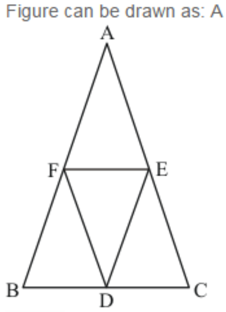
Quadrilaterals Ex 14.4 Q20

Answer :

(i) The triangle formed by joining the mid-points of the sides of an isosceles triangle is isosceles.

Explanation:

Figure can be drawn as: A



ΔABC, an isosceles triangle is given.

F and *E* are the mid-points of *AB* and *AC* respectively.

Therefore,

$EF = \frac{1}{2}BC$ ...... (I)

Similarly,

$DE = \frac{1}{2}AB$ ...... (II)

And

$FD = \frac{1}{2}AC$ ...... (III)

Now, ΔABC is an isosceles triangle.

$AB = AC$

$\frac{1}{2}AB = \frac{1}{2}AC$

From equation (II) and (III), we get:

$DE = FD$

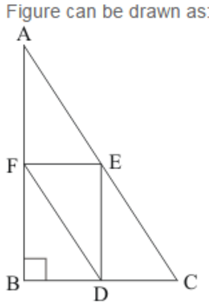
Therefore, in ΔABC two sides are equal.

Therefore, it is an isosceles triangle.

(ii) The triangle formed by joining the mid-points of the sides of a right triangle is right triangle.

Explanation:

Figure can be drawn as: A



ΔABC right angle at *B* is given.

$\angle B = 90^0$

F and *E* are the mid-points of *AB* and *AC* respectively.

Therefore,

$EF \parallel BC$ …… (I)

Similarly,

$DE \parallel AB$ …… (II)

And

$DF \parallel CA$ …… (III)

Now, *DE* || *AB* and transversal *CB* and *CA* intersect them at *D* and *E* respectively.

Therefore,

$\angle CDE = \angle B$

and $\angle CED = \angle A$

Similarly, $EF \parallel BC$

Therefore,

$\angle AEF = \angle C$

and $\angle AFE = \angle B$

Similarly, $DF \parallel CA$

Therefore,

$\angle BDF = \angle C$

$\angle BFD = \angle A$

Now *AC* is a straight line.

$$\angle AEF + \angle DEF + \angle CED = 180^0$$
$$\angle C + \angle FDE + \angle A = 180^0$$
$$\angle FDE + (\angle C + \angle A) = 180^0$$

Now, by angle sum property of ΔABC ,we get:

$\angle C + \angle A = 180^0 - \angle B$

Therefore,

$$\angle FDE + 180^0 - \angle B = 180^0$$
$$\angle FDE = \angle B$$

But, $\angle B = 90^0$

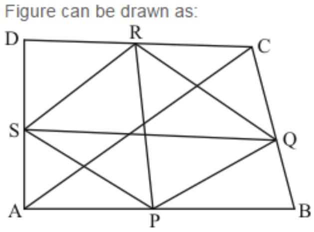
Then we have:

$\angle FDE = \boxed{90^0}$

(iii) The figure formed by joining the mid-points of the consecutive sides of a quadrilateral is **parallelogram**.

Explanation:

Figure can be drawn as:



Let *ABCD* be a quadrilateral such that *P, Q, R* and *S* are the mid-points of side *AB, BC, CD* and *DA* respectively.

In ΔABC, *P* and *Q* are the mid-points of *AB* and *BC* respectively.

Therefore,

$PQ \parallel AC$ and $PQ = \frac{1}{2}AC$

Similarly, we have

$RS \parallel AC$ and $RS = \frac{1}{2}AC$

Thus,

$PQ \parallel RS$ and $PQ = RS$

Therefore, *PQRS* is a parallelogram.

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