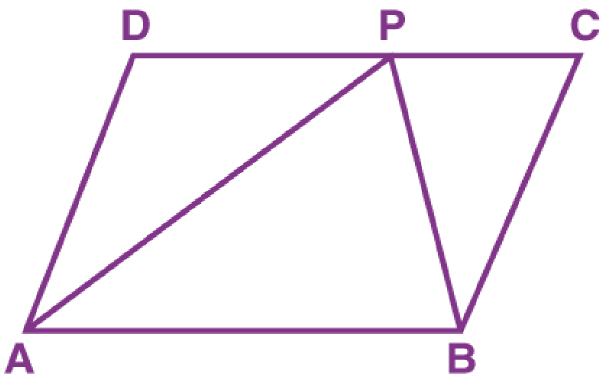
**1. ABCD is a parallelogram having an area of 60 cm$^2$. P is a point on CD. Calculate the area of △APB.**

**Solution:**




Area (△APB) = (1/2) x area (parallelogram ABCD)

(The area of a triangle is half that of a parallelogram on the same base and between the same parallels)

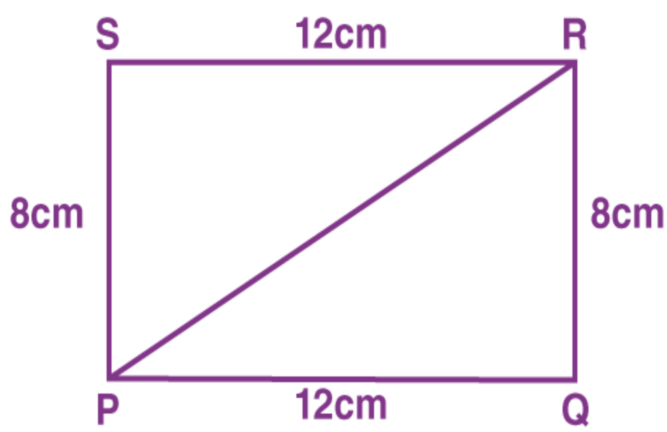
Area (△APB) = (1/2) x 60 cm$^2$

We get,

Area (△APB) = 30 cm$^2$

**2. PQRS is a rectangle in which PQ = 12 cm and PS = 8 cm. Calculate the area of △PRS.**

**Solution:**




Given PQRS is a rectangle

Hence,

PQ = SR

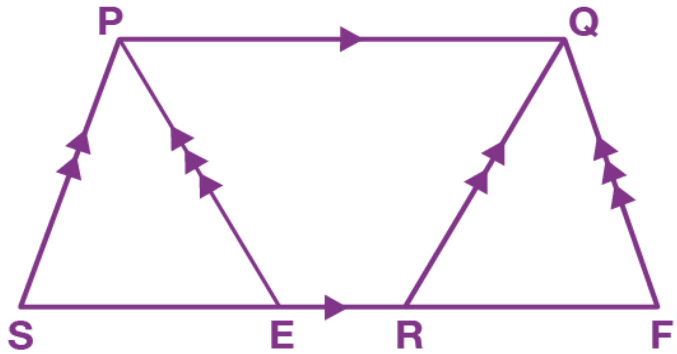
SR = 12 cm

PS = 8 cm

Area (△PRS) = (1/2) x base x height

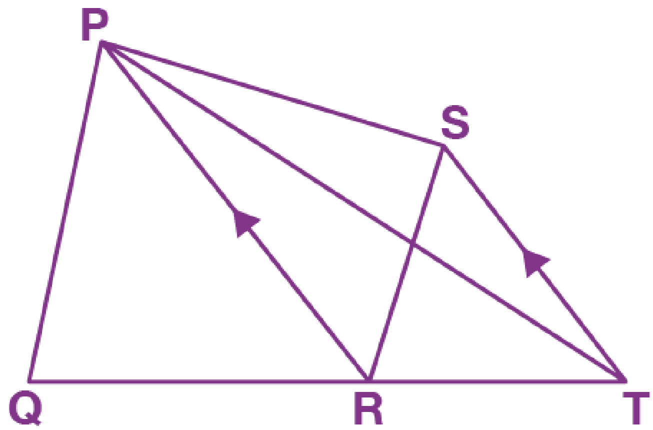
Area (△PRS) = (1/2) x SR x PS
Area (△PRS) = (1/2) x 12 x 8
We get,
Area (△PRS) = 48 $cm^2$

**3. In the given figure area of || gm PQRS is 30 $cm^2$. Find the height of || gm PQFE if PQ = 6 cm.**



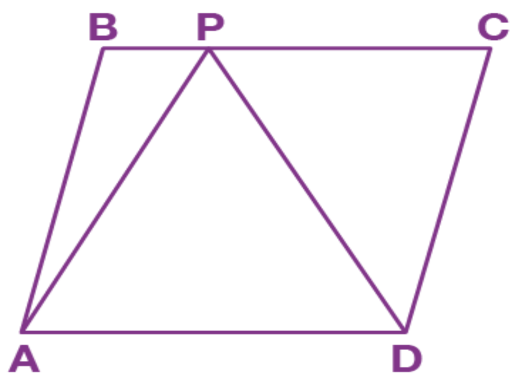

**Solution:**
Area (|| gm PQRS) = Area (|| gm PQFE)
(|| gm on same base PQ and between same parallel lines)
Therefore,
Area (|| gm PQFE) = 30 $cm^2$
Base x Height = 30
6 x Height = 30
Height = (30 / 6)
We get,
Height = 5 cm
Hence, the height of a parallelogram PQFE is 5 cm

**4. In the given figure, ST || PR. Prove that: area of quadrilateral PQRS = area of △PQT**




**Solution:**
Area (△PSR) = Area (△PTR)
(Triangles on the same base PR and between the same parallel lines PR and ST)
Adding Area (△PQR) on both sides
We get,
Area (△PSR) + Area (△PQR) = Area (△PTR) + Area (△PQR)
Area (Quadrilateral PQRS) = Area (△PQT)
Hence, proved

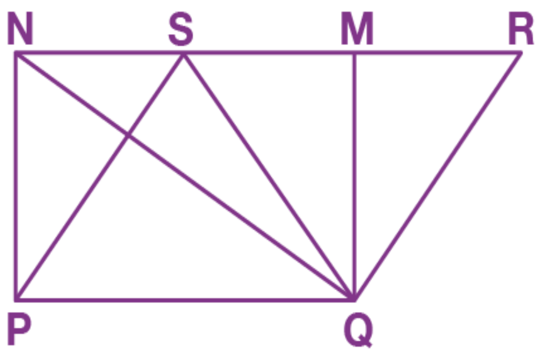
**5. In the figure, ABCD is a parallelogram and APD is an equilateral triangle of side 8 cm. Calculate the area of parallelogram ABCD.**




**Solution:**
Area (△APD) = ($\sqrt{3}s^2$) / 4
Area (△APD) = ($\sqrt{3}$ x $8^2$) / 4
Area (△APD) = ($\sqrt{3}$ x 64) / 4
Area (△APD) = ($\sqrt{3}$ x 16)
On further calculation, we get,
Area (△APD) = $16\sqrt{3}$ $cm^2$
Area (△APD) = (1/2) x area (parallelogram ABCD)
The area of a triangle is half that of a parallelogram on the same base and between the

same parallels)
Area (parallelogram ABCD) = 2 x area (△APD)
Area (parallelogram ABCD) = 2 x $16\sqrt{3}$ $cm^2$
We get,
Area (parallelogram ABCD) = $32\sqrt{3}$ $cm^2$

**6. In the figure, if the area of ||gm PQRS is 84 $cm^2$. Find the area of**
**(i) || gm PQMN**
**(ii) △PQS**
**(iii) △PQN**



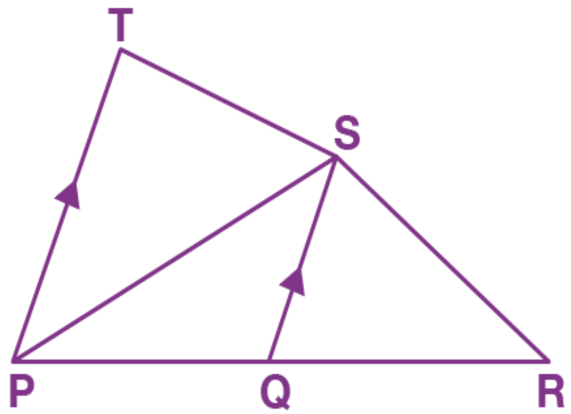

**Solution:**
(i) Area of a rectangle and area of a parallelogram on the same base is equal
Here,
For rectangle PQMN, base is PQ
For parallelogram PQRS, base is PQ
Hence,
Area of rectangle PQMN = Area of parallelogram PQRS
Area of rectangle PQMN = 84 $cm^2$

(ii) Area (△PQS) = (1/2) x area (parallelogram PQRS)
Area (△PQS) = (1/2) x 84 $cm^2$
We get,
Area (△PQS) = 42 $cm^2$

(iii) Area (△PQN) = (1/2) x area (rectangle PQMN)
Area (△PQN) = (1/2) x 84 $cm^2$
We get,
Area (△PQN) = 42 $cm^2$

**7. In the figure, PQR is a straight line. SQ is parallel to TP. Prove that the**

**quadrilateral PQST is equal in area to the △PSR.**




**Solution:**

In quadrilateral PQST,

Area (△PQS) = (1/2) x area (quadrilateral PQST)

Area (quadrilateral PQST) = 2 x area (△PQS) …….(i)

In △PSR,

Area (△PSR) = area (△PQS) + area (△QSR)

Since QS is median as QS || TP

Hence,

Area (△PQS) = Area (△QSR)

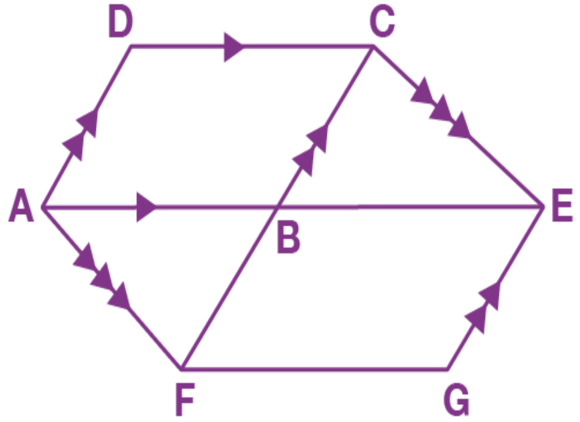
Area (△PSR) = 2 x area (△PQS) ……….(ii)

From equations (i) and(ii)

Area (quadrilateral PQST) = Area (△PSR)

Hence proved

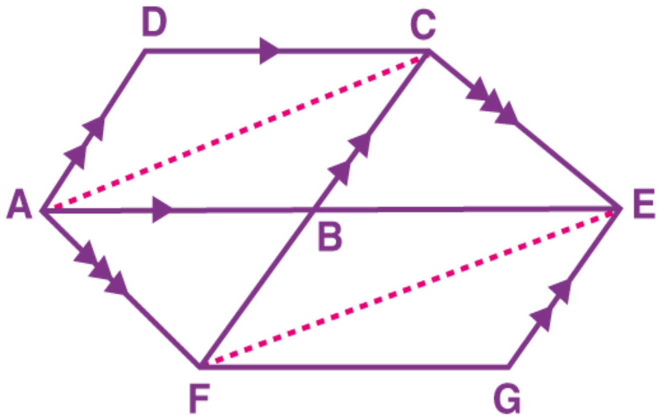
**8. In the given figure, if AB || DC || FG and AE is a straight line. Also, AD || FC. Prove that: area of || gm ABCD = area of ||gm BFGE**




**Solution:**

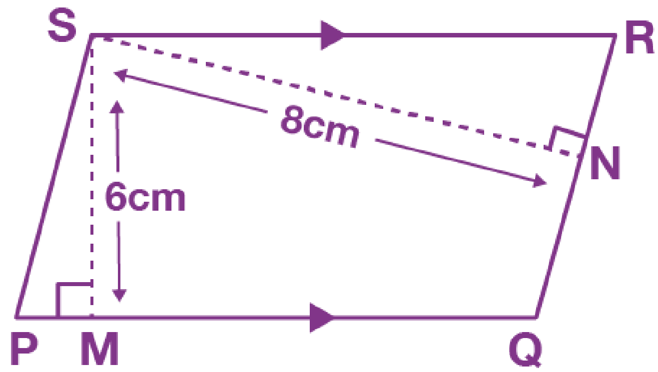
By joining AC and FE

We get,




△AFC and △AFE are on the same base AF and between the same parallels AF and CE
Area (△AFC) = Area (△AFE)
Area (△ABF) + Area (△ABC) = Area (△ABF) + Area (△BFE)
We get,
Area (△ABC) = Area (△BFE)
(1/2) Area (parallelogram ABCD) = (1/2) Area (parallelogram BFGE)
Area (parallelogram ABCD) = Area (parallelogram BFGE)
Hence, proved

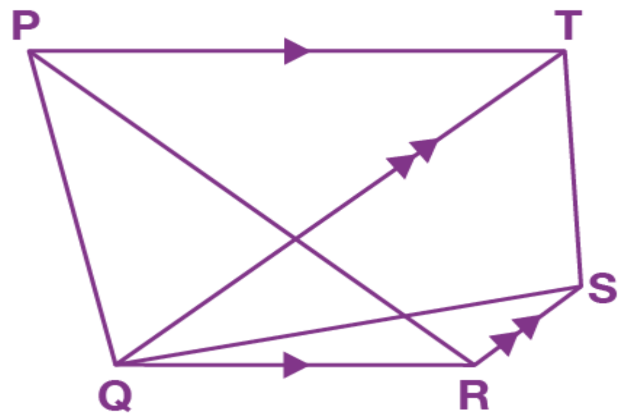
**9. In the given figure, the perimeter of parallelogram PQRS is 42 cm. Find the lengths of PQ and PS.**



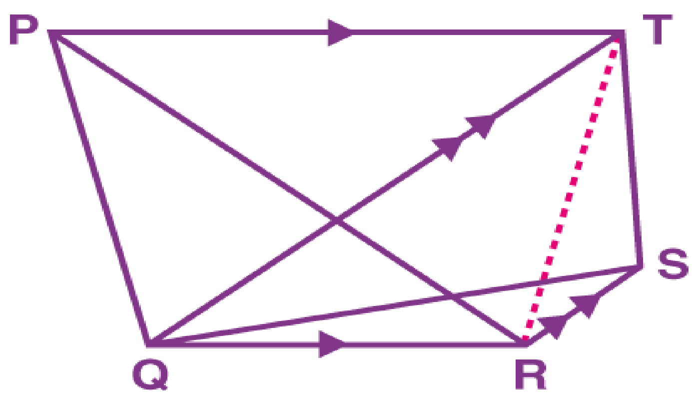

**Solution:**
Area of || gm PQRS = PQ x 6
Also,
Area of || gm PQRS = PS x 8
Therefore,
PQ x 6 = PS x 8
PQ = (8PS) / 6

We get,
PQ = (4PS) / 3 ……..(i)
Perimeter of || gm PQRS = PQ + QR + RS + PS
42 = 2PQ + 2PS (Opposite sides of a parallelogram are equal)
21 = PQ + PS
Substituting the value of PQ from equation (i), we get,
(4PS / 3) + PS = 21
{(4PS + 3PS) / 3} = 21
7PS = 63
We get,
PS = 9 cm
Now,
Substituting the value of PS in equation (i), we get,
PQ = (4PS) / 3
PQ = (4 x 9) / 3
We get,
PQ = 12 cm
Therefore, PQ = 12 cm and PS = 9 cm

**10. In the given figure, PT || QR and QT || RS. Show that: area of △PQR = area of △TQS.**




**Solution:**
By joining TR, we get,




△PQR and △QTR are on the same base QR and between the same parallel lines QR and PT

Therefore,

Area (△PQR) = Area (△QTR) ……….(i)

△QTR and △TQS are on the same base QT and between the same parallel lines QT and RS

Therefore,

Area (△QTR) = Area (△TQS) ……… (ii)

From equations (i) and (ii), we get,

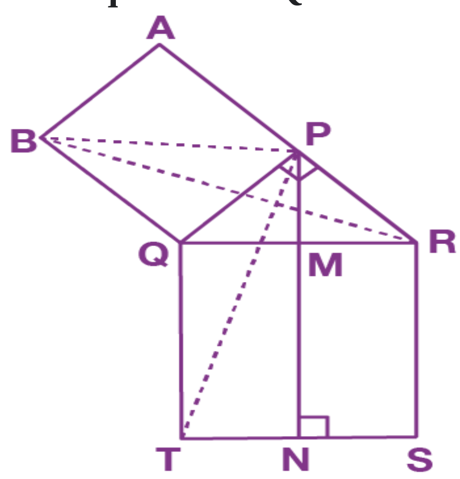
Area (△PQR) = Area (△TQS)

Hence proved

**11. In the given figure, △PQR is right – angled at P. PABQ and QRST are squares on the side PQ and hypotenuse QR. If PN ⊥ TS, show that:**

**(a) △QRB ≅ △PQT**

**(b) Area of square PABQ = area of rectangle QTNM.**




**Solution:**

∠BQR = ∠BQP + ∠PQR

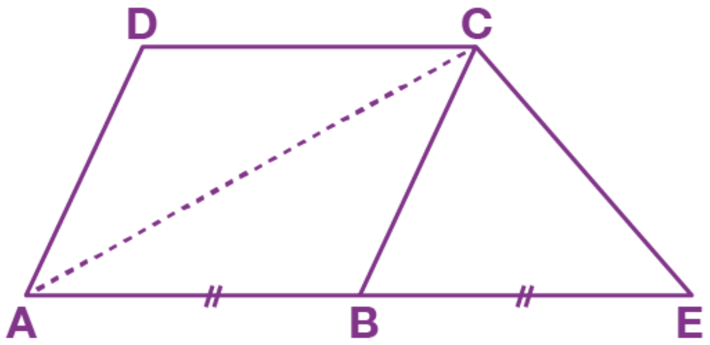
$\angle BQR = 90^0 + \angle PQR$
$\angle PQT = \angle TQR + \angle PQR$
$\angle PQT = 90^0 + \angle PQR$
Hence,
$\angle BQR = \angle PQT$ …(i)

(a) In △QRB and △PQT,
BQ = PQ ……. (sides of a square PABQ)
QR = QT ……. (sides of a square QRST)
∠BQR = ∠PQT …. {From (i)}
Therefore,
△QRB ≅ △PQT (By SAS congruence criterion)
Area (△BQR) = Area (△PQT) ……. (ii)

(b) △PQT and rectangle QTNM are on the same base QT and between the same parallel lines QT and PN
Hence,
Area (△PQT) = (1/2) Area (rectangle QTNM)
Area (rectangle QTNM) = 2 x Area (△PQT)
Area (rectangle QTNM) = 2 x Area (△BQR) {from (ii)} ….. (iii)

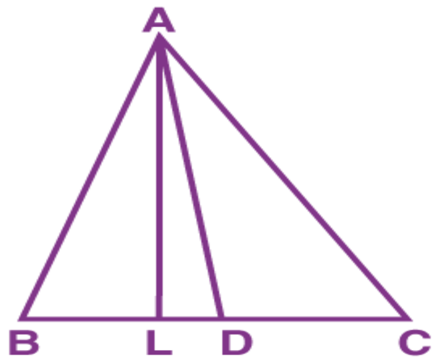
△BQR and square PABQ are on the same base BQ and between the same parallel lines BQ and AR
Therefore,
2 x Area (△BQR) = Area (square PABQ) ……….. (iv)
From equations (iii) and (iv), we get,
Area (square PABQ) = Area (rectangle QTNM)
Hence proved

**12. In the figure, AB = BE. Prove that the area of triangle ACE is equal in area to the parallelogram ABCD.**




**Solution:**
In parallelogram ABCD,
Area (△ABC) = (1/2) x Area (parallelogram ABCD)
(The area of a triangle is half that of a parallelogram on the same base and between the same parallels)
Area (parallelogram ABCD) = 2 x Area (△ABC) ……….. (i)
In △ACE,
Area (△ACE) = Area (△ABC) + Area (△BCE)
Since BC is median,
Hence,
Area (△ABC) = Area (△BCE)
Area (ACE) = 2 x Area (△ABC) ……….. (ii)
From equation (i) and (ii), we get,
Area (parallelogram ABCD) = Area (△ACE)

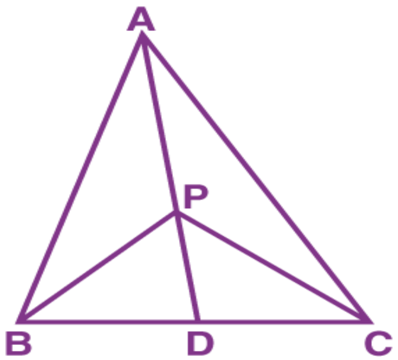
**13. Prove that the median of a triangle divides it into two triangles of equal area.**
**Solution:**




Draw AL perpendicular to BC
Since AD is median of △ABC
Hence,
D is the midpoint of BC
BD = DC

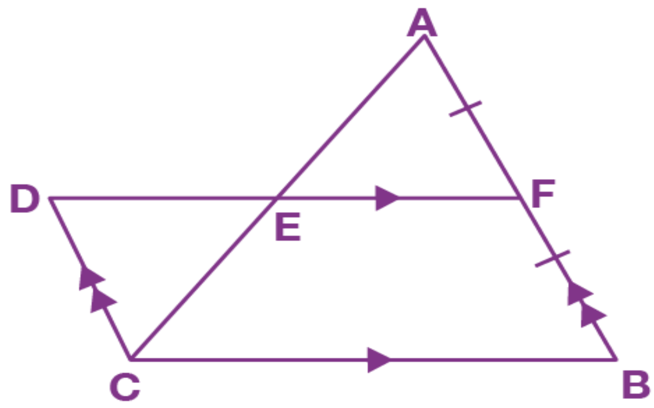
Multiplying by AL, we get,
BD x AL = DC x AL
(1/2) (BD x AL) = (1/2) (DC x AL)
Therefore,
Area (△ABD) = Area (△ADC)
Hence, proved

**14. AD is a median of a △ABC. P is any point on AD. Show that the area of △ABP is equal to the area of △ACP.**
**Solution:**




**Solution:**
AD is the median of △ABC.
So, it will divide △ABC into two triangles of equal areas
Hence,
Area (△ABD) = Area (△ACD) …….. (i)
Now,
PD is the median of △PBC
Hence,
Area (△PBD) = Area (△PCD) …….. (ii)
On subtracting equation (ii) from equation (i), we get,
Area (△ABD) – Area (△PBD) = Area (△ACD) – Area (△PCD)
Area (△ABP) = Area (△ACP)
Hence, proved

**15. In the given figure AF = BF and DCBF is a parallelogram. If the area of △ABC is 30 square units, find the area of the parallelogram DCBF.**




**Solution:**

In △ABC,

AF = FB and EF || BC ….(given)

Hence, AE = EC …. (converse of mid-point theorem) …….. (i)

In △AEF and △CED,

∠FEA = ∠DEC ……(vertically opposite angles)

CE = AE ….. {From (i)}

∠FAE = ∠DCE … (Alternate angles)

Therefore,

△AEF ≅ △CED (By ASA test of congruency)

Area (△AEF) = Area (△CED) ….. (ii)

Area (△ABC) = Area (△AEF) + Area (EFBC)

Area (△ABC) = Area (△CED) + Area (EFBC) …… {from (ii)}

Therefore,

Area (△ABC) = Area (parallelogram DCBF)

Hence, area of parallelogram DCBF is 30 square units