Welcome to Taimurkhani Learning Hub

Solving Linear Equations

Student Name:_____

Practice worksheet Guidelines

Requirements:

- *Use a black or blue pen for all answers.*
- *Attempt all questions unless stated otherwise.*
- *Write clearly in the spaces provided.*
- *Diagrams are not to scale unless specified.*
- *Show all working steps for calculations.*

Details:

- *Marks for each question are shown in brackets.*
- *Some questions may require multiple steps – answer thoroughly.*

Tips for Success:

- *Read each question carefully before starting.*
- *Manage your time to complete all questions.*
- *Answer every question, even if unsure.*
- *Review your answers if time allows.*

At Taimurkhani Learning Hub, we are committed to helping you succeed – follow these guidelines to enhance your skills and learning experience.

Best of luck!

Quick Reminders / Key Rules

1. Keep Both Sides Balanced

Whatever you do to one side of the equation, do the same to the other.

2. Use Opposite Operations

Use inverse operations to move terms.

Subtract if it says add

Divide if it says multiply

3. Simplify Before Solving

Expand brackets and combine like terms on both sides first.

4. Move Numbers and Letters Carefully

Move number terms (constants) to one side

Move variable terms (with x) to the other side

5. Clear Fractions or Decimals

Multiply through by a common denominator or 10 to remove fractions and decimals.

6. Always Check Your Answer

Substitute your value back into the original equation to make sure it works.

7. Special Cases to Remember

If both sides cancel and give a true statement (e.g. 4 = 4), there are infinite solutions.

If both sides cancel and give a false statement (e.g. 5 = 3), there is no solution.

Warm-Up Questions

Review these basic skills before solving linear equations.

1. Simplify the following expressions:

a) $3x + 4x$

b) $2(5x + 1)$

c) $6x - 2x + 7$

2. Evaluate using inverse operations:

a) What is the opposite of adding 7?

b) What is the inverse of multiplying by 3?

c) What is the opposite of dividing by 4?

3. Expand and simplify:

a) $2(x + 5)$

b) $-3(x - 2)$

c) $4(2x + 1) - 3x$

4. Solve one-step equations:

a) $x + 5 = 12$

b) $3x = 21$

c) $x - 4 = 9$

5. True or False?

a) To solve $x + 6 = 10$, subtract 6 from both sides.

b) The solution to $2x = 8$ is $\$x = 10$.

c) You should always check your answer by substituting it back into the original equation.

What is Linear Equation?

Definition:

A linear equation is an equation that represents a straight line when graphed.

It shows a relationship between variables where the highest power of the variable is 1.

➢ General Form:

$$\boldsymbol{ax + b = c}$$

Where:

- x is the variable
- a, b, and c are numbers
- $a \neq 0$

➢ Key Features:

- It has only one variable (like x) raised to the power of 1.
- It does not contain powers, squares (x^2), or roots.
- The goal is to find the value of the variable that makes the equation true.

Examples of Linear Equations:

- $x + 4 = 10$
- $3x - 5 = 7$
- $2(x + 3) = 12$

➢ Why It's Important:

Linear equations are used to model real-life problems, such as:

- Finding costs
- Solving for unknown quantities
- Predicting values in business, science, and daily life

Check Your Understanding

Solve the following.

(a) $x + 6 = 18$ (b) $\frac{y}{2} = 6.5$ (c) $4x = 24$

(d) $5y = 65$ (e) $h - 5 = 8$ (f) $p + 9 = 14$

(g) $k + k + k = 12$ (h) $5 + t = 8$ (i) $a + a + a = 3$

(j) $\frac{36}{l} = 9$ (k) $e - 5 = 19$ (l) $\frac{x}{3} = 7$

(m) $20 - h = 12$ (n) $8y = 40$

Solving equations (Variable on both sides)

(a) $4x + 1 = 2x + 7$ (b) $5x + 4 = 3x + 16$ (c) $7x + 1 = 2x + 46$

(d) $6x - 3 = 2x + 13$ (e) $2x + 21 = 4x + 5$ (f) $x + 2 = 5x - 2$

(g) $5x + 2 = 16 - 2x$ (h) $3x - 1 = 23 - x$ (i) $80 - x = 8x - 1$

(j) $2x + 7 = 17 - 8x$ (k) $12x - 20 = 15x - 38$ (l) $35x + 10 = 20x + 175$

Solve the following equations

(a) $4x + 15 = x + 3$ (b) $8x + 40 = 3x + 5$ (c) $9x + 7 = 11x + 20$

(d) $7x + 9 = 2x - 16$ (e) $9x - 70 = 2x - 91$ (f) $4 - 5x = 3x + 28$

(g) $10x + 136 = -8 - 2x$ (h) $-6x + 2 = -4x + 10$ (i) $-11x - 4 = -3x + 60$

Equations involving Fractions

Solve the following equations.

(a) $\frac{y}{2} = 6$ (b) $\frac{l}{3} = 1$ (c) $\frac{w}{8} = 7$

(d) $\frac{x}{2.5} = 8$ (e) $\frac{y}{4} = -3$ (f) $\frac{2a}{3} = 6$

(g) $\frac{2x}{9} = -9$ (h) $\frac{3t}{10} = 6$ (i) $\frac{5x}{14} = 3$

Solve the following equations.

(a) $\frac{y}{4} + 1 = 9$ (b) $\frac{p}{2} - 5 = 9$ (c) $\frac{m}{3} - 4 = 0$

(d) $\frac{m}{6} + 7 = 2$ (e) $\frac{w}{5} + 2 = 3$ (f) $\frac{k}{4} + 5 = -6$

(g) $\frac{y}{6} - 2 = -8$ (h) $\frac{x}{8} - 7 = 2$

Solve the following equations.

(a) $\frac{3y+5}{2} = 7$ (b) $\frac{5x-12}{3} = 11$ (c) $\frac{7x-12}{3} = -25$

(d) $\frac{5h-8}{2} = 10$ (e) $\frac{8x+4}{5} = 12.8$ (f) $\frac{29-2y}{3} = 5$

(g) $\frac{100-5x}{3} = 30$ (h) $\frac{24-3f}{12} = 5$ (i) $\frac{10p+3}{4} = 4$

Solve the equations below.

(a) $\frac{2x+1}{3} = x - 2$ (b) $4x - 9 = \frac{2x+3}{3}$ (c) $\frac{5x-3}{2} = 2x + 4$

(d) $\frac{9-x}{2} = x + 3$ (e) $\frac{x+17}{5} = x + 1$ (f) $\frac{15-2x}{3} = 2x - 3$

Solve the equations below.

(a) $\frac{2x-1}{x+3} = 9$ (b) $\frac{5x-24}{x-4} = 3$ (c) $\frac{x+1}{x+4} = 3$

(d) $\frac{x+7}{x-3} = -4$ (e) $\frac{x+11}{2x-5} = 2$ (f) $\frac{3x+8}{9-x} = -2$

Solve the equations below.

(a) $\frac{x+3}{2}+\frac{x+1}{4}=10$

(b) $\frac{x+3}{10}+\frac{x-2}{5}=2$

(c) $\frac{x-1}{4}-\frac{x+3}{2}=-4$

(d) $\frac{4x+9}{15}-\frac{x-3}{5}=1$

(e) $\frac{3x+5}{4}-\frac{x-7}{5}=1$

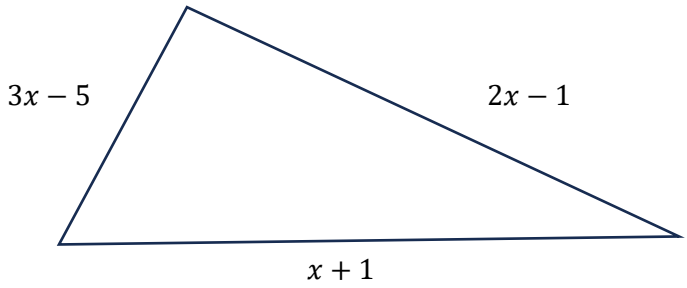
(f) $\frac{2x-5}{7}-\frac{2x-1}{2}=3$

(g) $\frac{x+1}{2}+\frac{2x-1}{4}+\frac{x+2}{3}=1$

(h) $\frac{2x-1}{9}+\frac{x+2}{3}=0$

(i) $\frac{x}{2}+\frac{4x+1}{10}=-8$

1. The lengths, in cm, of the sides of a triangle are $3x - 5$, $2x - 1$ and $x + 1$



(a) Write down an expression, in terms of x, for the perimeter of the triangle.

The perimeter of the triangle is 31 cm.

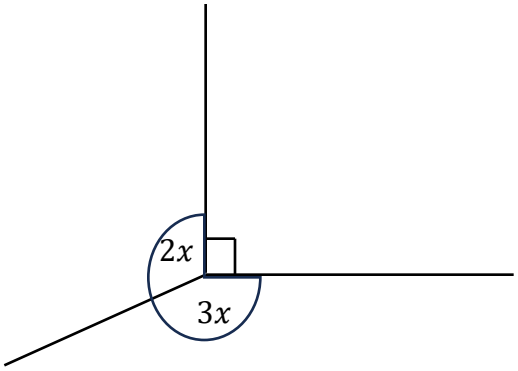
(b) Work out the value of x.

2. A rectangle has a length of $(2x + 3)$ cm and a width of $(x + 5)$ cm.

(a) Find an expression for the perimeter of the rectangle.

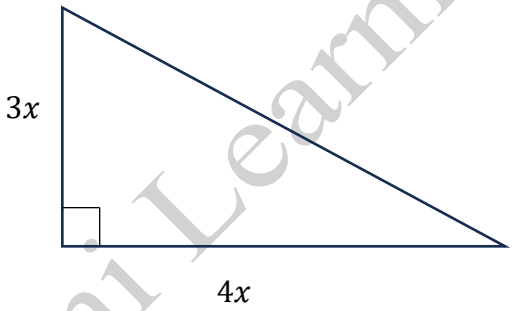
(b) Given the rectangle has a perimeter of 43 cm. Find the value of x.

3.



Find the value of x.

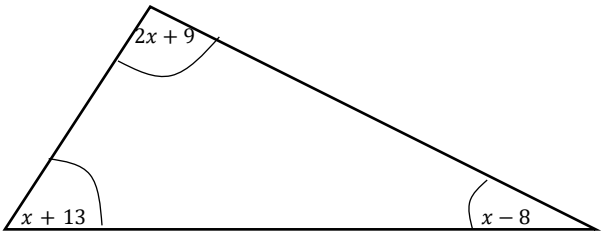
4. The diagram shows a right-angled triangle.



The area of the triangle is 294 cm^2.

Work out the value of x.

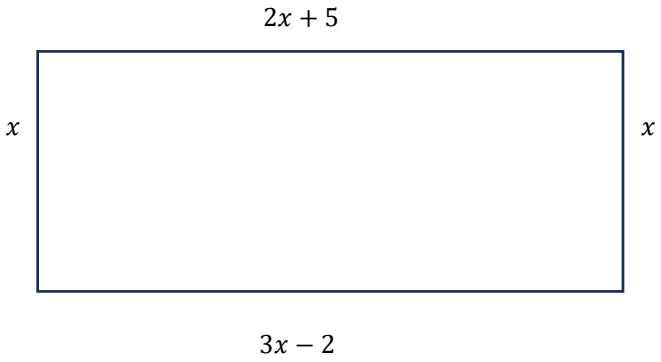
5. The sizes of the angles, in degrees, of a triangle are $2x + 9$, $x + 13$ and $x - 8$



Work out the value of x.

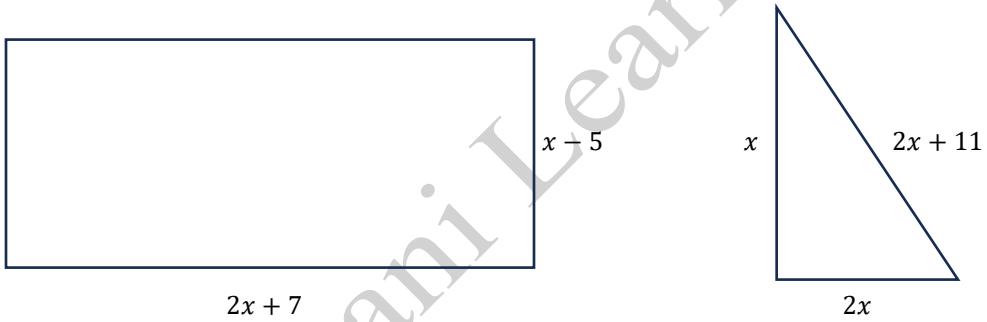
6. The diagram shows a rectangle.

All measurements are in centimeters.



Find the perimeter of the rectangle.

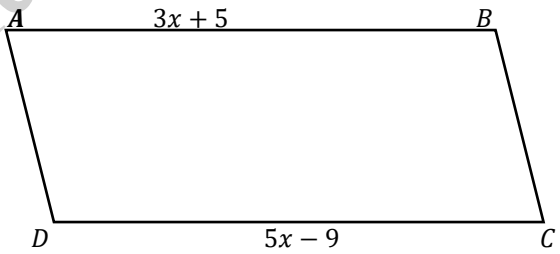
7. The diagram shows a rectangle and a triangle.



The perimeter of the rectangle is equal to the perimeter of the triangle.

Find the value of x.

8.



$ABCD$ is a parallelogram

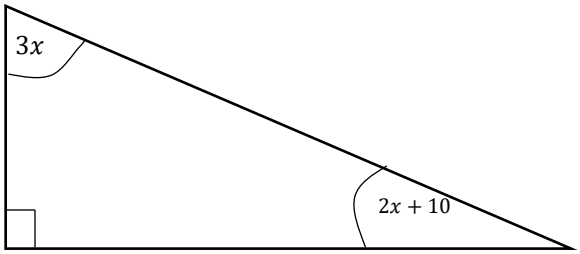
All measurements are in centimeters.

The perpendicular height of the parallelogram is 5 cm.

Find the area of $ABCD$

9. The diagram shows a right-angled triangle.

All of the angles are in degrees.



Find the value of size of the smallest angle in the triangle.

10. Adam has some marbles.

Bradley has twice as many marbles as Adam.

Chris has 5 more marbles than Bradley.

How many marbles does Chris have?

11. The size of the largest angle in a triangle is three times the size of the smallest angle.

The other angle is 35° more than the smallest angle.

Work out, in degrees, the size of each angle in the triangle.

You must show your working.

12. Lucy is three times as old as Alex.

Lucy is 7 years older than Megan.

The sum of their ages is 126.

Find the ratio of Alex's age to Lucy's age to Megan's age.

13. I think of a number.

I multiply the number by 3 and then add 5.

The answer is 29.

(a) Form an equation in terms of x.

(b) Solve the equation to find the original number.

14. I think of a number.

I multiply the number by 5 and then subtract 2.

The answer is 58.

(a) Form an equation in terms of x.

(b) Solve the equation to find the original number.

15. I think of a number.

I divide the number by 2 and then add 1.

The answer is 7.

(a) Form an equation in terms of x.

(b) Solve the equation to find the original number.

16. Gregory is x years old.

Daisy is 2 years older than Gregory

The sum of their ages is 40.

(a) Form an equation in terms of x

(b) Solve the equation and work out Gregory's and Daisy's ages.

17. Robert is x years old.

Hannah is 7 years younger than Robert

The sum of their ages is 61.

(a) Form an equation in terms of x

(b) Solve the equation and work out Robert's and Hannah's ages.

18. Michael is x years old.

Jenny is twice as old as Michael

The sum of their ages is 57.

(a) Form an equation in terms of x

(b) Solve the equation and work out Michael's and Jenny's ages.

19. Fiona is x years old.

Thomas is 3 years older than Fiona.

Cara is twice as old as Fiona.

The sum of their ages is 51.

(a) Form an equation in terms of x

(b) Solve the equation and work out Fiona's, Thomas's and Cara's ages.

20. Alan is x years old.

Barry is ten years younger than Alan.

Kevin is double Alan's age.

The sum of their ages is 54.

(a) Form an equation in terms of x

(b) Solve the equation and work out Alan's, Barry's and Kevin's ages.

21. Rebecca is x years old.

Mary is 8 years older than Rebecca.

Jill is three times older than Mary.

The sum of their ages is 67.

(a) Form an equation in terms of x

(b) Solve the equation and work out Rebecca's, Mary's and Jill's ages.

22. Andy has x pence.

Kelly has 7 pence more than Andy.

Georgia has 9 pence less than Andy.

The total amount of money they have is £1.48

(a) Form an equation in terms of x

(b) Solve the equation and work out how much money each has.

23. Billy has x pounds.

Liam has twice as much money as Billy.

Nicola has three times as much money as Liam.

The total amount of money they have is £180

(a) Form an equation in terms of x

(b) Solve the equation and work out how much money each has.

24. Farmer Jones has x sheep

Farmer Smith has 100 more sheep than Farmer Jones.

Farmer White has twice as many sheep as Farmer Jones.

In total there are 2500 sheep.

(a) Form an equation in terms of x

(b) Solve the equation and work out how many sheep each farmer has.

25. The cost of a TV is £x

The cost of a DVD player is £45 less than a TV.

The total cost of the TV and DVD player is £235

(a) Form an equation in terms of x

(b) Find the cost of a TV

26. The sum of three consecutive numbers is 51.

(a) Form an equation in terms of x

(b) Solve the equation and work out each number.

27. The sum of five consecutive numbers is 110.

(a) Form an equation in terms of x

(b) Solve the equation and work out each number.

28. A rectangular field is 7 meters longer than wide.

The perimeter of the field is 106m.

(a) Find the dimensions of the field.

(b) Find the area of the field.

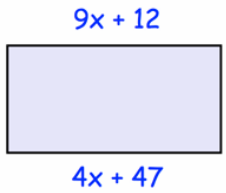
29. A rectangular field is 20 meters longer than wide.

The perimeter of the field is 280m.

(a) Find the dimensions of the field.

(b) Find the area of the field.

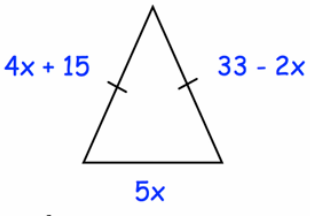
30. Shown is a rectangle



(a) Explain why 9x + 12 = 4x + 47

(b) Find x

31. Shown is an isosceles triangle



(a) Explain why 4x + 15 = 33 − 2x

(b) Find x

(c) Find the perimeter of the isosceles triangle

32. Explain why 8x + 3 = 2(4x + 1) has no solution.