

### Exercise 1.3

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

Solution:

Let  $x, x + 1, x + 2$  be three consecutive integers

By condition

$$x(x + 1) + (x + 2) = 42$$

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

$$3x + 3 = 42$$

$$3x = 42 - 3$$

$$3x = 39$$

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

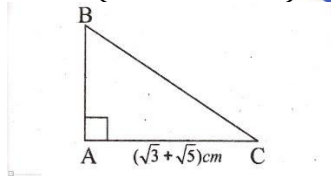
Now the 1<sup>st</sup> integer = 13

2<sup>nd</sup> integer  $x + 1 = 13 + 1 = 14$

3<sup>rd</sup> integer  $x + 2 = 13 + 2 = 15$

Thus 13, 14 and 15 are required three consecutive integers.

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



Solution:

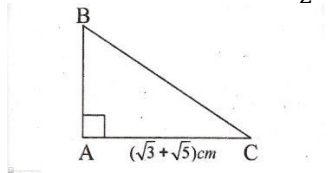
Given  $m\overline{AC} = (\sqrt{3} + \sqrt{5})\text{cm}$

Area of  $\triangle ABC = (1 + \sqrt{15})\text{cm}^2$

To find  $m\overline{AB} = ?$

We know that, Area of  $\triangle = \frac{1}{2}(b \times h)$

Area of  $\triangle ABC = \frac{1}{2}(m\overline{AC} \times m\overline{AB})$



To find  $m_{AB} = ?$

We know that, Area of  $\Delta = \frac{1}{2}(b \times h)$

Area of  $\Delta ABC = \frac{1}{2}(m_{AC} \times m_{AB})$

$$1 + \sqrt{15} = \frac{1}{2}[(\sqrt{3} + \sqrt{5}) \times m_{AB}]$$

$$\Rightarrow \frac{2(1 + \sqrt{15})}{\sqrt{3} + \sqrt{5}} = m_{AB}$$

$\Rightarrow$  Multiplying and dividing by  $(\sqrt{3} - \sqrt{5})$

$$\Rightarrow m_{AB} = \frac{(2 + 2\sqrt{15})}{(\sqrt{3} + \sqrt{5})} \times \frac{(\sqrt{3} - \sqrt{5})}{\sqrt{3} - \sqrt{5}}$$

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

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

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

$$= \frac{\sqrt{3} - \sqrt{5} + 3\sqrt{5} - 5\sqrt{3}}{-1}$$

$$= \frac{4\sqrt{2} + 2\sqrt{5}}{-1}$$

$$= 4\sqrt{3} - 2\sqrt{5}$$

Thus  $m_{AB} = (4\sqrt{3} - 2\sqrt{5})\text{cm}$

Q. 3 A rectangle has sides of length  $(2 + \sqrt{18})m$  and  $(5 - \frac{4}{\sqrt{2}})m$ .

Express

the area of the rectangle in the form  $a + b\sqrt{2}$  where  $a$  and  $b$  are integers.

Solution:

Let length of rectangle  $L = (2 + \sqrt{18})m$

Width of rectangle  $= W = (5 - \frac{4}{\sqrt{2}})m$

We know that

Area of Rectangle  $A = L \times W$

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

$$A = (2 + \sqrt{9 \times 2}) \times \left(5 - \frac{2 \times 2}{\sqrt{2}}\right)$$

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

$$\frac{a}{\sqrt{a}} = \sqrt{a}$$

$$A = 10 - 4\sqrt{2} + 15\sqrt{2} - (3\sqrt{2})(2\sqrt{2})$$

$$A = 10 + 11\sqrt{2} - 6\sqrt{4}$$

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

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

Thus, the area of rectangle is  $(-2 + 11\sqrt{2}) \text{ m}^2$

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

Solution:

$$\text{Sum} = 68$$

$$\text{Difference} = 22$$

Let  $x$  and  $y$  be required numbers

By given conditions:

$$\text{Sum: } x + y = 68 \text{ -----(i)}$$

$$\text{Diff. } x - y = 22 \text{ -----(ii)}$$

Adding eq. (i) and (ii),

$$x + y = 68$$

$$x - y = 22$$

$$\hline 2x = 90$$

$$x = \frac{90}{2}$$

$$x = 45$$

Put it in eq. (i),

$$x + y = 68$$

$$45 + y = 68$$

$$y = 68 - 45$$

$$y = 23$$

Thus, the required numbers are 45 and 23

Q.5 The weather in Lahore was usually warm during the summer of 2024 . The Tv news reported the temperature as high as  $48^\circ\text{C}$  by

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using the Formula  $^{\circ}\text{F} = \frac{9}{5} ^{\circ}\text{C} + 32$  Find the temperature in Fahrenheit Scale

Solution:

Temperature in degree centigrade =  $48^{\circ}\text{C}$  formula:  $^{\circ}\text{F} = \frac{9}{5} ^{\circ}\text{C} + 32$

Temperature in Fahrenheit,

$$^{\circ}\text{F} = \frac{9}{5} \times 48 + 32$$

$$^{\circ}\text{F} = 9 \times 9.6 + 32$$

$$^{\circ}\text{F} = 86.4 + 32$$

$$^{\circ}\text{F} = 118.4$$

Q. 6 The sum of the ages of the father and son is 72. 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 father's age =  $x$

Son's age =  $y$

By condition:

$$x + y = 72 \text{ ----- (i)}$$

Six year ago,

Father's age =  $x - 6$

Son's age =  $y - 6$

By condition:

Father's age = 2 times the son's age

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

$$x - 6 = 2y - 12$$

$$x - 2y = 6 - 12$$

$$x - 2y = -6 \text{ ----- (ii)}$$

Subtracting eq. (ii) from (i)

$$x + y = 72$$

$$\pm x \mp 2y = \mp 6$$

$$3y = 78$$

$$y = \frac{78}{3}$$

$$y = 26$$

Put  $y = 26$  in eq.(i)

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$$x + 26 = 72$$

$$x = 72 - 26$$

$$x = 46$$

Six years ago,

$$y = 26$$

Put  $y = 26$  in eq.(i)

$$x + 26 = 72$$

$$x = 72 - 26$$

$$x = 46$$

Six years ago,

$$\text{Son's age} = y - 6 = 26 - 6 = 20 \text{ years}$$

$$\text{Father's age} = x - 6 = 46 - 6 = 40 \text{ years}$$

Q. 7 Mirha bought a toy for Rs. 1500 and sold for Rs.1520. What was her profit percentage?

Solution:

The cost price = C. P = Rs. 1500

The selling price = SP = Rs. 1520

The profit amount = SP - CP

$$= \text{Rs. } 1520 - \text{Rs. } 1500 = \text{Rs. } 20$$

$$\text{Profit percentage} = \frac{\text{Profit}}{\text{C.P.}} \times 100\%$$

$$\text{Profit percentage} = \frac{20}{1500} \times 100\%$$

$$= \frac{20}{15 \times 100} \times 100\%$$

$$= 1.33\%$$

Q. 8 The annual income of Tayab is Rs. 960,000 , while the exempted amount is Rs. 130,000 . How much tax would he have to pay at the rate of 0.75%.

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Solution:

Annual income = Rs.9,60,000/-

Exempted amount = Rs. 130,000/-

Tax rate = 0.75%

We know that

Taxable income

= Annual income - exempted amount

Taxable income = 960,000 – 130,000

Taxable income = 830,000

Tax amount = 0.75% of Taxable income

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$$\begin{aligned}
 &= \frac{0.75}{100} \times 830,000 \\
 &= \frac{75}{100 \times 100} \times 830,000 \\
 &= 75 \times 83 \\
 &= \text{Rs. } 6,225
 \end{aligned}$$

Thus Tayab will pay tax of Rs. 6,225

Q. 9 Find the compound markup on Rs. 375,000 for one year at the rate of 14% compounded markup annually.

Solution:

Principal amount = P = Rs. 375,000/-

Time, T = 1 = 1 year

Rate, R = 14%

We know that

$$\begin{aligned}
 \text{Compound markup} &= P \times T \times R \\
 &= 375,000 \times 1 \times 14\% \\
 &= 375,000 \times \frac{14}{100} \\
 &= 3,750 \times 14 \\
 &= \text{Rs. } 52,500
 \end{aligned}$$

Thus, compound markup is Rs. 52,500/-

