GCSE MATHEMATICS

Depth

REVISION BOOKLET

Name: _____

Contents

Number and proportion

Quadratics

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Inverse Proportion – What you need to know:

- Two quantities are in **inverse proportion** when one increases and the other decreases so that their **product stays constant**.
- If A is inversely proportional to B, we write

$$A \propto \frac{1}{B} \quad \text{and} \quad A = \frac{k}{B}$$

where k is the constant of proportionality.
- To find the constant k, substitute a known pair of values into the equation.
- Once you know k, use the equation to find missing values.
- Sometimes you are told a relationship like "x is inversely proportional to y^2"

$$x \propto \frac{1}{y^2} \quad \text{and} \quad x = \frac{k}{y^2}$$

- The method is the same: **substitute → find k → use the equation**.

1. A is inversely proportional to B.
   When $B = 4$, $A = 15$.
   Find the value of A when $B = 10$.

2 marks

2. y is inversely proportional to x.
   When $x = 6$, $y = 12$.
   Find the value of y when $x = 9$.

2 marks

3. P is inversely proportional to Q.
   When $Q = 5$, $P = 18$.
   Write an equation connecting P and Q, and use it to find P when $Q = 12$.

3 marks

4. m is inversely proportional to n.
   When $n = 8$, $m = 30$.
   Find the value of n when $m = 20$.

3 marks

Completing the square – What you need to know:

- Completing the square rewrites a quadratic into the form $(x + p)^2 + q$
- The completed-square form shows the **minimum value** and **turning point** directly.
- The turning point of $(x + p)^2 + q$ is $(-p, q)$.

These rules apply when the coefficient of x^2 is 1

- For $x^2 + bx + c$ the value of p is always **half** the value of b
- After forming $(x+p)^2$, adjust the constant to get the correct value of q.

1. Rewrite $x^2 + 6x$ in the form $(x + p)^2 + q$.

2 marks

2. Complete the square for $x^2 - 8x + 3$.
   Give your answer in the form $(x + p)^2 + q$.

2 marks

3. Rewrite $x^2 + 10x + 4$ in completed-square form and state the **minimum value** of the expression.

2 marks

4. The quadratic $f(x) = x^2 - 4x + 7$ can be written in the form $(x + p)^2 + q$
   Find the values of p and q.
   Hence write down the coordinates of the turning point.

3 marks

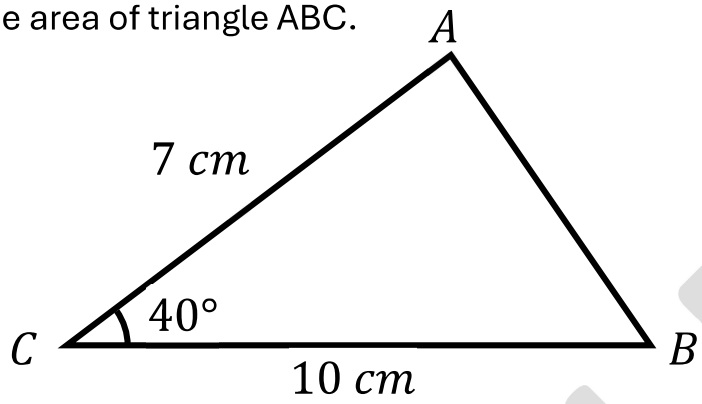
Area of a triangle – What you need to know:

- The formula works for **any triangle**, not just right-angled ones.

$$\text{Area} = \frac{1}{2}ab\sin C$$

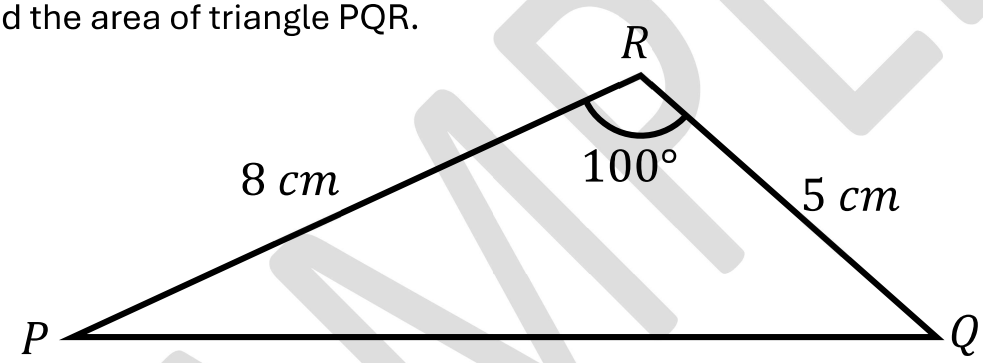
- The angle must be the one **between** the two given sides (the **included angle**).

1. Find the area of triangle ABC.



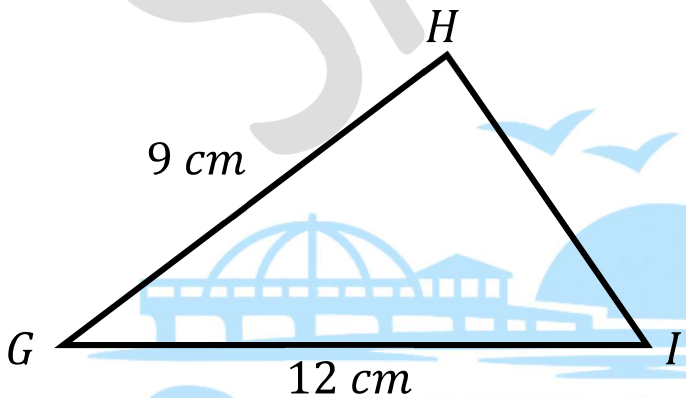
3 marks

2. Find the area of triangle PQR.



3 marks

3. The area of triangle GHI is 40 cm^2.
   Find the size of angle HGI to the nearest degree.



4 marks

Stratified Sampling – what you need to know

- Used when a population contains distinct groups (strata).
- Ensures the sample represents the population in the same proportions as the groups.
- To find how many people to sample from each group, use proportional reasoning:

$$\text{sample from group} = \frac{\text{group size}}{\text{population size}} \times \text{total sample size}$$

- Answers should be whole numbers (round sensibly if needed).
- Common strata: year groups, genders, age bands, departments, categories.

1. A school has 600 pupils.
   - 240 are in Year 7
   - 180 are in Year 8
   - 180 are in Year 9

   A stratified sample of 60 pupils is needed.
   Work out how many pupils should be chosen from each year group.

3 marks

2. A company has 120 employees:
   - 50 in Sales
   - 30 in HR
   - 40 in Production

   A stratified sample of 24 employees is required.
   Calculate the number of employees selected from each department.

3 marks

3. A gym has 375 members:
   - 150 attend mornings
   - 105 attend afternoons
   - 120 attend evenings

   A stratified sample of 50 members is taken.
   Work out the number selected from each time group.
   Give whole-number answers.

3 marks