EXERCISE 1.3

Q#1: The sum of the consecutive integers is forty-two, find the three integers.

Solution:

Let

1st integer $= x$

2nd integer $= x + 1$

3rd integer $= x + 2$

According to given condition:

$x + x + 1 + x + 2 = 42$

$3x + 3 = 42$

$3x = 42 - 3$

$3x = 39$

$x = \dfrac{39}{3} = 13$

1st integer $= \boxed{x = 13}$

2nd integer $= x + 1 = 13 + 1 \boxed{= 14}$

3rd integer $= x + 2 = 13 + 2 \boxed{= 15}$

Q#2: The diagram shows right angled $\triangle ABC$ in which the length of $\overline{AC}$ is $\left(\sqrt{3} + \sqrt{5}\right)$cm. The area of $\triangle ABC$ is $\left(1 + \sqrt{15}\right)$ cm². Find the length $\overline{AB}$ in the form $\left(a\sqrt{3} + b\sqrt{5}\right)$ cm, where a and b are integers.
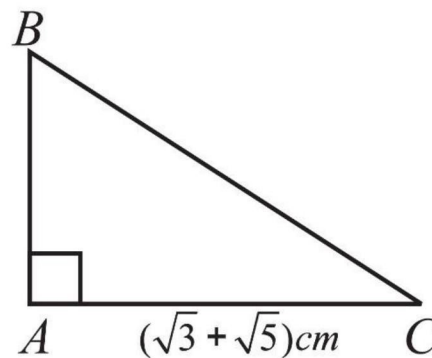
Solution:

$\text{Area} = \left(1 + \sqrt{15}\right)\text{cm}^2$

$\text{Base} = \left(\sqrt{3} + \sqrt{5}\right)\text{cm}$

We know that

$\text{Area} = \dfrac{1}{2}\text{Base} \times \text{Height}$

$$1 + \sqrt{15} = \frac{1}{2}\left(\sqrt{3} + \sqrt{5}\right) \times AB$$

$$2\left(1 + \sqrt{15}\right) = \left(\sqrt{3} + \sqrt{5}\right) \times \overline{\text{AB}}$$

$$\frac{2\left(1 + \sqrt{15}\right)}{\sqrt{3} + \sqrt{5}} = \overline{\text{AB}}$$

$$\overline{\text{AB}} = \frac{2 + 2\sqrt{15}}{\sqrt{3} + \sqrt{5}}$$

$$= \frac{2 + 2\sqrt{15}}{\sqrt{3} + \sqrt{5}} \times \frac{\sqrt{3} - \sqrt{5}}{\sqrt{3} - \sqrt{5}}$$

$$= \frac{\left(2 + 2\sqrt{15}\right)\left(\sqrt{3} - \sqrt{5}\right)}{\left(\sqrt{3}\right)^2 - \left(\sqrt{5}\right)^2}$$

$$= \frac{2\left(\sqrt{3} - \sqrt{5}\right) + 2\sqrt{15}\left(\sqrt{3} - \sqrt{5}\right)}{3 - 5}$$

$$= \frac{2\sqrt{3} - 2\sqrt{5} + 2\sqrt{15}\sqrt{3} - 2\sqrt{15}\sqrt{5}}{-2}$$

$$= \frac{2\sqrt{3} - 2\sqrt{5} + 2\sqrt{15 \times 3} - 2\sqrt{15 \times 5}}{-2}$$

$$= \frac{2\sqrt{3} - 2\sqrt{5} + 2\sqrt{45} - 2\sqrt{75}}{-2}$$

$$= \frac{2\sqrt{3} - 2\sqrt{5} + 2\sqrt{9 \times 5} - 2\sqrt{25 \times 3}}{-2}$$

$$= \frac{2\sqrt{3} - 2\sqrt{5} + 2\sqrt{9}\sqrt{5} - 2\sqrt{25}\sqrt{3}}{-2}$$

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

$$= \frac{2\sqrt{3} - 2\sqrt{5} + 6\sqrt{5} - 10\sqrt{3}}{-2}$$

$$= \frac{\left(2\sqrt{3} - 10\sqrt{3} - 2\sqrt{5} + 6\sqrt{5}\right)}{-2}$$

$$= \frac{-8\sqrt{3} + 4\sqrt{5}}{-2} = \frac{-8\sqrt{3}}{-2} + \frac{4\sqrt{5}}{-2}$$

$$\boxed{\overline{AB} = 4\sqrt{3} - 2\sqrt{5}}$$

Q#3: A rectangle has sides of length $2 + \sqrt{18}$ m and $\left(5 - \frac{4}{\sqrt{2}}\right)$ m. Express the area of the rectangle in the form $a + b\sqrt{2}$, where a and b are integers.

Solution:

$$\text{Length} = \left(2 + \sqrt{18}\right)m$$

$$\text{Width} = \left(5 - \frac{4}{\sqrt{2}}\right)m$$

$$\text{Area} = L \times W$$

$$= \left(2 + \sqrt{18}\right)\left(5 - \frac{4}{\sqrt{2}}\right)$$

$$= (2)(5) - (2)\left(\frac{4}{\sqrt{2}}\right) + \left(\sqrt{18}\right)(5) + \left(\sqrt{18}\right)\left(-\frac{4}{\sqrt{2}}\right)$$

$$= 10 - \left(\sqrt{2}.\sqrt{2}\right) \times \frac{4}{\sqrt{2}} + 5\sqrt{18} - \sqrt{18} \times \frac{4}{\sqrt{2}}$$

$$= 10 - \frac{\sqrt{2}.\sqrt{2}.4}{\sqrt{2}} + 5\sqrt{18} - \sqrt{9 \times 2} \times \frac{4}{\sqrt{2}}$$

$$= 10 - 4\sqrt{2} + 5\sqrt{9 \times 2} - \sqrt{9} \times \sqrt{2} \times \frac{4}{\sqrt{2}}$$

$$= 10 - 4\sqrt{2} + 5(3)\sqrt{2} - \sqrt{9} \times 4$$

$$= 10 - 4\sqrt{2} + 15\sqrt{2} - 3 \times 4$$

$$= 10 + 11\sqrt{2} - 12$$

$$= -2 + 11\sqrt{2}$$

$$\boxed{\text{Area} = \left(11\sqrt{2} - 2\right)m^2}$$

Q#4: Find two numbers whose sum is 68 and difference is 22.

Solution:

Let the two numbers be x and y

According to the given condition

$x + y = 68$ … … … … (1)

$x - y = 22$ … … … … (2)

By adding equation 1 and 2

$x + y = 68$

$x - y = 22$

$2x \quad = 90$

$$\boxed{x = \dfrac{90}{2} = 45}$$

Put the value of x in equation (1)

$x + y = 68$

$45 + y = 68$

$y = 68 - 45$

$\boxed{y = 23}$

Q#5: The weather in Lahore was unusually warm during the summer of 2024. The TV news reported temperature as high as 48°C. By using the formula, (°F = $\dfrac{9}{5}$ °C + 32) find the temperature as Fahrenheit scale.

Solution:

$°C = 48°$

$°F = ?$

$°F = \dfrac{9°C}{5} + 32$

$= \dfrac{9(48)}{5} + 32$

$= \dfrac{432}{5} + 32$

$= 86.4 + 32$

$\boxed{°F = 118.4°}$

Q#6: The sum of the ages of the father and son is 72 years. Six years ago, the father's age was 2 times the age of the son. What was son's age six years ago?

Solution:

Let

age of son $= x$

age of father $= y$

So,

$x + y = 72$ ……………(1)

<u>Six years ago:</u>

age of son $= x - 6$ …………..(2)

age of father $= y - 6$

According to the given condition:

$y - 6 = 2(x - 6)$

$y - 6 = 2x - 12$

$y = 2x - 12 + 6$

$y = 2x - 6$

Put in equation 1

$x + y = 72$

$x + 2x - 6 = 72$

$3x = 72 + 6$

$3x = 78$

$x = \dfrac{78}{3}$

$x = 26$

Son's age now $= 26$

Put in equation no. (2)

Son's age 6 years ago $= x - 6$

$= 26 - 6 \boxed{= 20 \text{ years}}$

Q#7: Mirha buys a toy for Rs. 1520. What will the selling price be to get a 15% profit?

Solution:

Cost price $= 1520$

Profit $= 15\%$

Profit amount $= \dfrac{15}{100} \times 1520$

$= \dfrac{22800}{100}$

Profit amount $= 228$

Selling price $=$ Cost price $+$ profit amount

$= 1520 + 228$

$\boxed{= 1748 \text{ rupees}}$

Q#8: The annual income of Tayyab is Rs. 9,60,000, while the exempted amount is Rs. 1,30,000. How much tax would he have to pay at the rate of 0.75%?

Solution:

Total income $= 9,60,000$

Exemption on $= 1,30,000$

Remaining $=$ Total income $-$ excemption on

Remaining $= 9,60,000 - 1,30,000$

$= 8,30,000$

Tax rate $= 0.75\%$

Tax amount $= \dfrac{75}{(100)(100)} \times 8,30,000$

$= \dfrac{75}{10000} \times 8,30,000$

$= 75 \times 83$

$\boxed{= 6,225 \text{ rupees}}$

Q#9: Find the compound markup on Rs. 3,75,000 for one year at the rate of 14% compounded annually.

Solution:

Principal amount = 3,75,000

rate = 14% annually

$$= \frac{14}{100} \times 3,75,000$$

$$= 14 \times 3750$$

$$\boxed{= 52500}$$

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