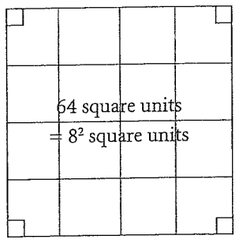
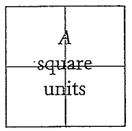
1.3 Measuring Line Segments

At Home / At School



8 units = $\sqrt{64}$ units

➤ This is true for all squares.



$l = \sqrt{A}$ units

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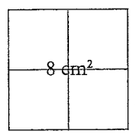
➤ In the square:
- the side length is 8 units and the area is 8^2 square units
- the area is 64 square units and the side length is $\sqrt{64}$ units

➤ In the square:
- the side length is l units and the area is l^2 square units
- the area is A square units and the side length is $\sqrt{A}$ units

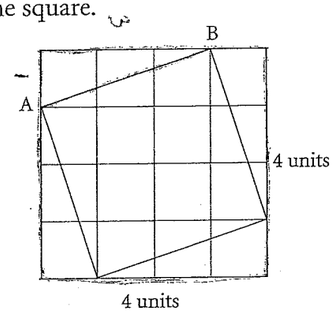
➤ Squares can have areas that are not square numbers.
The side length of this square is $\sqrt{8}$ cm and the area is $(\sqrt{8})^2 = 8$ cm²
The area is 8 cm² and the side length is $\sqrt{8}$ cm.



$l = \sqrt{8}$ cm

➤ You can find the length of a line segment AB on a grid by constructing a square on the segment. The length AB is the square root of the area of the square.

Draw an enclosing square around the square containing AB.
Then find the area of the enclosing square, and subtract the sum of the areas of the triangles.



Tip

The square of the square root of a number is that number. For example, $(\sqrt{2})^2 = 2$. $\sqrt{8}$ is not a whole number. It is called an irrational number.

The area of the enclosing square is 4^2 square units = 16 square units

Each triangle has area $\frac{1}{2} \times 1$ unit $\times 3$ units = 1.5 square units

4 triangles have area 4×1.5 square units = 6 square units
The area of the square with AB as a side is
16 square units − 6 square units = 10 square units
So, the length of AB is $\sqrt{10}$ units.

HINT

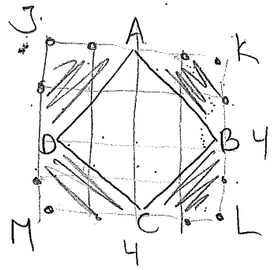
Use the formulas $A = s^2$ for the area of a square and $A = \frac{1}{2}bh$ for the area of a triangle.

1.3b Measuring Line Segments cont...

Review

Calculating Area and Side Length

a) Find the Area of square ABCD
b) What is the side length AB?



Area JKLM − Area 4 △'s = Area ABCD

Area JKLM = 4·4 = 16 units²

Area △ = $\frac{1}{2}$·2·2 or $\frac{2 \cdot 2}{2}$ = 2 units²

Area 4△ = 4·2 units² = 8 units²

A_{ABCD} = 16 units² − 8 units²

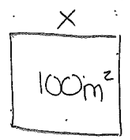
A_{ABCD} = 8 units²

Area □ = l·w

Area △ = $\frac{1}{2}$·b·h or $\frac{b \cdot h}{2}$

Area ⊙ = πr^2

New b) what is the side length AB?

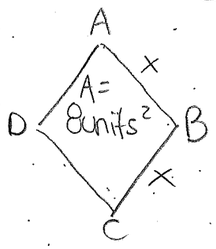


From before

$A = 100m^2 = 10 \cdot 10$

$x = 10m$ $\quad x = \sqrt{100} = \sqrt{10 \cdot 10} = \sqrt{10} \cdot \sqrt{10} = 10m$

So... side length AB = all the same



$x = \sqrt{8}$ ∵ (because) $\sqrt{8} \cdot \sqrt{8} = 8$

★ $\sqrt{10} \cdot \sqrt{10} = 10$ ★

$\sqrt{92} \cdot \sqrt{92} = 92$

$(\sqrt{45})^2 = \sqrt{45} \cdot \sqrt{45} = 45$

Advanced Concept →

∵ (because) $\sqrt{45} \cdot \sqrt{45} = \sqrt{45 \cdot 45} = \sqrt{45^2} = 45$