EXAM UNIT 5 (EQUATIONS)

1) Solve the following equations: (4 points)

a. $2x-4(x-1)+2x-1=2(x+5)-2x$

b. $\frac{2x-5}{5}=2-x-\frac{x+1}{4}$

c. $(3x-1)^2+6x-8=(3x-2)(3x+2)-3$

d. $\frac{x-10}{2}-\frac{x-20}{4}+\frac{x-30}{3}=5$

2) Solve the following equations: (5 points)

a. $(x-2)^2-3=3x+1$

b. $x(x-3)=2-3x-(x+4)(x-4)$

c. $2x+3(x-4)^2=37+(x-3)(x+3)$

d. $\frac{(x-2)(x+2)}{4}-\frac{x-6}{2}=\frac{10+x}{5}$

e. $\frac{(x-1)^2-3x+1}{15}+\frac{x+1}{5}=0$

3) Translate into an equation: (1 point)

a. Three subtracted from twice a number is equal to seventeen.

b. One third of a number plus five is equal to ten.

c. A number plus four, all multiplied by seven is equal to forty-two.

SOLUTION

1) Solve the following equations:

a. $2x-4(x-1)+2x-1=2(x+5)-2x \rightarrow 2x-4x+4+2x-1=2x+10-2x$

$2x-4x+2x-2x+2x=10-4+1 \rightarrow 0x=7$ It hasn't got any solution

b. $\frac{2x-5}{5}=2-x-\frac{x+1}{4} \rightarrow \frac{8x-20}{20}=\frac{40}{20}-\frac{20x}{20}-\frac{5x+5}{20}$

$8x-20=40-20x-5x-5 \rightarrow 8x+20x+5x=40-5+20$

$33x=55 \rightarrow x=\frac{55}{33} \rightarrow x=\frac{5}{3}$

c. $(3x-1)^2+6x-8=(3x-2)(3x+2)-3 \rightarrow 9x^2-6x+1+6x-8=9x^2-4-3$

$9x^2-9x^2-6x+1+6x-8=-4-3 \rightarrow 0x=-4-3+8-2 \rightarrow 0x=0$

It is an identity (Solution: all real numbers)

d. $\frac{x-10}{2}-\frac{x-20}{4}+\frac{x-30}{3}=5 \rightarrow \frac{6x-60}{12}-\frac{3x-60}{12}+\frac{4x-120}{12}=\frac{60}{12}$

$6x-60-3x+60+4x-120=60 \rightarrow 7x=60+120 \rightarrow x=\frac{180}{7}$

2) Solve the following equations:

a. $(x-2)^2-3=3x+1 \rightarrow x^2-4x+4-3=3x+1 \rightarrow x^2-7x=0$

$x^2-7x=0 \rightarrow x(x-7)=0 \begin{cases} x=0 \\ x-7=0 \end{cases} \rightarrow \begin{cases} x_1=0 \\ x_2=7 \end{cases}$

b. $x(x-3)=2-3x-(x+4)(x-4) \rightarrow x^2-3x=2-3x-(x^2-16)$

$x^2-3x=2-3x-x^2+16 \rightarrow 2x^2=18 \rightarrow x^2=9 \rightarrow x=\pm\sqrt{9}=\pm 3$

c. $2x+3(x-4)^2=37+(x-3)(x+3) \rightarrow 2x+3(x^2-8x+16)=37+x^2-9$

$2x+3x^2-24x+48=37+x^2-9 \rightarrow 2x^2-22x+20=0 \rightarrow x^2-11x+10=0$

$x=\frac{11\pm\sqrt{11^2-40}}{2}=\frac{11\pm\sqrt{81}}{2}=\frac{11\pm 9}{2} \begin{cases} x_1=10 \\ x_2=1 \end{cases}$

d. $\frac{(x-2)(x+2)}{4}-\frac{x-6}{2}=\frac{10+x}{5} \rightarrow \frac{x^2-4}{4}-\frac{x-6}{2}=\frac{10+x}{5}$

$\frac{5x^2-20}{20}-\frac{10x-60}{20}=\frac{40+4x}{20} \rightarrow 5x^2-20-10x+60=40+4x$

$5x^2-14x=0 \rightarrow x(5x-14)=0 \rightarrow \begin{cases} x_1=0 \\ 5x-14=0 \rightarrow x_2=\frac{14}{5} \end{cases}$

e. $\frac{(x-1)^2-3x+1}{15}+\frac{x+1}{5}=0 \rightarrow \frac{x^2-2x+1-3x+1}{15}+\frac{x+1}{5}=0$

$\frac{x^2-5x+2}{15}+\frac{3x+3}{15}=0 \rightarrow x^2-5x+2+3x+3=0 \rightarrow x^2-2x+5=0$

$x=\frac{2\pm\sqrt{(-2)^2-20}}{2}=\frac{2\pm\sqrt{-16}}{2}$ It does not have any solution

3) Translate into an equation:

a. Three subtracted from twice a number is equal to seventeen.

$2x-3=17$

b. One third of a number plus five is equal to ten.

$\frac{x}{3}+5=10$

c. A number increased by four, all multiplied by seven equals forty-two.

$7(x+4)=42$