Math 8- Ch 1 notes

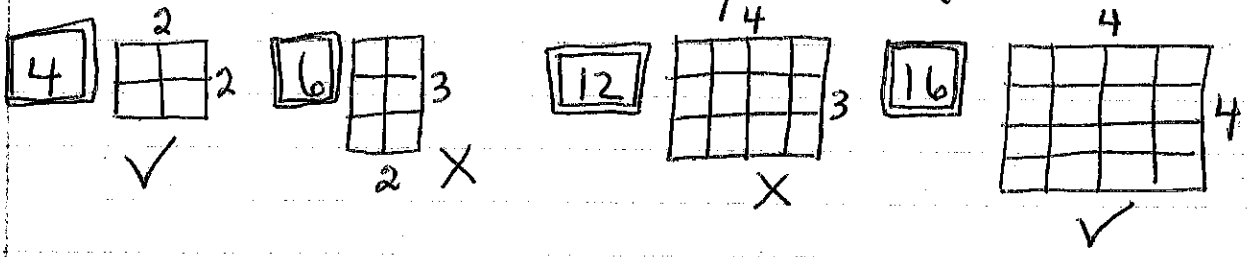
1.1 Square Numbers & Area Models

$3^2 = 3 \times 3 = 9$ * a squared number is multiplied by itself.

Are the following square numbers?

4 6 12 16

Ask → can you make them into squares (both sides =)

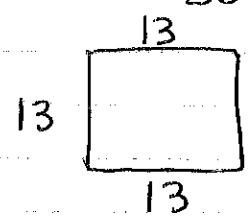


Area = l x w
Perimeter = add all sides

A field has an area of 169. (it is a square)
What is the perimiter?

A=169 ___ ___ x ___ = 169?

13 x 13 = 169
So each side is 13



Perimeter = 13+13+13+13
= 52

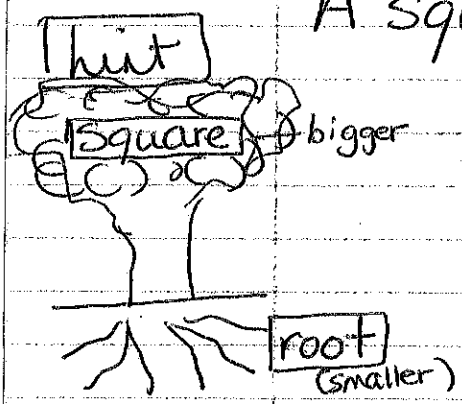
1.2 Squares & Square Roots

Square number → 64 = 8 × 8

To square a number → $8^2 = 64$

A square root ⇒ $\sqrt{\ }$

so $\sqrt{64} = \sqrt{8 \times 8} = 8$



think of $\sqrt{\ }$ as jail

* in order for a # to escape you need 2 sames

for (one) to escape

$\sqrt{4} = \sqrt{2 \times 2} = 2$

2 sames

$\sqrt{16} = \sqrt{4 \times 4} = 4$

2 sames

$\sqrt{144} = \sqrt{12 \times 12} = 12$

2 sames

ascending ← small → big

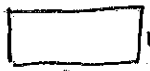
If you are unsure if it is a square number (that you can find square root of)

* list all the factors

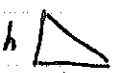
ex 225 → 1×225, 5×45

16: 1×16, 2×8, 3×—, 4×4, 8×2, 16×1 ← yes a square # has 2 equal factors (2 sames!)

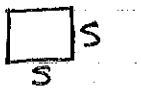
1.3 Measuring Line Segments



Area = $l \times w$



Area = $\frac{b \times h}{2}$

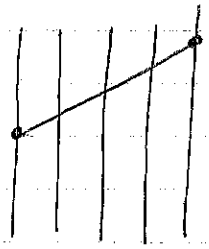


Area of a square = s^2

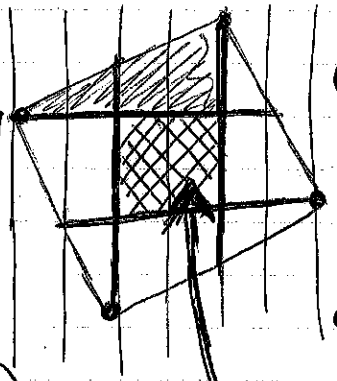
Side length of a square = $\sqrt{\text{area}}$

To find the length of a line:

Method 1



① make into a square



② connect corner to sides ↕ + ↔

③ in the centre there will be a square

* find area

$= 2 \times 2 = 4$

④ find area of  (Call 4 will be the same)

2 

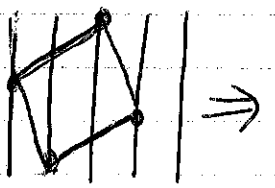
$\frac{b \times h}{2} = \frac{4 \times 2}{2} = 4$

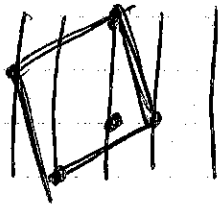
4  areas $\times$ 4 = 16

Total area = 16 + 4
= 20

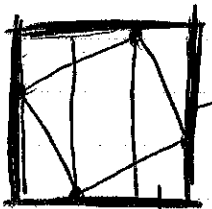
∴ side length $\sqrt{\text{area}}$
$= \sqrt{20}$.

Method 2





① draw a square outside



area
$= 3 \times 3$
$= 9$

② find area & subtract triangles

$\Delta = \frac{1 \times 2}{2} = 1$; $4\Delta = 4$

Area = 9 − 4 = 5

1.4 Estimating Square Roots

$\sqrt{1}$	$\sqrt{4}$	$\sqrt{9}$	$\sqrt{16}$	$\sqrt{25}$	$\sqrt{36}$	$\sqrt{49}$	$\sqrt{64}$	$\sqrt{81}$	$\sqrt{100}$	$\sqrt{121}$	$\sqrt{144}$	$\sqrt{169}$ ...
1	2	3	4	5	6	7	8	9	10	11	12	13

To estimate a square root
- start with what you know

ex $\sqrt{20}$ ← is between $\sqrt{16}$ and $\sqrt{25}$
(4) (5)

So $\sqrt{20}$ is between 4 & 5

* to get a closer estimate
→ find ½ way
or count how far away it is from known square roots

$\sqrt{20}$ — 5 away from $\sqrt{25}$, 4 away from $\sqrt{16}$

∴ $\sqrt{20}$ is closer to $\sqrt{16}$ but almost ½ way to from $\sqrt{16}$ – $\sqrt{25}$
a good estimate would be 4.4

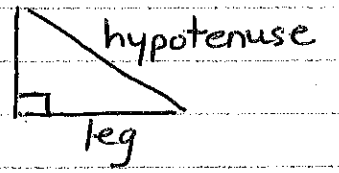
ex 2
estimate $\sqrt{96}$

$\sqrt{81}$ — 15 away — $\sqrt{96}$ — 4 away — $\sqrt{100}$

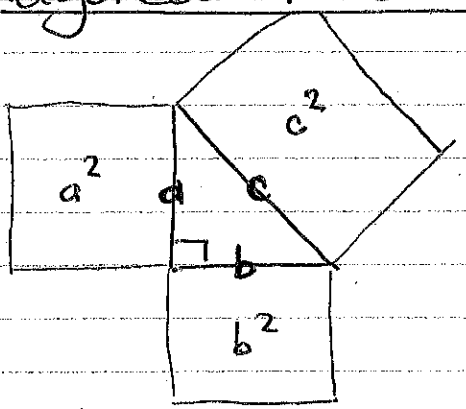
$\sqrt{96}$ is close to $\sqrt{100}$ & over ½ way
– so a good estimate is 9.8 or 9.9

1.5
1.6
1.7

The Pythagorean Theorem
— used to find sides of a right angle triangle.

right angle triangle ⇒ 

Pythagorean Theorem ⇒ $a^2+b^2=c^2$



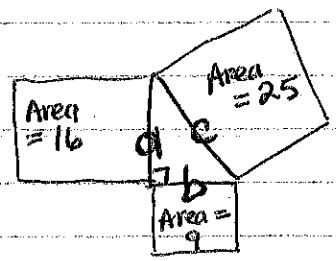
Area of side $a = a^2$
Area of side $b = b^2$

Area of side $c = a^2+b^2$
or c^2

* c is always the hypotenuse
* c is always across from the right angle.

To find the side:

$\sqrt{\text{Area of side}}$

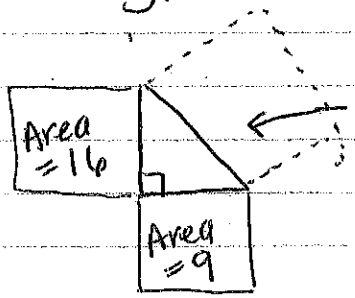


side $a = \sqrt{16} = 4$

side $b = \sqrt{9} = 3$

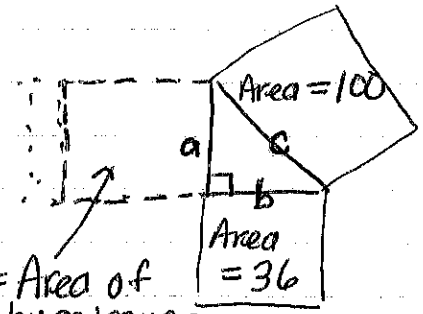
side $c = \sqrt{25} = 5$

To find hypotenuse



Area = Area leg 1 + Area leg 2
$= 16 + 9$
$= 25$ ∴ side c (hypotenuse)
$= \sqrt{25} = 5$

To find a missing leg



(a) Area = Area of hypotenuse subtract Area of other leg (b) $\Rightarrow$ $100 - 36 = 64$

so side $a = \sqrt{64} = 8$

Pythagorean triple

ex $3, 4, 5 \Rightarrow 9 + 16 = 25$

$6, 8, 10 \Rightarrow 36 + 64 = 100$

*can square 2 legs and add to get largest side squared

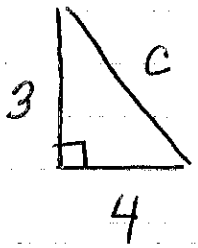
Find hypotenuse using formula $a^2 + b^2 = c^2$

*add

*remember c is always hypotenuse

and c is always across from the right angle.

ex



$a = 3 \quad b = 4 \quad c = ?$

$a^2 + b^2 = c^2$

$3^2 + 4^2 = c^2$

$9 + 16 = c^2$

$25 = c^2 \Rightarrow$ * $\sqrt{}$ to find side c

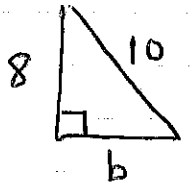
$c = 5$

Find leg using formula $a^2 + b^2 = c^2$

* subtract

rearrange $b^2 = c^2 - a^2$

and $a^2 = c^2 - b^2$



$a = 8 \quad b = ? \quad c = 10$

$b^2 = c^2 - a^2$

$= 10^2 - 8^2 = 100 - 64 = 36 \rightarrow \sqrt{}$ to find side

$b^2 = 36$

$b = 6$