Math Genius
Algebra Equations

Name: _____

(ID:305) 1. Find the sum of the solutions to $|x - 26| = 11$.

(ID:376) 2. Solve for s: $|3s - 1| = 9$.

(ID:250) 3. Madeline and Emma drive toward each other from towns 96 miles apart. Madeline drives at 40 mph, and Emma at 20 mph. How long until they meet?

(ID:251) 4. Sofia rows a boat at 8 mph in still water. The river's current is 2 mph. How long does it take Sofia to row 18 miles downstream and back upstream?

(ID:252) 5. Hailey flies a plane at 81 mph in still air over 512 miles. With a 27 mph headwind outbound and tailwind inbound, how long is the round trip?

(ID:253) 6. Paris cycles at 18 mph. 4 hours later, Arianna cycles at 26 mph to catch up. How long does Arianna take to overtake Paris?

(ID:254) 7. Oliver's train travels at 11 mph, and Seth's at 5 mph, starting from the same point in opposite directions. How far apart are they after 4 hours?

(ID:255) 8. Abigail runs at 10 mph, and Alexis at 12 mph, starting 100 miles apart in the same direction. How long until Alexis catches Abigail?

(ID:256) 9. Melanie drives 24 miles at 15 mph and returns at 9 mph. What is the average speed for the round trip?

(ID:257) 10. Nathan rows at 6 mph in still water with a 3 mph current. How far does Nathan travel downstream in 3 hours?

Math Genius
Algebra Equations

Name: _____

Answer Key

1. 52
2. $s = \frac{10}{3}$ or $s = -\frac{8}{3}$
3. $\frac{8}{5}$ hours
4. 24/5 hours
5. 128/9 hours
6. 9 hours
7. 64 miles
8. 50 hours
9. $\frac{45}{4}$ mph
10. 27 miles

 Name: _____

Solution to Problem 1

To find the sum of the solutions to the equation:

$$|x - 26| = 11$$

Step 1: Analyze the absolute value equation
The equation $|x - 26| = 11$ always has solutions since the right side $11 \geq 0$.

Step 2: Solve the equation
Rewrite $|x - 26| = 11$ as two equations:

$$x - 26 = 11 \quad \text{or} \quad x - 26 = -11$$

Solving the first: $x - 26 = 11 \implies x = 37$. Solving the second: $x - 26 = -11 \implies x = 15$.

Step 3: Sum the solutions
The solutions are $x = 37$ and $x = 15$. Their sum is:

$$37 + (15) = 52$$

Step 4: Final Answer
The sum of the solutions is $\boxed{52}$.

 Name: _____

Solution to Problem 2

Solve $|3s - 1| = 9$:

Step 1: Create two linear equations

$$3s - 1 = 9 \quad \text{and} \quad 3s - 1 = -9$$

Step 2: Solve each

$$s = \frac{10}{3}, \quad s = -\frac{8}{3}$$

Step 3: Final Answer

$$\boxed{s = \frac{10}{3}} \quad \text{or} \quad \boxed{s = -\frac{8}{3}}$$

 Name: _____

Solution to Problem 3

Madeline and Emma drive toward each other from towns 96 miles apart. Madeline drives at 40 mph, and Emma at 20 mph.

Step 1: Calculate relative speed
When two objects move toward each other, their speeds combine:

$$40 + 20 = 60 \text{ mph}$$

Step 2: Compute time
Use the formula: Time = Distance ÷ Speed

$$t = \frac{96}{60} = \frac{8}{5} \text{ hours}$$

Step 3: Final Answer
The solution is

$$\boxed{\frac{8}{5}}$$

hours

 Name: _____

Solution to Problem 4

Sofia rows a boat at 8 mph in still water with a 2 mph current, traveling 18 miles downstream and back upstream.

Step 1: Downstream time
Downstream speed is boat speed plus current:

$$8 + 2 = 10 \text{ mph}$$

Time downstream:

$$t_1 = \frac{18}{10} = \frac{9}{5} \text{ hours}$$

Step 2: Upstream time
Upstream speed is boat speed minus current:

$$8 - 2 = 6 \text{ mph}$$

Time upstream:

$$t_2 = \frac{18}{6} = 3 \text{ hours}$$

Step 3: Total time
Add both times:

$$\frac{9}{5} + 3 = \frac{24}{5} \text{ hours}$$

Step 4: Final Answer
The solution is

$$\boxed{\frac{24}{5}}$$

hours

 Name: _____

Solution to Problem 5

Hailey flies a plane at 81 mph in still air over 512 miles, with a 27 mph headwind outbound and tailwind inbound.

Step 1: Outbound time
With a headwind, ground speed decreases:

$$81 - 27 = 54 \text{ mph}$$

Time outbound:

$$t_1 = \frac{512}{54} = \frac{256}{27} \text{ hours}$$

Step 2: Inbound time
With a tailwind, ground speed increases:

$$81 + 27 = 108 \text{ mph}$$

Time inbound:

$$t_2 = \frac{512}{108} = \frac{128}{27} \text{ hours}$$

Step 3: Total time
Add both times:

$$\frac{256}{27} + \frac{128}{27} = \frac{128}{9} \text{ hours}$$

Step 4: Final Answer
The solution is

$$\boxed{\frac{128}{9}}$$

hours

 Name: _____

Solution to Problem 6

Paris cycles at 18 mph. Arianna starts 4 hours later at 26 mph to catch up.

Step 1: Calculate distance covered by Paris
Paris has a 4 hours head start:

$$18 \cdot 4 = 72 \text{ miles}$$

Step 2: Relative speed
Arianna catches up at the difference in speeds:

$$26 - 18 = 8 \text{ mph}$$

Step 3: Time to catch up
Time for Arianna to close the gap:

$$t = \frac{72}{8} = 9 \text{ hours}$$

Step 4: Final Answer
The solution is

$$\boxed{9}$$

hours

 Name: _____

Solution to Problem 7

Oliver's train travels at 11 mph, and Seth's at 5 mph, starting from the same point in opposite directions.

Step 1: Calculate relative speed
When traveling in opposite directions, speeds add:

$$11 + 5 = 16 \text{ mph}$$

Step 2: Compute distance
Distance after 4 hours:

$$16 \cdot 4 = 64 \text{ miles}$$

Step 3: Final Answer
The solution is

$$\boxed{64}$$

miles

 Name: _____

Solution to Problem 8

Abigail runs at 10 mph, and Alexis at 12 mph, starting 100 miles apart in the same direction.

Step 1: Relative speed
When two objects move in the same direction, their relative speed is the difference of their speeds:

$$12 - 10 = 2 \text{ mph}$$

Step 2: Compute time
Time for Alexis to catch Abigail:

$$t = \frac{100}{2} = 50 \text{ hours}$$

Step 3: Final Answer
The solution is

$$\boxed{50}$$

hours

 Name: _____

Solution to Problem 9

Melanie drives 24 miles at 15 mph and returns at 9 mph.

Step 1: Total distance
Round trip distance:

$$24 + 24 = 48 \text{ miles}$$

Step 2: Total time
Time for first segment:

$$t_1 = \frac{24}{15}$$

Time for return:

$$t_2 = \frac{24}{9}$$

Total time:

$$\frac{24}{15} + \frac{24}{9} = \frac{576}{135} = \frac{64}{15} \text{ hours}$$

Step 3: Average speed
Average speed is total distance divided by total time:

$$\frac{48}{\frac{64}{15}} = \frac{45}{4} \text{ mph}$$

Step 4: Final Answer
The solution is

$$\boxed{\frac{45}{4}}$$

mph.

 Name: _____

Solution to Problem 10

Nathan rows at 6 mph in still water with a 3 mph current.

Step 1: Calculate downstream speed
Downstream speed is rowing speed plus current:

$$6 + 3 = 9 \text{ mph}$$

Step 2: Compute distance
Distance in 3 hours:

$$9 \cdot 3 = 27 \text{ miles}$$

Step 3: Final Answer
The solution is

$$\boxed{27}$$

miles