EXERCISE 9.1 - Question No. 1

Which of the following figures lie on the same base and between the same parallels. In such a case, write the common base and the two parallels.

EXERCISE 9.2 - Question No. 1

In Fig. 9.15, ABCD is a parallelogram, $AE \perp DC$ and $CF \perp AD$. If $AB = 16\ cm$, $AE = 8\ cm$ and $CF = 10\ cm$, find AD.

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EXERCISE 9.2 - Question No. 2

If E,F,G and H are respectively the mid-points of the sides of a parallelogram ABCD, show that $ar(EFGH) = \frac{1}{2}ar(ABCD)$

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EXERCISE 9.2 - Question No. 3

P and Q are any two points lying on the sides DC and AD

respectively of a parallelogram ABCD. Show that

$ar\,(APB) \;=\; ar\,(BQC)$.

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EXERCISE 9.2 - Question No. 4

In Fig. 9.16, P is a point in the interior of a parallelogram ABCD.

Show that (i) $ar(APB) + ar(PCD) = \frac{1}{2}ar(ABCD)$ (ii)

$ar(APD) + ar(PBC) = ar(APB) + ar(PCD)$

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EXERCISE 9.2 - Question No. 5

In Fig. 9.17, PQRS and ABRS are parallelograms and X is any point on side BR. Show that (i) $ar(PQRS) = ar(ABRS)$ (ii) $ar(AXS) = \frac{1}{2}ar(PQRS)$

EXERCISE 9.2 - Question No. 6

A farmer was having a field in the form of a parallelogram PQRS. She took any point A on RS and joined it to points P and Q. In how many parts the fields is divided? What are the shapes of these parts? The farmer wants to sow wheat and pulses in equal portions of the field separately. How should she do it?

EXERCISE 9.3 - Question No. 1

In Fig.9.23, E is any point on median AD of a ΔABC . Show that $ar\ (ABE)\ =\ ar\ (ACE)$.

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EXERCISE 9.3 - Question No. 2

In a triangle ABC, E is the mid-point of median AD. Show that

$$ar\ (BED) = \frac{1}{4} ar\ (ABC)$$

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EXERCISE 9.3 - Question No. 3

Show that the diagonals of a parallelogram divide it into four triangles of equal area.

EXERCISE 9.3 - Question No. 4

In Fig. 9.24, ABC and ABD are two triangles on the same base AB. If line- segment CD is bisected by AB at O, show that

EXERCISE 9.3 - Question No. 5

D, E and F are respectively the mid-points of the sides BC, CA and AB of a ΔABC . Show that (i) BDEF is a parallelogram. (ii) $ar\ (DEF) = \frac{1}{4} ar\ (ABC)$ (iii) $ar\ (BDEF) = \frac{1}{2} ar\ (ABC)$

EXERCISE 9.3 - Question No. 6

In Fig. 9.25, diagonals AC and BD of quadrilateral ABCD intersect at O such that $OB = OD$. If $AB = CD$, then show that: (i) $ar\ (DOC) = ar\ (AOB)$ (ii) $ar\ (DCB) = ar\ (ACB)$ (iii) `D A\ ||\ C

EXERCISE 9.3 - Question No. 7

D and E are points on sides AB and AC respectively of ΔABC such that$ar\ (DBC)\ =\ ar\ (EBC)$. Prove that $DE\ \|\ BC$.

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EXERCISE 9.3 - Question No. 8

XY is a line parallel to side BC of a triangle ABC. If $BE\ \|\ AC$ and $CF\ \|\ AB$ meet XY at E and F respectively, show that $ar\ (ABE)\ =\ ar\ (ACF)$

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EXERCISE 9.3 - Question No. 9

The side AB of a parallelogram ABCD is produced to any point P. A line through A and parallel to CP meets CB produced at Q and then parallelogram PBQR is completed. Show that $ar\,(ABCD) = ar\,(PBQR)$.

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EXERCISE 9.3 - Question No. 10

Diagonals AC and BD of a trapezium ABCD with $AB \| DC$ intersect each other at O. Prove that $ar\,(AOD) = ar\,(BOC)$.

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EXERCISE 9.3 - Question No. 11

In Fig. 9.27, ABCDE is a pentagon. A line through B parallel to

AC meets DC produced at F. Show that (i)

$ar\ (ACB)\ =\ ar\ (ACF)$ (ii) $ar\ (AEDF)\ =\ ar\ (ABCDE)$

EXERCISE 9.3 - Question No. 12

A villager Itwaari has a plot of land of the shape of a quadrilateral.

The Gram Panchayat of the village decided to take over some

portion of his plot from one of the corners to construct a Health

Centre. Itwaari agrees to the above proposal with the condition that

he should be given equal amount of land in lieu of his land

adjoining his plot so as to form a triangular plot. Explain how this proposal will be implemented.

EXERCISE 9.3 - Question No. 13

ABCD is a trapezium with $AB \mid\mid DC$. A line parallel to AC intersects AB at X and BC at Y. Prove that $ar\,(ADX) = ar\,(ACY)$.

EXERCISE 9.3 - Question No. 14

In Fig.9.28, $AP \parallel BQ \parallel CR$. Prove that

$ar\,(AQC) = ar\,(PBR)$.

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EXERCISE 9.3 - Question No. 15

Diagonals AC and BD of a quadrilateral ABCD intersect at O in such a way that $ar(AOD) = ar(BOC)$. Prove that ABCD is a trapezium.

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EXERCISE 9.3 - Question No. 16

In Fig.9.29, $ar\ (BDP)\ =\ ar\ (ARC)$ and

$ar\ (BDP)\ =\ ar\ (ARC)$. Show that both the quadrilaterals

ABCD and DCPR are trapeziums.

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EXERCISE 9.4 - Question No. 1

Parallelogram ABCD and rectangle ABEF are on the same base

AB and have equal areas. Show that the perimeter of the

parallelogram is greater than that of the rectangle.

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EXERCISE 9.4 - Question No. 2

In Fig. 9.30, D and E are two points on BC such that

$BD = DE = EC$. Show that

$ar\,(ABD) = ar\,(ADE) = ar\,(AEC)$. Can you now answer

the question that you have left in the Introduction of this chapter,

whether the field of Budha has been actually divided into three

parts of equal area ?

EXERCISE 9.4 - Question No. 3

In Fig. 9.31, ABCD, DCFE and ABFE are parallelograms. Show

that $ar(ADE) = ar(BCF)$.

EXERCISE 9.4 - Question No. 4

In Fig. 9.32, ABCD is a parallelogram and BC is produced to a point Q such that $AD = CQ$. If AQ intersect DC at P, show that $ar\ (BPC) = ar\ (DPQ)$.

EXERCISE 9.4 - Question No. 5

In Fig.9.33, ABC and BDE are two equilateral triangles such that D is the mid-point of BC. If AE intersects BC at F, show that (i) $ar(BDE) = \frac{1}{4}ar(ABC)$ (ii) $ar(BDE) = \frac{1}{2}ar(BAE)$ (iii) $ar(ABC) = 2ar\ (BEC)$

EXERCISE 9.4 - Question No. 6

Diagonals AC and BD of a quadrilateral ABCD intersect each other at P. Show that

$ar\,(APB) \times ar\,(CPD) = ar\,(APD) \times ar\,(BPC)$.

EXERCISE 9.4 - Question No. 7

P and Q are respectively the mid-points of sides AB and BC of a triangle ABC and R is the mid-point of AP, show that (i) $ar(PRQ) = \frac{1}{2}ar(ARC)$ (ii) $ar(RQC) = \frac{3}{8}ar(ABC)$ (iii) $ar(PBQ) = ar(ARC)$

EXERCISE 9.4 - Question No. 8

ABC is a right triangle right angled at A. BCED, ACFG and ABMN are squares on the sides BC, CA and AB respectively. Line segment $AX \perp DE$ meets BC at Y. Show that: (i) $\Delta MBC \cong \Delta ABD$ (ii) `a r\ (B Y X D)\ =\ 2\

SOLVED EXAMPLES - Question No. 1

In Fig. 9.13, ABCD is a parallelogram and EFCD is a rectangle.Also, $AL \perp DC$. Prove that (i)

$ar\,(ABCD) = ar\,(EFCD)$ (ii) $ar\,(ABCD) = DC \times AL$

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SOLVED EXAMPLES - Question No. 2

If a triangle and a parallelogram are on the same base and between the same parallels, then prove that the area of the triangle is equal to half the area of the parallelogram.

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SOLVED EXAMPLES - Question No. 3

Show that a median of a triangle divides it into two triangles of equal areas.

SOLVED EXAMPLES - Question No. 4

In Fig. 9.22, ABCD is a quadrilateral and $BE \mid\mid AC$ and also BE meets DC produced at E. Show that area of ΔADE is equal to the area of the quadrilateral ABCD.