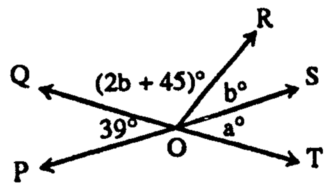
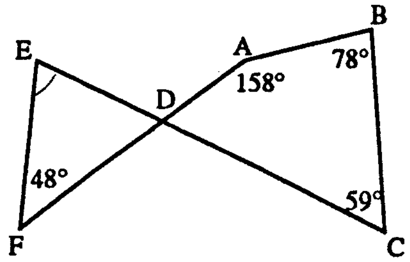
PLANE GEOMETRY

* Give reasons in all quest

1. PS, QT are straight lines. Find a and b.



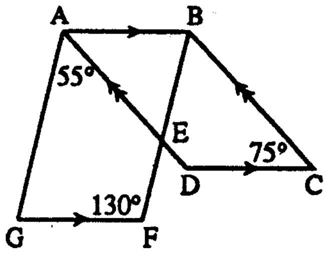
2. Find ∠DEF.



3. AB ∥ GF ∥ DC. AD ∥ BC.

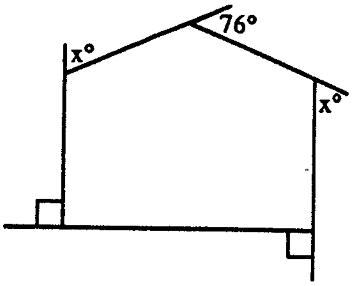
∠BCD = 75°. ∠BFG = 130°.

∠GAD = 55°. Show that AG ∥ BF.



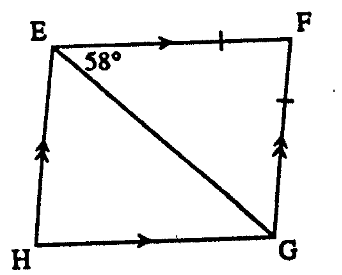
4. If the angle sum of a polygon is 2160°, find the number of sides.

5. Find the value of x.

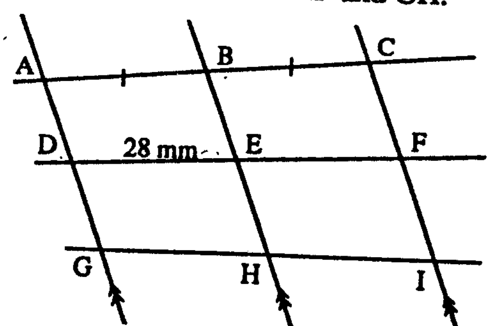


6. EFGH is a rhombus.

$F\hat{E}G = 58°$. Find $E\hat{H}G$.

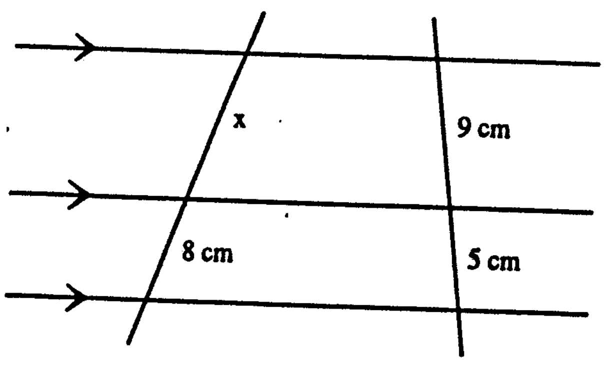


7. AB = BC; DE = 28 mm;
GI = 58 mm. Find EF and GH.

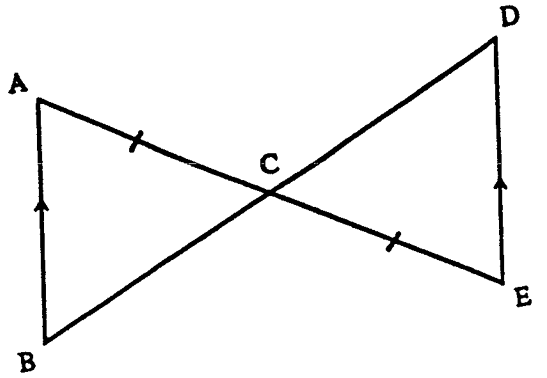


58

8. Find the value of x.



9 AB ∥ DE, C is the mid-point of AE.
Prove that C is the mid-point of BD.

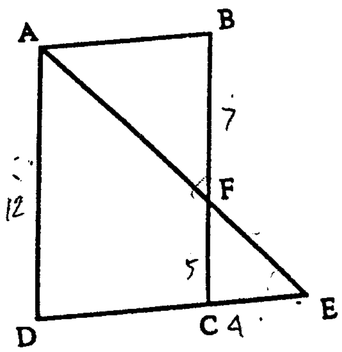


10.

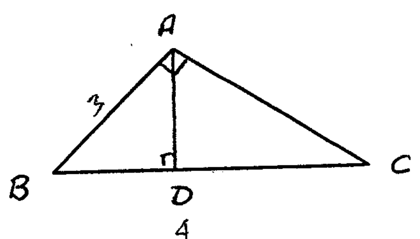
ABCD is a parallelogram,
AD = 12 cm, CE = 4 cm, BF = 7 cm.

(a) Show that ΔABF is similar to ΔECF.

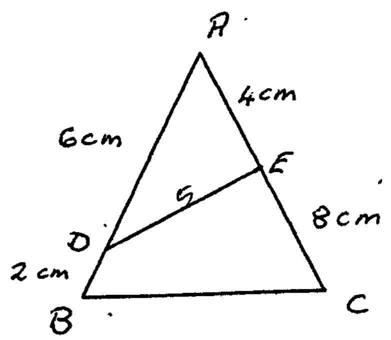
(b) Find AB.



11. Prove the Δ's ABC and ABD are similar and hence find the length of AD if AB = 3cm and BC = 4cm.
(Hint: Note the triangles are right angled)



12. Prove Δ's ADE and ABC are similar and find the length of BC if DE = 5cm.



(7)

$AB = BC$

$\therefore\ DE = EF$ [parallel lines cut equal intercepts]

$EF = 28$ mm

$GH = HI$ [parallel lines cut equal intercepts]

$\therefore\ GH = \frac{1}{2}\cdot 58 = 29$ mm

$\therefore\ EF = 28$ mm and $GH = 29$ mm

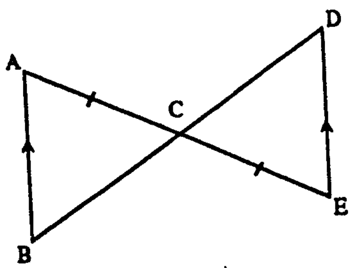
(8)

Parallel lines preserve the ratio of intercepts.

$\therefore\ \dfrac{x}{8} = \dfrac{9}{5}$

$x = \dfrac{9\times 8}{5} = 14.4$ cm

(9)



In ΔABC, ΔCDE

$A\hat{C}B = D\hat{C}E$ [vertically opposite]

$B\hat{A}C = C\hat{E}D$ [alternate, $AB \parallel DE$]

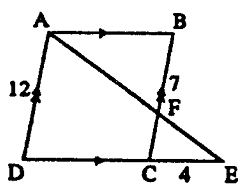
$AC = CE$ [C is mid-point of AE],

$\therefore \Delta ABC \equiv \Delta EDC$ [AAS],

$\therefore\ BC = CD$ [corresponding sides of congruent triangles],

$\therefore$ C is the mid-point of BD.

(10) (a)



In ΔABF, ΔFCE

$A\hat{F}B = C\hat{F}E$ [vertically opposite]

$A\hat{B}F = F\hat{C}E$ [alternate, $AB \parallel CE$],

$\therefore\ \Delta ABF\ |||\ \Delta ECF$.

(b) $AD = BC$ [opposite sides of a parallelogram]

$BC = 12$ cm

$CF = BC - BF$

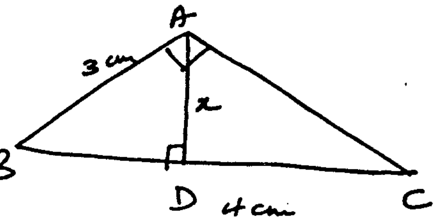
$= 12 - 7 = 5$ cm

$\dfrac{AB}{CE} = \dfrac{BF}{CF}$ [corresponding sides of similar triangles]

$\dfrac{AB}{4} = \dfrac{7}{5}$

$AB = \dfrac{4\times 7}{5} = 5.6$ cm

(11)



In Δs ABC and ABD

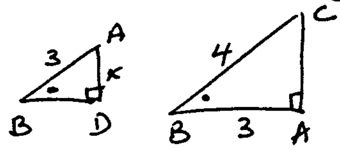
$\angle ABC = \angle ABD$ (same $\angle$)

$\angle BAC = \angle ADB$ (given, $90°$)

$\therefore \angle ACB = \angle BAD$ ($\angle$ sum of Δ)

$\therefore \Delta ABC\ |||\ \Delta DBA$ (equiangular)

$\therefore$



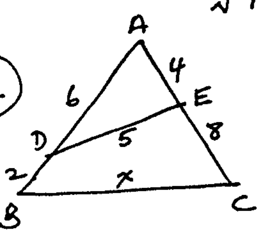
By Pyth. Thm, $AC = \sqrt{16-9}$

$= \sqrt{7}$

$\therefore \dfrac{AD}{AC} = \dfrac{AB}{CB}$ (corresp. sides of sim. Δs in prop.)

$\therefore \dfrac{x}{\sqrt{7}} = \dfrac{3}{4}$ $\quad \therefore AD = \dfrac{3\sqrt{7}}{4}$ cm

(12)



$\dfrac{AE}{AD} = \dfrac{4}{6} = \dfrac{2}{3}$

$\dfrac{AB}{AC} = \dfrac{8}{12} = \dfrac{2}{3}$

In Δs ADE + ABC

$\angle A$ is common

$\dfrac{AE}{AD} = \dfrac{AB}{AC}$ (proven above)

$\therefore \Delta ADE\ |||\ ACB$ (sides about eq. $\angle$ are in prop.)

Since corresp sides in prop,

$\dfrac{DE}{BC} = \dfrac{AE}{AB} = \dfrac{4}{8} =$

or

$\dfrac{BC}{DE} = \dfrac{2}{1}$

$\therefore \dfrac{BC}{5} = 2$

$BC = 10$

$\therefore BC = 10$ cm

1

$$\hat{SOT} = \hat{POQ} \quad \text{[vertically opposite angles]}$$
$$\therefore \quad a° = 39°$$
$$\hat{POQ} + \hat{QOR} + \hat{ROS} = 180° \quad \text{[angles on a straight line]}$$
$$\therefore \quad 39° + (2b+45)° + b° = 180°$$
$$3b° + 84° = 180°$$
$$3b° = 96°$$
$$b° = 32°$$
$$\therefore \quad a° = 39° \text{ and } b° = 32°$$

(2)

$$\angle ADC + 158° + 78° + 59° = 360° \quad \text{[angle sum of a quadrilateral]}$$
$$\therefore \quad \angle ADC = 65°$$
$$\therefore \quad \angle EDF = 65° \quad \text{[vertically opposite } \angle ADC\text{]}$$
$$\angle DEF + 65° + 48° = 180° \quad \text{[angle sum of a triangle]}$$
$$\therefore \quad \angle DEF = 67°$$

(3)

$$\angle ABC = 105° \quad \text{[co-interior to } \angle BCD,\ AB \parallel DC\text{]}$$
$$\angle ABF = 50° \quad \text{[co-interior to } \angle BFG,\ AB \parallel GF\text{]}$$
$$\therefore \quad \angle CBF = 55°$$
$$\angle BEA = 55° \quad \text{[alternate to } \angle CBF,\ AD \parallel BC\text{]}$$
$$\therefore \quad \angle BEA = \angle GAD$$
$$\therefore \quad AG \parallel BF \quad \text{[alternate angles are equal]}$$

(4)

Angle sum = $(2n-4)$ right angles

$$2160° = (2n-4) \times 90°$$
$$\therefore \quad 2n - 4 = 2160° \div 90°$$
$$= 24$$
$$2n = 28$$
$$n = 14$$

$\therefore$ the polygon has fourteen sides.

(5)

$$x° + 76° + x° + 90° + 90° = 360° \quad \text{[angle sum of exterior angles]}$$
$$2x° + 256° = 360°$$
$$2x° = 104°$$
$$x° = 52°$$

(6)

$$\hat{FEG} = 58°$$
$$\therefore \quad \hat{FEH} = 116° \quad \text{[diagonals of a rhombus bisect the angles]}$$
$$\hat{EHG} = 180° - 116° \quad \text{[co-interior to } \hat{FEH},\ EF \parallel HG\text{]}$$
$$= 64°$$