MATHEMATICS

Important Questions

Multiple Choice questions-

Question 1. △ABC = △PQR, then which of the following is true?

(a) CB = QP

(b) CA = RP

(c) AC = RQ

(d) AB = RP

Question 2. In △ABC and △DEF, AB = DE and ∠A = ∠D. Then two triangles will be congruent by SA axiom if:

(a) BC = EF

(b) AC = EF

(c) AC = DE

(d) BC = DE

Question 3. In a right triangle, the longest side is:

(a) Perpendicular

(b) Hypotenuse

(c) Base

(d) None of the above

Question 4. In △ABC, if ∠A = 45° and ∠B = 70°, then the shortest and the longest sides of the triangle are respectively,

(a) BC, AB

(a) AB, AC

(c) AB, BC

(d) BC, AC

Question 5. If the altitudes from vertices of a triangle to the opposite sides are equal, then the triangles is

(a) Scalene

(b) Isosceles

(c) Equilateral

(d) Right-angled

Question 6. D is a Point on the Side BC of a △ABC such that AD bisects ∠BAC then:

(a) BD = CD

(b) CD > CA

(c) BD > BA

(d) BA > BD

Question 7. If ΔABC ≅ ΔPQR then which of the following is true:

(a) CA = RP

(b) AB = RP

(c) AC = RQ

(d) CB = QP

Question 8. If two triangles ABC and PQR are congruent under the correspondence A ↔ P, B ↔ Q, and C ↔ R, then symbolically, it is expressed as

(a) ΔABC ≅ ΔPQR

(b) ΔABC = ΔPQR

(c) ΔABC and ΔPQR are scalene triangles

(d) ΔABC and ΔPQR are isosceles triangles

Question 9. If the bisector of the angle A of an △ABC is perpendicular to the base BC of the triangle then the triangle ABC is:

(a) Obtuse Angled

(b) Isosceles

(c) Scalene

(d) Equilateral

Question 10.

If AB = QR, BC=RP and CA = QP, then which of the following holds?

(a) △BCA ≅ △PQR

(b) △ABC ≅ △PQR

(c) △CBA ≅ △PQR

(d) △CAB ≅ △PQR

Very Short:

1. Find the measure of each exterior angle of an equilateral triangle.

2. If in ΔABC, ∠A = ∠B + ∠C, then write the shape of the given triangle.

3. In ΔPQR, PQ = QR and ∠R = 50°, then find the measure of ∠Q.

4. If ΔSKY ≅ ΔMON by SSS congruence rule, then write three equalities of corresponding angles.

5. Is ΔABC possible, if AB = 6 cm, BC = 4 cm and AC = 1.5cm?

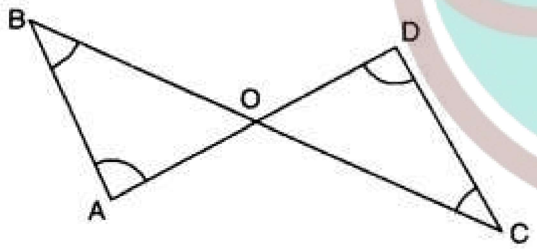
6. In ΔMNO, if ∠N = 90°, then write the longest side.

7. In ΔABC, if AB = AC and ∠B = 70°, find ∠A.

8. In ΔABC, if AD is a median, then show that AB + AC > 2AD.

Short Questions:

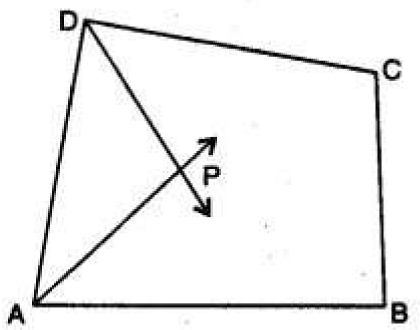
1. In the given figure, AD = BC and BD = AC, prove that ∠DAB = ∠CBA.
2. In the given figure, ΔABD and ABCD are isosceles triangles on the same base BD. Prove that ∠ABC = ∠ADC.
3. In the given figure, if ∠1 = ∠2 and ∠3 = ∠4, then prove that BC = CD.
4. In the given figure, ∠B < ∠A and ∠C < ∠D. Show that AD < BC.



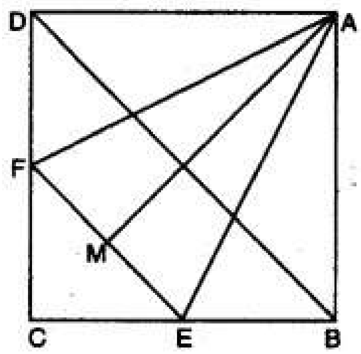
5. In the given figure, AC > AB and D is a point on AC such that AB = AD. Show that BC > CD.
6. In a triangle ABC, D is the mid-point of side AC such that $BD = \frac{1}{2}$ AC Show that ∠ABC is a right angle.

Long Questions:

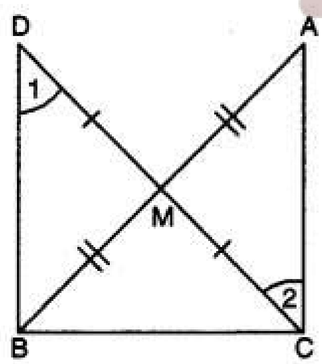
1. In the given figure, AP and DP are bisectors of two adjacent angles A and D of quadrilateral ABCD. Prove that 2 ∠APD = ∠B + 2C



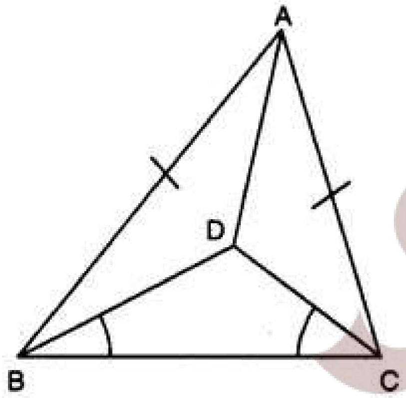
2. In figure, ABCD is a square and EF is parallel to diagonal BD and EM = FM. Prove that (i) DF = BE (i) AM bisects ∠BAD.



3. In right triangle ABC, right-angled at C, M is the mid-point of hypotenuse AB. C is joined to M and produced to a point D such that DM = CM. Point D is joined to point B (see fig.). Show that : (i) ΔAMC ≅ ΔBMD (ii) ∠DBC = 90° (ii) ΔDBC ≅ ΔACB (iv) $CM = \frac{1}{2} AB$



4. In figure, ABC is an isosceles triangle with AB = AC. D is a point in the interior of ΔABC such that ∠BCD = ∠CBD. Prove that AD bisects ∠BAC of ΔABC.



5. Prove that two triangles are congruent if any two angles and the included side of one triangle is equal to any two angles and the included side of the other triangle.

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: If we draw two triangles with angles 30°, 70° and 80° and the length of the sides of one triangle be different than that of the corresponding sides of the other triangle then two triangles are not congruent.

Reason: If two triangles are constructed which have all corresponding angles equal but have unequal corresponding sides, then two triangles cannot be congruent to each other.

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.

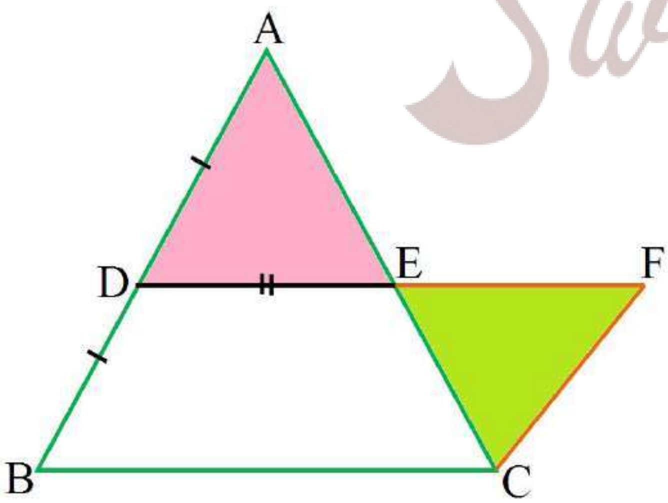
d) Assertion is wrong statement but reason is correct statement.

Assertion: If the bisector of the vertical angle of a triangle bisects the base of the triangle, then the triangle is equilateral.

Reason: If three sides of one triangle are equal to three of the other triangle, then the two triangles are congruent.

Case Study Questions-

1. Read the Source/ Text given below and answer these questions:



Hareesh and Deep were trying to prove a theorem. For this they did the following:

i. Drew a triangle ABC.
ii. D and E are found as the mid points of AB and AC.
iii. DE was joined and DE was extended to F so DE = EF.
iv. FC was joined.

Answer the following questions:

i. △ADE and △EFC are congruent by which criteria?
   a. SSS
   b. RHS
   c. SAS
   d. ASA

ii. ∠EFC is equal to which angle?
   a. ∠DAE
   b. ∠ADE
   c. ∠AED
   d. ∠B

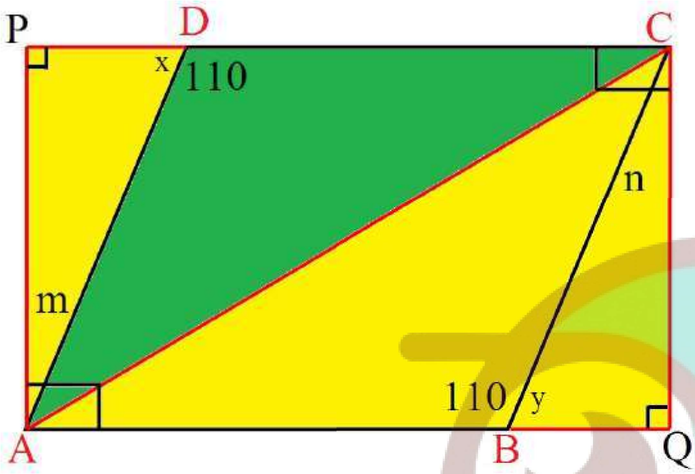
iii. ∠ECF is equal to which angle?
   a. ∠DAE
   b. ∠ADE
   c. ∠AED
   d. ∠B

iv. CF is equal to which of the following?
   a. BD
   b. CE
   c. AE
   d. EF

v. CF is parallel to which of the following?
   a. AE
   b. CE
   c. BD
   d. EF

2. Read the Source/ Text given below and answer these questions:

In the middle of the city, there was a park ABCD in the form of a parallelogram form so that AB = CD, AB || CD and AD = BC, AD || BC Municipality converted this park into a rectangular form by adding land in the form of △APD and △BCQ. Both the triangular shape of land were covered by planting flower plants.



Answer the following questions:

i. What is the value of ∠x?

a. 110°

b. 70°

c. 90°

d. 100°

ii. △APD and △BCQ are congruent by which criteria?

a. SSS

b. SAS

c. ASA

d. RHS

iii. PD is equal to which side?

a. DC

b. AB

c. BC

d. BQ

iv. △ABC and △ACD are congruent by which criteria?

a. SSS

b. SAS

c. ASA

d. RHS

v. What is the value of ∠m?

a. 110°

b. 70°

c. 90°

d. 20°

Answer Key:

MCQ:

1. (b) CA = RP
2. (c) AC = DE
3. (b) Hypotenuse
4. (d) BC,AC
5. (b) Isosceles
6. (d) BA > BD
7. (a) CA = RP
8. (a) ΔABC ≅ ΔPQR
9. (b) Isosceles
10. (d) △CAB ≅ △PQR

Very Short Answer:

1. We know that each interior angle of an equilateral triangle is 60°.

   ∴ Each exterior angle = 180° – 60° = 120°

2. Here, ∠A = ∠B + ∠C

   And in ΔABC, by angle sum property, we have

   ∠A + ∠B + C = 180°

   ⇒ ∠A + ∠A = 180°

   ⇒ 2∠A = 180°

   ⇒ ∠A = 90°

   Hence, the given triangle is a right triangle.

3. Here, in ΔPQR, PQ = QR

   ⇒ ∠R = ∠P = 50° (given)

Now, ∠P + ∠Q + ∠R = 180°

50° + ∠Q + 50° = 180°

⇒ ∠Q = 180° – 50° – 50°

= 80°

4. Since ΔSKY ≅ ΔMON by SSS congruence rule, then three equalities of corresponding angles are ∠S = ∠M, ∠K = ∠O and ∠Y = ∠N.

5. Since 4 + 1.5 = 5.5 ≠ 6

Thus, triangle is not possible.

6. We know that, side opposite to the largest angle is longest.

∴ Longest side = MO.

7. Here, in ΔABC AB = AC ∠C = ∠B [∠s opp. to equal sides of a Δ)

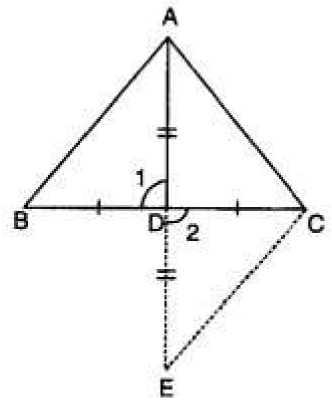
Now, ∠A + ∠B + ∠C = 180°

⇒ ∠A + 70° + 70° = 180°

[∵ ∠B = 70°]

⇒ ∠A = 180° – 70° – 70° = 40°

8.



Produce AD to E, such that AD = DE.

In ΔADB and ΔEDC, we have

BD = CD, AD = DE and ∠1 = ∠2

ΔADB ≅ ΔEDC

AB = CE

Now, in ΔAEC, we have

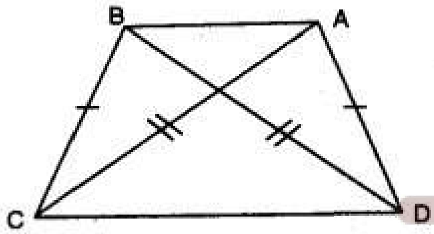
AC + CE > AE

AC + AB > AD + DE

AB + AC > 2AD [∵ AD = DE]

Short Answer:

Ans: 1.



In ΔDAB and ΔCBA, we have

AD = BC [given]

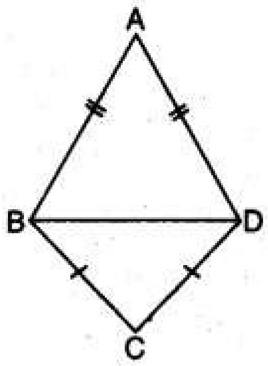
BD = AC [given]

AB = AB [common]

∴ ΔDAB ≅ ΔCBA [by SSS congruence axiom]

Thus, ∠DAB =∠CBA [c.p.c.t.]

Ans: 2.



In ΔABD, we have

AB = AD (given)

∠ABD = ∠ADB [angles opposite to equal sides are equal] ...(i)

In ΔBCD, we have

CB = CD

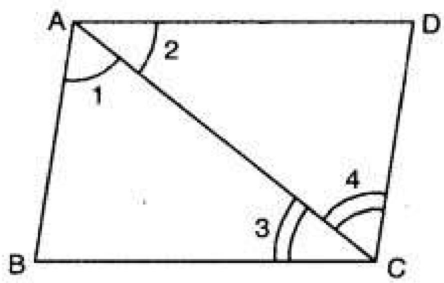
⇒ ∠CBD = ∠CDB [angles opposite to equal sides are equal] ... (ii)

Adding (i) and (ii), we have

∠ABD + ∠CBD = ∠ADB + ∠CDB

⇒ ∠ABC = ∠ADC

Ans: 3.



In ΔABC and ACDA, we have

∠1 = ∠2 (given)

AC = AC [common]

∠3 = ∠4 [given]

So, by using ASA congruence axiom

ΔABC ≅ ΔCDA

Since corresponding parts of congruent triangles are equal

∴ BC = CD

Ans: 4. In ΔABC and ACDA, we have

∠1 = ∠2 (given)

AC = AC [common]

∠3 = ∠4 [given]

So, by using ASA congruence axiom

ΔABC ≅ ΔCDA

Since corresponding parts of congruent triangles are equal

∴ BC = CD

Ans: 5. Here, in ΔABD, AB = AD

∠ABD = ∠ADB

[∠s opp. to equal sides of a Δ]

In ΔBAD

ext. ∠BDC = ∠BAD + ∠ABD

⇒ ∠BDC > ∠ABD …. (ii)

Also, in ΔBDC.

ext. ∠ADB > ∠CBD …(iii)

From (ii) and (iii), we have

∠BDC > CD [∵ sides opp. to greater angle is larger]

Ans: 6. Here, in ΔABC, D is the mid-point of AC.

⇒ AD = CD $= \frac{1}{2}$ AC ….(i)

Also, BD $= \frac{1}{2}$ AC …. (ii) [Given]

From (i) and (ii), we obtain

AD = BD and CD = BD

⇒ ∠2 = ∠4 and ∠1 = ∠3 …..(iii)

In ΔABC, we have

∠ABC + ∠ACB + ∠CAB = 180°

⇒ ∠1 + ∠2 + ∠3 + ∠4 = 180°

⇒ ∠1 + ∠2 + ∠1 + ∠2 = 180° [using (iii)]

⇒ 2(∠1 + ∠2) = 180°

⇒ ∠1 + ∠2 = 90°

Hence, ∠ABC = 90°

Long Answer:

Ans: 1. Here, AP and DP are angle bisectors of ∠A and ∠D

∴ ∠DAP $= \frac{1}{2}$∠DAB and ∠ADP $= \frac{1}{2}$∠ADC ……(i)

In ΔAPD, ∠APD + ∠DAP + ∠ADP = 180°

⇒ ∠APD + $\frac{1}{2}$ ∠DAB + $\frac{1}{2}$∠ADC = 180°

⇒ ∠APD = 180° - $\frac{1}{2}$ (∠DAB + ∠ADC)

⇒ 2∠APD = 360° – (∠DAB + ∠ADC) ……(ii)

Also, ∠A + ∠B + C + ∠D = 360°

∠B + 2C = 360° – (∠A + ∠D)

∠B + C = 360° – (∠DAB + ∠ADC) ……(iii)

From (ii) and (iii), we obtain

2∠APD = ∠B + ∠C

Ans: 2. (i) EF || BD = ∠1 = ∠2 and ∠3 = ∠4 [corresponding ∠s]

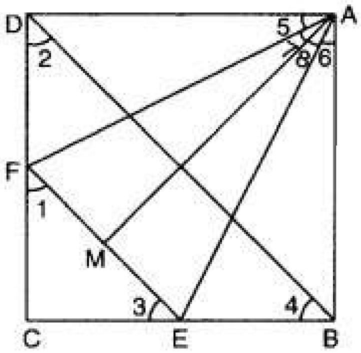
Also, ∠2 = ∠4

⇒ ∠1 = ∠3

⇒ CE = CF (sides opp. to equals ∠s of a Δ]

∴ DF = BE

[∵ BC – CE = CD – CF)



(ii) In ΔADF and ΔABE, we have

AD = AB [sides of a square]

DF = BE [proved above]

∠D = ∠B = 90°

⇒ ΔADF ≅ ΔABE [by SAS congruence axiom]

⇒ AF = AE and ∠5 = ∠6 … (i) [c.p.c.t.]

In ΔAMF and ΔAME

AF = AE [proved above]

AM = AM [common]

FM = EM (given)

∴ ΔAMF ≅ ΔAME [by SSS congruence axiom]

∴ ∠7 = ∠8 …(ii) [c.p.c.t.]

Adding (i) and (ii), we have

∠5 + ∠7 = ∠6 + ∠8

∠DAM = ∠BAM

∴ AM bisects ∠BAD.

Ans: 3. Given: ΔACB in which 4C = 90° and M is the mid-point of AB.

To Prove:

(i) ΔAMC ≅ ΔBMD

(ii) ∠DBC = 90°

(iii) ΔDBC ≅ ΔACB

(iv) CM $= \frac{1}{2}$ AB

Proof: Consider ΔAMC and ΔBMD,

we have AM = BM [given]

CM = DM [by construction]

∠AMC = ∠BMD [vertically opposite angles]

∴ ΔAMC ≅ ΔBMD [by SAS congruence axiom]

⇒ AC = DB ...(i) [by c.p.c.t.]

and ∠1 = ∠2 [by c.p.c.t.]

But ∠1 and ∠2 are alternate angles.

⇒ BD || CA

Now, BD || CA and BC is transversal.

∴ ∠ACB + ∠CBD = 180°

⇒ 90° + CBD = 180°

⇒ ∠CBD = 90°

In ΔDBC and ΔACB,

we have CB = BC [common]

DB = AC [using (i)]

∠CBD = ∠BCA

∴ ΔDBC ≅ ΔACB

⇒ DC = AB

$\Rightarrow \frac{1}{2}\ \mathrm{AB} = \frac{1}{2}\ \mathrm{DC}$

$\Rightarrow \frac{1}{2}\ \mathrm{AB} = \mathrm{CM}\ \mathrm{Or}\ \mathrm{CM} = \frac{1}{2}\ \mathrm{AB}\ (\because \mathrm{CM} = \frac{1}{2}\ \mathrm{DC})$

Ans: 4. In ΔBDC, we have ∠DBC = ∠DCB (given).

⇒ CD = BD (sides opp. to equal ∠s of ΔDBC)

Now, in ΔABD and ΔACD,

we have AB = AC [given]

BD = CD [proved above]

AD = AD [common]

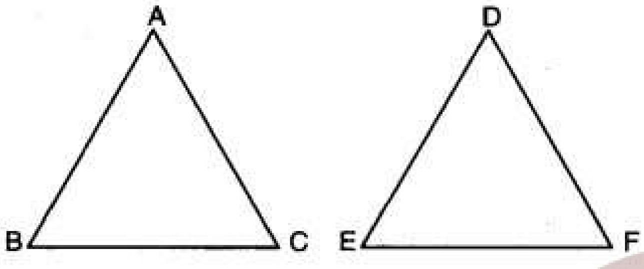
∴ By using SSS congruence axiom, we obtain

ΔABD ≅ ΔACD

⇒ ∠BAD = ∠CAD [c.p.ç.t.]

Hence, AD bisects ∠BAC of ΔABC.

Ans: 5.



Given: Two As ABC and DEF in which

∠B = ∠E,

∠C = ∠F and BC = EF

To Prove: ΔABC = ΔDEF

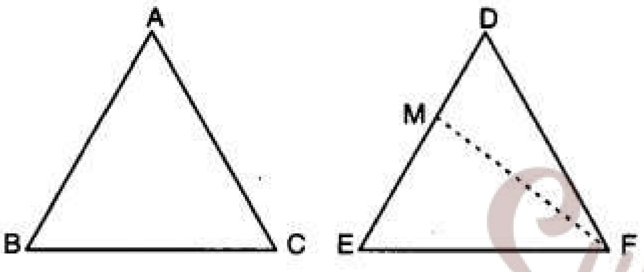
Proof: We have three possibilities

Case I. If AB = DE,

we have AB = DE,

∠B = ∠E and BC = EF.

So, by SAS congruence axiom, we have ΔABC ≅ ΔDEF



Case II. If AB < ED, then take a point Mon ED

such that EM = AB.

Join MF.

Now, in ΔABC and ΔMEF,

we have

AB = ME, ∠B = ∠E and BC = EF.

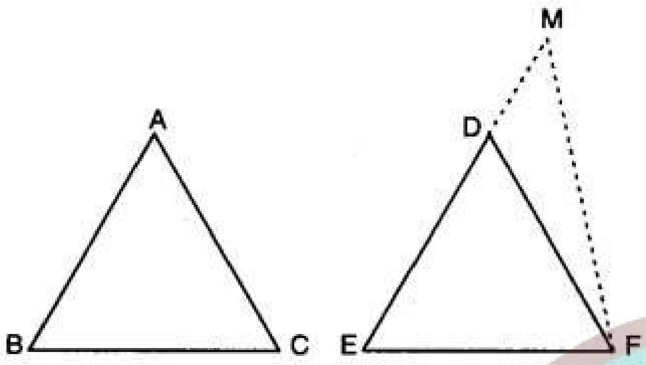
So, by SAS congruence axiom,

we have ΔABC ≅ ΔMEF

⇒ ∠ACB = ∠MFE

But ∠ACB = ∠DFE

∴ ∠MFE = ∠DFE



Which is possible only when FM coincides with B FD i.e., M coincides with D.

Thus, AB = DE

∴ In ΔABC and ΔDEF, we have

AB = DE,

∠B = ∠E and BC = EF

So, by SAS congruence axiom, we have

ΔABC ≅ ΔDEF

Case III. When AB > ED

Take a point M on ED produced

such that EM = AB.

Join MF

Proceeding as in Case II, we can prove that

ΔABC = ΔDEF

Hence, in all cases, we have

ΔABC = ΔDEF.

Assertion and Reason Answers-

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

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

Case Study Answers-

1.

(i)	(c)	SAS
(ii)	(b)	∠ADE∠ADE
(iii)	(a)	∠DAE∠DAE
(iv)	(a)	BD
(v)	(c)	BD

2.

(i)	(b)	70°
(ii)	(c)	ASA
(iii)	(d)	BQ
(iv)	(a)	SSS
(v)	(d)	20°