MATHEMATICS

Important Questions

Multiple Choice questions-

Question 1. What is the area of a parallelogram?

(a) $\frac{1}{2}$ × Base × Altitude

(b) Base × Altitude

(c) $\frac{1}{4}$ × Base × Median

(d) Base × Base

Question 2. AE is a median to side BC of triangle ABC. If area(ΔABC) = 24cm, then area(ΔABE) =

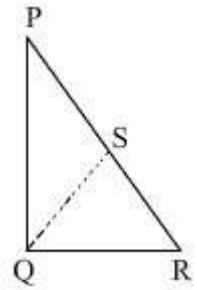
(a) 8cm

(b) 12cm

(c) 16cm

(d) 18cm

Question 3. In the figure, ∠PQR = 90°, PS = RS, QP = 12cm and QS = 6.5cm. The area of ΔPQR is



(a) 30cm^2

(b) 20cm^2

(c) 39cm^2

(d) 60cm^2

Question 4. BCD is quadrilateral whose diagonal AC divides it into two parts, equal in area, then ABCD

ABCD is quadrilateral whose diagonal AC divides it into two parts, equal in area, then ABCD

(a) Is a rectangles

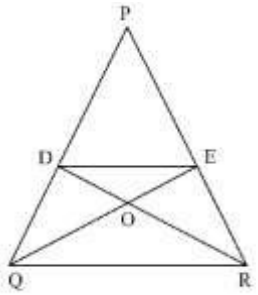
(b) Is a parallelogram

(c) Is a rhombus

(d) Need not be any of (a), (b) or (c).

Question 5. In ΔPQR, if D and E are points on PQ and PR respectively such that DE || QR, then

ar (PQE) is equal to



(a) ar (PRD)

(b) ar (DQM)

(c) ar (PED)

(d) ar (DQR)

Question 6. If Diagonals AC and BD of a trapezium ABCD with AB || DC intersect each other at O. Then,

(a) ar (AOD) = ar (BOC)

(b) ar (AOD) > ar (BOC)

(c) ar (AOD) < ar (BOC)

(d) None of the above

Question 7. For two figures to be on the same base and between the same parallels, one of the lines must be.

(a) Making an acute angle to the common base

(b) The line containing the common base

(c) Perpendicular to the common base

(d) Making an obtuse angle to the common base

Question 8. Two parallelograms are on equal bases and between the same parallels. The ratio of their areas is:

(a) 1 : 3

(b) 1 : 2

(c) 2 : 1

(d) 1 : 1

Question 9. If P and Q are any two points lying on the sides DC and AD respectively of a parallelogram ABCD, then:

(a) ar (APB) > ar(BQC)

(b) ar (APB) < ar(BQC)

(c) ar (APB) = ar(BQC)

(d) None of the above

Question 10. A triangle and a rhombus are on the same base and between the same parallels. Then the ratio of area of triangle to that rhombus is:

(a) 1 : 3

(b) 1 : 2

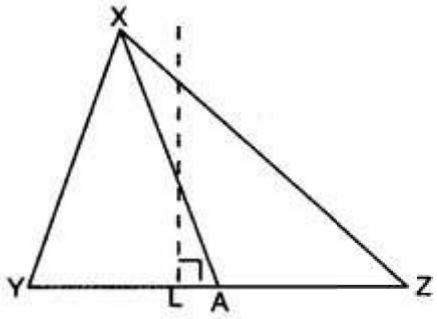
(c) 1 : 1

(d) 1 : 4

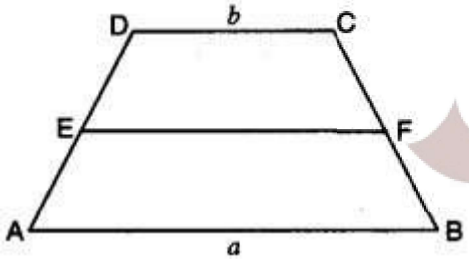
Very Short:

1. Two parallelograms are on equal bases and between the same parallels. Find the ratio of their areas.

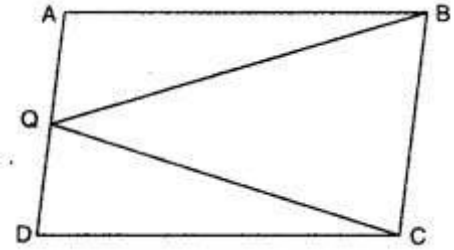
2. In ΔXYZ, XA is a median on side YZ. Find ratio of ar(ΔXYA) : ar(ΔXZA)



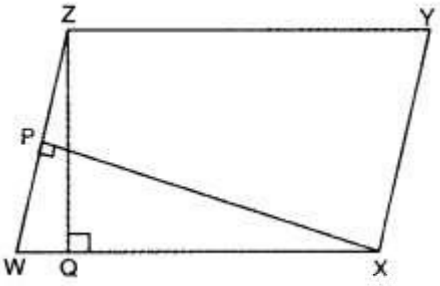
3. ABCD is a trapezium with parallel sides AB = a cm and DC = b cm (fig.). E and F are the mid-points of the non parallel sides. Find the ratio of ar(ABFE) and ar(EFCD).



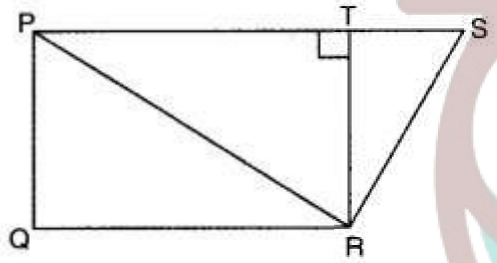
4. ABCD is a parallelogram and Q is any point on side AD. If ar(ΔQBC) = 10 cm2, find ar(ΔQAB) + ar(ΔQDC).



5. WXYZ is a parallelogram with XP ⊥ WZ and ZQ ⊥ WX. If WX = 8 cm, XP = 8 cm and ZQ = 2 cm, find YX.

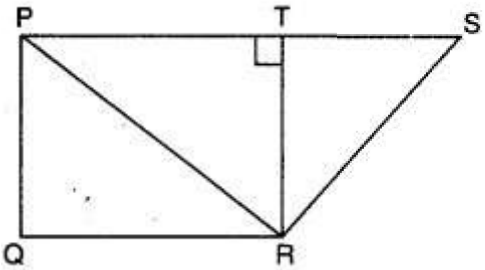


6. In figure, TR ⊥ PS, PQ || TR and PS || QR. If QR = 8 cm, PQ = 3 cm and SP = 12 cm, find ar(quad. PQRS).



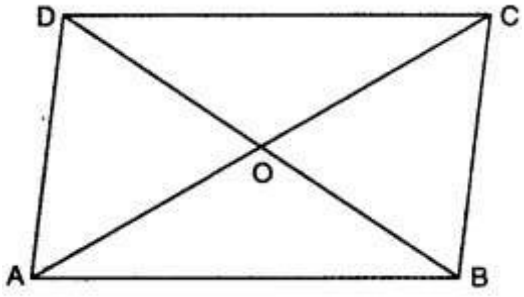
7. In the given figure, ABCD is a parallelogram and L is the mid-point of DC. If ar(quad. ABCL) is 72 cm, then find ar(ΔADC).

8. In figure, TR ⊥ PS, PQ || TR and PS || QR. If QR = 8 cm, PQ = 3 cm and SP = 12 cm, find ar (PQRS).

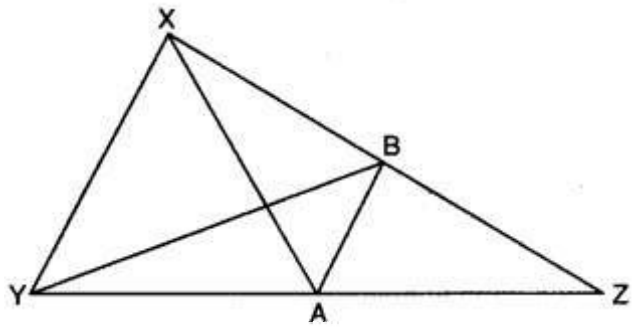


Short Questions:

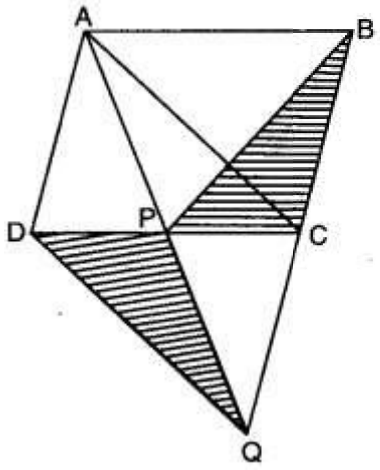
1. ABCD is a parallelogram and O is the point of intersection of its diagonals. If ar(A AOD) = 4 cm\(2\) find area of parallelogram ABCD.



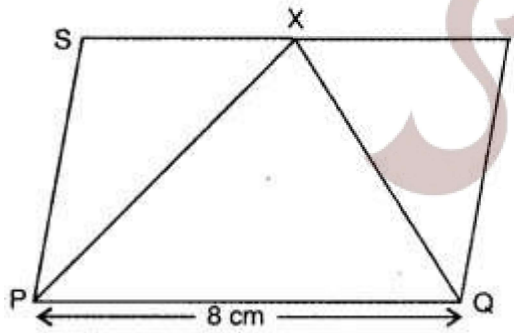
2. In the given figure of ΔXYZ, XA is a median and AB || YX. Show that YB is also a median.



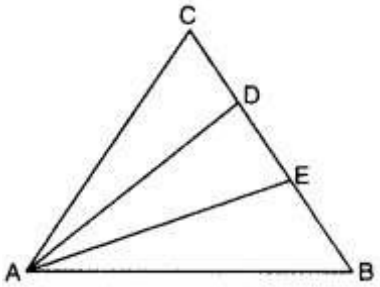
3. ABCD is a trapezium. Diagonals AC and BD intersect each other at O. Find the ratio ar (ΔAOD) : ar (ΔBOC).
4. ABCD is a parallelogram and BC is produced to a point Q such that AD = CQ (fig.). If AQ intersects DC at P, show that ar(ΔBPC) = ar(ΔDPQ).



5. In the figure, PQRS is a parallelogram with PQ = 8 cm and ar(ΔPXQ) = 32 cm2. Find the altitude of gm PQRS and hence its area.

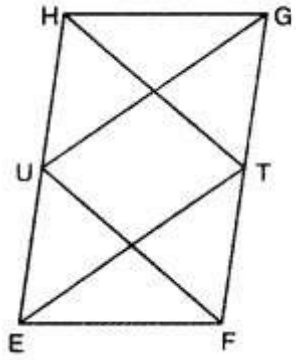


6. In ΔABC. D and E are points on side BC such that CD = DE = EB. If ar(ΔABC) = 27cm, find ar(ΔADE)



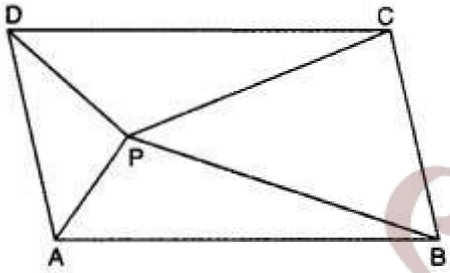
Long Questions:

1. EFGH is a parallelogram and U and T are points on sides EH and GF respectively. If ar(ΔEHT) = 16cm, find ar(ΔGUF).

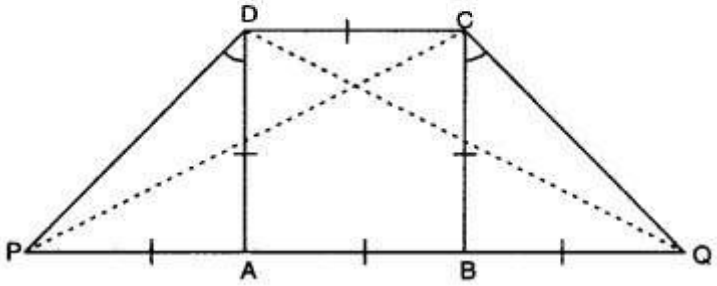


2. ABCD is a parallelogram and P is any point in its interior. Show that:

   ar(ΔAPB) + ar(ΔCPD) = ar(ΔBPC) + ar(ΔAPD)

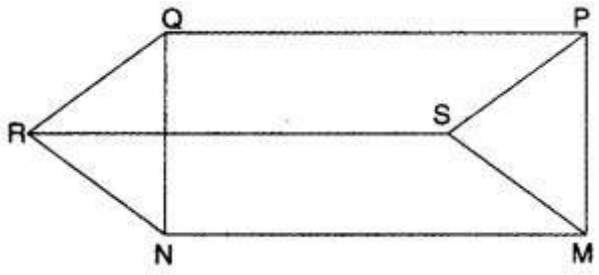


3. In the given figure, ABCD is a square. Side AB is produced to points P and Q in such a way that PA = AB = BQ. Prove that DQ = CP.



4. In the given figure, PQRS, SRNM and PQNM are parallelograms, Show that :

   ar(ΔPSM) = ar(ΔQRN).



5. Naveen was having a plot in the shape of a quadrilateral. He decided to donate some portion of it to construct a home for orphan girls. Further he decided to buy a land in lieu of his donated portion of his plot so as to form a triangle.

   (i) Explain how this proposal will be implemented?

   (ii) Which mathematical concept is used in it?

   (iii) What values are depicted by Naveen?

Assertion and Reason Questions-

1. In these questions, a statement of assertion followed by a statement of reason is given. Choose the correct answer out of the following choices.

a) Assertion and reason both are correct statements and reason is correct explanation for assertion.

b) Assertion and reason both are correct statements but reason is not correct explanation for assertion.

c) Assertion is correct statement but reason is wrong statement.

d) Assertion is wrong statement but reason is correct statement.

Assertion: The area of a parallelogram and a rectangle having a common base and between same parallels are equal.

Reason: Another name of a rectangle is a parallelogram.

2. In these questions, a statement of assertion followed by a statement of reason is given. Choose the correct answer out of the following choices.

a) Assertion and reason both are correct statements and reason is correct explanation for assertion.

b) Assertion and reason both are correct statements but reason is not correct explanation for assertion.

c) Assertion is correct statement but reason is wrong statement.

d) Assertion is wrong statement but reason is correct statement.

Assertion: The parallelogram on the same and between the same parallel are equal in area.

Reason: The areas of parallelogram between the same parallels are equal

Answer Key:

MCQ:

1. (b) Base × Altitude
2. (b) 12cm
3. (c) $30cm^2$
4. (d) Need not be any of (a), (b) or (c).
5. (a) ar (PRD)
6. (a) ar (AOD) = ar (BOC)
7. (b) The line containing the common base
8. (d) 1 : 1
9. (c) ar(APB) = ar(BQC)
10. (b) 1 : 2

Very Short Answer:

1. 1:1 [∵ Two parallelograms on the equal bases and between the same parallels are equal in area.]
2. Here, XA is the median on side YZ.

   ∴ YA = AZ

   Draw XL ⊥ YZ

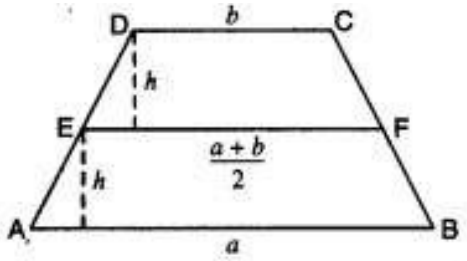
   $$\therefore \text{ar}(\Delta XYA) = \frac{1}{2} \times YA \times XL$$

   $$\text{ar}(\Delta XZA) = \frac{1}{2} \times AZ \times XL$$

   $$\text{Thus, ar } (\Delta XYA) : \text{ar}(\Delta XZA) = \frac{1}{2} \times YA \times XL : \frac{1}{2} \times AZ \times XL$$

   $$= 1 : 1 \qquad [\because YA = AZ]$$

3.



Clearly, $EF = \frac{AB + DC}{2} = \frac{a+b}{2}$

Let h be the height, then

ar(Trap. ABFE) : ar(Trap. EFCD)

$$\Rightarrow \quad \frac{1}{2}\left[a+\left(\frac{a+b}{2}\right)\right] \times h : \frac{1}{2}\left[b+\left(\frac{a+b}{2}\right)\right] \times h$$

$$\Rightarrow \quad \frac{2a+a+b}{2} : \frac{2b+a+b}{2}$$

$$\Rightarrow \quad 3a + b : 3b + a$$

4. Here, ΔQBC and parallelogram ABCD are on the same base BC and lie between the same parallels BC || AD.

   ∴ ar(||gm ABCD) = 2 ar(ΔQBC) ar(ΔQAB) + ar(ΔQDC) + ar(ΔQBC) = 2 ar(ΔQBC)

   ar(ΔQAB) + ar(ΔQDC) = ar(ΔQBC)

   Hence, ar(ΔQAB) + ar(ΔQDC) = 10cm^2

   [∵ ar(ΔQBC) = 10 cm2 (given)]

5. ar(||gm WXYZ) = ar(||gm WXYZ)

WX × ZQ = WZ × XP

8 × 2 = WZ × 8

⇒ WZ = 2cm

Now, YX = WZ = 2cm

[∵ opposite sides of parallelogram are equal]

6. Here,

   PS || QR [given]

   ∴ PQRS is a trapezium

   Now, TR ⊥ PS and PQ || TR [given]

   ⇒ PQ ⊥ PS

   ∴ PQ = TR = 3cm [given]

Now, ar(quad. PQRS) = $\frac{1}{2}$ (PS + QR) × PQ = $\frac{1}{2}$ (12 + 8) × 3 = 30cm^2

7. In ||gm ABCD, AC is the diagonal

$$\therefore \quad ar(\Delta ABC) = ar(\Delta ADC) = \frac{1}{2} ar(||^{gm} ABCD)$$

In ΔADC, AL is the median

$$\therefore \quad ar(\Delta ADL) = ar(\Delta ACL) = \frac{1}{2} ar(\Delta ADC) = \frac{1}{4} ar(||^{gm} ABCD)$$

$$\text{Now, } ar(\text{quad. } ABCL) = ar(\Delta ABC) + ar(\Delta ACL) = \frac{3}{4} ar(||^{gm} ABCD)$$

$$72 \times \frac{4}{3} = ar(||^{gm} ABCD)$$

$$\Rightarrow \quad ar(||^{gm} ABCD) = 96 \text{ cm}^2$$

$$\therefore \quad ar(\Delta ADC) = \frac{1}{2} ar(||^{gm} ABCD) = \frac{1}{2} \times 96 = 48 \text{ cm}^2$$

8. Here, PS || QR

∴ PQRS is a trapezium in which PQ = 3cm, QR = 8cm and SP = 12cm

Now, TR I PS and PQ || TR

∴ PQRT is a rectangle

[∵ PQ || TR, PT || QR and ∠PTR = 90°]

⇒ PQ = TR = 3cm

Now, ar(PQRS) = $\frac{1}{2}$ (PS + QR) × TR = $\frac{1}{2}$ (12 + 8) × 3 = 30cm^2.

Short Answer:

Ans: 1. Here, ABCD is a parallelogram in which its diagonals AC and BD intersect each other in O.

∴ O is the mid-point of AC as well as BD.

Now, in ΔADB, AO is its median

∴ ar(ΔADB) = 2 ar(ΔAOD)

[∵ median divides a triangle into two triangles of equal areas]

So, ar(ΔADB) = 2 × 4 = 8cm^2

Now, ΔADB and ||gm ABCD lie on the same base AB and lie between same parallels AB and CD

∴ ar(ABCD) = 2 ar(ΔADB).

= 2 × 8

= 16cm^2

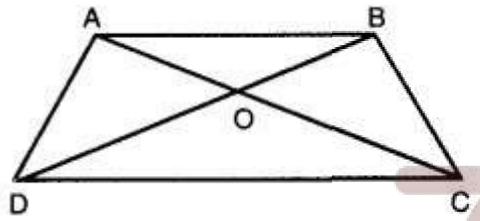
Ans: 2. Here, in ΔXYZ, AB || YX and XA is a median.

∴ A is the mid-point of YZ. Now, AB is a line segment from mid-point of one side (YZ) and parallel to another side (AB || YX), therefore, it bisects the third side XZ.

⇒ B is the mid-point of XZ.

Hence, YB is also a median of ΔXYZ.

Ans: 3.



Here, ABCD is a trapezium in which diagonals AC and BD intersect each other at O. ΔADC and ABCD are on the same base DC and between the same 'parallels i.e., AB || DC.

∴ ar(ΔADC) = ar(ΔBCD)

⇒ ar(ΔAOD) + ar(ΔODC)

= ar(ABOC) + ar (AODC)

⇒ ar(ΔAOD) = ar(ΔBOC)

⇒ $\frac{\text{ar }(\Delta\text{AOD})}{\text{ar }(\Delta\text{BOC})} = 1$

Ans: 4. In ||^{gm} ABCD,

ar(ΔAPC) = ar(ΔBCP) …(i)

[∵ triangles on the same base and between the same parallels have equal area]

Similarly, ar(ΔADQ) = ar(ΔADC) i …(ii)

Now, ar(ΔADQ) – ar(ΔADP) = ar(ΔADC) – ar(ΔADP)

ar(ΔDPQ) = ar(ΔACP) … (iii)

From (i) and (iii), we have

ar(ΔBCP) = ar(ΔDPQ)

or ar(ΔBPC) = ar(ΔDPQ)

Ans: 5. Since parallelogram PQRS and APXQ are on the same base PQ and lie between the same parallels PQ || SR

∴ Altitude of the ΔPXQ and ||gm PQRS is same.

Now, $\frac{1}{2}$ PQ × altitude = ar(ΔPXQ)

$\Rightarrow \frac{1}{2} \times 8 \times$ altitude = 32

altitude = 8cm

ar(||gm PQRS) = 2 ar(ΔPXQ)

$= 2 \times 32 = 64cm^2$

Hence, the altitude of parallelogram PQRS is 8cm and its area is $64cm^2$.

Ans: 6. Since in ΔAEC, CD = DE, AD is a median.

∴ ar(ΔACD) = ar(ΔADE)

[∵ median divides a triangle into two triangles of equal areas]

Now, in ΔABD, DE = EB, AE is a median

ar(ΔADE) = ar(ΔAEB) … (ii)

From (i), (ii), we obtain

ar(ΔACD) = ar(ΔADE) = ar(ΔAEB) $\frac{1}{3}$ ar(ΔABC)

∴ ar(ΔADE) = $\frac{1}{3} \times 27 = 9cm^2$

Long Answer:

Ans: 1. ∴ ar(ΔEHT) = $\frac{1}{2}$ ar(||gm EFGH) …..(i)

Similarly, ΔGUF and parallelogram EFGH are on the same base GF and lie between the same parallels GF and HE

∴ ar(ΔGUF) = $\frac{1}{2}$ ar(||gm EFGH) …..(ii)

From (i) and (ii), we have

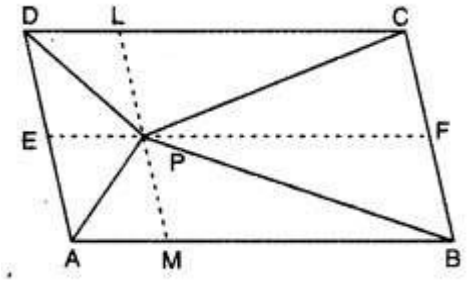
ar(ΔGUF) = ar(ΔEHT)

$= 16cm^2$ [∵ ar(ΔEHT) = $16cm^2$] [given]

Ans: 2. Through P, draw a line LM || DA and EF || AB

Since ΔAPB and ||gm ABFE are on the same base AB and lie between the same parallels AB and EF.

∴ ar(ΔAPB) = $\frac{1}{2}$ ar(||gm ABFE) … (i)



Similarly, ACPD and parallelogram DCFE are on the same base DC and between the same parallels DC and EF.

$\therefore$ ar(ΔCPD) = $\frac{1}{2}$ ar(||^{gm} DCFE) ... (ii)

Adding (i) and (ii), we have

ar(ΔAPB) + ar(ΔCPD) = $\frac{1}{2}$ ar (||^{gm} ABFE) + ar(||^{gm} DCFE)

= $\frac{1}{2}$ ar(||^{gm} ABCD) ... (iii)

Since ΔAPD and parallelogram ADLM are on the same base AB and between the same parallels AD and ML

$\therefore$ ar(ΔAPD) = $\frac{1}{2}$ ar(||^{gm} ADLM) .....(iv)

Similarly, ar(ΔBPC) = $\frac{1}{2}$ = arc||^{gm} BCLM) ....(v)

Adding (iv) and (u), we have

ar(ΔAPD) + ar (ΔBPC) = $\frac{1}{2}$ ar(||^{gm} ABCD) ....(vi)

From (iii) and (vi), we obtain

ar(ΔAPB) + ar(ΔCPD) = ar(ΔAPD) + ar(ABPC)

Ans: 3. In ΔPAD, $\angle$A = 90° and DA = PA = AB

$\Rightarrow \angle ADP = \angle APD = \frac{90°}{2} = 45°$

Similarly, in ΔQBC, $\angle$B = 90° and BQ = BC = AB

$\Rightarrow \angle BCQ = \angle BQC = \frac{90°}{2} = 45°$

In ΔPAD and ΔQBC, we have

PA = BQ [given]

$\angle$A = $\angle$B [each = 90°]

AD = BC [sides of a square]

$\Rightarrow \angle PAD \cong \Delta QBC$ [by SAS congruence rule]

$\Rightarrow$ PD = QC [c.p.c.t.]

Now, in APDC and ΔQCD

DC = DC [common]

PD = QC [prove above]

∠PDC = ∠QCD [each = 90° + 45° = 135°]

⇒ ΔPDC = ΔQCD [by SAS congruence rule]

⇒ PC = QD or DQ = CP

Ans: 4. Since PQRS is a parallelogram.

∴ PS = QR and PS || QR

Since SRNM is also a parallelogram.

∴ SM = RN and SM || RN

Also, PQNM is a parallelogram

∴ PM || QM and PM = QM

Now, in APSM and ΔQRN

PS = QR

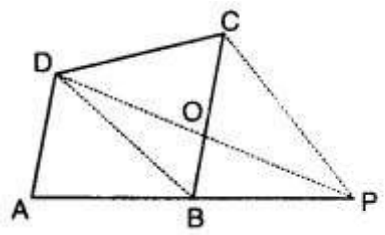
SM = RN

PM = QN

ΔPSM ≅ ΔQRN [by SSS congruence axiom]

∴ ar (ΔPSM) = ar (ΔQRN) [congruent triangles have same areas)

Ans: 5.



(i) Let ABCD be the plot and Naveen decided to donate some portion to construct a home for orphan girls from one corner say C of plot ABCD. Now, Naveen also purchases equal amount of land in lieu of land CDO, so that he may have triangular form of plot. BD is joined. Draw a line through C parallel to DB to meet AB produced in P.

Join DP to intersect BC at 0.

Now, ABCD and ABPD are on the same base and between same parallels CP || DB.

ar(ΔBCD) = ar(ΔBPD) ar(ΔCOD) + ar(ΔDBO) = ar(ΔBOP) + ar(ΔDBO)

ar(ACOD) = ar(ABOP) ar(quad. ABCD)

= ar(quad. ABOD) + ar(ΔCOD)

= ar(quad. ABOD) + ar(ΔBOP)

[∵ ar(ACOD) = ar(ABOP)] (proved above]

= ar(ΔAPD)

Hence, Naveen purchased the portion ABOP to meet his requirement.

(ii) Two triangles on the same base and between same parallels are equal in area.

(iii) We should help the orphan children.

Assertion and Reason Answers-

1. a) Assertion and reason both are correct statements and reason is correct explanation for assertion.

2. c) Assertion is correct statement but reason is wrong statement.