|  |  |
| --- | --- |
| **Addition** | increased by, more than, combined, together, total of, sum, added to,  larger than,  longer than |
| **Subtraction** | decreased by minus, less difference between less than, fewer than |
| **Multiplication** | of times, multiplied by product of increased/decreased by a factor of (this type can involve both addition or subtraction *and* multiplication!) |
| **Division** | per, out of ratio of, quotient of percent (divide by 100) |
| **Equals** | is, are, was, were, will be gives, yields |

Key Words in Word Problems

***Translating Word Problems: Examples (***

* **Translate "the sum of 8 and *y*" into an algebraic expression.**

This translates to "**8 + *y***"

* **Translate "4 less than *x*" into an algebraic expression.**

This translates to "***x* – 4**"

Remember? "Less than" is *backwards* in the math from how you say it in words!

* **Translate "*x* multiplied by 13" into an algebraic expression.**

This translates to "**13*x***"

* **Translate "the quotient of *x* and 3" into an algebraic expression.**

This translates to

* **Translate "the difference of 5 and *y*" into an algebraic expression.**

This translates to "**5 – *y***"

* **Translate "the ratio of 9 more than *x* to *x*" into an algebraic expression.**

This translates to

* **Translate "nine less than the total of a number and two" into an algebraic expression, and simplify.**

This translates to "(*n* + 2) – 9", which then simplifies to "***n* – 7**"

Here are some more wordy examples:

* **The length of a football field is 30 yards more than its width. Express the length of the field in terms of its width *w*.**

Whatever the width *w* is, the length is 30 more than this. Recall that "more than" means "plus that much", so you'll be adding 30 to *w*.

The expression they're looking for is "***w* + 30**".

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* **Twenty gallons of crude oil were poured into two containers of different size. Express the amount of crude oil poured into the smaller container in terms of the amount *g* poured into the larger container.**

The expression they're looking for is found by this reasoning: There are twenty gallons total, and we've already poured *g* gallons of it. How many gallons are left? There are 20 – *g* gallons left. They want the answer "**20 – *g***".

This is the "how much is left" construction: You will be given some total amount. Smaller amounts, of unspecified sizes, are added (combined, mixed, etc) to create this total amount. You will pick a variable to stand for one of these unknown amounts. After having thus accounted for one of the amounts, the remaining amount is whatever is left after deducting this named amount from the total.

* They may tell you that a trip took ten hours, and that the trip had two legs. You might name the time for the first leg as *"t"*, with the *remaining* time for the second leg being *10 – t*.
* They may tell you that a hundred-pound order of animal feed was filled by mixing products from Bins A, B, and C, and that twice as much was added from Bin C as from Bin A. Let *"a"* stand for the amount from Bin A. Then the amount from Bin C was *"2a"*, and the amount taken from Bin B was the remaining portion of the hundred pounds: *100 – a – 2a.*

I'm making a big deal about this "how much is left" construction because it comes up a lot and tends to cause a lot of confusion. Make sure you understand this one!