# I.G.C.S.E. Solving Linear Equations

## Index:

Please click on the question number you want



**You can access the solutions from the end of each question**

## Question 1

Solve the following equations:

**a.** $x + 5 = -3$ **b.** $3x - 4 = 7$ **c.** $2 - x = 7$ **d.** $23x + 45 = -12$

***Click here to read the solution to this question***

***Click here to return to the index***

## Solution to question 1

**a.** $x + 5 = -3$

$x + 5 - 5 = -3 - 5$

$x = -8$

**b.** $3x - 4 = 7$

$3x - 4 + 4 = 7 + 4$

$\frac{3x}{3} = \frac{13}{3}$

$x = \frac{13}{3}$ or $4\frac{1}{3}$

**c.** $2 - x = 7$

$2 - x - 2 = 7 - 2$

$-x = 5$

$x = -5$

**d.** $23x + 45 = -12$

$23x + 45 - 45 = -12 - 45$

$\frac{23x}{23} = \frac{-57}{23}$

$x = -\frac{57}{23}$ or $-2\frac{11}{23}$

***Click here to read the question again***

***Click here to return to the index***

## Question 2

Solve the following equations with $x$ on both sides

**a.** $6x - 4 = 3x + 7$ **b.** $8x - 7 = 3x + 7$ **c.** $3 - x = 2x - 5$

***Click here to read the solution to this question***

***Click here to return to the index***

## Solution to question 2

**a.**

$$6x - 4 = 3x + 7$$
$$6x - 4 + 4 = 3x + 7 + 4$$
$$6x = 3x + 13$$
$$6x - 3x = 3x + 13 - 3x$$
$$\frac{3x}{3} = \frac{13}{3}$$
$$x = \frac{13}{3} \text{ or } 4\frac{1}{3}$$

**b.**

$$8x - 7 = 3x + 7$$
$$8x - 7 + 7 = 3x + 7 + 7$$
$$8x = 3x + 14$$
$$8x - 3x = 3x + 14 - 3x$$
$$\frac{5x}{5} = \frac{14}{5}$$
$$x = \frac{14}{5} \text{ or } 2\frac{4}{5}$$

**c.**

$$3 - x = 2x - 5$$
$$3 - x - 3 = 2x - 5 - 3$$
$$-x = 2x - 8$$
$$-x - 2x = 2x - 8 - 2x$$
$$\frac{-3x}{-3} = \frac{-8}{-3}$$
$$x = \frac{8}{3} \text{ or } 2\frac{2}{3}$$

***Click here to read the question again***

***Click here to return to the index***

## Question 3

Solve the following equations with brackets

**a.** $3(x-4)=2x-4$ **b.** $7(2x-4)+4=6(2-x)$

**c.** $3(x+4)-2(x-4)=0$ **d.** $5(3-x)-3(3x+7)=3x$

***Click here to read the solution to this question***

**Click *here* to return to the index**

## Solution to question 3

**a.**
$$\begin{aligned} 3(x-4) &= 2x-4 \\ 3x-12 &= 2x-4 \\ 3x-12+12 &= 2x-4+12 \\ 3x &= 2x+8 \\ 3x-2x &= 2x+8-2x \\ x &= 8 \end{aligned}$$

**b.**
$$\begin{aligned} 7(2x-4)+4 &= 6(2-x) \\ 14x-28+4 &= 12-6x \\ 14x-24 &= 12-6x \\ 14x-24+24 &= 12-6x+24 \\ 14x &= 36-6x \\ 14x+6x &= 36-6x+6x \\ \frac{20x}{20} &= \frac{36}{20} \\ x &= \frac{\cancel{36}^{9}}{\cancel{20}_{5}} = \frac{9}{5} \text{ or } 1\frac{4}{5} \end{aligned}$$

**c.**
$$\begin{aligned} 3(x+4)-2(x-4) &= 0 \\ 3x+12-2x+8 &= 0 \\ x+20 &= 0 \\ x+20-20 &= 0-20 \\ x &= -20 \end{aligned}$$

**d.**
$$\begin{aligned} 5(3-x)-3(3x+7) &= 3x \\ 15-5x-9x-21 &= 3x \\ -14x-6 &= 3x \\ -14x-6+6 &= 3x+6 \\ -14x &= 3x+6 \\ -14x-3x &= 3x+6-3x \\ \frac{-17x}{-17} &= \frac{6}{-17} \\ x &= -\frac{6}{17} \end{aligned}$$

***Click here to read the question again***

***Click here to return to the index***

## Question 4

Solve the following equations with fractions

**a.** $\frac{7}{x} = 8$ **b.** $\frac{x}{5} = \frac{7}{10}$ **c.** $\frac{x}{8} - 2 = 6$ **d.** $3 - \frac{9}{x} = 12$

***Click here to read the solution to this question***

***Click here to return to the index***

## Solution to question 4

**a.**

$$\frac{7}{x}=8$$

$$\frac{7}{\cancel{x}}\left(\cancel{x}\right)=8\left(x\right)$$

$$\frac{7}{8}=\frac{8x}{8}$$

$$\frac{7}{8}=x$$

**b.**

$$\frac{x}{5}=\frac{7}{10}$$

$$\frac{x}{\cancel{5}}\left(\cancel{5}\right)=\frac{7}{\cancel{10}^{2}}\left(\cancel{5}\right)$$

$$x=\frac{7}{2}\text{ or }3\frac{1}{2}$$

**c.**

$$\frac{x}{8}-2=6$$

$$\frac{x}{8}-2+2=6+2$$

$$\frac{x}{8}=8$$

$$\frac{x}{\cancel{8}}\left(\cancel{8}\right)=8\left(8\right)$$

$$x=64$$

**d.**

$$3-\frac{9}{x}=12$$

$$3-\frac{9}{x}-3=12-3$$

$$-\frac{9}{x}=9$$

$$-\frac{9}{\cancel{x}}\left(\cancel{x}\right)=9\left(x\right)$$

$$\frac{-9}{9}=\frac{9x}{9}$$

$$-1=x$$

***Click here to read the question again***

***Click here to return to the index***

## Question 5

Find the ‘mystery’ number in each question by forming an equation and then solving it.

**a.** If I multiply a number by 4 and then add 7 the answer is 11.

**b.** If I subtract 5 from a number and then multiply the result by 3 the answer is 7.

**c.** If we treble a number and add 8 we get the same answer as when we subtract 3 from a number and double the result.

***Click here to read the solution to this question***

***Click here to return to the index***

## Solution to question 5

**a.** If I multiply a number by 4 and then add 7 the answer is 11.

Let $x$ be the 'mystery' number then multiplying by 4 it becomes $4x$, adding 7 the number becomes $4x+7$.

$$\begin{aligned} \text{Now} \quad 4x+7 &= 11 \\ 4x+7-7 &= 11-7 \\ \frac{4x}{4} &= \frac{4}{4} \\ x &= 1 \end{aligned}$$

**b.** If I subtract 5 from a number and then multiply the result by 3 the answer is 7.

Let $x$ be the 'mystery' number then subtracting 5 the number becomes $x-5$, multiplying the result by 3 the number becomes $3(x-5)$.

$$\begin{aligned} \text{Now} \quad 3(x-5) &= 7 \\ 3x-15 &= 7 \\ 3x-15+15 &= 7+15 \\ \frac{3x}{3} &= \frac{22}{3} \\ x &= \frac{22}{3} \text{ or } 7\frac{1}{3} \end{aligned}$$

***Click here to continue with solution or go to next page***

**c.** If we treble a number and add 8 we get the same answer as when we subtract 3 from a number and double the result.

Let $x$ be the 'mystery' number. Now on one side we have to treble (3 times), which gives $3x$ and then add 8, which gives $3x+8$. We know that this is the same subtracting 3 from the 'mystery number, which gives $x-3$ and doubling (2 times) the result, which gives $2(x-3)$.

$$\begin{aligned} \text{Now} \quad 3x+8 &= 2(x-3) \\ 3x+8 &= 2x-6 \\ 3x+8-8 &= 2x-6-8 \\ 3x &= 2x-14 \\ 3x-2x &= 2x-14-2x \\ x &= -14 \end{aligned}$$

***Click here to read the question again***

***Click here to return to the index***

## Question 6

The length of a rectangle is 3 cm more than its width. If its perimeter is 18 cm, find its width. Hint: draw a diagram.

***Click here to read the solution to this question***

***Click here to return to the index***

## Solution to question 6

Drawing a diagram

Width
$x$

Length 3 more than the width ($x$)
$x+3$

The perimeter is $x+(x+3)+x+(x+3)=18$

$$4x+6=18$$
$$4x+6-6=18-6$$
$$\frac{4x}{4}=\frac{12}{4}$$
$$x=3$$

The width is 3 cm.

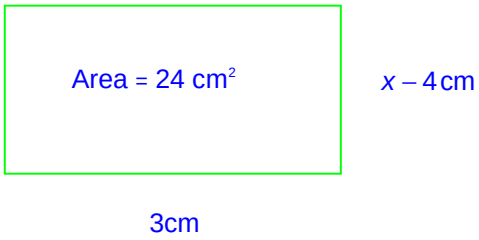
***Click here to read the question again***

***Click here to return to the index***

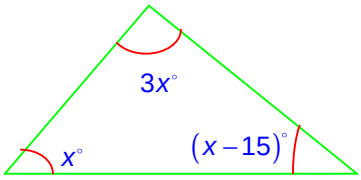
## Question 7

Find the value of $x$ in the following diagrams.

**a.**




**b.**

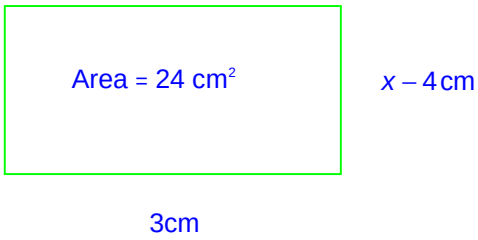



***Click here to read the solution to this question***

***Click here to return to the index***

## Solution to question 7

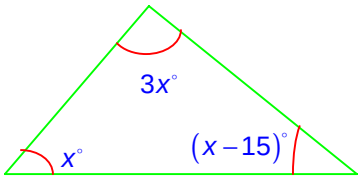
**a.**




Area of a rectangle $= lw$

Now
$$3(x-4)=24$$
$$3x-12=24$$
$$3x-12+12=24+12$$
$$\frac{3x}{3}=\frac{36}{3}$$
$$x=12\,\text{cm}$$

**b.**




Angle sum of a triangle is $180^\circ$

Now
$$x^\circ+3x^\circ+(x-15)^\circ=180^\circ$$
$$5x^\circ-15=180^\circ$$
$$5x^\circ-15+15=180^\circ+15$$
$$\frac{5x^\circ}{5}=\frac{195^\circ}{5}$$
$$x^\circ=39^\circ$$

***Click here to read the question again***

***Click here to return to the index***

## Question 8

The sum of three consecutive even numbers is 72. Find the numbers.

***Click here to read the solution to this question***

***Click here to return to the index***

## Solution to question 8

Let $x$ be the first of the three numbers, then as the numbers are even the next two are $x+2$ and $(x+2)+2=x+4$.

The sum of these three consecutive even numbers is 72

$$\begin{aligned} \text{Now } x+(x+2)+(x+4) &= 72 \\ 3x+6 &= 72 \\ 3x+6-6 &= 72-6 \\ \frac{3x}{3} &= \frac{66}{3} \\ x &= 22 \end{aligned}$$

The first number is $x=22$

The second number is $x+2=22+2=24$

The third number is $x+4=22+4=26$

The three numbers are 22, 24 and 26.

***Click here to read the question again***

***Click here to return to the index***