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Section 1.1

August 18, 22

Translating Words into Equations

+	−	×	÷	=
plus	minus	multiply	divide	equals
add	less than	times	quotient	is
more than	subtract	by	fraction	exact
sum	take away	product	over	creates
and	difference	double	ratio	same as
combine	remove	repeated	of	makes

e.g. Convert into algebra (m, ×, 5, =, 60)

ⓐ the product of a number and five is sixty

$5m = 60$

ⓑ seven times a number plus another is five,

$7x + y = 5$

e.g. Investing

Bob invested an amount at 6% and another amount at 3%.
Write an expression for:

ⓐ total amount invested

$x + y$

let x represent amount invested at 6%
let y represent amount invested at 3%

ⓑ total interest: $0.06x + 0.03y$

ⓒ new amount: $1.06x + 1.03y$

e.g. Speed

A car is driving in km/h. Wind travels 32 km/h.
Write an expression for speed:

ⓐ with wind

$x + 32$

let x represent speed of car (km/h).

ⓑ against wind

$x - 32$

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Word Problems

- basic - age, measurement
- investing
- mixing
- speed
- current

eg Bob had $1000 to invest. He puts part in stocks at 4% and the rest in bonds at 5%. Total interest after 1 year is $44. How much was invested at each rate?

Let x represent the amount invested in stocks. ($)
Let y . . . . . in bonds. ($)

$$\begin{cases} ① \; x + y = 1000 \\ ② \; 0.04x + 0.05y = 44 \end{cases}$$

① → ④ $x = 1000 - y$

② ×100 → ③ $4x + 5y = 4400$

Sub x into ③
$4(1000 - y) + 5y = 4400$
$4000 - 4y + 5y = 4400$
$\boxed{y = 400}$

Sub y into ④
$x = 1000 - 400$
$\boxed{x = 600}$

∴ Bob put $600 into stocks and $400 into bonds.

eg Mixing - You need 100L of 42% acid sol^n. The acid solutions available are 30% and 50%, by volume. How many L of each are needed?

Let x represent the number of litres of 30% sol^n. (L)
Let y represent the # of L of 50% sol^n

$$\begin{cases} ① \; x + y = 100 \\ ② \; 0.3x + 0.5y = \underline{0.42(100)} \end{cases}$$

① * 3 → ④ $3x + 3y = 300$

② * 10 → ③ $3x + 5y = 420$

* be careful

③ − ④: $2y = 120$
$\boxed{y = 60}$

Sub y into ①
$x + 60 = 100$
$\boxed{x = 40}$

∴ You would need 40L of 30% & 60L of 50%.

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Word Problems

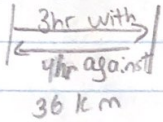
Formula distance = speed × time ("rate")

$d = rt$, $r = d/t$, $t = d/r$

eg. current

A boat took 3 hrs (time) to travel 36 km (d) with the current in a river and 4 hrs against it. Find the speed of the boat in still water and the speed of the current. (km/h)

$d = rt$



let x represent the speed of the boat in still water

let y represent the speed of the current (km/h)

$d = rt$

$36 = (x+y)3$ ← trip with

$36 = (x-y)4$ ← trip against

① $12 = x + y$

② $9 = x - y$

$21 = 2x$ ① + ②

$x = 21/2 = 10.5$

sub x into ①

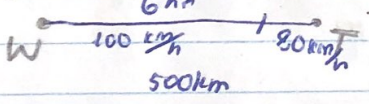
$12 = 21/2 + y$

$y = 1.5$

∴ The speed of the boat is 10.5 km/h and the current is 1.5 km/h.

eg. Car Trip (speed)

Jill drove 500km from Windsor to Toronto in 6hrs, she drove part at 100km/h and part at 80km/h. How far did she drive at each speed?



let x represent how far she drove at 100 km/h (km)

let y represent how far she drove at 80 km/h (km)

$d = rt$

$t = d/r$

① $x + y = 500$

② $x/100 + y/80 = 6$

∴ Solve by substitution/elimination