SN _____   ID _____ NAME _____

Show all necessary steps for full marks.

Question 1: (6 points): If the length of a rectangle is 6 cm more than the width and the perimeter of the rectangle is 60 cm. then find the length and the width of the rectangle.

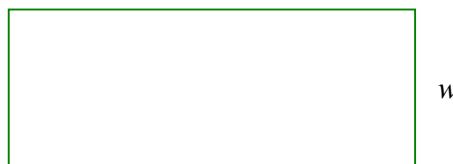.**Solution:**

$$P = 2(w + 6) + 2w$$
$$P = 2w + 12 + 2w$$
$$60 = 4w + 12$$
$$15 = w + 3$$
$$w = 12 \text{ cm}$$
$$L = w + 6 = 18 \text{ cm}$$

$L = w + 6$

w

Question 2: (6 points): Solve $(3x + 2)(x - 1) = 3x$

Solution: $3x^2 - x - 2 = 3x$

$$3x^2 - 4x - 2 = 0$$

Let $a = 3, b = -4,$ and $c = -2.$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$= \frac{-(-4) \pm \sqrt{(-4)^2 - 4(3)(-2)}}{2(3)}$$

$$= \frac{4 \pm \sqrt{16 + 24}}{6} = \frac{4 \pm \sqrt{40}}{6}$$

$$= \frac{4 \pm 2\sqrt{10}}{6} = \frac{2 \pm \sqrt{10}}{3}$$

Solution set: $\left\{ \frac{2 \pm \sqrt{10}}{3} \right\}$

Question 3: (6 points): If the equation $(3x - 4)(x + 1) = -2$ is written in the form $(x + m)^2 = n$, then find $m + n = ?$

Solution:

$$3x^2 + 3x - 4x - 4 = -2$$

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

$$x^2 - \frac{1}{3}x = \frac{2}{3}$$

$$x^2 - \frac{1}{3}x + \left(\frac{1}{2} \cdot \frac{1}{3}\right)^2 = \frac{2}{3} + \left(\frac{1}{6}\right)^2$$

$$x^2 - \frac{1}{3}x + \left(\frac{1}{6}\right)^2 = \frac{2}{3} + \frac{1}{36}$$

$$\left(x + \frac{-1}{6}\right)^2 = \frac{2(12)}{3(12)} + \frac{1}{36}$$

$$\left(x + \frac{-1}{6}\right)^2 = \frac{25}{36}$$ is in the form $(x + m)^2 = n$ where $m = \frac{-1}{6}$ and $n = \frac{25}{36}$.

$$m + n = -\frac{1}{6} + \frac{25}{36} = \frac{-6 + 25}{36} = \frac{19}{36}$$

Question 4: *(7 points):* **(1.6 Exercise 52):** Solve $\sqrt{2x-5} = 2+\sqrt{x-2}$

Solution:

Check $x = 3$.

$$\sqrt{2x-5} = 2+\sqrt{x-2}$$

$$\sqrt{2x-5} = 2+\sqrt{x-2}$$

$$\sqrt{2(3)-5} \overset{?}{=} 2+\sqrt{3-2}$$

$$\left(\sqrt{2x-5}\right)^2 = \left(2+\sqrt{x-2}\right)^2$$

$$\sqrt{6-5} = 2+\sqrt{1}$$

$$2x-5 = 4+4\sqrt{x-2}+(x-2)$$

$$\sqrt{1} = 2+1 \Rightarrow 1 = 3$$

This is a false statement. 3 is not a solution.

$$2x-5 = x+2+4\sqrt{x-2}$$

Check $x = 27$.

$$x-7 = 4\sqrt{x-2}$$

$$\sqrt{2x-5} = 2+\sqrt{27-2}$$

$$(x-7)^2 = \left(4\sqrt{x-2}\right)^2$$

$$\sqrt{2(27)-5} \overset{?}{=} 2+\sqrt{27-2}$$

$$x^2-14x+49 = 16(x-2)$$

$$\sqrt{54-5} = 2+\sqrt{25}$$

$$x^2-14x+49 = 16x-32$$

$$\sqrt{49} = 2+5 \Rightarrow 7 = 7$$

$$x^2-30x+81 = 0 \Rightarrow (x-3)(x-27) = 0 \text{ :}$$ This is a true statement. 27 is a solution.

$$x = 3 \text{ or } x = 27$$

Solution set: $\{27\}$