Ex # 2.8

Q.No.1

The product of two positive consecutive numbers is 182. Find the numbers.

Let the numbers are x and $x+1$

According to given condition:-

$$x(x+1) = 182$$

$$x^2 + x = 182$$

$$x^2 + x - 182 = 0$$

$$x^2 + 14x - 13x - 182 = 0$$

$$x(x+14) - 13(x+14) = 0$$

$$(x+14)(x-13) = 0$$

$$x + 14 = 0 \qquad x - 13 = 0$$

$$x = -14 \qquad x = 13$$

According to given condition required numbers are positive. So we consider required number as $x = 13$

$$x + 1 = 13 + 1$$

$$x + 1 = 13 + 1$$

$$x + 1 = 14$$

So, 13 and 14 are required numbers.

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Q.No.2

The sum of the squares of three positive consecutive numbers is 77. Find them.

Let the numbers are $x-1, x, x+1$

Now, according to given condition.

$$(x-1)^2 + x^2 + (x+1)^2 = 77$$

$$x^2 + 1 - 2x + x^2 + x^2 + 1 + 2x = 77$$

$$3x^2 + 2 = 77$$

$$3x^2 = 77 - 2$$

$$x^2 = \frac{75}{3}$$

$$x^2 = 25$$

$$x = \pm 5$$

According to given condition numbers are positive.

So, we consider $x = 5$

$$x - 1 = 5 - 1$$
$$= 4$$

and

$$x + 1 = 5 + 1$$
$$= 6$$

So, required numbers are 4, 5, 6

Q. No. 3

The sum of five times a number and the square of the number is 204. Find numbers.

Let the number is x

So, According to given condition.

$$5x + x^2 = 204$$

$$x^2 + 5x - 204 = 0$$

$$x^2 + 17x - 12x - 204 = 0$$

$$x(x+17) - 12(x+17) = 0$$

$$(x - 12)(x + 17) = 0$$

$x - 12 = 0$ $\qquad$ $x + 17 = 0$

$x = 12$ $\qquad$ $x = -17$

So required number is either 12 or -17.

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Q.No.4

The Product of five less than three times a certain number and one less than four times the numbers is 7. Find the number.

Let the number is "x".

So, According to given condition

$$(3x-5)(4x-1)=7$$

$$12x^2-3x-20x+5=7$$

$$12x^2-23x+5-7=0$$

$$12x^2-23x-2=0$$

$$12x^2+24x+x-2=0$$

$$12x(x-2)+1(x-2)=0$$

$$(12x+1)(x-2)=0$$

$12x+1=0$ $\qquad$ $x-2=0$

$x=\frac{-1}{12}$ $\qquad$ $x=2$

So, the required number is either 2 or $-\frac{1}{12}$.

Q.No.5

The difference of a number and its reciprocal is $\frac{15}{4}$. Find the number.

Let the number is x then its reciprocal is $\frac{1}{x}$

So, According to given condition:-

$$x-\frac{1}{x}=\frac{15}{4}$$

$$\frac{x^2-1}{x}=\frac{15}{4}$$

$$4x^2-4=15x$$

$$4x^2-15x-4=0$$

$$4x^2-16x+x-4=0$$

$$4x(x-4)+1(x-4)=0$$

$$(4x+1)(x-4)=0$$

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$4x + 1 = 0$ $\quad$ $x - 4 = 0$

$x = -\frac{1}{4}$, $\quad$ $x = 4$

So, the required number is either 4 or $-\frac{1}{4}$.

Q. No. 6

The sum of the squares of two digits of a positive integral number is 65 and the number is 9 times the sum of its digits. Find the number.

Let the digits are x and y.

Now, according to given conditions.

$$x^2 + y^2 = 65 \quad \text{— (1)}$$

Consider x in tens place and y in Once place.

$$10x + y = 9x + 9y$$

$$10x - 9x = 9y - y$$

$$x = 8y \quad \text{— (A)}$$

put value of x in (1)

$$(8y)^2 + y^2 = 65$$

$$64y^2 + y^2 = 65$$

$$65y^2 = 65$$

$$y^2 = 1$$

$$y = \pm 1$$

As required number is positive

so $y = 1$

and $x = 8y$

$x = 8(1)$

$x = 8$

Now the required number is $10x + 1$

$= 10(8) + 1 \triangleq 81$

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Q.No.7

The sum of the co-ordinates of a point is 9 and sum of their squares is 45. Find the co-ordinates of the point.

Let the co-ordinates of point is x & y

Now, according to given condition.

$$x + y = 9 \quad \text{—} \quad (1)$$

$$x^2 + y^2 = 45 \quad \text{—} \quad (2)$$

From (1)

$$x = 9 - y \quad \text{—} \quad (A)$$

Put $x = 9 - y$ in (2)

$$(9-y)^2 + y^2 = 45$$

$$81 + y^2 - 18y + y^2 = 45$$

$$2y^2 - 18y + 81 - 45 = 0$$

$$2y^2 - 18y + 36 = 0$$

$$2y^2 - 12y - 6y + 36 = 0$$

$$2y(y-6) - 6(y-6) = 0$$

$$(2y-6)(y-6) = 0$$

$2y - 6 = 0$

$2y = 6$

$y = \frac{6}{2}$

$y = 3$

$y - 6 = 0$

$y = 6$

Put values of y in (A)

$x = 9 - 6$, $x = 9 - 3$

$x = 3$, $x = 6$

So, the required point either $(3, 6)$ or $(6, 3)$

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Q.No.8

Find two integers whose sum is 9 and the difference of their squares is also 9.

Let the integers are x and y.

Now, according to given condition

$$x + y = 9 \quad \text{—} \quad (1)$$
$$x^2 - y^2 = 9 \quad \text{—} \quad (2)$$

from (1) $x = 9 - y$ — (A)

Put value of x in (2)

$$(9-y)^2 - y^2 = 9$$
$$81 + y^2 - 18y - y^2 = 9$$
$$81 - 18y = 9$$
$$18y = 81 - 9$$
$$18y = 72$$
$$y = \frac{72}{18}$$
$$y = 4$$

Put value of y in (A)

$$x = 9 - 4$$
$$x = 5$$

So, the required integers are 5 and 4.

Q.No.9

Find two integers whose difference is 4 and whose squares differ by 72.

Let the integers are x and y

So, according to given condition

$$x - y = 4 \quad \text{—} \quad (1)$$
$$x^2 - y^2 = 72 \quad \text{—} \quad (2)$$

From (1)

$$x = 4 + y \quad \text{—} \quad (A)$$

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Put values of x in (2)

$$(4+y)^2 - y^2 = 72$$
$$16 + y^2 + 8y - y^2 = 72$$
$$8y = 72 - 16$$
$$8y = 56$$
$$y = 7$$

Put values of y in (A)

$$x = 4 + y$$
$$x = 4 + 7$$
$$x = 11$$

So, the required Integers are 7 and 11.

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Q.No.10

Find the dimensions of a rectangle whose perimeter is 80cm and its area is $375cm^2$.

Let the length of rectangle is x and width of rectangle is y.

Now, according to given condition.

Perimeter $\Rightarrow$ $2(x+y) = 80cm$ — (1)

Area : $xy = 375\,cm^2$ — (2)

From (1)
$$x + y = \frac{80}{2}$$
$$x = 40 - y \quad \text{— (A)}$$

Put values of x in (2)

$$(40-y)\,y = 375$$
$$40y - y^2 = 375$$
$$y^2 - 40y + 375 = 0$$

$$y^2 - 25y - 15y + 375 = 0$$

$$y(y-25) - 15(y-25) = 0$$

$$(y-15)(y-25) = 0$$

$y - 15 = 0$ | $y - 25 = 0$

$y = 15$ | $y = 25$

Put value of y in (i)

$x = 40 - 15$ | $x = 40 - 25$

$x = 25$ | $x = 15$

So, length of rectangle = 25 cm.
and width of rectangle = 15cm.

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