  $x + 5 = 70 + 5 = 75$  kph.