I.G.C.S.E. Algebra 02

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Question 1

The distance travelled by an accelerating missile is given by $s = ut + \frac{1}{2}at^2$.

Find s when $u = 2\,\text{m/s}$, $t = 60\,\text{s}$ and $a = 10\,\text{m/s}^2$.

Solution to question 1

$s = ut + \dfrac{1}{2}at^2$ when $u = 2\,\text{m/s}$, $t = 60\,\text{s}$ and $a = 10\,\text{m/s}^2$.

$$s = ut + \frac{1}{2}at^2$$
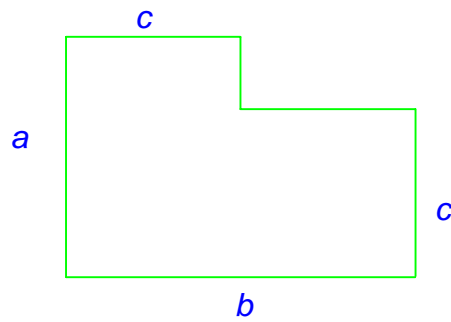$$= 2(60) + \frac{1}{2}(10)(60)^2$$
$$= 120 + 18000$$
$$= 18120\,\text{m}$$

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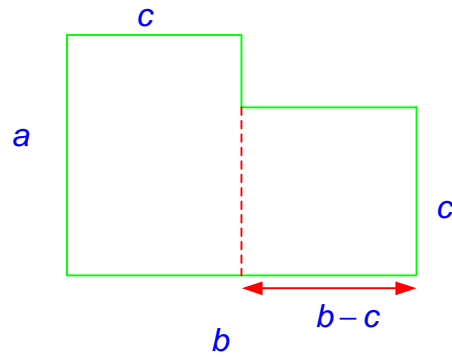**Click *here* to return to the index**

Question 2

Find a formula for the area of the following shape in terms of a, b and c.

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Solution to question 2

Area $= ac + (b - c)c$

$\quad = ac + bc - c^2$

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Question 3

Evaluate the following if $x = 5$, $y = -4$ and $z = 2$.

a. $\dfrac{xy - z}{2y}$ b. $\dfrac{x^2 - y^2 - z^2}{x + y + z}$ c. $\sqrt{z^2 + y + x^2}$

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Solution to question 3

$x = 5$, $y = -4$ and $z = 2$.

a. $\dfrac{xy - z}{2y} = \dfrac{5(-4) - 2}{2(-4)} = \dfrac{-22}{-8} = 2\dfrac{3}{4}$

b. $\dfrac{x^2 - y^2 - z^2}{x + y + z} = \dfrac{(5)^2 - (-4)^2 - (2)^2}{(5) + (-4) + (2)} = \dfrac{25 - 16 - 4}{3} = \dfrac{5}{3} = 1\dfrac{2}{3}$

c. $\sqrt{z^2 + y + x^2} = \sqrt{(5)^2 + (-4) + (2)^2} = \sqrt{25 - 4 + 4} = \sqrt{25} = 5$

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Question 4

Simplify as far as possible

a. $4x - 3y + 2x$ **b.** $x^2 - 2x + 2x^2 - y$ **c.** $\dfrac{2m}{x} + \dfrac{3m}{x}$ **d.** $2x - x^2 + (3x)^2$

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Solution to question 4

a. $4x - 3y + 2x = 6x - 3y$

b. $x^2 - 2x + 2x^2 - y = 3x^2 - 2x - y$

c. $\dfrac{2m}{x} + \dfrac{3m}{x} = \dfrac{5m}{x}$

d. $2x - x^2 + (3x)^2 = 2x - x^2 + 9x^2 = 2x + 8x^2$

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Question 5

Remove the brackets and collect the like terms in the following

a. $4x + 2(x-2)$ 　　 **b.** $a - (3-2a)$ 　 **c.** $(3x+4)(x+2)$ 　　 **d.** $(x-2)(2x+1)$

e. $(5x-2)(3-x)$ 　　 **f.** $3x(x+2)(x-2)$ 　　 **g.** $(7x-2)^2$

h. $(x+3)^2 - (x-2)^2$

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Solution to question 5

a. $4x + 2(x-2) = 4x + 2x - 4 = 6x - 4$

b. $a - (3 - 2a) = a - 3 + 2a = 3a - 3$

c. $(3x+4)(x+2) = 3x(x+2) + 4(x+2)$

$$= 3x^2 + 6x + 4x + 8$$

$$= 3x^2 + 10x + 8$$

d. $(x-2)(2x+1) = x(2x+1) - 2(2x+1)$

$$= 2x^2 + x - 4x - 2$$

$$= 2x^2 - 3x - 2$$

e. $(5x-2)(3-x) = 5x(3-x) - 2(3-x)$

$$= 15x - 5x^2 - 6 + 2x$$

$$= 17x - 5x^2 - 6$$

f. $3x(x+2)(x-2) = 3x\left[x(x-2) + 2(x-2)\right]$

$$= 3x\left(x^2 - 2x + 2x - 4\right)$$

$$= 3x\left(x^2 - 4\right)$$

$$= 3x^3 - 12x$$

g. $(7x-2)^2 = (7x-2)(7x-2)$

$$= 7x(7x-2) - 2(7x-2)$$

$$= 49x^2 - 14x - 14x + 4$$

$$= 49x^2 - 28x + 4$$

h. $(x+3)^2 - (x-2)^2 = (x+3)(x+3) - (x-2)(x-2)$

$$= x(x+3) + 3(x+3) - \left[x(x-2) - 2(x-2)\right]$$

$$= x^2 + 3x + 3x + 9 - \left(x^2 - 2x - 2x + 4\right)$$

$$= x^2 + 6x + 9 - x^2 + 4x - 4$$

$$= 10x + 5$$

Question 6

Solve the following equations

a. $3x - 2 = 7$ **b.** $\dfrac{3x}{7} = -5$ **c.** $9x - 7 = 3 - x$

d. $3(x-5) + 6(1-x) = 3 + 5x$ **e.** $(x+1)(x-2) = (x-3)(x-4)$

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Solution to question 6

a. $3x - 2 = 7$

$\qquad 3x = 9$

$\qquad x = \textcolor{red}{3}$

b. $\dfrac{3x}{7} = -5$

$\qquad 3x = -35$

$\qquad x = \dfrac{-35}{3}$

$\qquad = \textcolor{red}{-11\dfrac{2}{3}}$

c. $9x - 7 = 3 - x$

$\qquad 10x = 10$

$\qquad x = \textcolor{red}{1}$

d. $3(x - 5) + 6(1 - x) = 3 + 5x$

$\qquad 3x - 15 + 6 - 6x = 3 + 5x$

$\qquad -9 - 3x = 3 + 5x$

$\qquad -12 = 8x$

$\qquad x = \dfrac{-3}{2}$

$\qquad = \textcolor{red}{-1\dfrac{1}{2}}$

e. $\qquad (x + 1)(x - 2) = (x - 3)(x - 4)$

$\qquad x(x - 2) + (x - 2) = x(x - 4) - 3(x - 4)$

$\qquad x^2 - 2x + x - 2 = x^2 - 4x - 3x \textcolor{blue}{+} 12$

$\qquad -x - 2 = -7x + 12$

$\qquad 6x = 12$

$\qquad x = \textcolor{red}{2\dfrac{1}{3}}$

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Question 7

Solve the following equations

a. $\dfrac{5}{x} = -3$ **b.** $\dfrac{4}{x-2} = \dfrac{6}{3-x}$ **c.** $\dfrac{x+5}{4} - \dfrac{x}{3} = \dfrac{1}{6}$

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Solution to question 7

a. $\dfrac{5}{x} = -3$

$5 = -3x$

$x = \dfrac{5}{-3}$

$\qquad = -1\dfrac{2}{3}$

b. $\qquad \dfrac{4}{x-2} = \dfrac{6}{3-x}$

$2(3-x) = 6(x-2)$ (cross multiplying)

$6 - 2x = 6x - 12$

$24 = 10x$

$x = \dfrac{12}{5}$

$\qquad = 2\dfrac{2}{5}$

c. $\qquad \dfrac{x+5}{4} - \dfrac{x}{3} = \dfrac{1}{6}$

$(\times 12)$ $\quad \dfrac{12(x+5)}{4} - \dfrac{12x}{3} = \dfrac{12}{6}$

$3(x+5) - 4x = 2$

$3x + 15 - 4x = 2$

$-x = -13$

$x = 13$

Question 8

The sum of three consecutive even numbers is 144. Form an equation and find the numbers

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Solution to question 8

As the numbers are consecutive even numbers the difference between the numbers is 2.

Hence let the fist number be x the second number is $x+2$ and the third number is $x+4$. The sum of these numbers is 144.

$$x+(x+2)+(x+4)=144$$
$$3x+6=144$$
$$3x=138$$
$$x=46$$

The first number is $x=46$
The second number is $x+2=(46)+2=48$
The third number is $x+4=(46)+4=50$

The numbers are 46, 48 and 50.

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Question 9
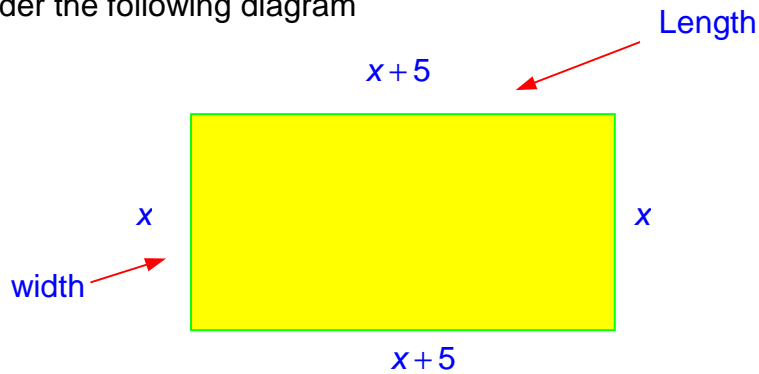
The length of a rectangle is 5 more than its width. If the perimeter is 90 cm find the width.

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Solution to question 9

Consider the following diagram

Let the width be *x*. the length is 5 more than the width which is written $x+5$,

The perimeter is the distance around the rectangle.

$$x+\left(x+5\right)+x+\left(x+5\right)=90$$
$$4x+10=90$$
$$4x=80$$
$$x=20$$

Therefore the width is 20 cm.

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Question 10

The product of two consecutive odd numbers is 12 more than the square of the smaller number. Find the smaller number.

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Solution to question 10

Let the smaller odd number be *x*. The second consecutive odd number is $x+2$.

Now the difference between the product of these two consecutive odd numbers and the smaller one squared is 12.

The square of the smaller number

Product of two consecutive odd numbers

$$x(x+2)-x^2=12$$
$$x^2+2x-x^2=12$$
$$2x=12$$
$$x=6$$

The difference is 12

Hence the smaller number is 6.

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