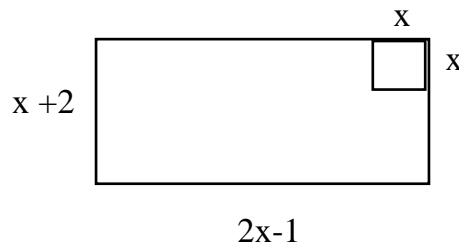
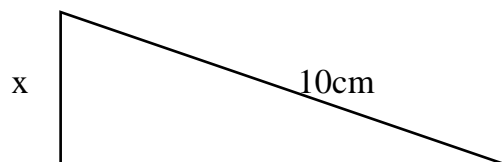


Quadratic equation & function

1. A rectangle has length  $(x + 4)$ cm and width  $(3x + 4)$ cm. The area of the rectangle is  $11\text{cm}^2$ . Find  $x$
2. A piece of card has a length of  $(2x - 1)$ cm and a width of  $(x + 2)$ cm. A square of side  $x$  cm is removed from the card. The area of the card that is left is  $68\text{cm}^2$ . Find the area of the card that has been removed.



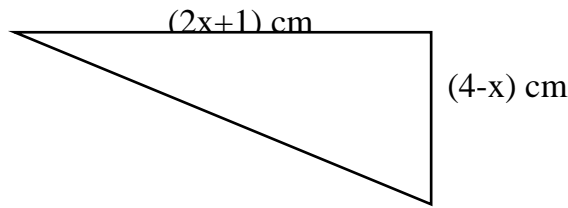
3. Two numbers differ by 4. Their product is 21. Write down a quadratic equation and solve it to find the two numbers
4. Solve  $\frac{2x^2+5x+3}{x^2+3x+2} = 4$
5. Show that  $x^2 + 8x + 16 \geq 0$  for all values of  $x$
6. Show that  $1 + 100x^2 - 20x \geq 0$  for all values of  $x$
7. If  $2x^2 - ax + 8 = 0$  has no real roots, find the range of possible values of  $a$
8. If  $6 - 2x - kx^2 = 0$  has a repeated root, find the value of  $k$
9. The equation  $x^2 + px + q = 0$ , where  $p$  and  $q$  are constants, has roots  $-3$  and  $2$ . Find the value of  $p$  and  $q$
10. Use the discriminant to find the nature of the roots of the equation  $3x + 4 = \frac{5}{x}$
11. The quadratic equation  $kx^2 + 5x + 2 = 0$  has two distinct real roots. Find the range of possible values of  $k$
12. Find the value of  $p$  for which the quadratic equation  $px^2 - 4px + 2 - p = 0$  has equal roots
13. Prove that the quadratic equation  $(q - 5)x^2 + 5x - q = 0$  has real roots for any value of  $q$
14. The quadratic equation  $x + k + \frac{9}{x} = 0$  has equal roots. Find the two possible values of  $k$
15. The equation  $px^2 + qx + r = 0$ , where  $p$ ,  $q$  and  $r$  are constants, has roots  $-\frac{1}{2}$  and  $\frac{3}{4}$ . Find the smallest possible integer values of  $p$ ,  $q$  and  $r$
16. A right-angled triangle has a width of  $x$  cm. The length of the hypotenuse is  $10\text{cm}$ . The perimeter of the triangle is  $24\text{cm}$ . Find the maximum area of the triangle.
17. A rectangle has a width of  $x$  cm. The perimeter of the rectangle is  $32\text{cm}$ . Find the maximum area of the rectangle.



18. A rectangle has a width of  $x$  cm. The perimeter of the rectangle is  $32\text{cm}$ . Find the maximum area of the rectangle.



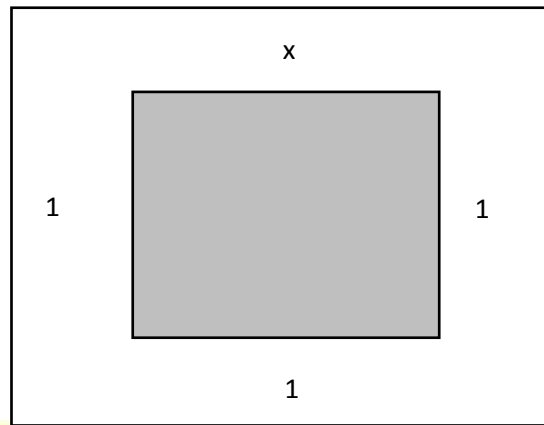
19. Find the maximum area of the triangle on the right. State the value of  $x$  when this occurs.



20. Faisal is  $x$  years old. Faisal has a brother called Omar. The sum of the two boys' ages is 20 years.

- Express the product of their ages in the form  $y = a(x - b)^2 + c$
- How old must Faisal be to make the product of their ages a maximum?

21. A square garden of side  $x$  metres is surrounded by a path of width 1 metre. The area of the garden is the same as the area of the path. Find the value of  $x$ . Leave your answer in surd form



22. The equation  $x^2 + px + q = 0$ , where  $p$  and  $q$  are constants, has roots  $-3$  and  $5$ .

- Find the values of  $p$  and  $q$
- Using these values of  $p$  and  $q$ , find the value of the constant  $r$  for which the equation  $x^2 + px + q + r = 0$  has equal roots

23. Find the set of values of  $k$  for which the line  $y = kx - 4$  intersects the curve  $y = x^2 - 2x$  at two distinct points

24. Determine the set of values of the constant  $k$  for which the line  $y = 4x + k$  does not intersect the curve  $y = x^2$

25. Find the real roots of the equation  $\frac{18}{x^4} + \frac{1}{x^2} = 4$