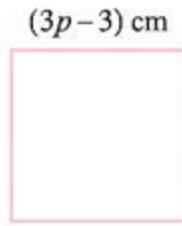
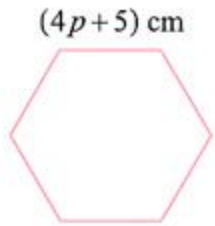
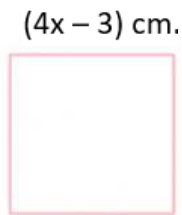


Algebraic Perimeter and Area

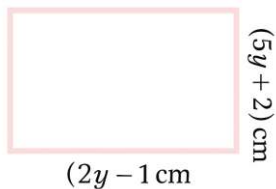
1. The perimeter of a hexagon is equal to the perimeter of a square. Each side of the hexagon is $(4p + 5)$ cm and each side of the square is $(3p - 3)$ cm. Find the value of p .



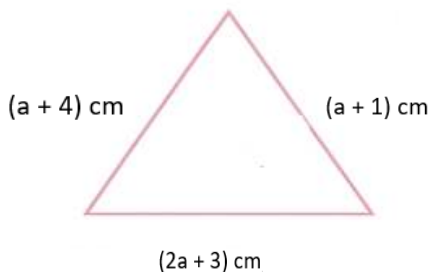
2. A square has sides of $(4x - 3)$ cm. Find its area.



3. A rectangle has a length of $(5y + 2)$ cm and a width of $(2y - 1)$ cm. Find an expression for its perimeter.

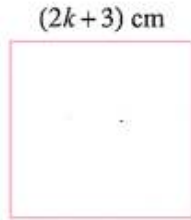
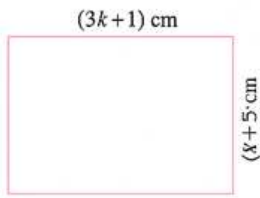


4. A triangle has sides $(2a + 3)$ cm, $(a + 1)$ cm and $(a + 4)$ cm. If its perimeter is 30 cm, find the value of a .

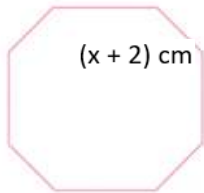


5. The area of a rectangle is equal to the area of a square.

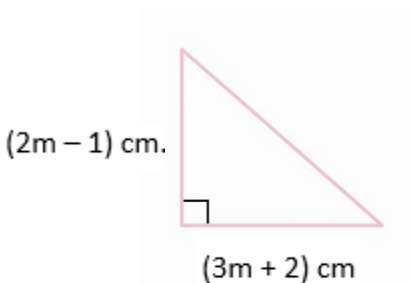
The rectangle has length $(3k + 1)$ cm and width $(k + 5)$ cm. The square has side $(2k + 3)$ cm. Find the value of k .



6. A regular octagon has sides of $(x + 2)$ cm. Write an expression for its perimeter.



7. The area of a right-angled triangle is equal to the area of a square. The triangle has a base of $(3m + 2)$ cm and a height of $(2m - 1)$ cm. The square has sides of $(4m - 3)$ cm. Find the value of m .



Answers

$$6(4p + 5) = 4(3p - 3)$$

2. Solve for p

Expand both sides of the equation:

$$24p + 30 = 12p - 12$$

Collect p terms on the left and constant terms on the right:

$$24p - 12p = -12 - 30$$

$$12p = -42$$

Divide by 12:

$$p = \frac{-42}{12}$$

$$p = -\frac{7}{2}$$

$$\mathbf{p = -3.5}$$

Maths with Melissa

Combine the terms containing a and the constant terms separately:

$$\text{Terms with } a : 2a + a + a = 4a$$

$$\text{Constant terms: } 3 + 1 + 4 = 8$$

Substitute these back into the equation:

$$4a + 8 = 30$$

Subtract 8 from both sides:

$$4a = 30 - 8$$

$$4a = 22$$

Divide by 4:

$$a = \frac{22}{4}$$

$$a = 5.5$$

3. Check the Side Lengths

We must ensure that the side lengths are positive for $a = 5.5$:

- **Side 1:** $2(5.5) + 3 = 11 + 3 = 14$ cm
- **Side 2:** $5.5 + 1 = 6.5$ cm
- **Side 3:** $5.5 + 4 = 9.5$ cm
- **Perimeter Check:** $14 + 6.5 + 9.5 = 30$ cm (Correct)

Since all side lengths are positive, the value $a = 5.5$ is correct.

2. Area = $(4x - 3)^2 = 16x^2 - 24x + 9$.

3. Perimeter = $2 \times ((5y + 2) + (2y - 1)) = 2 \times (7y + 1) = 14y + 2$.

4.

1. Set Up the Perimeter Equation

The perimeter of a triangle is the sum of the lengths of its three sides. We set the sum of the side expressions equal to the given perimeter, 30 cm:

$$(2a + 3) + (a + 1) + (a + 4) = 30$$

2. Solve for a

Combine the terms containing a and the constant terms:

- **Combine a terms:** $2a + a + a = 4a$
- **Combine constants:** $3 + 1 + 4 = 8$

Substitute these back into the equation:

$$4a + 8 = 30$$

Subtract 8 from both sides:

$$4a = 30 - 8$$

$$4a = 22$$

Divide by 4:

$$a = \frac{22}{4}$$

$$a = 5.5$$

5.

The formulas for the areas are:

- **Area of a Rectangle (A_R):** Length $\times$ Width
- **Area of a Square (A_S):** Side²

We are given that $A_R = A_S$:

$$(3k + 1)(k + 5) = (2k + 3)^2$$

2. Expand Both Sides

Left-Hand Side (Rectangle Area): Expand the product of the two binomials:

$$(3k + 1)(k + 5) = 3k(k) + 3k(5) + 1(k) + 1(5)$$

$$= 3k^2 + 15k + k + 5$$

$$= 3k^2 + 16k + 5$$

Right-Hand Side (Square Area): Expand the squared binomial using the formula $(a + b)^2 = a^2 + 2ab + b^2$:

$$(2k + 3)^2 = (2k)^2 + 2(2k)(3) + 3^2$$

$$= 4k^2 + 12k + 9$$

Equating the two expanded areas:

$$3k^2 + 16k + 5 = 4k^2 + 12k + 9$$

3. Solve the Quadratic Equation

Rearrange the equation into the standard quadratic form, $ak^2 + bk + c = 0$. We'll move terms to the right-hand side to keep the k^2 term positive:

$$0 = (4k^2 - 3k^2) + (12k - 16k) + (9 - 5)$$

$$0 = k^2 - 4k + 4$$

This is a perfect square trinomial, which can be factored as $(k - 2)^2$:

$$0 = (k - 2)(k - 2)$$

This gives one solution for k :

$$k - 2 = 0$$

$$k = 2$$

4. Apply Geometric Constraints (Check the Solution)

Since k is used to define lengths, all dimensions must be positive. We check $k = 2$:

- **Rectangle Length:** $3k + 1 = 3(2) + 1 = 7$ cm (Valid)
- **Rectangle Width:** $k + 5 = 2 + 5 = 7$ cm (Valid)
- **Square Side:** $2k + 3 = 2(2) + 3 = 7$ cm (Valid)

Since all lengths are positive, the value $k = 2$ is the correct solution.

6. Perimeter = $8(x + 2) = 8x + 16$.

7. $\frac{1}{2}(3m + 2)(2m - 1) = (4m - 3)^2 \rightarrow 3m^2 + m - 1 = 16m^2 - 24m + 9 \rightarrow 13m^2 - 25m + 10 = 0 \rightarrow m = 2$ or $m = \frac{1}{2}$.