

Counting of Figures

~ Reasoning · SSC Exams ~



← circled = key tricks!

A **counting-of-figures** question hides several triangles, squares, rectangles, lines or parallelograms inside one diagram. You must count **systematically, size by size** — never by random guessing.

① The Core Method – Count by Size 🔍

Step 1 — Label: mark every smallest (elementary) region of the figure with a small letter a, b, c...

Step 2 — Count by size: count figures made of exactly 1 part, then 2 parts, then 3 parts... combining only adjacent regions whose outer boundary is a straight, unbroken side.

Step 3 — Add up: total = (1-part) + (2-part) + (3-part) + ... Don't forget the **outermost / whole** figure — it always counts too!

Warm-up example — triangle with 1 line

Step 1 — smallest parts: a(ABD), b(ADC).

Step 2 — 1-part: a, b = 2. 2-part (a+b): ABC = 1.

Answer → $2 + 1 = 3$ triangles. ✓

This notebook covers every **SSC figure type**: triangles (simple & with cevians), squares & rectangles in grids, straight lines/segments, parallelograms, embedded/overlapping shapes & common traps — each with a solved example.

Tip → on grid/line-based figures, a direct **formula** is faster than manual counting — but on irregular figures, count-by-size never fails.

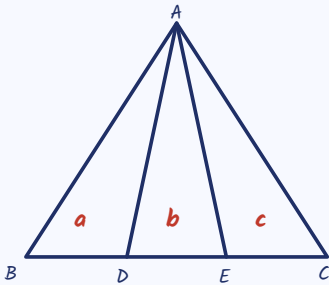
page 1

② Counting Triangles – Simple Figures $\triangle$

Rule

Total triangles = (triangles of 1 elementary part) + (of 2 parts) + (of 3 parts) + ... A group of parts forms a triangle **only** if its outer edges are straight, unbroken lines.

Worked example – triangle with 2 cevians from apex



Step 1 – smallest parts: $a(ABD)$, $b(ADE)$, $c(AEC) = 3$.

Step 2 – 2-part: $ABE(a+b)$, $ADC(b+c) = 2$.

Step 3 – 3-part: $ABC(a+b+c) = 1$.

Answer $\rightarrow 3+2+1 = 6$.

Try this – square with 1 diagonal

A square cut by **one** diagonal gives exactly **2** triangles – the simplest possible case.



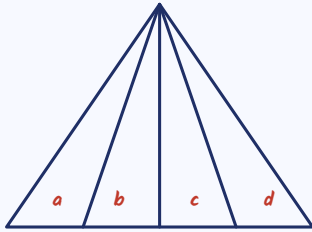
Always name each vertex (A,B,C,D,E...) on the figure first – it stops you from calling the same triangle by two different names and double-counting it.

③ Triangles with Cevians (Concurrent Lines)

Formula

If n cevians are drawn from ONE vertex to the opposite side, they cut the base into $(n+1)$ equal-looking parts, giving $(n+1)$ smallest triangles. **Total triangles** = $(n+1)(n+2) \div 2$.

Worked example – 3 cevians from apex ($n=3$)

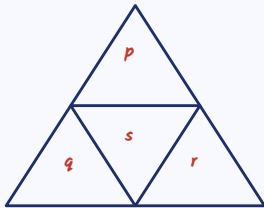


Step 1 – base cut into 4 parts $\rightarrow$ 1-part: $a, b, c, d = 4$.

Step 2 – 2-part=3, 3-part=2, 4-part=1.

Formula check – $(3+1)(3+2) \div 2 = 4 \times 5 \div 2 = 10$. 

Try this – medial triangle (midpoints joined)



Joining the 3 midpoints makes 4 small triangles (p, q, r, s). Only the outer whole triangle ($p+q+r+s$) is a 4-part triangle – the 3-part groups form trapeziums, not triangles. **Total** = $4 + 1 = 5$. 



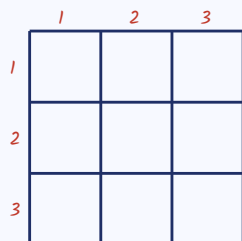
Not every group of adjacent parts is a valid triangle – check that the OUTER boundary of the group is a straight line on all 3 sides.

④ Counting Squares in a Grid

Formula

In an $n \times n$ square grid: count 1×1 squares, then 2×2 , then 3×3 ... each size $(n-k+1)^2$. Total squares = $1^2 + 2^2 + 3^2 + \dots + n^2 = n(n+1)(2n+1) \div 6$.

Worked example — 3×3 grid



1×1 squares — 9 (every cell).

2×2 squares — 4.

3×3 square — 1 (the whole grid).

Answer $\rightarrow 9 + 4 + 1 = 14$. 

Try this — general $m \times n$ grid

For a non-square $m \times n$ grid, add $(m-k+1)(n-k+1)$ for each size $k = 1, 2, \dots, \min(m, n)$. E.g. a 3×2 grid: $k=1 \rightarrow 3 \times 2 = 6$; $k=2 \rightarrow 2 \times 1 = 2$. Total = $6 + 2 = 8$ squares. 



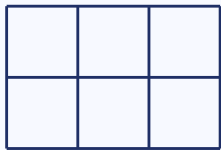
Count squares size-by-size, largest to smallest confuses fewer people — but the running total is the same either way.

⑤ Counting Rectangles in a Grid

Formula

A rectangle needs any 2 vertical lines $\times$ any 2 horizontal lines. In an $m \times n$ grid (m columns, n rows): **Rectangles** = $[m(m+1) \div 2] \times [n(n+1) \div 2]$. (this also counts the squares!)

Worked example – 3×2 grid ($m=3, n=2$)



Step 1 – $m=3 \rightarrow 3(4) \div 2 = 6$ ways to pick 2 vertical lines.

Step 2 – $n=2 \rightarrow 2(3) \div 2 = 3$ ways to pick 2 horizontal lines.

Answer $\rightarrow 6 \times 3 = 18$ rectangles. 

(of these, squares = $6+2 = 8$, see page 4 method)

Grid formula table – $n \times n$ grids

Grid ($n \times n$)	Squares Σn^2	Rectangles $[n(n+1) \div 2]^2$
1x1	1	1
2x2	5	9
3x3	14	36
4x4	30	100
5x5	55	225



“Rectangles” in the formula already includes squares (a square is a special rectangle) – if asked for “non-square rectangles”, subtract the square count.

⑥ Counting Straight Lines / Segments →

Formula

If n distinct points lie on ONE straight line, every pair of points makes one segment.

Segments = $n(n-1) \div 2$. Count each FULL straight line only once, even if points break it into pieces.

Worked example – 5 points on a line



Step 1 — $n = 5$ points, so pairs = $5 \times 4 \div 2$.

Answer → $20 \div 2 = 10$ line segments (PIP2, PIP3...P4P5). ✓

Trap – “lines” vs “segments”



4 straight lines cross at ONE common point. Count of **full lines** = 4, but each line is cut into 2 rays by the centre, so count of **segments/rays** = 8. Read the question carefully — “lines” and “line segments” are NOT the same!



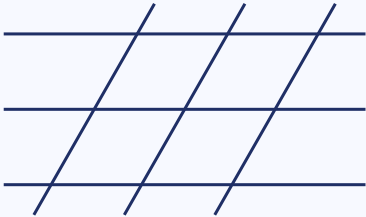
Underline the exact word in the question — “lines”, “line segments” or “straight lines” — before you start counting.

⑦ Counting Parallelograms □

Formula

If a figure has m parallel lines in one direction crossing n parallel lines in another direction, every choice of 2 lines from each set makes 1 parallelogram. **Parallelograms** = $[m(m-1) \div 2] \times [n(n-1) \div 2]$.

Worked example – 3 horizontal × 3 slanted lines



Step 1 – $m=3$ horizontal lines $\rightarrow 3 \times 2 \div 2 = 3$ pairs.

Step 2 – $n=3$ slanted lines $\rightarrow 3 \times 2 \div 2 = 3$ pairs.

Answer $\rightarrow 3 \times 3 = 9$ parallelograms. ✓

Try this – 4 × 3 lines

4 parallel lines cross 3 parallel lines: pairs = $(4 \times 3 \div 2) = 6$ and $(3 \times 2 \div 2) = 3$. Parallelograms = $6 \times 3 = 18$. ✓



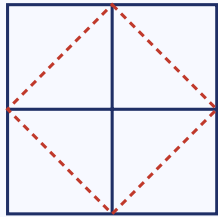
Squares & rectangles ARE parallelograms too – if a grid figure is right-angled, the same formula quietly counts them as well.

⑧ Embedded & Overlapping Shapes

Rule

Some figures hide a **tilted / rotated** shape formed by joining midpoints or crossing diagonals. Apply count-by-size to the grid **FIRST**, then separately hunt for any rotated square/rectangle/triangle hiding among the lines.

Worked example – 2x2 grid + inscribed diamond



Step 1 – the 2x2 grid gives 4 unit squares + 1 big square = 5.

Step 2 – joining the 4 edge-midpoints (dashed) makes **ONE** more, tilted square.

Answer → $5 + 1 = 6$ squares in all. 

Count-by-size, restated for any figure

1→ Count the plain grid shapes with the formula. 2→ Separately look for shapes made by diagonals, midpoints or overlapping outlines. 3→ Add both counts – never let the formula alone be the final answer on a decorated figure.



A square rotated 45° is still a square – SSC figures love hiding exactly one of these inside a plain-looking grid.

⑨ Common Traps & Double-Counting ⚠

Trap Forgetting the **outermost / whole** figure — it is almost always a valid shape and must
1→ be added to the total.

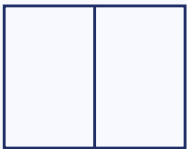
Trap **Double-counting** — naming the same triangle/square twice from different starting
2→ corners. Naming every vertex first prevents this.

Trap Treating a single straight line broken by points as **two lines** instead of one (or the
3→ reverse, when the question says “segments”).

Trap Missing a **rotated/tilted** shape formed by diagonals or midpoints hiding inside a
4→ plain grid.

Trap Counting a shape the question did NOT ask for — e.g. counting rectangles when only
5→ “squares” were asked.

Try this — did you forget the whole figure?



A rectangle split by 1 vertical line gives 2 small rectangles — but the FULL outer rectangle is a 3rd one. Total = $2 + 1 = 3$, not 2. ✓

Try this — same triangle, two names

In the page-2 figure (2 cevians), triangle “ABE” and “a+b combined” are the **same** triangle — count it only **once**. Naming vertices stops this error before it happens.



List every shape you count in a table (name → parts used) — if two rows list the identical vertices, you’ve double-counted.

How to Attack ANY Counting Figure

- 1→ Read carefully — is it asking for **triangles, squares, rectangles, lines or parallelograms**?
- 2→ Label every **smallest (elementary) region** or every vertex with a letter.
- 3→ Count **size by size** — 1-part, 2-part, 3-part... adding only where the outer boundary stays straight.
- 4→ For grid/line patterns, switch to the **direct formula** — it's faster and less error-prone.
- 5→ Always add the **outermost figure**, and check once more for a hidden tilted/rotated shape.



Common traps → missing the outer figure; double-counting the same shape; confusing “lines” with “segments”; and forgetting a tilted/rotated shape.

Quick Formula Gallery — one-glance revision

Cevians (n , 1 vertex): $(n+1)(n+2) \div 2 \rightarrow n=2$ gives **6**

Square+both diagonals: $4+4 =$ **8**

Grid rectangles ($m \times n$): $[m(m+1) \div 2][n(n+1) \div 2] \rightarrow 3 \times 2$ gives **18**

Parallelograms: $\text{pairs} \times \text{pairs} \rightarrow 3 \times 3$ lines gives **9**

Medial triangle: 4 small+1 big = **5**

Grid squares ($n \times n$): $\sum k^2 \rightarrow 3 \times 3$ gives **14**

Points on a line: $n(n-1) \div 2 \rightarrow 5$ pts gives **10**

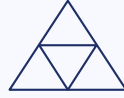
Grid + diamond: $4+1+1 =$ **6**

Exercise – Count the Figures

Solve using count-by-size or the formulas, then check the Answer Key on the next page.



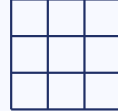
Q1. Triangles in this figure (3 cevians)?
(1) 6 (2) 8 (3) 10 (4) 12



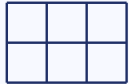
Q2. Triangles here (midpoints joined)?
(1) 4 (2) 5 (3) 6 (4) 8



Q3. Triangles in this square (both diagonals)?
(1) 4 (2) 6 (3) 8 (4) 10



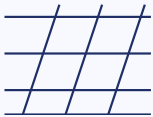
Q4. Squares in this 3x3 grid?
(1) 9 (2) 12 (3) 14 (4) 16



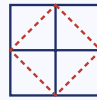
Q5. Rectangles in this 3x2 grid?
(1) 12 (2) 15 (3) 18 (4) 20



Q6. Line segments from 6 points on a line?
(1) 10 (2) 12 (3) 15 (4) 18



Q7. Parallelograms (4 horiz. x 3 slanted lines)?
(1) 12 (2) 15 (3) 18 (4) 21



Q8. Squares in this 2x2 grid + diamond?
(1) 4 (2) 5 (3) 6 (4) 8



Label each figure's vertices on paper first – then count size by size before flipping the page.



Answer Key & Quick Recap

Q1 → **10** — base cut into 4 parts, $(n+1)(n+2) \div 2$ with $n=3 \rightarrow 4 \times 5 \div 2 = 10$.

Q2 → **5** — medial triangle: 4 small + 1 big = 5.

Q3 → **8** — square+both diagonals: 4 small (AOB, BOC, COD, DOA) + 4 combined (ABC, BCD, CDA, DAB) = 8.

Q4 → **14** — 3x3 grid: $9(1 \times 1) + 4(2 \times 2) + 1(3 \times 3) = 14$.

Q5 → **18** — 3x2 grid rectangles: $[3 \times 4 \div 2] \times [2 \times 3 \div 2] = 6 \times 3 = 18$.

Q6 → **15** — 6 points on a line: $6 \times 5 \div 2 = 15$.

Q7 → **18** — pairs: $(4 \times 3 \div 2) = 6$, $(3 \times 2 \div 2) = 3 \rightarrow 6 \times 3 = 18$.

Q8 → **6** — 2x2 grid gives $4+1=5$ squares, + 1 tilted diamond = 6.

Recap — the 3-step method, always

Label the smallest parts → **Count** size by size (1-part, 2-part, 3-part...) → **Add** every size together, including the outermost whole figure. For grids and lines, swap in the direct formula to save time.

Score yourself

7-8 correct → **excellent**, counting figures is your strength! 4-6 → **good**, revisit pages 2-8. Below 4 → **redo** the “How to Attack” steps on page 10 slowly.

☆ Label it, count by size, crack the figure! ☆

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