6.) To prove : AC bisects $\angle C$

i.e, $\angle 3 = \angle 4$

~~Proof~~ Proof

Now,

$\angle 1 = \angle 2$

$\angle 2 = \angle 3$

$\angle 1 = \angle 4$

Hence, we can say that

$\angle 1 = \angle 2 = \angle 3 = \angle 4$. proved.

7.) To prove

(i) AC bisects $\angle A$ i.e, $\angle 1 = \angle 2$ & bisects $\angle C$, i.e $\angle 3 = \angle 4$

(ii) BD bisects $\angle D$ & $\angle B$

Proof:

In $\triangle ABC$,

$AB = BC$

So, $\angle 4 = \angle 2$

Now, $AD \parallel BC$ (Opposite sides of rhombus are parallel)
and transversal AC

$\angle 1 = \angle 4$

From (1) & (2)

$\angle 1 = \angle 2$

AC bisects $\angle A$

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8) Proof : (i) In $\triangle ABC$ and $\triangle ADC$

$\angle BAC = \angle DAC$ [Given]

$\angle BCA = \angle DAC$ [Given]

$AC = AC$

$\therefore \triangle ABC \cong \triangle ADC$ [ASA congruence]

$\therefore AB = AD$ and $CB = CD$

But in a rectangle opposite sides are equal i.e., $AB = BC$ and $BC \neq AD$)

$\therefore AB = BC = CD = DA$

Hence ABCD is a square proved.

(ii) In $\triangle ABD$ and $\triangle CDB$, we have

$AD = CD$ } [Sides of a square
$AB = CD$ } Common]
$BD = BD$

$\therefore \triangle ABD \cong \triangle CBD$
[SSS congruence]

So $\angle ABD = \angle CBD$ } [CPCT]
$\angle ADB = \angle CDB$ }

Hence, diagonal BD bisects $\angle B$ as well as $\angle D$