3-2 p.142 Solving Systems Algebraically

Substitution

Solve $\begin{cases} 3x+4y=12 \\ 2x+y=10 \end{cases}$

$2x+y=10$
$-2x \quad -2x$
$y=10-2x$

Step 1
Solve ONE equation for ONE variable.

$3x+4(10-2x)=12$
$3x+40-8x=12$
$-5x+40=12$
$-40 \quad -40$
$-5x=-28$
$\frac{-5x}{-5}=\frac{-28}{-5}$
$x=5.6$

Step 2
Substitute solved expression in to the other equation

$2(5.6)+y=10$
$11.2+y=10$
$-11.2 \quad -11.2$
$y=-1.2$

Step 3
Plug in solved value to get the other value.

$(5.6, -1.2)$

Solve $\begin{cases} x+3y=5 \\ -2x-4y=-5 \end{cases}$

Solve for one variable

$x+3y=5$
$-3y \quad -3y$
$x=5-3y$

Plug into other equation

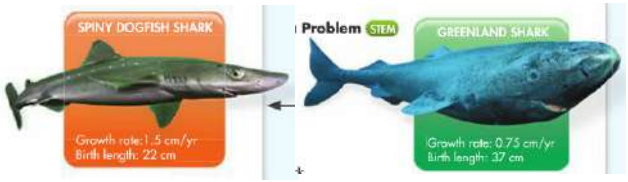
$-2(5-3y)-4y=-5$
$-10+6y-4y=-5$
$-10+2y=-5$
$+10 \quad +10$
$\frac{2y}{2}=\frac{5}{2}$
$y=2.5$

Get x

$x+3(2.5)=5$
$x+7.5=5$
$-7.5 \quad -7.5$
$x=-2.5$

$(-2.5, 2.5)$

Biology The diagrams show the birth lengths and growth rates of two species of shark. If the growth rates stay the same, at what age would a Spiny Dogfish and a Greenland shark be the same length?



y = size
x = age

Steps
Define Variables
Write Equations
Solve

$y = 22 + 1.5x$

$y = 37 + 0.75x$

$37 + 0.75x = 22 + 1.5x$
$-37 \quad -1.5x \quad -37 \quad -1.5x$

$-.75x = -15$

$\frac{-.75x}{-.75} = \frac{-15}{-.75}$

$x = 20$

20 years old!

An online music company offers 15 downloads for $19.75 and 40 downloads for $43.50. Each price includes the same one-time registration fee. What is the cost of each download and the registration fee?

c = cost r = registration fee

$15c + r = 19.75$
$40c + r = 43.50$

$r = 19.75 - 15c$ ✓

$40c + 19.75 - 15c = 43.50$

$25c + 19.75 = 43.50$
$-19.75 \quad -19.75$

$25c = 23.75$

$\frac{25c}{25} = \frac{23.75}{25}$

$c = \$.95$

$40(.95) + r = 43.50$

$38 + r = 43.50$
$-38 \quad -38$

$r = \$5.50$

Elimination

Solve $4x + 2y = 9$
$-4x + 3y = 16$

Step 1

Combine equations by adding/subtracting in order to eliminate a variable.

Step 2

Solve

Step 3

plug back in and solve.

Solve $2x + 7y = 4$
$3x + 5y = -5$

$-3x+y=-5$
$6x-2y=10$

$\rightarrow$ $y=-5+3x$

$6x-2(-5+3x)=10$

$6x+10-6x=10$

$10=10$

Special Case

Infinite Solutions

$4x-6y=6$
$4x-6y=3$

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