Wisgrow Math A – Plus

Session 39 │Second Degree Equations 1│ Worksheet 39

Concepts

Let us learn second degree equations.This is a tool for solving problems in various mathematical situations. Here we discuss the methods to solve equations and its applications.

1) Form the equations in the following cases.

    a) The sum of a number and its square is 12

    b) When a number is subtracted from its square results 20

    c) The sum of the square of a number and two times that number is 63

    d) Product of two consecutive odd numbers is 63.

    e) The sum of a number and its reciprocal is $\frac{10}{3}$.

Answers

    a) If the number is x then $x^2 + x = 12$

    b) If the numebr is x then $x^2 - x = 20$

    c) If the numebr is x then $x^2 + 2x = 63$

    d) Numbers are $x, x + 2$ then $x(x + 2) = 63, x^2 + 2x = 63$

    e) If the number is x then $x + \frac{1}{x} = \frac{10}{3}$
$$\frac{x^2+1}{x} = \frac{10}{3}$$
$$3(x^2 + 1) = 10x,$$

$$3x^2 - 10x + 3 = 0$$

2) The square of a number is 16.

    a) What are the numbers ?

    b) Take the number as x and form an equation

    c) Can the square of a real number -16? Explain.

Answers

    a) Numbers are $4, -4$

    b) If the number is x then $x^2 = 16$

    c) No real number exist with its square a negative number. The square of -4 and the square of $+4$ is 16.

3) The sum of a number and its square is 30.

    a) If the number is x, form an equation.

    b) What is the positive number x ?

c) Can more than one number satisfying this condition?

> **Answers**
>
> a) If the number is x then $x^2 + x = 30$
>
> b) $x = 5$
>
> c) $5^2 + 5 = 30, (-6)^2 + (-6) = 30$. Numbers are $5, -6$

4) x is an odd number greater than 1.

   a) What are the odd numbers nearer to x

   b) If the product of those numbers is 45, form an equation.

   c) Find the numbers.

> **Answers**
>
> a) Odd number is x. The numbers nearer to it are $x - 2, x + 2$
>
> b) $(x - 2)(x + 2) = 45$
> $x^2 - 4 = 45, x^2 = 49$
>
> c) $x = 7$
>   Numbers are $5, 9$

5) If the sides of a square are reduced by 1 , the area becomes 100.

   a) If the side of the first square before reducing is x, form an equation.

   b) Find the side of the square.

   c) What will be the perimetre of the new square.

> **Answers**
>
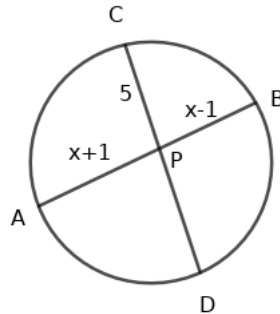> a) If one side is x then $(x - 1)^2 = 100$
>
> b) $x - 1 = \sqrt{100} = 10, x = 11$
>
> c) Perimetre decreases by 4

[1]

Session 40 │ Second Degree Equations 2 │ Worksheet 40

1) The chords AB and CD meet at a point P inside the circle.
$CD = 21$cm, $PC = 5$cm.

a) What is PD?

b) If $PA = x + 1$ and $PB = x - 1$ then form an equation

c) Find the lenght PA and PB.

Answers

a) $PD = 21 - 5 = 16$cm

b) $PA \times PB = PC \times PD$
$(x + 1)(x - 1) = 5 \times 16 = 80$
$x^2 - 1^2 = 80, x^2 - 1 = 80$

c) $x^2 - 1 = 80 \rightarrow x^2 = 81, x = 9$

d) $PA = 9 + 1 = 10$cm, $PB = 9 - 1 = 8$cm

2) The product of two consecutive even numbers is 360

a) If the odd number in between these numbers is x then write the numbers .

b) Form an equation using the given condition.

c) Find the numbers.

Answers

a) Numbers are $x - 1, x + 1$

b) $(x - 1)(x + 1) = 360, x^2 - 1 = 360$

c) $x^2 = 361, x = \sqrt{361} = 19$. Numbers $19 - 1 = 18, 19 + 1 = 20$

3) Consider the arithmetic sequence $5, 9, 13, 17, 21 \cdots$.

a) Write the algebraic form of this sequence.

b) What is the position of the term in the sequence whose square is 625?

c) Is 36 a term of this sequence . How can you realize it ?

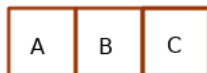d) What is the position of 49 in this sequence ?

Answers

a) $x_n = dn + (f - d) = 4n + (5 - 4) = 4n + 1$

b) $(4n + 1)^2 = 625, 4n + 1 = \sqrt{625} = 25, 4n = 24, n = 6$

c) All terms are odd numbers . The even number 36 cannot be a term of this sequence

d) $4n + 1 = 49, 4n = 48, n = 12.$
12 th term is 49

4) Three boxes in which dates of a calandar are given.

A	B	C

a) If $B = x$ find A, C

b) If $A \times C = 120$ form an equation.

c) Find B

d) Find the days A and C

Answers

a) $A = x - 1, C = x + 1$

b) $(x - 1)(x + 1) = 120, x^2 - 1 = 120, x^2 = 121$

c) $x = \sqrt{121} = 11, B = 11$

d) $A = 10, C = 12$

5) Sum of the areas of two rectangles is 130. Side of one square is 2 more than the side of the other square .

a) If the side of the small square is x then what is the side of the big square ?

b) Form a second degree equation using the condition.

Answers

a) Side of the big square is $x + 2$

b) $x^2 + (x + 2)^2 = 130$
$x^2 + x^2 + 4x + 4 = 130, 2x^2 + 4x + 4 - 130 = 0, 2x^2 + 4x - 126 = 0$

Wisgrow Math A – Plus

Session 41 │Second Degree Equations 3 │ Worksheet 41

1) Consider two adjacent even numbers

    a) If one of them is x then what is the other?

    b) If the product is 120 then write a second degree equation.

    c) Convert this equation as a completed square by suitable changes

   d) Find the numbers .

> **Answers**
>
>   a) $x + 2$
>
>   b) $x(x + 2) = 120$
> $x^2 + 2x = 120$
>
>   c) Add 1 on both sides $x^2 + 2x + 1 = 120 + 1$
> $(x + 1)^2 = 121$
>
>   d) $x + 1 = \sqrt{121} = 11, 11, x + 1 = 11, x = 10$
>   Even numbers are $10, 12$

2) Length of a rectangle is 8 more then its breadth.

    a) If the breadth is x then what is its length?

    b) If the area is 240 sq.cm form a second degree equation.

    c) Calculate the lenght and breadth

> **Answers**
>
>   a) Length$= x + 8$
>
>   b) $x(x + 8) = 240, x^2 + 8x = 240$
>
>   c) Add $\left(\frac{8}{2}\right)^2$ on both sides. It is 16
> $x^2 + 8x + 16 = 240 + 16$
> $(x + 4)^2 = 256, x + 4 = \sqrt{256} = 16, x = 16 - 4 = 12$
>   Breadth 12 cm,Length $12 + 8 = 20$cm

3) In the figure AB is the diametre of the semicircle. AB is perpendicular to PC.Also,$AP = BP + 5$, $PC = 6$.
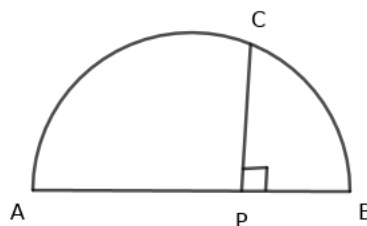
    a) Write the relation between the lenghts PA, PB and PC

b) If $PB = x$ then write an equation connecting the lenghts PA, PB and PC

c) What is the length of PB?

d) What is the radius of this circle?

Answers

a) $PA \times PB = PC^2$

b) $(x + 5) \times x = 6^2$, $x^2 + 5x = 36$
$x^2 + 5x + (\frac{5}{2})^2 = 36 + (\frac{5}{2})^2$
$(x + \frac{5}{2})^2 = 36 + \frac{25}{4}$
$(x + \frac{5}{2})^2 = \frac{169}{4}$
$(x + \frac{5}{2}) = \sqrt{\frac{169}{4}} = \frac{13}{2}$
$x = \frac{13}{2} - \frac{5}{2} = 4$

c) $PB = 4$
$AP = 4 + 5 = 9$, $AB = 9 + 4 = 13$
Radius $= 6.5$cm

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4) Consider the sequence of even numbers $2, 4, 6, 8 \cdots$.

a) What is its algebraic form?

b) How many terms from the beginning in the order makes the sum 210?

Answers

a) $x_n = 2n$

b) $n(n + 1) = 210$, $n^2 + n = 210$
$n^2 + n + \frac{1}{4} = 210 + \frac{1}{4}$
$(n + \frac{1}{2})^2 = \frac{841}{4}$
$n + \frac{1}{2} = \sqrt{\frac{841}{4}} = \frac{29}{2}$
$n = \frac{29}{2} - \frac{1}{2} = 14$
The sum of the first 14 even numbers is 210

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5) The smallest side of a right angled triangle is 4 less than its hypotenuse.Third side is 2 more than the smallest side.

a) If the smallest side is x what are the other two sides.

b) Write an equation connecting the length of the sides .

c) What is the length of the smallest side?
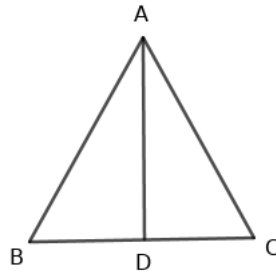
d) Find the length of other sides of the triangle.

Answers

a) If the smallest side is x then hypotenuse is $= x + 4$, third side is $x + 2$

b) $(x + 4)^2 = (x + 2)^2 + x^2$, $x^2 + 8x + 16 = x^2 + 4x + 4 + x^2$
$x^2 - 4x - 12 = 0$

c) $x^2 - 4x = 12$, $x^2 - 4x + 4 = 12 + 4$
$(x - 2)^2 = 16$, $x - 2 = 4$, $x = 6$
Smallest side is 6

d) Sides are $6, 8, 10$

Session 42 │Second Degree Equations 4 │ Worksheet 42

1) In traingle ABC, $AB = AC$

AD is the perpendicular from A to BD. This perpendicular distance from A to BC is 2 cm more than BC. Area of the triangle is 60 sq.cm

a) If $BC = x$ then what is the langth AD?

b) Form an equation connecting the lengths BC, AD and area of the rectangle

c) Find the length of BC.

d) What is the lenghth of AD?

e) Calculate the perimetre of the triangle ABC

Answers

a) $AD = x + 2$

b) $\frac{1}{2} \times x \times (x + 2) = 60$
$x(x + 2) = 120, x^2 + 2x = 120$

c) $x^2 + 2x + 1 = 121, (x + 1)^2 = 121, (x + 1) = \sqrt{121} = 11, x = 11 - 1 = 10$cm

d) $AD = 10 + 2 = 12$

e) $AB^2 = BD^2 + AD^2$
$AB^2 = 5^2 + 12^2 = 169, AB = \sqrt{169} = 13$cm
Perimetre $= 13 + 13 + 10 = 36$cm

2) Length of a rectangle is 4 more than its breadth .Area of the rectangle is 357 sq.cm

a) If the breadth is x then what is its length?

b) Write an equation connecting length , breadth and area

c) Find the lenghth and breadth of the rectangle .

Answers

a) Length $x + 4$

b) $x(x + 4) = 357, x^2 + 4x = 357$

c) $x^2 + 4x + 4 = 357 + 4 = 361, (x + 2)^2 = 361, x + 2 = \sqrt{361} = 19, x = 19 - 2 = 17$

d) Breadth 17cm ,length $17 + 4 = 21$cm

3) Given picture is the dates marked in a calandar .
A, B, C, D denotes the dates.

a) If $A = x$ write B, C, D?

b) If $A \times C = 84$ form a second degree equation.

c) Find the number corresponding to A.

d) Write the numbers in the boxes A, B, C, D

Answers

a) $B = x + 1, D = x + 7, C = x + 8$

b) $x(x + 8) = 84, x^2 + 8x = 84$

c) $x^2 + 8x + 4^2 = 84 + 4^2$
$(x + 4)^2 = 100, x + 4 = \sqrt{100}, x = 10 - 4 = 6$
$A = 6$

d) $A = 6, B = 7, C = 14. D = 13$

4) Sum of the areas of two squares is 468 sq.cm. The difference between the perimetres is 24 cm.

a) If the small side is x then what is the length of the big side ?

b) What is the perimetre of the gig square?

c) Write the length of the sides the squares in x

d) Form a second degree equation and find the length of the small square.

e) Find the length of the big square.

Answers

a) $4x$

b) $4x + 24$

c) Side of the small square is x, Side of the big square is $\frac{4x+24}{4} = x + 6$

d) $x^2 + (x + 6)^2 = 468, x^2 + x^2 + 12x + 36 = 468, 2x^2 + 12x = 432$
$x^2 + 6x = 216, x^2 + 6x + 9 = 225, (x + 3)^2 = 225$
$(x + 3) = 15, x = 12$
Side of the small square is 12 cm

e) Side of the big square is $12 + 6 = 18$ cm

5) Hypotenuse of a right angled triangle is 1 less than twice its small side. Third side is 1 more than its small side

a) If the small side is x what is the length of other two sides .

b) Form an equation connecting the length of the sides .

c) Calculate the length of the sides of the triangle.

Answers

a) Hypotenuse $= 2x - 1$, Third side $= x + 1$

b) $(2x - 1)^2 = x^2 + (x + 1)^2$, $4x^2 - 4x + 1 = x^2 + x^2 + 2x + 1$
$2x^2 - 6x = 0$

c) $x = 3$.Sides are :
Hypotenuse$2x - 1 = 6 - 1 = 5$cm.
Other two sides are 3cm ,4cm.

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Session 44 │Second Degree Equations 6 │ Worksheet 44

1) The product of the digits of a two digit number is 18. When 63 is subtracted from the number we get the two digit number with digits in the reversed order.

   a) If the digit in the tens place is x when what will be the digit in the one's place ?

   b) Write the number using the place value of the digits.

   c) Form a second degree equation using the given condition.

   d) Find the number.

   Answers

   a) Digit in one's place $\frac{18}{x}$

   b) Number $= 10x + \frac{18}{x}$

   c) $10x + \frac{18}{x} - 63 = 10 \times \frac{18}{x} + x$
   $10x + \frac{18}{x} - \frac{180}{x} - x = 63$
   $9x^2 - 162 = 63x$
   $9x^2 - 63x - 162 = 0$
   Dividing both sides by 9 ,
   $x^2 - 7x - 18 = 0.$

   d) $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
   $x = \frac{-(-7) \pm \sqrt{(-7)^2 - 4 \times 1 \times -18}}{2 \times 1}$
   $x = \frac{7 \pm \sqrt{121}}{2}$
   $x = 9, -2$
   $x = 9$

   e) Tens' place 9, one's place $\frac{18}{9} = 2$
   Number $= 10 \times 9 + 2 = 92$

2) The difference between the squares of two numbers is 45. The square of the small number is 4 times the large number.

   a) Write an equation by taking x as the large number.

   b) Calculate the numbers.

   Answers

   a) Let x be the small number and y the other number
   $y^2 - x^2 = 45, x^2 = 4y$
   From these two equations we can write $y^2 - 4y = 45, y^2 - 4y + 4 = 49$

   b) $(y - 2)^2 = 49, y - 2 = 7, y = 9$ Numbers are $y = 9, x^2 = 4 \times 9 = 36, x = 6$
   Numbers are $9, 4$

3) A rod of 16cm length is cut into two pieces. Two times the square of the length of the larger piece is equal to 164 more than the square of the smaller piece.

   a) If the length of the larger piece is x then what is the length of the smaller piece.

b) Form an equation using the given conditions.

c) Find the length of the pieces .

> **Answers**
>
> a) Length of small piece $16 - x$
>
> b) $2x^2 = (16 - x)^2 + 164$
> $x^2 + 32x - 420 = 0$
>
> c) $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
> $x = \frac{-32 \pm \sqrt{32^2 - 4 \times 1 \times -420}}{2 \times 1}$
> $x = \frac{-32 \pm \sqrt{1024 + 1680}}{2}$
> $x = \frac{-32 \pm \sqrt{2704}}{2}$, $x = 10$
>
> c) Two pieces are $10, 16 - 10, 10$cm ,6 cm

4) The sum of the squares of two positive numbers is 208.18 times the small number is equal to the square of the large number.

a) Form an equation by taking x as the small number.

b) Find the numbers.

> **Answers**
>
> a) Small number $= x$, Large number $18x$
> $x^2 + 18x = 208$
> $x^2 + 18x - 208 = 0$
>
> b) $x = \frac{-18 \pm \sqrt{18^2 - 4 \times 1 \times -208}}{2 \times 1}$
> $x = \frac{-18 \pm \sqrt{324 + 832}}{2 \times 1}$
> $x = \frac{-18 \pm \sqrt{1156}}{2}$
> $x = \frac{-18 \pm 34}{2}$, $x = 8$
> square of big number $= 18 \times 8 = 144$. Larger number $= 12$, small number$8, 12$

5) A two digit number is 4 times the sum of the digits.Also the number is 3 times the product of the digits.

a) Form an equation by taking x, y as the digits.

b) Make a second degree equation using the given condition.

c) Find the numbers.

Answers

a) Digit in tens place x, digit in one's place y

Number is $10x + y$

$$10x + y = 4(x + y) \qquad \text{(1)}$$

$$10x + y = 3xy \qquad \text{(2)}$$

b) $10x + y = 4x + 4y, 6x = 3y, y = 2x$

$10x + y = 3xy \rightarrow 10x + 2x = 3x \times 2x$

$12x = 6x^2$

c) $x = 0, x = 2$. Tens palce cannot be 0 . Tens place $= 2$, one's place $2x = 4$

Number $= 24$

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Session 45 │Second Degree Equations 7 │ Worksheet 45

1) The age of a man after 15 years would be the square of his age before 15 years.

    a) If the present age is x , form a second degree equation

    b) Find the present age.

    c) Without using algebra find the present age .

Answers

    a) $(x-15)^2 = (x+15)$
$x^2 - 30x + 225 = x + 15$
$x^2 - 31x + 210 = 0$

    b) $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
$x = \frac{-(-31) \pm \sqrt{(-31)^2 - 4 \times 1 \times 210}}{2 \times 1}$
$x = \frac{31 \pm \sqrt{961 - 840}}{2}$
$\frac{31 \pm 11}{2} = 21, 10$

    c) x values are $21, 10$.The value of $x = 10$ cannot be admissible.Present age is 21years.

    d) While considering the age before and after 15 years there will be a gap of 30years.The perfect square just above 30 is 36.
15 years below 36 is 21, 15years below 21 is 6. The square of 6 is 36. The present age is 21

---

2) Manju's present age is the square of Laya's age.After 5years Manju's age become 3 times Laya's age.

    a) If Laya's present age is x form a second degree equation.

    b) Find the present age of both.

    c) How many years later the age of Manju become two times Laya's age?

Answers

    a) Laya's present age is $= x$. manju's present age is $= x^2$.
Laya's age after five years is $= x + 5$,Manju's age after five years is $= x^2 + 5$.
$x^2 + 5 = 3(x + 5), x^2 + 5 = 3x + 15, x^2 - 3x - 10 = 0$

    b) $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
$x = \frac{-(-3) \pm \sqrt{(-3)^2 - 4 \times 1 \times -10}}{2 \times 1}$
$x = \frac{3 \pm 7}{2} = 5, -2$
Laya's present age is 5 years .Manju's present age is 25 years

    c) Suppose that after n years Manju's age become two times Laya's age .
$(5 + n) \times 2 = 25 + n, n = 15$
After 15 years Manju's age become two times Laya's age .

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3) One year ago, Ajayan's age was 8 times his son's age.Present age of Ajayan is the square of his son's present age.

    a) If son's age before 1 year is x what was Ajayans age one year ago.

b) Form a second degree equation using the given condition.

c) Calculate their present age.

> **Answers**
>
> a) Son's age before one year is x, Ajay's age is $8x$.
>
> b) Present age of son $= x + 1$, Ajay's present age $= 8x + 1$
> $(x+1)^2 = 8x + 1, x^2 + 2x + 1 - 8x - 1 = 0, x^2 - 6x = 0,$
>
> c) $x(x-6) = 0, x = 6, 0$
> We can take x value 6. Son's present age $x + 1 = 7$, Ajay's present age is $8 \times 6 + 1 = 49$

4) The sum of the ages of a father and son is 45. 5 years ago the product of their ages was 124.

   a) If father's present age is x what is son's present age?

   b) Form a second degree equation using the given condition.

   c) Find the their present age.

> **Answers**
>
> a) Son's present age $= 45 - x$
>
> b) Fathers age before fice years $= x - 5$, Sons's age before five years $= 40 - x$
> $(x-5)(40-x) = 124,$
> $x^2 - 45x + 324 = 0$
>
> c) $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
> $x = \frac{-(-45) \pm \sqrt{(-45)^2 - 4 \times 1 \times 324}}{2 \times 1}$
> $x = \frac{45 \pm \sqrt{729}}{2}$
> $x = 36, 9$
> Fathers age $= 36$, Son's age $= 9$

5) Nasrin's age is two times Riswan's age. Four years hence the product of their ages become 160.

   a) If Riswan's present age is x what is Nasrin's present age?

   b) Form a second degree equation using the given condition.

   c) Calculate their present age.

> **Answers**
>
> a) Riswan's age $= x$, Nasrin's age $= 2x$
>
> b) Nasrin's age after four years $= x + 4$, Riswan's age after four years $= 2x + 4$
> $(x+4)(2x+4) = 160$
> $2x^2 + 12x + 16 = 160$
> $2x^2 + 12x - 144 = 0$
> $x^2 + 6x - 72 = 0$
>
> c) $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
> $x = \frac{-6 \pm \sqrt{6^2 - 4 \times 6 \times -72}}{2 \times 1}$
>
> $x = 6, -12$. Riswan's age $= 6$, Nasrin's age $= 12$.

Session 46 | Second Degree Equations 8 | Worksheet 46

1) The difference between the length of the perpendicular sides of a right triangle is 10, area of the triangle is 600 square cm.

    a) One of the perpendicular sides is x then what is the length of the other?

    b) Form an equation using the given condition.

    c) What is the length of the perpendicular sides?

    d) Calculate the perimetre of the triangle.

Answers

    a) $x + 10$

    b) $\frac{1}{2} \times x \times (x + 10) = 600$
$$x^2 + 10x = 1200$$
$$x^2 + 10x - 1200 = 0$$

    c) $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
$$x = \frac{-10 \pm \sqrt{10^2 - 4 \times 1 \times -1200}}{2 \times 1}$$
$$x = \frac{-10 \pm \sqrt{4900}}{2 \times 1}$$
$x = 30, -40$. Length of the side cannot be a negative quantity. $x = 30$cm.
Parpendicular sides are 30cm, 40cm.

    d) Hypotenuse $= \sqrt{30^2 + 40^2} = \sqrt{2500} = 50$cm Perimetre$= 30 + 40 + 50 = 120$cm.

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2) Perimetre of a rectangle is 82cm, area 400 sq.cm

    a) What is the total length of the adjacent sides?

    b) If one side is x then what is the length of the other side?

    c) Form a second degree equation using the given condition.
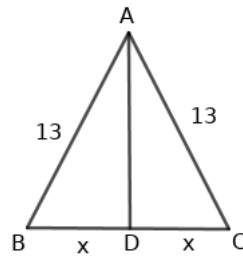
    d) Calculate the length of the sides.

Answers

    a) $2(length + breadth) = 82, l + b = 41$

    b) If one side is x , the other side will be $41 - x$

    c) $x(41 - x) = 400, -x^2 + 41x = 400, x^2 - 41x + 400 = 0$

    d) $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
$$x = \frac{-(-41) \pm \sqrt{(-41)^2 - 4 \times 1 \times 400}}{2 \times 1}$$
$$x = \frac{41 \pm \sqrt{1681 - 1600}}{2 \times 1}$$
$$x = \frac{41 \pm \sqrt{81}}{2 \times 1}$$
$$\frac{41 \pm 9}{2} = 25, 16$$
If one side is 16 cm and other side will be $41 - 16 = 25$cm

---

3) In triangle $ABC, AB = AC = 13$cm, area of the triangle is 60sq.cm .The perpendicular distance from A to BC is AD.

a) If $BD = x$ then what is AD?

b) Form a second degree equation using BC, AD, and area .

c) What is the length of BC?

d) What is the perimetre of the triangle?

Answers

a) $AD = \sqrt{13^2 - x^2}$

b) $\frac{1}{2} \times BC \times AD = 60$
$\frac{1}{2} \times 2x \times \sqrt{13^2 - x^2} = 60$
$x\sqrt{13^2 - x^2} = 60$
Squaring on both sides , $x^2(169 - x^2) = 3600$
If $x^2 = y$, $y(169 - y) = 3600$, $y^2 - 169y + 3600 = 0$.

c) Solving $y = 144, 25$.
If $x^2 = 144$,$x = 12, -12$.
If $x^2 = 25$, $x = 5, -5$
If $x = 12$, $BC = 24$cm .
If $x = 5$, $BC = 10$cm

d) Perimetre of the triangle $13 + 13 + 10 = 36$cm or $13 + 13 + 24 = 50$cm

4) The perimetre of a right triangle is 60 cm, hypotenuse is 25cm

a) What is the total length of the perpendicular sides ?

b) If the length of one perpendicular side is x then what will be the length of the other ?

c) Form an equation using the length of the sides

d) Calculate the area of the triangle.

Answers

a) Length of the perpendicular sides is $60 - 25 = 35$cm

b) If one perpendicular side is x then the other perpendicular side is $35 - x$

c) $25^2 = x^2 + (35 - x)^2$
$x^2 - 35x + 300 = 0$

d) Solving , $x = 20, 15$.
If $x = 20$ other perpendicular side is $35 - 20 = 15$. Area $= \frac{1}{2} \times 20 \times 15 = 150$sq.cm

5) The difference between the length of the sides of two squares is 4cm. The sum of the areas is 400sq.cm

a) If the side of the small square is x then what is the side of the other square?

b) Form an equation using the given condition.

c) Calculate the side of the squares.

Answers

a) $x + 4$

b) $x^2 + (x + 4)^2 = 400$
$x^2 + x^2 + 8x + 16 = 400$
$2x^2 + 8x - 384 = 0$
$x^2 + 4x - 192 = 0$

c) Solving $x = 12, -16$.
Length of the side of one square is 12, length of the side of other square is $12 + 4 = 16$cm

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Session 47 │Second Degree Equations 9 │ Worksheet 47

1) The speed of a boat in still water is 8 km in an hour.The boat travels 15 kilometre in upstream and 22 kilometre in downstream in 5 hours.

    a) If the speed of the stream is x what will be the speed attained by the boat in the downstream.

    b) If the speed of the stream is x what will be the resulting speed inn the upstream?

    c) Form an equation using the given condition.

    d) Calculate the speed of the stream.

Answers

    a) $8 + x$

    b) $8 - x$

    c) Speed of boat in the downstream journey $= 8 + x$. Time taken for the downward journey is $\frac{22}{8+x}$
Speed of boat in the upstream journey $= 8 - x$. Time taken for the downstream journey $\frac{15}{8-x}$
$$\frac{15}{8-x} + \frac{22}{8+x} = 5$$
$$\frac{15(8+x)+22(8-x)}{8^2-x^2} = 5$$
$$5x^2 - 7x - 24 = 0.$$

    d) $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
$$x = \frac{-(-7) \pm \sqrt{(-7)^2 - 4 \times 5 \times -24}}{2 \times 5}$$
$$x = \frac{7 \pm \sqrt{529}}{10}$$
$$\frac{7+23}{10} = 3$$
speed of stream 3 km/h

2) A train travels with uniform speed in 300 km.If the speed of the train is increased by 5 km per hour, the journey would have taken 2 hours less.

    a) If the usual speed is x what will be the time taken for the journey.

    b) If the speed is increased by 5 km per hour what will be the time taken for the journey?

    c) Form an equation using the given condition.

    d) Calculate the speed of the train .

Answers

    a) $\frac{300}{x}$

    b) $\frac{300}{x+5}$

    c) $\frac{300}{x} - \frac{300}{x+5} = 2$
$$\frac{1}{x} - \frac{1}{x+5} = \frac{2}{300}$$
$$\frac{1}{x} - \frac{1}{x+5} = \frac{1}{150}$$
$$x^2 + 5x - 750 = 0$$

    d) $x = \frac{-5 \pm \sqrt{5^2 - 4 \times 1 \times -750}}{2a}$
$x = 25, -30.$Usual speed of train 25km/h.

3) There are 64 small squares in a chess board.The area of one small square is 6.25 sq.cm.There is a boarder of width 2cm around the chess board squares.

    a) If the length of the board is x what will be the total area of small squares?

    b) Form a second degree equation using the given condition.

    c) Calculate the length of the chess board.

Answers

    a) On subtracting 2 from both sides area of the square formed by 64 small squares is $(x-4)^2$

    b) $(x-4)^2 = 6.25 \times 64$
$$x^2 - 8x + 16 = 400$$
$$x^2 - 8x - 384 = 0$$

    c) $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
$$x = \frac{-(-8) \pm \sqrt{(-8)^2 - 4 \times 1 \times -384}}{2 \times 1}$$
$$x = 24, -16.$$
Side of the chess board is 24cm

4) In a group of children each child gives a gift to every other child.If the total number .of gifts is 132, then

    a) If the number of children is n then how many gifts each child give other children.

    b) Form an equation using the given condition.

    c) calculate the number of children in the group.

Answers

    a) $n - 1$ gifts should be given by a child

    b) Total number of gifts is $n(n-1) = 132$
$$n^2 - n - 132 = 0$$

    c) $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
$$x = \frac{-(-1) \pm \sqrt{(-1)^2 - 4 \times 1 \times -132}}{2 \times 1}$$
$$\frac{1 \pm \sqrt{529}}{2}$$
$$x = 12, -11. \text{ Number of children} = 12$$

5) Teacher asked the children to draw a rectangle of area 5 sq.cm and perimetre 8 cm. Manju , a good student made a comment that it is possible to draw such a square after some algebraic calculations.

    a) If one side of the reactangle is x then what will be the other.

    b) Form a second degree equatio.

    c) Prove that it is not possible to construct such a rectangle.

Answers

a) $2(l + b) = 8, l + b = 4$

ഒരു വശം x ആയാൽ മറ്റേ വശം $4 - x$

b) $x(4 - x) = 5, -x^2 + 4x - 5 = 0, x^2 - 4x + 5 = 0$

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

$b^2 - 4ac = -4$. $\sqrt{b^2 - 4ac}$ is not a real number. Side is not real. Rectangle cannot be constructed.

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Session 48 │Second Degree Equations 10 │ Worksheet 48

1) The participants of a meeting gave hanshakes to eachother. It is found that there are 190 handshakes in total.

   a) If there are n participants , what is the number of handshakes given by a participant to others?

   b) Form a second degree equation using the number of participants and the number of handshakes.

   c) Calculate the number of participants of the meeting.

Answers

a) $n - 1$

b) $\frac{n(n-1)}{2} = 190$
   $n^2 - n - 380 = 0$

c) $n = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
   $x = \frac{-(-1) \pm \sqrt{(-1)^2 - 4 \times 1 \times -380}}{2 \times 1}$
   $x = \frac{1 \pm \sqrt{1521}}{2 \times 1}$
   $n = 20, -14$, Number of participants is 20

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2) If the price of a book is reduced by 5 rupees,a person can buy 5 more books for 300 rupees.

   a) If the original price of the book is x, how many books can be purchased for 300 rupees?

   b If the price is decreased by 5 how many books can be purchased in 300 rupees

   c) Form a second degree equation using the given condition.

   d) Calculate the original price of the book

Answers

a) $\frac{300}{x}$

b) If the price is $x - 5$, the number of books $= \frac{300}{x-5}$

c) $\frac{300}{x-5} - \frac{300}{x} = 5$
   $\frac{300x - 300x + 1500}{x(x-5)} = 5$
   $x^2 - 5x - 300 = 0$

d) $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
   $x = \frac{-(-5) \pm \sqrt{(5)^2 - 4 \times 1 \times -300}}{2 \times 1}$
   $x = 20, -15$. The original price of the book is 20 rupees

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3) The perimetre of a rectangle is 82 cm, area 400 sq.cm

   a) If the length of one side is x then what is the length of other side ?

   b) Form a second degree equation

   c) Find the sides of the rectangle.

4) The hypotenuse of a right triangle is 25cm,the difference between other two sides is 5cm

    a) If one of the perpendicular sides is x what is the length of other perpendicular side?

    b) Form a second degree equation .

    c) Calculate the length of its sides.

    d) Calculate the area of the triangle.

5) The denominator of a fraction is 1 more than two times its numerator.The sum of the fraction and its reciprocal is $2\frac{16}{21}$.

    a) If the numerator is x what is its denominator.

    b) Write the fraction in x

    c) Form a second degree equation using the given condition.

    d) Find the fraction.

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Session 49 │Second Degree Equations 11 │ Worksheet 49

1) First term of an arithmetic sequence is 7 and common difference 3.

    a) What is its algebraic form?

    b) Find the sum of the first n terms

    c) How many terms of this sequence beginning from the first term makes the sum 710?

Answers

    a) $x_n = dn + (f - d) = 3n + (7 - 3) = 3n + 4$

    b) $S_n = (x_1 + x_n) \times \frac{n}{2}$
        $S_n = (7 + 3n + 4) \times \frac{n}{2}$
        $(11 + 3n) \times \frac{n}{2} = \frac{11n}{2} + \frac{3n^2}{2}$

    c) $\frac{3n^2}{2} + \frac{11n}{2} = 710$
        $\frac{3n^2 + 11n}{2} = 720.\ 3n^2 + 11n - 1420 = 0$
        $n = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
        $n = \frac{-11 \pm \sqrt{11^2 - 4 \times 3 \times -1420}}{2 \times 3}$
        $n = \frac{-11 + \sqrt{17161}}{6}, n = \frac{120}{6}, \frac{-142}{6}$
        $n = 20.$Twenty terms make the sum 720

2) On joining two vertices of a polygon we get either a side or a diagonal.Consider a polygon of n sides.

    a) How many diagonals can be drawn from a vertex?

    b) How many diagonals are there in a polygon of n sides ?

    c) Find the number of sides of a polygon having 35 diagonals.

Answers

    a) $n - 3$
    (Joining a vertex to other vertices on either side of it forms a side of the polygon. That is , $n - 3$
    diagonals can be drawn from a vertex)

    b) $\frac{n(n-3)}{2}$
    (Diagonal from the vertex A to B and the diagonal from B to A are treated as a single diagonal. So
    we should take half of $n(n - 3)$

    c) $\frac{n(n-3)}{2} = 35$
        $n(n - 3) = 70, n^2 - 3n = 70, n^2 - 3n - 70 = 0.$
        $n = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
        $n = \frac{-(-3) \pm \sqrt{(-3)^2 - 4 \times 1 \times -3}}{2 \times -3}$
        $\frac{3 \pm \sqrt{289}}{2}$, $n = 10, -7.$ The number of sides is 10

3) The points $A_1, A_2, A_3 \cdots A_n$ are marked in a circle. On joining two points we get a chord .

    a) How many chords can be drawn from a given point to other points?

    b) What is the total number of chords?

    c) How many points should be marked on the circle to get 120 chords.

4) Consider the sequence of numbers which gives the remainder 3 on dividing by 4.

    a) Write the algebraic form of this sequence ?

    b) What is the sum of first n terms of this sequence ?

    c) How many terms from the beginning make the sum 820?

    d) Can the sum of any 25 terms of this sequence 2020?

5) The sum of a number and its positive square root is $\frac{6}{25}$.

    a) If x is the number , write an equation using the given conditions.

    b) Write the equation in the form $ax^2 + bx + c = 0$

    c) Find the number.

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Session 50 │Second Degree Equations 12 │ Worksheet 50

1) An aeroplane takes 1 hour less for a journey of 1200km. If the speed is increased by 100 km per hour, from its usual speed.

   a) If the usual speed is x then what is the time taken for the journey?

   b) If the speed is increased by 100 km/h what will be the time taken for the journey?

   c) Form a second degree equation using the given condition.

   d) Calcualte the usual speed.

Answers

a) $\frac{1200}{x}$

b) $\frac{1200}{x+100}$

c) $\frac{1200}{x} - \frac{1200}{x+100} = 1$

$\frac{1}{x} - \frac{1}{x+100} = \frac{1}{1200}$

$\frac{100+x-x}{x(x+100)} = \frac{1}{1200}$

$\frac{100}{x^2+100x} = \frac{1}{1200}$

$120000 = x^2 + 100x$

$x^2 + 100x - 120000 = 0$

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

$x = \frac{-100 \pm \sqrt{100^2 - 4 \times 1 \times -120000}}{2 \times 1}$

$x = \frac{-100 \pm \sqrt{490000}}{2}$, $\frac{-100 \pm 700}{2}$, $x = 300$ speed$300\ km/h$

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2) The length of a rectangular hall is 5m more than its width and the area of the hall is 84 sq.

   a) If the length is x , what will be its width?

   b) Form a second degree equation using the given condition.

   c) Find the length and breadth of the hall.

Answers

a) If x is the length , width will be$= x - 5$

b) $x(x-5) = 84$, $x^2 - 5x - 84 = 0$

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

$x = \frac{-(-5) \pm \sqrt{(-5)^2 - 4 \times 1 \times -84}}{2 \times 1}$

$x = 12, -7$

c) Length12m , width $= 12 - 5 = 7$cm

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3) A two digit number is 4 times the sum of the digits and twice the product of the digits.

   a) If the digit in the one's place is y and the digit in ten's place is x, write two equations using the given conditions.

b) Form a second degree equation.

c) Find the digits and write the number.

Answers

a) $10x + y = 4(x + y), 10x + y = 2xy$
$10x + y = 4x + 4y, 6x - 3y = 0, 2x = y$

b) $10x + y = 2xy, 10x + 2x = 2 \times x \times 2x$
$12x = 4x^2, 12 = 4x, x = 3$

c) Digits are $x = 3, y = 6$
Number $= 3 \times 10 + 6 = 36$

4) The area of a rectangular plot is 528 sq.m.Length of the plot is 1 more than twice its breadth.

a) If the breadth is x what will be its length?

b) Form a second degree equation with the given condition.

c) Find the length and beradth of the plot.

Answers

a) breadth x, length $= 2x + 1$

b) $x(2x + 1) = 528, 2x^2 + x - 528 = 0,$

c) $x = 16$
Langth $= 2 \times 16 + 1 = 33$m , breadth $= 16$m

5) In copying a second degree equation to solve it,the term without x was written as 24 instead of -24.The answers found were 4 and 6.

a) If the equation wrongly written is $ax^2 + bx + 24 = 0$, write two equations using the wrong answers given

b) Find a and b by solving the equations.

c) Write the correct equation and find its solution.

Answers

a) Since $x = 4$, $a \times 4^2 + b \times 4 + 24 = 0, 4a + b = -6$
Since x, $a \times 6^2 + b \times 6 + 24 = 0, 6a + b = -4$

b) Solving the equations $4a + b = -6, 6a + b = -4, a = 1, b = -10$

c) Correct equation is $x^2 - 10x - 24 = 0$
$x = 12, -2$

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