1.4: Write Equations and Inequalities

Goals: *Translate verbal sentences into equations or inequalities
*Decide if a given value is a solution to an equation or inequality

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Open sentence: two algebraic expressions compared by =, >, <, ≥, or ≤.

Equation: An open sentence with an equals sign

Inequality: An open sentence with an inequality sign.

IS =	< Is less than
The same as	> Is greater than
	≥ "Is greater than or equal to" "At least," "No less than"
	≤ "Is less than or equal to" "At most," "No more than"

Translate the following phrases into equations or inequalities:

Ex: The difference of twice a number *k* and 8 is 12

$2k - 8 = 12$

Ex: The product of 6 and a number is at least 24

$6x \geq 24$

Ex: The quotient of a number *p* and 12 is at least 30

$\frac{p}{12} \geq 30$

Ex: The sum of twice a number *r* and 3 is 11

$2r + 3 = 11$

Ex: The quotient of a number and 2 is at most 16

$\frac{x}{2} \leq 16$

Ex: Your math grade, g, needs to be at least a 75

$g \geq 75$

Combining inequalities:

Ex: x is greater than 3 and less than 9

Start with: $x > 3$ and $x < 9$
Write as one sentence that you can read left to right: $3 < x < 9$

Ex: A number y is no less than 5 and no more than 13

$5 \leq y \leq 13$

Ex: A number q is at least 5 and less than 17

$5 \leq q \leq 17$

Solution (of an equation or inequality): The value of the variable that makes an equation or inequality true!

Check whether 3 is a solution to the equation or inequality. Yes or No.

Ex: $8 - 2x = 2$

$8 - 2(3) = 2$
$8 - 6 = 2$
$2 = 2$ YES

Ex: $2z + 5 > 12$

$2(3) + 5 > 12$
$6 + 5 > 12$
$11 > 12$ NO!

Ex: $4x - 5 = 6$

$4(3) - 5 = 6$
$12 - 5 = 6$
$7 = 6$ NO!

Ex: $5 + 3n \leq 20$

$5 + 3(3) \leq 20$
$5 + 9 \leq 20$
$14 \leq 20$ YES!

Check whether 5 is a solution to the equation or inequality. Yes or No.

Ex: $24 - 3d = 9$

$9 = 9$
Yes

Ex: $3x + 4 = 18$

$19 = 18$
No

Ex: $2w - 7 \leq 3$

$3 \leq 3$
Yes

Ex: $4 + 3p > 19$

$19 > 19$
No

Check whether the given number is a solution: (the number given comes after the semi-colon)

Ex: $9 - x = 4; 5$
$9 - 5 = 4$
$4 = 4$
Yes

Ex: $b + 5 < 15; 7$
$7 + 5 < 15$
$12 < 15$
Yes

Ex: $2n + 3 \geq 21; 9$

$21 \geq 21$
Yes

Ex: The last time you and 3 friends went to a mountain bike park, you had a coupon for $10 off the total purchase and paid $17 for 4 tickets. What is the regular price for the 4 tickets? What is the regular price of 1 ticket?

$4x - 10 = 17$ The total cost should have been $27 without the coupon for 4 tickets
Which means each ticket costs $6.75

Ex: A basketball player scored 351 points last year. If the player plays 18 games this year, will an average of 20 points per game be enough to beat least year's total?

Write an inequality first: $18x > 351$ x is the points per game the player can score
$18(20) > 351$ Check if 20 is a solution
$360 > 351$ Yes

Ex: Tyler would like to make no less than $610 selling coffee mugs online. If he sells 28 mugs for $22, will he achieve his goal?

$28(22) \geq 610$
$616 \geq 610$ Yes