

Foundation GCSE: Equations and Inequalities Problems

Name: _____

Class: _____

Instructions: Answer all questions. Questions are ordered from easiest (1) to hardest (20). Working out should be shown where appropriate.

1. A rectangle has width x cm and length $x + 4$ cm. If its perimeter is 32 cm, set up and solve an equation for x .
2. The angles in a triangle are x° , $(2x + 10)^\circ$, and $(3x + 20)^\circ$. Find x .
3. A ticket for a concert costs $\pounds x$ for an adult and $\pounds(x - 6)$ for a child. 3 adults and 4 children cost $\pounds 74$. Find x .
4. John is x years old. His sister is 3 years older than twice John's age. Their combined age is 33. Form an equation and find John's age.
5. A phone company charges a fixed monthly fee of $\pounds 15$ plus $\pounds 0.08$ per minute of calls. If a bill is $\pounds 27$, write and solve an equation to find the number of minutes m used.
6. Find the range of integer values of x for which the perimeter of a square of side length x cm is greater than 12 cm and less than 24 cm.
7. A rectangle has width x cm and length $2x$ cm. If its area is 72 cm^2 , set up an equation and find x .
8. A car travels at an average speed of $(x + 10)$ mph for 2 hours and covers 140 miles. Find x .
9. The sum of three consecutive odd numbers is 57. Set up an equation using x as the smallest number and solve for x .
10. A bag contains x red counters and $(x + 5)$ blue counters. If a counter is chosen at random, the probability of picking a red counter is $\frac{3}{7}$. Form an equation and solve for x .
11. Sarah has x books. David has twice as many books as Sarah. Emma has 5 fewer books than David. Together they have 55 books. Find x .
12. The base of a triangle is x cm and its perpendicular height is 6 cm. If the area is 21 cm^2 , find x .
13. Consecutive integers x , $x + 1$, $x + 2$, and $x + 3$ have a sum of 90. Form an equation and find the largest integer.
14. A triangular field has a base of $(2x)$ metres and a height of 15 metres. Its area is no more than 120 metres^2 . Set up and solve an inequality for x .
15. An integer x is such that 5 times the number, decreased by 4, is between 11 and 26 inclusive. Find the possible values of x .
16. A rectangle's length is 3 cm more than its width x . If the area is less than 40 cm^2 , set up an inequality for x (with $x > 0$).
17. A father is 4 times as old as his son. In 6 years, the father will be three times as old as his son. Let the son's age be x . Form an equation and find the son's present age.
18. The cost of hiring a hall is $\pounds 50$ plus $\pounds 12$ per hour. A club has a budget of at most $\pounds 150$. Write and solve an inequality for the maximum number of hours h they can hire the hall.
19. Two numbers have a difference of 4 and their product is 96. Let the smaller number be x . Form a quadratic equation and solve for x .
20. A square garden of side x m is surrounded by a path of uniform width 1 m. If the total area of the garden plus path is 81 m^2 , find x .

Answers & Worked Solutions

1. $x = 6$
 $Perimeter = 2(x + x + 4) = 32 \implies 4x + 8 = 32 \implies 4x = 24 \implies x = 6.$
2. $x = 25$
 $Sum\ to\ 180^\circ: x + (2x + 10) + (3x + 20) = 180 \implies 6x + 30 = 180 \implies 6x = 150 \implies x = 25.$
3. $x = 14$
 $Equation: 3x + 4(x - 6) = 74 \implies 3x + 4x - 24 = 74 \implies 7x = 98 \implies x = 14.$
4. $x = 10$
 $Equation: x + (2x + 3) = 33 \implies 3x + 3 = 33 \implies 3x = 30 \implies x = 10.$
5. $m = 150$
 $Equation: 15 + 0.08m = 27 \implies 0.08m = 12 \implies m = \frac{12}{0.08} = 150.$
6. 4, 5
 $Perimeter = 4x.$ $Inequality: 12 < 4x < 24 \implies 3 < x < 6.$ *Integers are 4, 5.*
7. $x = 6$
 $Area = x(2x) = 2x^2 = 72 \implies x^2 = 36 \implies x = 6$ (since length $\neq 0$).
8. $x = 60$
 $Equation: 2(x + 10) = 140 \implies x + 10 = 70 \implies x = 60.$
9. $x = 17$
 $Numbers\ are\ x, x + 2, x + 4.$ $Sum: 3x + 6 = 57 \implies 3x = 51 \implies x = 17.$
10. $x = 15$
 $Total = 2x + 5.$ $Probability = \frac{x}{2x + 5} = \frac{3}{7} \implies 7x = 3(2x + 5) \implies 7x = 6x + 15 \implies x = 15.$
11. $x = 12$
 $Sarah = x, David = 2x, Emma = 2x - 5.$ $Sum: x + 2x + 2x - 5 = 55 \implies 5x = 60 \implies x = 12.$
12. $x = 7$
 $Area = \frac{1}{2} \times base \times height = \frac{1}{2}(x)(6) = 3x = 21 \implies x = 7.$
13. $x = 21 \implies$ largest = 24
 $Sum: 4x + 6 = 90 \implies 4x = 84 \implies x = 21.$ *Largest integer is $21 + 3 = 24$.*
14. $x \leq 8$
 $Area = \frac{1}{2}(2x)(15) = 15x \leq 120 \implies x \leq 8.$
15. $x = 3, 4, 5, 6$
 $Inequality: 11 \leq 5x - 4 \leq 26 \implies 15 \leq 5x \leq 30 \implies 3 \leq x \leq 6.$ *Values are 3, 4, 5, 6.*
16. $0 < x < 5$
 $Area = x(x + 3) < 40 \implies x^2 + 3x - 40 < 0 \implies (x + 8)(x - 5) < 0.$ *Since $x > 0$, $0 < x < 5$.*
17. $x = 12$
 $Father = 4x.$ *In 6 years: son = $x + 6$, father = $4x + 6$.* $Equation: 4x + 6 = 3(x + 6) \implies 4x + 6 = 3x + 18 \implies x = 12.$
18. $h \leq 8$ hours
 $Inequality: 50 + 12h \leq 150 \implies 12h \leq 100 \implies h \leq 8.33.$ *Maximum whole hours is 8.*
19. $x = 8$
 $Equation: x(x + 4) = 96 \implies x^2 + 4x - 96 = 0 \implies (x + 12)(x - 8) = 0 \implies x = 8$ (positive number).
20. $x = 7$
 $Total\ side\ length\ is\ x + 2.$ $Area: (x + 2)^2 = 81 \implies x + 2 = 9 \implies x = 7.$