NAME _____

ALGEBRA READINESS
Solving Equations Using Addition and Subtraction

Subtraction Property of Equality
If you subtract the same number from each side of an equation, the two sides remain equal.

$$x + 8 = 14$$

To undo the addition of 8, subtract 8.

$$x + 8 - 8 = 14 - 8$$
$$x + 0 = 6$$
$$x = 6$$

Addition Property of Equality
If you add the same number to each side of an equation, the two sides remain equal.

$$n - 6 = 7$$

To undo the subtraction of 6, add 6.

$$n - 6 + 6 = 7 + 6$$
$$n - 0 = 13$$
$$n = 13$$

Write the operation that would undo the operation in the equation.

	a	b
1.	$x - 16 = 20$ addition	$24 + n = 38$ _____
2.	$14 = n - 32$ _____	$a + 50 = 84$ _____

Solve each equation.

	a	b
3.	$n - 7 = 12$ 19	$x + 17 = 25$ _____
4.	$a - 11 = 6$ _____	$32 + b = 40$ _____
5.	$x + 9 = 18$ _____	$n - 45 = 90$ _____
6.	$16 + a = 54$ _____	$12 + x = 24$ _____
7.	$b - 15 = 0$ _____	$83 + n = 83$ _____
8.	$16 + b = 32$ _____	$52 = a - 5$ _____
9.	$35 = n + 15$ _____	$x + 18 = 19$ _____

Write and solve an equation for each situation.

10. A total of 97 students tried out for the debate team. If 45 of the students were girls, how many were boys? _____

11. Three members left the debate team during the year. If 12 members remained, how many were on the team originally? _____

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ALGEBRA READINESS
Solving Equations Using Multiplication and Division

Division Property of Equality
If you divide each side of an equation by the same nonzero number, the two sides remain equal.

$$3 \times n = 15$$

To undo multiplication by 3, divide by 3.

$$\frac{3 \times n}{3} = \frac{15}{3}$$

$$n = 5$$

Multiplication Property of Equality
If you multiply each side of an equation by the same number, the two sides remain equal.

$$\frac{a}{3} = 9$$

To undo division by 3, multiply by 3.

$$\frac{a}{3} \times 3 = 9 \times 3$$

$$a = 27$$

Write the operation that would undo the operation in the equation.

	a	b
1.	$6 \times a = 24$ division	$\frac{x}{4} = 16$ _____
2.	$4 = \frac{n}{3}$ _____	$42 = 7 \times a$ _____
3.	$x \times 8 = 56$ _____	$\frac{a}{8} = 16$ _____

Solve each equation.

	a	b
4.	$\frac{x}{3} = 4$ 12	$6 \times a = 54$ _____
5.	$x \times 12 = 144$ _____	$\frac{n}{6} = 16$ _____
6.	$\frac{x}{8} = 24$ _____	$9 \times n = 81$ _____
7.	$54 = x \times 6$ _____	$8 = \frac{n}{7}$ _____
8.	$72 = 9 \times a$ _____	$n \times 16 = 160$ _____
9.	$356 \times n = 356$ _____	$34 \times a = 544$ _____
10.	$\frac{n}{15} = 38$ _____	$x \times 53 = 3445$ _____

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ALGEBRA READINESS
Solving Two-Step Equations

A **two-step equation** is solved by undoing each operation in the equation.

$$4n + 5 = 17$$

To undo the addition of 5, subtract 5.

$$4n + 5 - 5 = 17 - 5$$

$$4n = 12$$

To undo the multiplication of 4, divide by 4.

$$\frac{4n}{4} = \frac{12}{4}$$

$$n = 3$$

$$\frac{n}{4} - 1 = 2$$

To undo the subtraction of 1, add 1.

$$\frac{n}{4} - 1 + 1 = 2 + 1$$

$$\frac{n}{4} = 3$$

To undo the division by 4, multiply by 4.

$$\frac{n}{4} \times 4 = 3 \times 4$$

$$n = 12$$

Solve each equation.

	a	*b*	*c*
1.	$2x + 5 = 11$ 3	$3a - 5 = 7$ _____	$6n + 8 = 50$ _____
2.	$2b - 9 = 7$ _____	$5x + 15 = 35$ _____	$\frac{a}{5} - 3 = 0$ _____
3.	$\frac{n}{6} + 12 = 15$ _____	$7 + 3x = 28$ _____	$2n - 4 = 6$ _____
4.	$\frac{a}{12} - 10 = 2$ _____	$\frac{n}{10} - 9 = 1$ _____	$6n - 12 = 18$ _____
5.	$\frac{n}{6} - 12 = 0$ _____	$\frac{a}{7} - 3 = 1$ _____	$4 + 10x = 74$ _____
6.	$8a - 50 = 6$ _____	$\frac{a}{3} - 6 = 6$ _____	$12 = 9x - 15$ _____
7.	$\frac{n}{9} - 9 = 0$ _____	$\frac{a}{12} - 15 = 3$ _____	$18a - 6 = 30$ _____

Write the equation. Then solve.

8. Seven more than two times a number is 23. _____

9. Three times a number, increased by 4, equals 31. _____

10. Eight less than five times a number is 27. _____

11. Twice a number, decreased by 16, is 54. _____

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ALGEBRA READINESS
Solving Equations

Some equations contain multiple steps.

$2 + 6 + 4x = 80$

Combine $2 + 6 = 8$.

$$\begin{aligned} 8 + 4x &= 80 \\ 8 - 8 + 4x &= 80 - 8 \\ 4x &= 72 \\ \frac{4x}{4} &= \frac{72}{4} \\ x &= 18 \end{aligned}$$

$$\frac{a}{4+6} - 3 = 11$$

Simplify the denominator.

$$\begin{aligned} \frac{a}{10} - 3 &= 11 \\ \frac{a}{10} - 3 + 3 &= 11 + 3 \\ \frac{a}{10} &= 14 \\ 10 \times \frac{a}{10} &= 14 \times 10 \\ a &= 140 \end{aligned}$$

Solve each equation.

	a		*b*	
1.	$\frac{n}{15-8} + 31 = 45$	$n =$ _____	$7 + 18 + 3x = 34$	$x =$ _____
2.	$\frac{x}{11-3} + 7 = 16$	$x =$ _____	$5d + 15 + 5 = 45$	$d =$ _____
3.	$6a - 37 = 3 + 2$	$a =$ _____	$8 + 4b + 21 = 33$	$b =$ _____
4.	$7 + \frac{u}{24-18} = 12$	$u =$ _____	$33 - 15 + 3z = 57$	$z =$ _____
5.	$8c + 108 - 95 = 45$	$c =$ _____	$\frac{h}{34-17} - 27 = 3$	$h =$ _____
6.	$\frac{w}{8-5} - 21 = 14$	$w =$ _____	$11y + 53 - 30 = 78$	$y =$ _____
7.	$27 + 23 + 10d = 60$	$d =$ _____	$49 - 44 + 13x = 96$	$x =$ _____
8.	$123 + \frac{r}{7+9} = 131$	$r =$ _____	$85 - 67 = 9 + \frac{w}{14}$	$w =$ _____
9.	$\frac{m}{36-19} - 11 = 6$	$m =$ _____	$24 - 11 = \frac{n}{3} + 6$	$n =$ _____
10.	$15 + 37 - 8 + 9b = 98$	$b =$ _____	$39 + \frac{z}{26+8-11} = 58$	$z =$ _____