

LESSON 12 Solving Age Problems

IMPLEMENTATION: Solve the equation:

$$2(12 + x) = 34 + x$$

$$24 + 2x = 34 + x$$

$$24 + 2x - x = 34 + x - x$$

$$24 + x = 34$$

$$24 - 24 + x = 34 - 24$$

$$x = 10$$

Hence, in 10 years the father will be twice as old as his son.

EVALUATION: In 10 years, the father will be $34 + 10 = 44$ years old, and the son will be $12 + 10 = 22$ years, in which case the father is twice as old as his son.

Try These

1. A man is six times as old as his son. In 9 years he will be three times as old as his son. How old are they now?
2. A woman is twice as old as her daughter. Twenty years ago, she was four times as old as her daughter. How old are they now?
3. Mark is 4 years older than his brother Mike. If the sum of their ages is 20, how old are they now?
4. Marie is 12 years older than Mary. Nine years ago, Marie was twice as old as Mary. Find their present ages.
5. Sam is 18 and Bill is 24. How many years ago was Bill three times as old as Sam?
6. Pat is five years older than her brother. Two years from now, the sum of their ages will be 23. Find their present ages.
7. The sum of Tyler and Alane's ages is 36. Twelve years ago, Alane was twice as old as Tyler. Find their present ages.
8. Tara is two years older than Ashley. In 4 years from now, Tara will be twice as old as Ashley was 4 years ago. Find their present ages.
9. A father is three times as old as his twin sons. If the sum of their ages in two years will be 81, how old are they now?

10. Will is 4 years older than Phil. Three years from now, Will will be twice as old as Phil was last year. Find their present ages.

SOLUTIONS:

1. Let x = the son's age and $6x$ = the father's age; then $x + 9$ = the son's age and $6x + 9$ = the father's age in 9 years.

$$3(x + 9) = 6x + 9$$

$$3x + 27 = 6x + 9$$

$$3x - 6x + 27 = 6x - 6x + 9$$

$$-3x + 27 = 9$$

$$-3x + 27 - 27 = 9 - 27$$

$$-3x = -18$$

$$\frac{-3^1 x}{-3^1} = \frac{-18}{-3}$$

$$x = 6 \quad (\text{son's age})$$

$$6x = 6 \cdot 6 = 36 \quad (\text{father's age})$$

2. Let x = daughter's age and $2x$ = mother's age; then $x - 20$ = the daughter's age and $2x - 20$ = the mother's age 20 years ago.

$$4(x - 20) = 2x - 20$$

$$4x - 80 = 2x - 20$$

$$4x - 2x - 80 = 2x - 2x - 20$$

$$2x - 80 = -20$$

$$2x - 80 + 80 = -20 + 80$$

$$2x = 60$$

$$\frac{2^1 x}{2^1} = \frac{60}{2}$$

$$x = 30 \quad (\text{daughter's age})$$

$$2x = 2 \cdot 30 = 60 \quad (\text{mother's age})$$

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3. Let $x =$ Mike's age and $x + 4 =$ Mark's age.

$$x + x + 4 = 20$$

$$2x + 4 = 20$$

$$2x + 4 - 4 = 20 - 4$$

$$2x = 16$$

$$\frac{2^1 x}{2^1} = \frac{16}{2}$$

$$x = 8 \quad (\text{Mike's age})$$

$$x + 4 = 8 + 4 = 12 \quad (\text{Mark's age})$$

4. Let $x =$ Mary's age and $x + 12 =$ Marie's age; then $x - 9 =$ Mary's age and $x + 12 - 9 =$ Marie's age 9 years ago.

$$2(x - 9) = x + 12 - 9$$

$$2x - 18 = x + 3$$

$$2x - x - 18 = x - x + 3$$

$$x - 18 = 3$$

$$x - 18 + 18 = 3 + 18$$

$$x = 21 \quad (\text{Mary's age})$$

$$x + 12 = 21 + 12 = 33 \quad (\text{Marie's age})$$

5. Let $x =$ number of years ago when Bill was three times as old as Sam; then $18 - x =$ Sam's age and $24 - x =$ Bill's age x years ago.

$$3(18 - x) = 24 - x$$

$$54 - 3x = 24 - x$$

$$54 - 3x + x = 24 - x + x$$

$$54 - 2x = 24$$

$$54 - 54 - 2x = 24 - 54$$

$$-2x = -30$$

$$\frac{-2^1 x}{-2^1} = \frac{-30}{-2}$$

$$x = 15 \text{ years ago}$$

6. Let $x = \text{Pat's brother's age}$ and $x + 5 = \text{Pat's age}$; then $x + 2 = \text{Pat's brother's age}$ and $x + 5 + 2 = \text{Pat's age in two years}$.

$$x + 2 + x + 5 + 2 = 23$$

$$2x + 9 = 23$$

$$2x + 9 - 9 = 23 - 9$$

$$2x = 14$$

$$\frac{2x}{2} = \frac{14}{2}$$

$$x = 7 \text{ (Pat's brother's age)}$$

$$x + 5 = 7 + 5 = 12 \text{ (Pat's age)}$$

7. Let $x = \text{Tyler's age}$ and $36 - x = \text{Alane's age}$; then $x - 12 = \text{Tyler's age}$ and $36 - x - 12 = \text{Alane's age 12 years ago}$.

$$2(x - 12) = 36 - x - 12$$

$$2x - 24 = 24 - x$$

$$2x + x - 24 = 24 - x + x$$

$$3x - 24 = 24$$

$$3x - 24 + 24 = 24 + 24$$

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$$3x = 48$$

$$\frac{3^1 x}{3^1} = \frac{48}{3}$$

$$x = 16 \quad (\text{Tyler's age})$$

$$36 - x = 36 - 16 = 20 \quad (\text{Alane's age})$$

8. Let $x =$ Ashley's age and $x + 2 =$ Tara's age; then $x - 4 =$ Ashley's age 4 years ago and $x + 2 + 4 =$ Tara's age in 4 years.

$$2(x - 4) = x + 2 + 4$$

$$2x - 8 = x + 6$$

$$2x - x - 8 = x - x + 6$$

$$x - 8 = 6$$

$$x - 8 + 8 = 6 + 8$$

$$x = 14 \quad (\text{Ashley's age})$$

$$x + 2 = 14 + 2 = 16 \quad (\text{Tara's age})$$

9. Let $x =$ age of the sons and $3x =$ age of the father; then $x + 2 =$ the sons' ages and $3x + 2 =$ the father's age in 2 years.

$$x + 2 + x + 2 + 3x + 2 = 81$$

$$5x + 6 = 81$$

$$5x + 6 - 6 = 81 - 6$$

$$5x = 75$$

$$\frac{5^1 x}{5^1} = \frac{75}{5}$$

$$x = 15 \quad (\text{each son's age})$$

$$3x = 3 \cdot 15 = 45 \quad (\text{father's age})$$

10. Let $x =$ Phil's age and $x + 4 =$ Will's age; then $x - 1 =$ Phil's age one year ago and $x + 4 + 3 =$ Will's age in 3 years.

$$x + 4 + 3 = 2(x - 1)$$

$$x + 7 = 2x - 2$$

$$x - x + 7 = 2x - x - 2$$

$$7 = x - 2$$

$$7 + 2 = x - 2 + 2$$

$$9 = x \quad (\text{Phil's age})$$

$$x + 4 = 9 + 4 = 13 \quad (\text{Will's age})$$