MATHEMATICS – STANDARD 10

WORKSHEET FOR 13h October 2020

A JOINT VENTURE OF DIET PALAKKAD AND SSK PALAKKAD

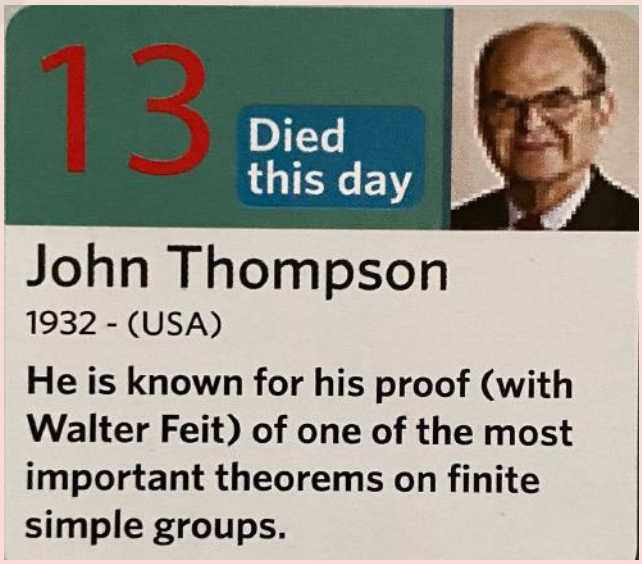
INTER BELL
INTERVENTION BASED ON EFFECTIVE LEISURE LEARNING

STUDENT SUPPORT MATERIAL for X Mathematics

KITE VICTERS STD 10

Mathematics - Class – 44

(Second Degree Equations)



Chapter 4 – Second Degree Equations:

MATHEMATICS – STANDARD 10

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WORKSHEET FOR 13^{h} October 2020

Do you remember?... Don’t forget.....

Identity I

$(a + b)^2 = a^2 + 2ab + b^2$

Identity II

$(a - b)^2 = a^2 - 2ab + b^2$

Identity III

$a^2 - b^2 = (a + b)(a - b)$

Identity IV

$(x + a)(x + b) =$
$x^2 + (a + b)\,x + ab$

Few steps to find the + ve value of x ,by completing the square method from the equation $x^2 + 8x = 9$ is given below. Can you complete?

$x^2 + 8x$ + _____ = 9 + _____.

$(x +$ _____$)^2$ =_____.

So x + _____=_____.

∴ x = _____.

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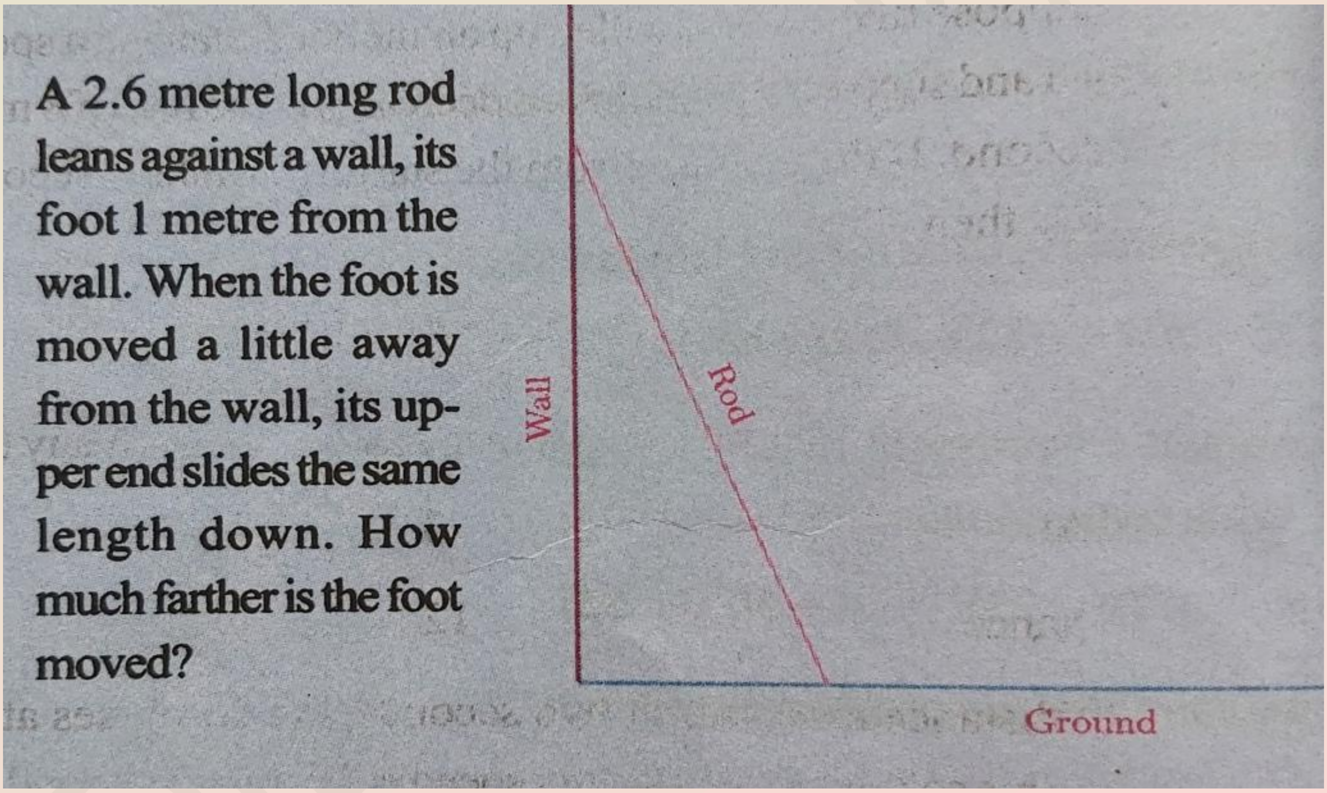
Using the same method find the value of x from the given equations

1) $x^2 + 14x = 32$
2) $x^2 — 10x = 24$
3) $x^2 — 12x = -20$

We can solve one problem_____


A 2.6 metre long rod leans against a wall, its foot 1 metre from the wall. When the foot is moved a little away from the wall, its upper end slides the same length down. How much farther is the foot moved?

You Can see This...

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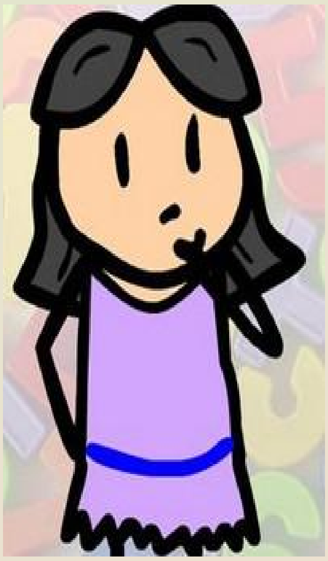
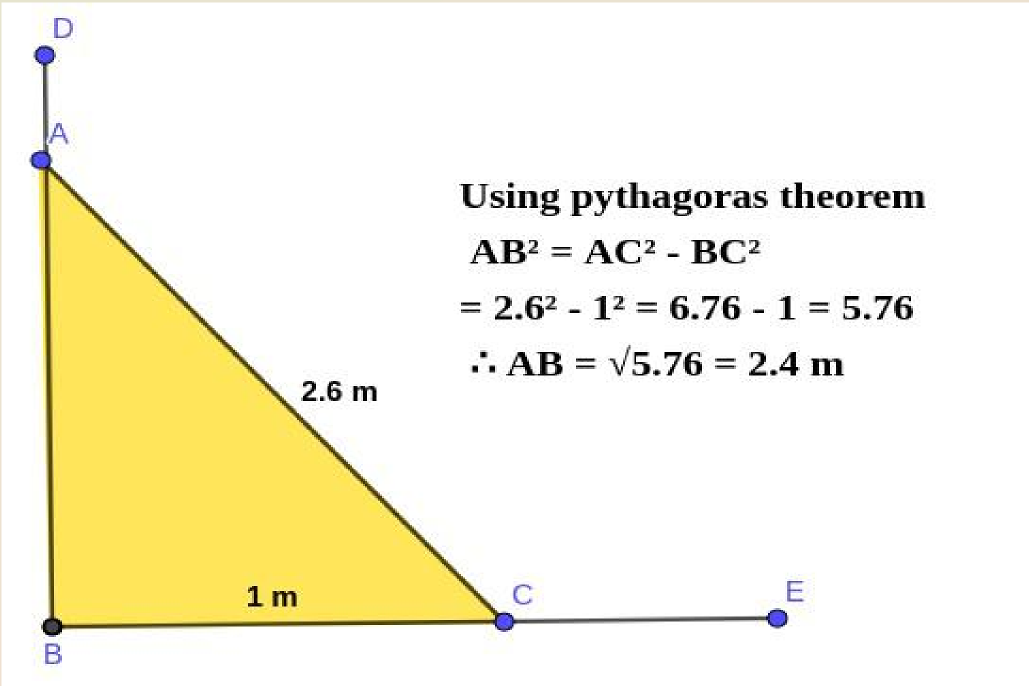
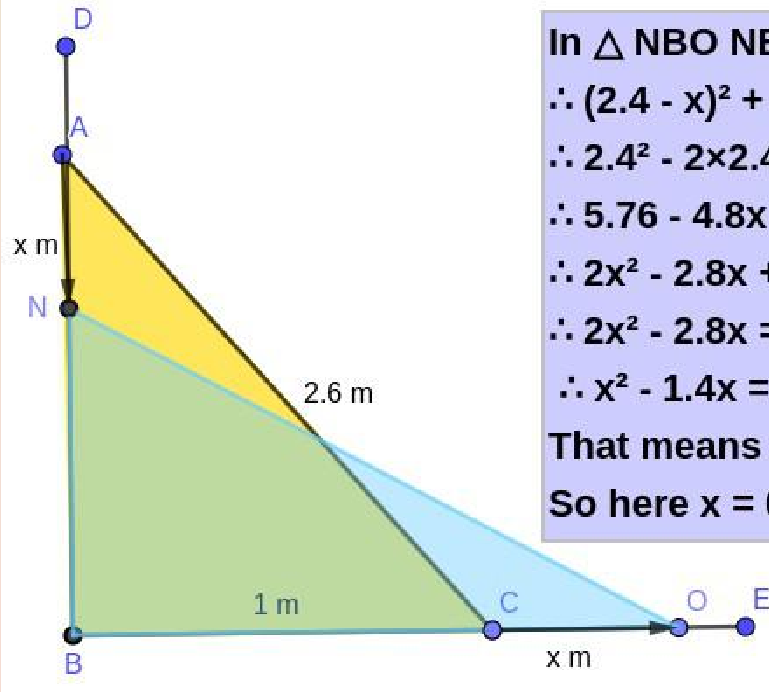
If we denote the points as A, B and C, using Pythagoras theorem as shown below we get AB = 2.4 m.





Both ends of the rod slides the same distance. Let it be x meters ____.



In $\triangle$ NBO $NB^2 + BO^2 = NO^2$

$\therefore (2.4 - x)^2 + (1 + x)^2 = 2.6^2$

$\therefore 2.4^2 - 2\times 2.4 \times x + x^2 + 1^2 + 2\times 1 \times x + x^2 = 2.6^2$

$\therefore 5.76 - 4.8x + x^2 + 1 + 2x + x^2 = 6.76$

$\therefore 2x^2 - 2.8x + 6.76 = 6.76$

$\therefore 2x^2 - 2.8x = 0 \therefore 2(x^2 - 1.4x) = 0$

$\therefore x^2 - 1.4x = 0 \therefore x(x - 1.4) = 0$

That means $x = 0$ or $x - 1.4 = 0$

So here $x = 0 + 1.4 = 1.4$ m

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We can solve this problem using completing the square also_____.

$$x^2 - 1.4x = 0$$

If we add half of the coefficient of x on both sides_____

$$x^2 - 1.4x + (-1.4/2)^2 = (-1.4/2)^2$$

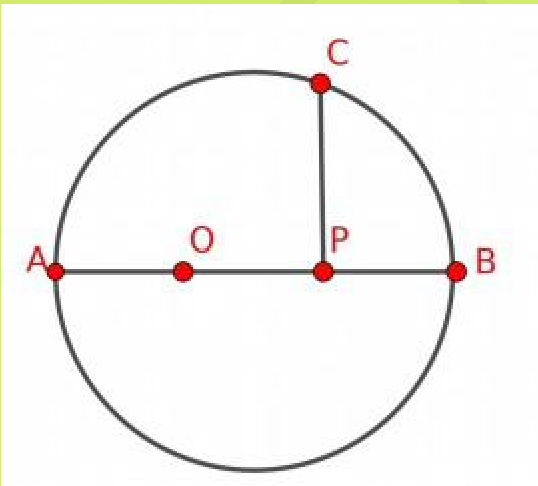
$$x^2 - 1.4x + (-0.7)^2 = (0.7)^2$$

$$(x - 0.7)^2 = (0.7)^2$$

$$\therefore x - 0.7 = 0.7$$

$$\therefore x = 0.7 + 0.7 = 1.4 \text{ m.}$$

We can solve some more problems.



1. In the figure above, AB is a diameter of the circle. PC is perpendicular to AB. PC= PO. AO= 3cm and BP= 4cm. Then what will be the length of PC?

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2. In a right angled triangle the length of hypotenuse is 3 units more than 2 times the length of its base. Third side is 1 unit less than the length of hypotenuse.

i) If the length of the base is x unit. Write the lengths of hypotenuse and the third side in terms of x.

ii)Find the lengths of the sides of the right angled triangle.

3. The length and breadth of a rectangle is 18 cm,12 cm.If the length and breadth is increased by x cm , the area becomes 432 cm^2 . Then find the value of x.

4.

i) Write the pairs of numbers which are sides of the rectangle with perimeter 40 cm.

ii)Find out the sides of a rectangle having perimeter 40cm and area 96 cm^2 (Yes..... here is another idea.....

Find out the numbers with sum 20 and product 96.

_____., _____.

You can think like this too ...)

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WORKSHEET FOR 12h October 2020

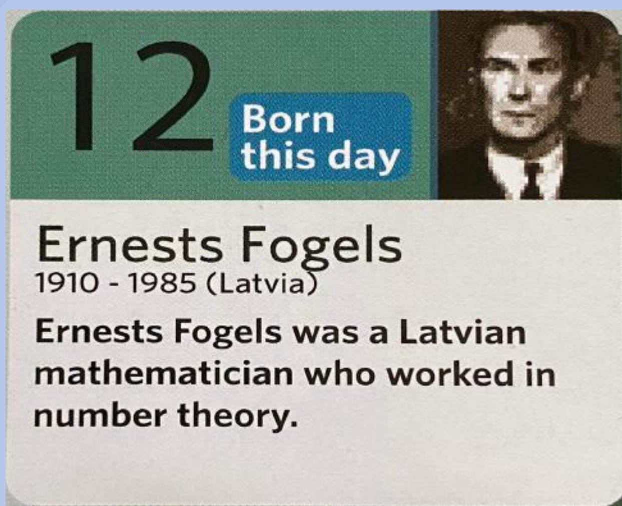
A JOINT VENTURE OF DIET PALAKKAD AND SSK PALAKKAD

SAMAGRA SHIKSHA ABHIYAN
QUALITY EDUCATION FOR ALL

INTER BELL
INTERVENTION BASED ON EFFECTIVE LEISURE LEARNING

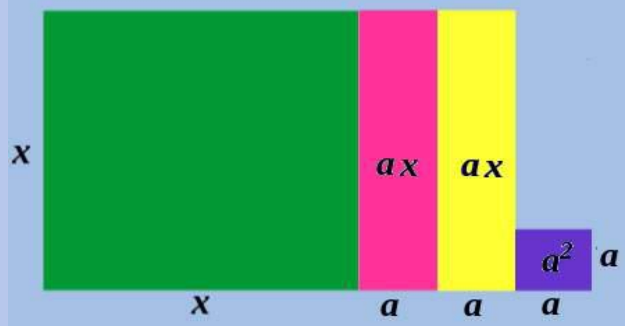
STUDENT SUPPORT MATERIAL for X Mathematics

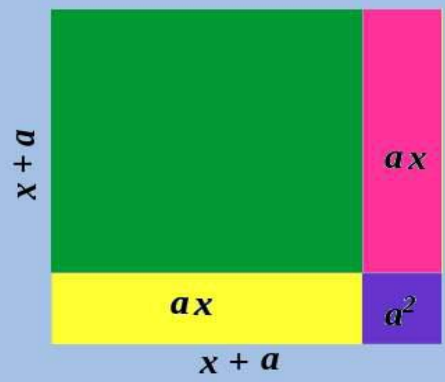
KITE VICTERS STD 10
Mathematics - Class – 43
(Second Degree Equations)



Chapter 4 – Second Degree Equations:

WORKSHEET FOR 12h October 2020





Area of larger square = x^2 *sq unit*

Area of one rectangle = ax *sq unit*

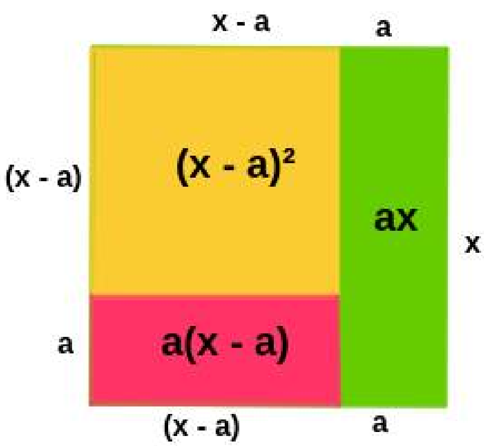
Area of smaller square = a^2 *sq unit*

Area = $(x+a)^2$

$\therefore$ *Total area* = *Area of larger square*
+ *Area of two rectangles*
+ *Area of smaller square*

$= x^2 + ax + ax + a^2 = x^2 + 2ax + a^2$

$\therefore\ (x+a)^2 = x^2 + 2ax + a^2$



Area of Large square = x^2
Area of small square = $(x - a)^2$
Area of red rectangle = $a(x - a)$
Area of green rectangle = ax

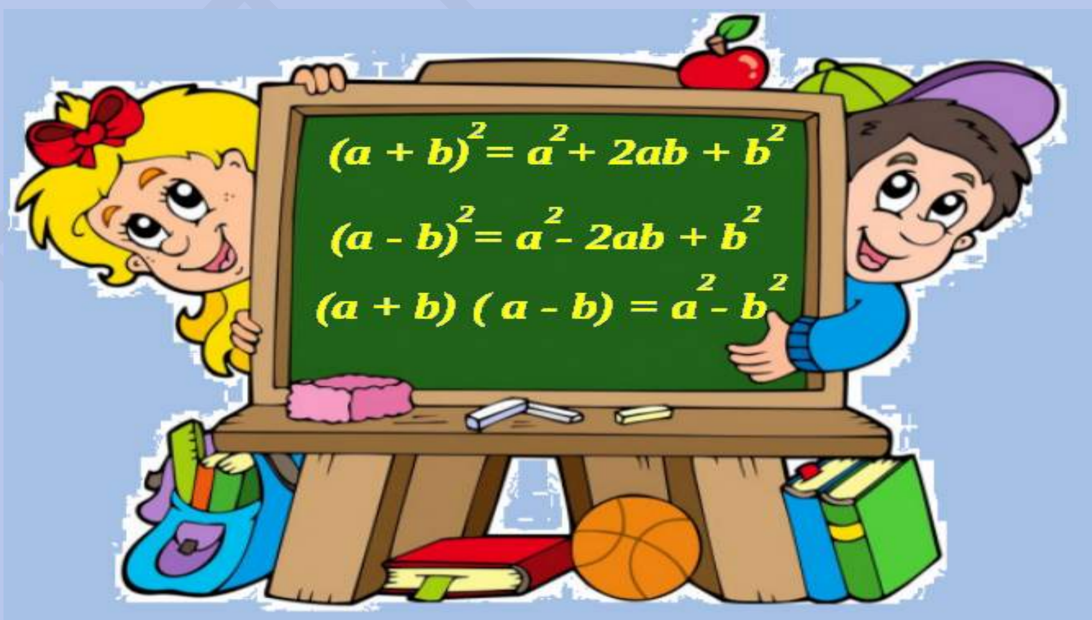
So area of small square = Area of large square
- area of red rectangle - Area of green rectangle

So $(x - a)^2 = x^2 - a(x - a) - ax$
$= x^2 - ax + a^2 - ax$
$= x^2 - 2ax + a^2$

$(x - a)^2$
⇓
$x^2 - 2ax + a^2$

Completing the Square

Algebraic form	Coeficient of x	Adding square	Square form
$x^2 + 2x$	2	$(2/2)^2 = 1^2 = 1$	$(x + 1)^2$
$x^2 + 4x$	4	$(4/2)^2 = 2^2 = 4$	$(x + 2)^2$
$x^2 + 6x$	6	$(6/2)^2 = 3^2 = 9$	$(x + 3)^2$
$x^2 + 8x$	8	$(8/2)^2 = 4^2 = 16$	$(x + 4)^2$
.	.	.	.
.	.	.	.
.	.	.	.
.	.	.	.
$x^2 + 2nx$	$2n$	$(2n/2)^2 = n^2$	$(x+ n)^2$
Algebraic form	**Coeficient of x**	**Adding square**	**Square form**
$x^2 - 2x$	-2	$(-2/2)^2 =(-1)^2 = 1$	$(x - 1)^2$
$x^2 - 4x$	-4	$(-4/2)^2 =(-2)^2 = 4$	$(x - 2)^2$
$x^2 - 6x$	-6	$(-6/2)^2 =(-3)^2 = 9$	$(x - 3)^2$
$x^2 - 8x$	-8	$(-8/2)^2 =(-4)^2=16$	$(x - 4)^2$
.	.	.	.
.	.	.	.
.	.	.	.
.	.	.	.
$x^2 - 2nx$	$-2n$	$(-2n/2)^2 = (-n)^2=n^2$	$(x - n)^2$



Do you want to see?

Example:

1. The product of two alternate counting numbers is 440 . What are the numbers?

Let the alternate counting numbers be x and x +2.

$\therefore \quad x(x+2) = 440$

$x^2 + 2x = 440$

Here we want to add $(\frac{2}{2})^2 = 1^2 = 1$ to both sides to make perfect square.

$x^2 + 2x + 1 = 440 + 1 = 441$

$\therefore (x+1)^2 = 21^2$

$\therefore x+1 = 21$

$\therefore \quad x = 21 - 1 = 20$

$\therefore$ The numbers are 20 and 22.

Another method

Let the alternate counting numbers be (x-1) and (x+1)

$\therefore$ $(x-1)(x+1) = 440$

$\therefore$ $x^2 - 1 = 440$ $[(x-1)(x+1) = x^2 - 1]$

$x^2 - 1 + 1 = 440 + 1 = 441$

$\therefore$ $x^2 = 441 = 21^2$

$\therefore$ $x = 21$

$\therefore$ **The numbers are 21-1 = 20 and 21+1 = 22.**

Use your logic.

**Here the product is 440,
we know 20 x 20 =400,
21 x 21 = 441, so the numbers are near or equal to 20 and 21.
Here it is even numbers,
so the answer is 20 and 22.
That is 20 x 22 = 440.**

2) The difference between the vertical sides of a right triangle is 10 cm. The area of the right triangle is 72 sq. cm. Then find the length of the vertical sides?

Solution 1	Solution 2
Let the long side be X, Short side be X-10 Then Area = 1/2 x X (X-10) = 72 X(X-10) = 72 x 2 = 144 $X^2 – 10X = 144$ $X^2 – 10X + (-5)^2 = 144 + 25$ $(X - 5)^2 = 169 = 13^2$ X - 5 = 13 X=13+5 =18 Long side is 18 cm., Short side is 18-10 = 8 cm.	Let the Short side be X, long side be X+10 Then Area 1/2 x X (X+10) = 72 X(X+10) = 72 x 2 = 144 $X^2 + 10X = 144$ $X^2 + 10X + 5^2 = 144 + 25$ $(X + 5)^2 = 169 = 13^2$ X + 5 = 13 X =13-5 = 8 Short side is 8 cm., Long side is 8+10 = 18 cm.

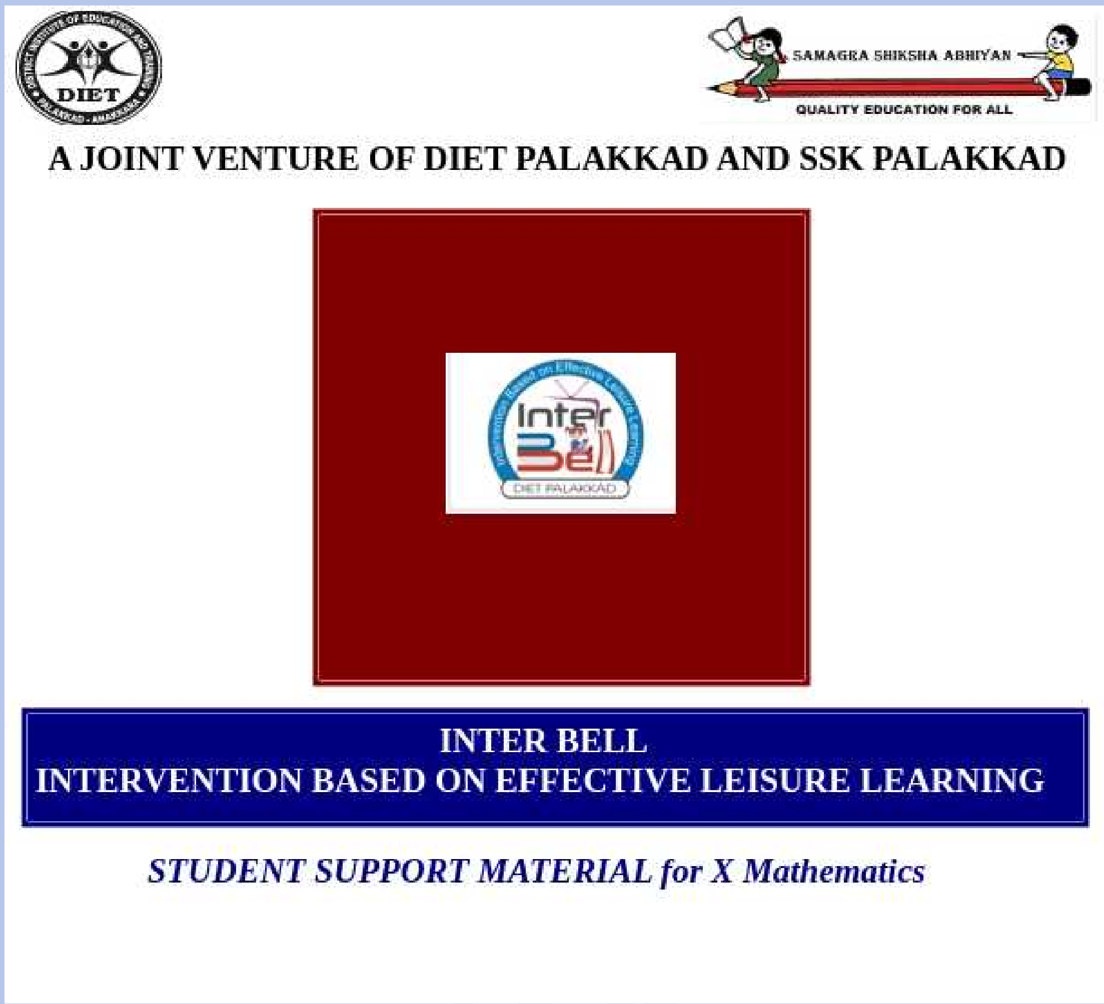
WORKSHEET FOR 12h October 2020

Questions:

1. 16 added to the sum of the first few terms of the arithmetic sequence 9,11,13... gave 256. How many terms are added?
2. A rectangle is to be made with perimeter 100 metres and area 525 square metres. What should be the length of its sides?
3. The difference of two positive numbers is 6. Their product is 216. Find the numbers?

MATHEMATICS – STANDARD 10

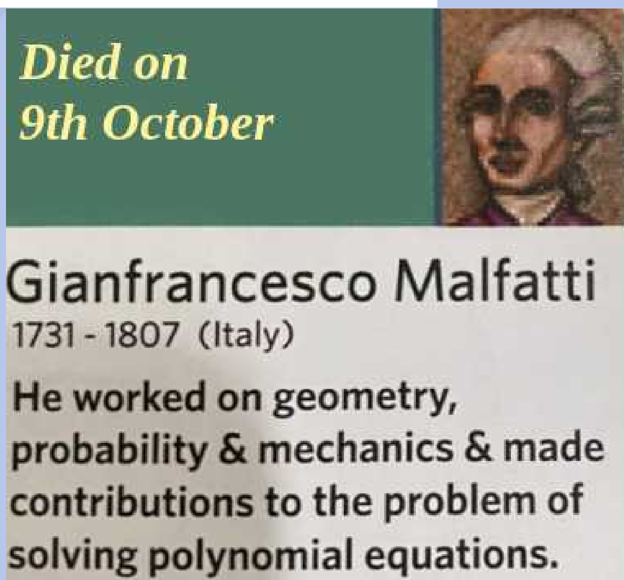
WORKSHEET FOR 9th October 2020



KITE VICTERS STD 10

Mathematics - Class – 42

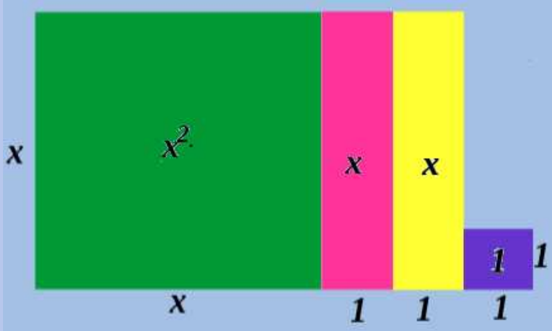
(Second Degree Equations)

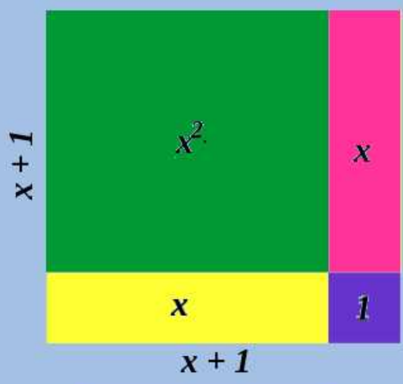


Chapter 4 – Second Degree Equations:

MATHEMATICS – STANDARD 10

WORKSHEET FOR 9th October 2020





Area of larger square = x^2 sq unit

Area of one rectangle = x sq unit

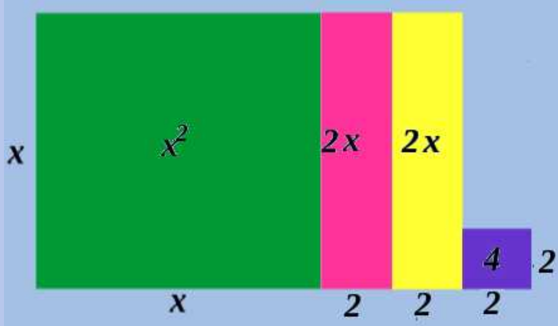
Area of smaller square = 1 sq unit

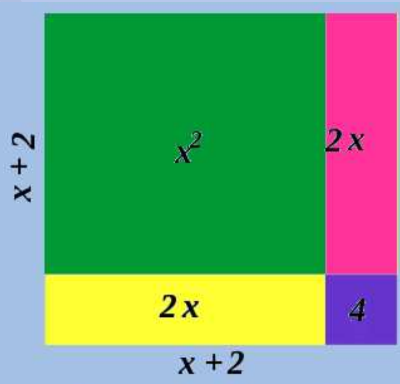
Area = $(x + 1)^2$

∴ Total area = Area of larger square
+ Area of two rectangles
+ Area of smaller square

$= x^2 + x + x + 1 = x^2 + 2x + 1$

$\therefore (x + 1)^2 = x^2 + 2x + 1$





Area of larger square = x^2 sq unit

Area of one rectangle = 2x sq unit

Area of smaller square = 4 sq unit

Area = $(x + 2)^2$

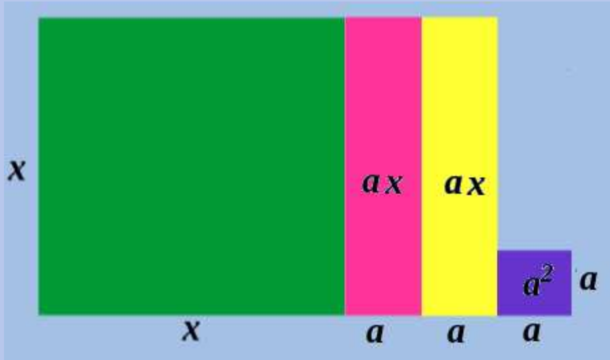
∴ Total area = Area of larger square
+ Area of two rectangles
+ Area of smaller square

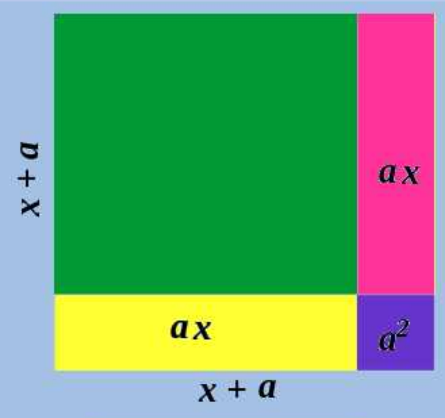
$= x^2 + 2x + 2x + 4 = x^2 + 4x + 4$

$\therefore (x + 2)^2 = x^2 + 4x + 4$

MATHEMATICS – STANDARD 10

WORKSHEET FOR 9th October 2020





Area of larger square = x^2 *sq unit*

Area of one rectangle = ax *sq unit*

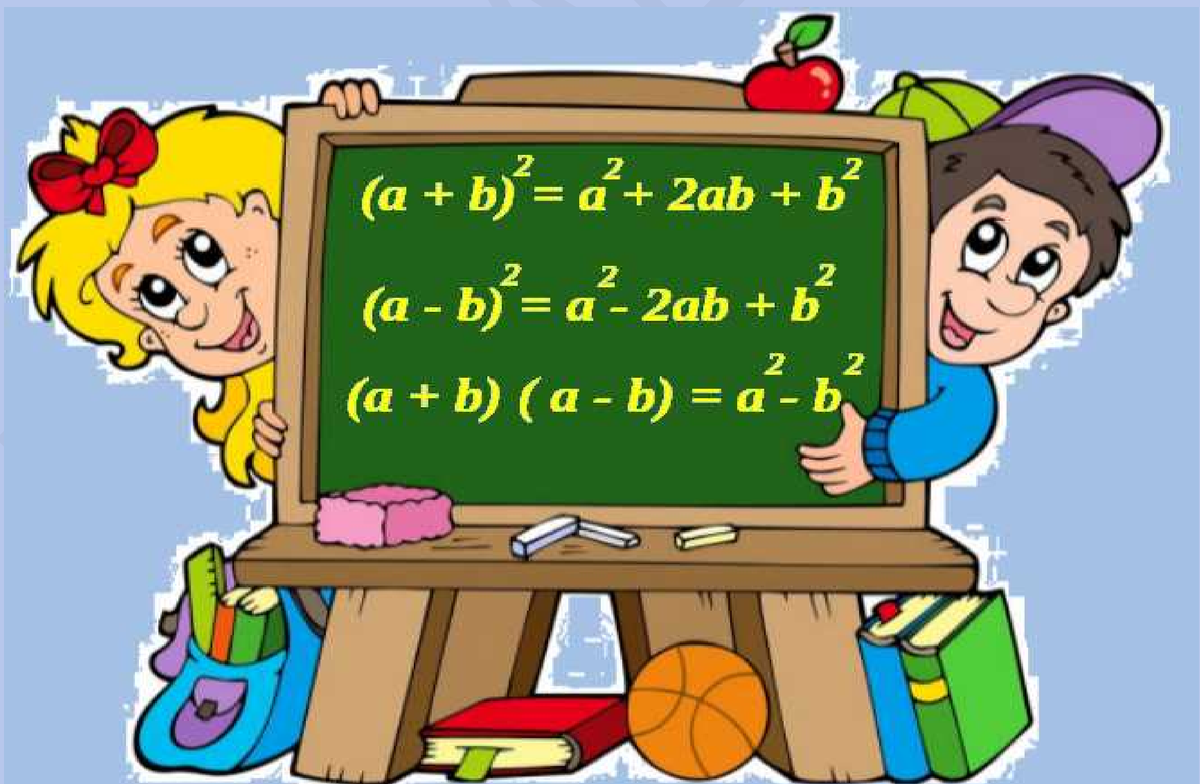
Area of smaller square = a^2 *sq unit*

Area = $(x+a)^2$

$\therefore$ *Total area* = *Area of larger square*
+ *Area of two rectangles*
+ *Area of smaller square*

$= x^2 + ax + ax + a^2 = x^2 + 2ax + a^2$

$\therefore\ (x+a)^2 = x^2 + 2ax + a^2$



Do you want to see?

Examples:

1. **If we add 1 to the product of two alternate counting numbers we will get 289. Then what are the numbers?**

   Let the alternate counting numbers be x and x +2.

   $\therefore \quad x(x+2)+1 = 289$

   $x^2 + 2x + 1 = 289$

   $\therefore (x+1)^2 = 17^2$

   $\therefore x+1 = 17$

   $\therefore \quad x = 17 - 1 = 16$

   $\therefore$ **The numbers are 16 and 18**

Another method

Let the alternate counting numbers be (x-1) and (x+1)

$\therefore \quad (x-1)(x+1) + 1 = 289$

$\therefore \quad x^2 - 1 + 1 = 289 \quad [(x-1)(x+1) = x^2 - 1]$

$\therefore \quad x^2 = 289 = 17^2$

$\therefore x = 17$

$\therefore$ **The numbers are 17-1 = 16 and 17+1 = 18**

2. Find the position of the term in the arithmetic sequence 4,10,16 ….., whose square is 1156.

In the arithmetic sequece 4,10,16.....

First term = 4

Common difference = 6

Algebraic form = 6 n – 2

Square of term = 1156

$(6n - 2)^2 = 1156$

$\therefore 6n - 2 = \sqrt{1156}$

$= 34$

$6n = 34 + 2 = 36$

$n = 36 \div 6 = 6$

$\therefore$ 1156 is the square of the 6^{th} term.

(In the arithmetic sequence 4, 10, 16, 22, 28, 34 ....the 6^{th} term = 34)

3. **Rs 1000 is deposited in a scheme in which the interest is compounded annually. After two years, the amount will be Rs 1210. What is the rate of interest?**

Amount deposited, P = Rs. 1000
Term, n = 2 years
Amount received after 2 years, A = Rs. 1210
Let the rate of interest be R

$$A = P\left(1+\frac{R}{100}\right)^n$$
$$\Rightarrow 1210 = 1000\left(1+\frac{R}{100}\right)^2$$
$$\Rightarrow \frac{1210}{1000} = \left(1+\frac{R}{100}\right)^2$$
$$\Rightarrow \frac{121}{100} = \left(1+\frac{R}{100}\right)^2$$
$$\Rightarrow \left(1+\frac{R}{100}\right)^2 = \frac{121}{100}$$
$$\Rightarrow \left(1+\frac{R}{100}\right) = \sqrt{\frac{121}{100}}$$

$$\Rightarrow \left(1+\frac{R}{100}\right) = \frac{11}{10}$$
$$\Rightarrow \frac{R}{100} = \left(\frac{11}{10}\right)-1$$
$$\Rightarrow \frac{R}{100} = \left(\frac{11}{10}\right)-\left(\frac{10}{10}\right)$$
$$\Rightarrow \frac{R}{100} = \frac{1}{10}$$
$$\Rightarrow R = \left(\frac{1}{10}\right)100$$
$$\Rightarrow R = 10$$

∴ The rate of interest = 10 %

Questions:

1. A pavement of width 2 metres is built around a square shaped garden. The area of the pavement alone is 116 square metres. Find one side of the garden?

2. The length of a rectangular playground is 4 m more than its width. When the area of the playground is increased by adding 4 m^2 it became 324 m^2. Then what was the initial length and width of the playground?

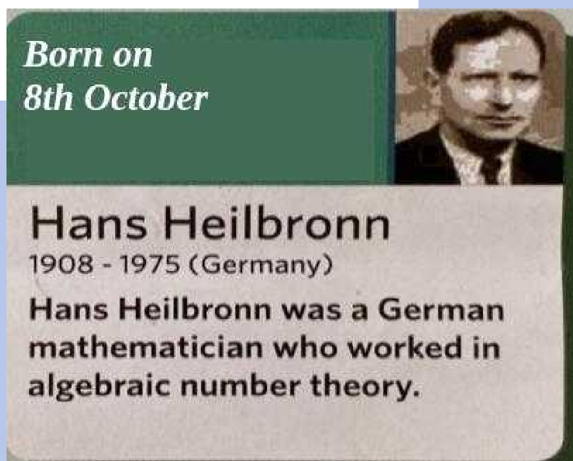
WORKSHEET FOR 8th October 2020

A JOINT VENTURE OF DIET PALAKKAD AND SSK PALAKKAD

INTER BELL
INTERVENTION BASED ON EFFECTIVE LEISURE LEARNING

STUDENT SUPPORT MATERIAL for X Mathematics

KITE VICTERS STD 10 Mathematics - Class – 41 (Second Degree Equations)	



Chapter 4 – Second Degree Equations:

Ancient mathematicians have developed numerous methods to solve the problems which involved equations dealing with measurements. Algebraic methods became common in the renaisance period.

Let's go through few problems.....

- **Dealing with problems which include one unknown and one equation.**

1. The perimeter of a rectangle is 26 m. If the width is 5 m, what will be the length?

Perimeter = 26m

∴ 2(Length + Breadth)= 26

∴ Length + Breadth = 13

∴ Length + 5= 13

∴ Length = 13 – 5 = 8 m.

Shall we solve this problem in another method?

Perimeter = 26 m

∴ 2(Length + Breadth)= 26

Let the length be x metres.

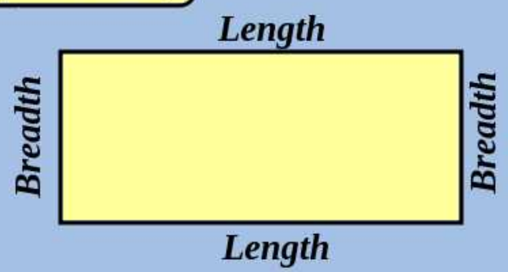
∴ 2(x + 5)= 26

∴ x + 5= 13

∴ x = 13 – 5 = 8

∴ Length = 8 m.

Rectangle:



Perimeter is the sum of all sides.

Perimeter = 2 length + 2 breadth

= 2(length + breadth)

length + breadth = $\frac{\text{Perimeter}}{2}$

Area = Length × Breadth

2. Length of a rectangle is 1 cm more than twice its breadth. If the perimeter is 80m, find the length and breadth.

Perimeter = 80 m

∴ 2(Length + Breadth)= 80

Length + Breadth = 80 ÷ 2 = 40

Length is 1 cm more than twice the breadth.

∴ If the breadth is added to twice the breadth = 40 – 1 = 39

∴ Three times breadth = 39

∴ Breadth = 39 ÷ 3 = 13 m

∴ Length = 2 × 13 + 1 = 27 m

We can solve the above problem in another method by taking an unknown as x.

Let the breadth be x metres.

∴ Length = (2 x + 1) m

∴ Length + Breadth = 40

∴ 2 x + 1 + x = 40

∴ 3 x + 1 = 40

∴ 3x = 40 – 1 = 39

∴ x = 39 ÷ 3 = 13

∴ Breadth = 13 m

∴ Length = 2 × 13 + 1 = 27 m.

We have dealt with a lot of such problems in lower classes. Let us see another type of problems.

- **Problems with two unknowns and two equations.**

1. Perimeter of a rectangle is 1 m. The longer side is 5 cm more than the other. Find the lengths of the sides.

Let us take x and y for the unknown values.
That is let the length and breadth be x and y respectively.
Perimeter = 1 m = 100 cm
$\therefore$ 2(Length + Breadth)=100
$\therefore 2(x + y)= 100$
$\therefore x + y = 100 \div 2 = 50$
$\therefore x + y = 50$ ...... (i)
Also given that, $x - y = 5$ ....(ii)
(i)+ (ii) $\longrightarrow 2x = 55$
$x = 55 \div 2 = 27.5$
Substitute $x = 27.5$ in (i)
Then, $27.5 + y = 50$
$\therefore y = 50 - 27.5 = 22.5$

- In the equation $x + y = 50$, both x and y are unknowns and whose degree and coefficient are 1.

The problems discussed above are dealt with equations with one or two unknowns whose degree was 1.
Now let us see a different type.

1. The area of a square is 36 cm^2. What will be its side?

Area of the square = side × side

= 36 = 6 × 6

∴ side = 6 cm

(Note that we have not used the result 36 = (-6) × (-6) here. Why didn't we use the negative value? Can you find the reason?)

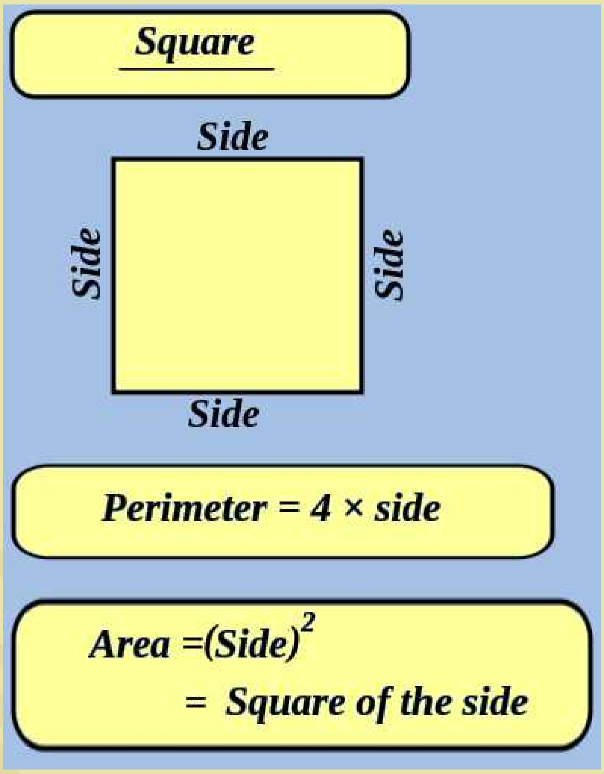
Shall we try by making an equation?

Let the side be x cm .

Area = side × side = $x \times x = x^2$.

∴ $x^2 = 36$

∴ $x = \sqrt{36} = 6$ cm



Note that, here we have to find only one number (the side) and hence we took side = x to make the equation. Also note that the degree of the equation is 2.

MATHEMATICS – STANDARD 10

WORKSHEET FOR 8^{th} October 2020

What do you mean by square and square root?

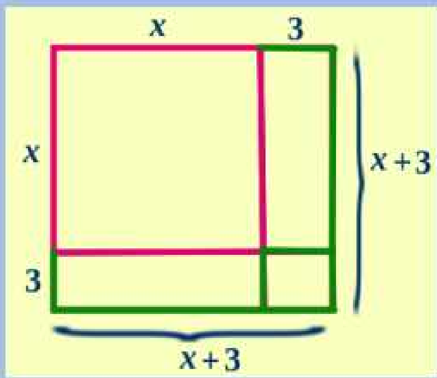
Square	Square root
$1^2 = 1 \times 1 = (-1) \times (-1) = 1$	$\pm\sqrt{1} = \pm 1$
$2^2 = 2 \times 2 = (-2) \times (-2) = 4$	$\pm\sqrt{4} = \pm 2$
$3^2 = 3 \times 3 = (-3) \times (-3) = 9$	$\pm\sqrt{9} = \pm 3$
$4^2 = 4 \times 4 = (-4) \times (-4) = 16$	$\pm\sqrt{16} = \pm 4$
$5^2 = 5 \times 5 = (-5) \times (-5) = 25$	$\pm\sqrt{25} = \pm 5$
$6^2 = 6 \times 6 = (-6) \times (-6) = 36$	$\pm\sqrt{36} = \pm 6$
$7^2 = 7 \times 7 = (-7) \times (-7) = 49$	$\pm\sqrt{49} = \pm 7$
$8^2 = 8 \times 8 = (-8) \times (-8) = 64$	$\pm\sqrt{64} = \pm 8$
$9^2 = 9 \times 9 = (-9) \times (-9) = 81$	$\pm\sqrt{81} = \pm 9$
$10^2 = 10 \times 10 = (-10) \times (-10) = 100$	$\pm\sqrt{100} = \pm 10$
$11^2 = 11 \times 11 = (-11) \times (-11) = 121$	$\pm\sqrt{121} = \pm 11$
$12^2 = 12 \times 12 = (-12) \times (-12) = 144$	$\pm\sqrt{144} = \pm 12$
$13^2 = 13 \times 13 = (-13) \times (-13) = 169$	$\pm\sqrt{169} = \pm 13$
$14^2 = 14 \times 14 = (-14) \times (-14) = 196$	$\pm\sqrt{196} = \pm 14$
$15^2 = 15 \times 15 = (-15) \times (-15) = 225$	$\pm\sqrt{225} = \pm 15$
$16^2 = 16 \times 16 = (-16) \times (-16) = 256$	$\pm\sqrt{256} = \pm 16$
$17^2 = 17 \times 17 = (-17) \times (-17) = 289$	$\pm\sqrt{289} = \pm 17$
$18^2 = 18 \times 18 = (-18) \times (-18) = 324$	$\pm\sqrt{324} = \pm 18$
$19^2 = 19 \times 19 = (-19) \times (-19) = 361$	$\pm\sqrt{361} = \pm 19$
$20^2 = 20 \times 20 = (-20) \times (-20) = 400$	$\pm\sqrt{400} = \pm 20$

WORKSHEET FOR 8th October 2020

Let us see few more problems with second degree equations.

1. When each side of a square is increased by 3 metres, the area became 64 square metres. What was the length of the side of the original square?

Let the side of the original square be x metres.



When the side is increased by 3 m,
the side of the newly formed square = (x + 3) m

Area of newly formed square = 64 sq m.

$\therefore (x + 3)^2 = 64 = 8^2$

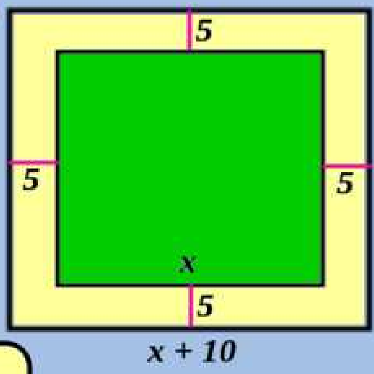
$\therefore x + 3 = 8$

$\therefore x = 8 - 3 = 5$

∴ The length of the side of the original square = 5 m

2. A square ground has a 5 metres wide path all around it. The total area of the ground and the path is 900 sq m. What is the area of the ground?

Let the length of the side of the ground = x metres.



Width of path = 5 m

The length of the side of the ground and path together = (x+10) m

The total area of the ground and the path = 900 sq m

$\therefore (x+10)^2 = 900 = 30^2$

$\therefore x + 10 = 30$

$\therefore x = 30 - 10 = 20$

$\therefore$ *The length of the side of the ground = 20 m*

$\therefore$ *Area of the ground = 20^2 = 400 sq m*

Questions.

1. If we subtract 3 from a natural number and square the result, we will get 64. Then find the number.

2. **Malu's brother's age is 3 more than her age. If the square of brother's age is 144, find Malu's age.**

3. **When the length of each side of a square is reduced by 5 cm, the area became 225 sq cm. Find the side of the given square?**