Areas of Parallelograms and Triangles Ex 15.3 Q11

Answer :

Given: Here from the question we get

(1) ABCD is a parallelogram

(2) P is any point in the interior of parallelogram ABCD

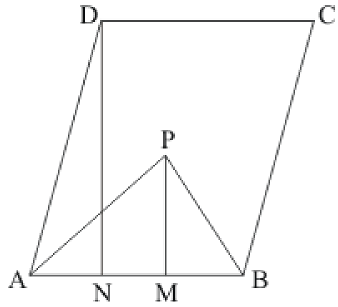
To prove: Area of ΔAPB < $\frac{1}{2}$Area of parallelogram ABCD

Construction: Draw DN perpendicular to AB and PM perpendicular AB

Proof: Area of triangle = $\frac{1}{2}$ × base× height

Area of $\Delta APB = \frac{1}{2} \cdot AB \cdot PM \ldots\ldots (1)$

Also we know that: Area of parallelogram = base× height



Area of parallelogram $ABCD = AB \cdot DN \ldots\ldots (2)$

Now PM < DN (Since P is a point inside the parallelogram ABCD)

$\Rightarrow AB \times PM < AB \times DN$

$\Rightarrow \frac{1}{2} AB \times PM < \frac{1}{2} AB \times DN$

$\Rightarrow$ Area of ΔAPB < $\frac{1}{2}$ Area of parallelogram ABCD

Hence it is proved that

$$\boxed{\text{Area of } \Delta APB < \frac{1}{2} \text{ Area of parellelogram ABCD}}$$

Areas of Parallelograms and Triangles Ex 15.3 Q12

Answer :

Given:

(1) ABC is a triangle

(2) AD is the median of ΔABC

(3) G is the midpoint of the median AD

To prove:

(a) Area of Δ ADB = Area of Δ ADC

(b) Area of Δ BGC = 2 Area of Δ AGC

Construction: Draw a line AM perpendicular to AC

Proof: Since AD is the median of ΔABC.

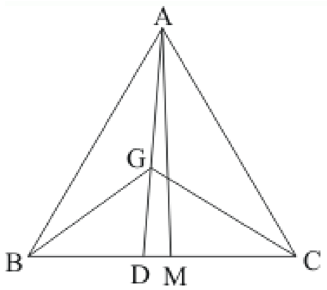
Therefore BD = DC

So multiplying by AM on both sides we get

$$BD \times AM = DC \times AM$$

$$\Rightarrow \quad \frac{1}{2} BD \times AM = \frac{1}{2} DC \times AM$$

$$\Rightarrow \quad \text{Area of } \Delta ADB = \text{Area of } \Delta ADC$$



In ΔBGC, GD is the median

Since the median divides a triangle in to two triangles of equal area. So

Area of ΔBDG = Area of ΔGCD

$\Rightarrow$ Area of $\Delta BGC = 2$(Area of ΔBGD)

Similarly In ΔACD, CG is the median

$\Rightarrow$ Area of ΔAGC = Area of ΔGCD

From the above calculation we have

Area of ΔBGD = Area of ΔAGC

But Area of $\Delta BGC = 2$(Area of ΔBGD)

So we have

Area of $\Delta BGC = 2$(Area of ΔAGC)

Hence it is proved that

(1) $\boxed{\text{Area of } \Delta ADB = \text{Area of } \Delta ADC}$

(2) $\boxed{\text{Area of } \Delta BGC = 2(\text{Area of } \Delta AGC)}$

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