ASSERTION REASONING QUESTIONS

DIRECTION : In the following questions, a statement of assertion (A) is followed by a statement of reason (R). Mark the correct choice as:

(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).

(b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).

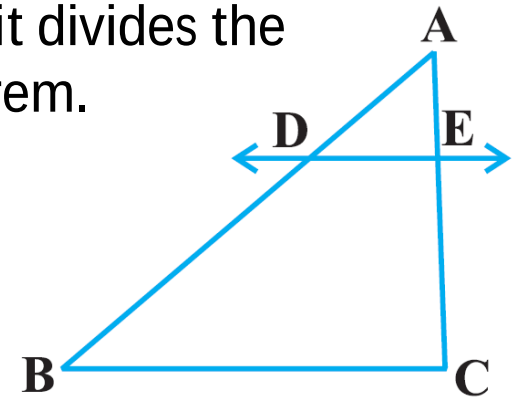
(c) Assertion (A) is true but reason (R) is false.

(d) Assertion (A) is false but reason (R) is true.

1. Assertion : D and E are points on the sides AB and AC respectively of a ΔABC such that DE ∥ BC then the value of x is 4, when AD = x cm, DB = (x – 2) cm, AE = (x + 2) cm and EC = (x – 1) cm.

Reason : If a line is parallel to one side of a triangle then it divides the other two sides in the same ratio.

Ans: We know that If a line is parallel to one side of a triangle then it divides the other two sides in the same ratio. This is Basic Proportionality theorem.



So, Reason is correct.

By Basic Proportionality theorem, we have $\frac{AD}{DB} = \frac{AE}{EC}$

$\Rightarrow \frac{x}{x-2} = \frac{x+2}{x-1}$

$\Rightarrow x(x-1) = (x-2)(x+2)$

$\Rightarrow x^2 - x = x^2 - 4$

$\Rightarrow x = 4$ cm

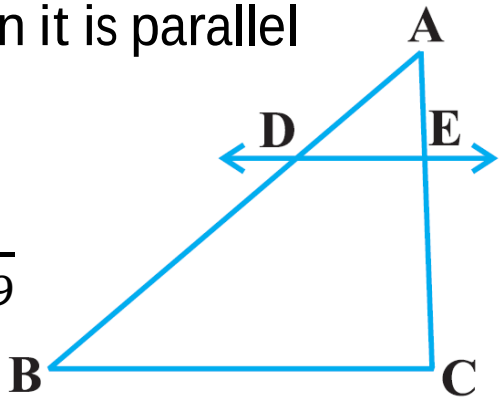
So, Assertion is correct

Correct option is (a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).

2. Assertion : D and E are points on the sides AB and AC respectively of a ΔABC such that DE ∥ BC then the value of x is 11, when AD = 4cm, DB = (x – 4) cm, AE = 8cm and EC = (3x – 19) cm.

Reason : If a line divides any two sides of a triangle in the same ratio then it is parallel to the third side.

Ans: If a line divides any two sides of a triangle in the same ratio then it is parallel to the third side. This is Converse of Basic Proportionality theorem.



So, Reason is correct.

By Basic Proportionality theorem, we have $\frac{AD}{DB} = \frac{AE}{EC} \Rightarrow \frac{4}{x-4} = \frac{8}{3x-19}$

$\Rightarrow$ 4 (3x – 19) = 8 (x – 4)

$\Rightarrow$12x – 76 = 8x – 32

$\Rightarrow$ 4x = 44 $\Rightarrow$ x = 11 cm

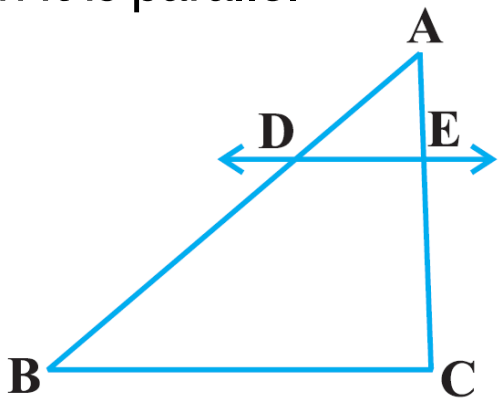
So, Assertion is correct

But reason (R) is not the correct explanation of assertion (A).

Correct option is (b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).

3. Assertion : D and E are points on the sides AB and AC respectively of a ΔABC such that AD = 5.7cm, DB = 9.5cm, AE = 4.8cm and EC = 8cm then DE is not parallel to BC.
Reason : If a line divides any two sides of a triangle in the same ratio then it is parallel to the third side.

Ans: If a line divides any two sides of a triangle in the same ratio then it is parallel to the third side. This is Converse of Basic Proportionality theorem.



So, Reason is correct.

Now, $\frac{AD}{DB} = \frac{5.7}{9.5} = \frac{57}{95} = \frac{3}{5}$

and $\frac{AE}{EC} = \frac{4.8}{8} = \frac{48}{80} = \frac{3}{5}$

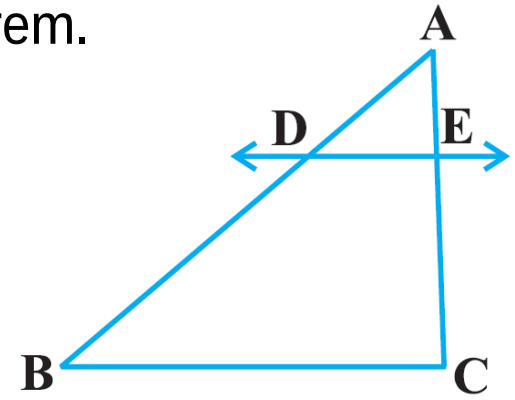
$\Rightarrow \frac{AD}{DB} = \frac{AE}{EC}$

By Converse of Basic Proportionality theorem, DE ∥ BC

So, Assertion is not correct

Correct option is (d) Assertion (A) is false but reason (R) is true.

4. Assertion : D and E are points on the sides AB and AC respectively of a ΔABC such that AB = 10.8cm, AD = 6.3cm, AC = 9.6cm and EC = 4cm then DE is parallel to BC.
Reason : If a line is parallel to one side of a triangle then it divides the other two sides in the same ratio.
Ans: We know that If a line is parallel to one side of a triangle then it divides the other two sides in the same ratio. This is Basic Proportionality theorem.
So, Reason is correct.



DB = 10.8 – 6.3 = 4.5 cm and AE = 9.6 – 4 = 5.6 cm

Now, $\frac{AD}{DB} = \frac{6.3}{4.5} = \frac{63}{45} = \frac{7}{5}$ and $\frac{AE}{EC} = \frac{5.6}{4} = \frac{56}{40} = \frac{7}{5}$

$\Rightarrow \frac{AD}{DB} = \frac{AE}{EC}$

By Converse of Basic Proportionality theorem, DE ∥ BC
So, Assertion is correct
But reason (R) is not the correct explanation of assertion (A).
Correct option is (b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).

5. Assertion : ΔABC ~ ΔDEF such that ar(ΔABC) = 36cm^2 and ar(ΔDEF) = 49cm^2. Then, the ratio of their corresponding sides is 6 : 7

Reason : The ratio of the areas of two similar triangles is equal to the square of the ratio of their corresponding sides.

Ans : We know that the ratio of the areas of two similar triangles is equal to the square of the ratio of their corresponding sides.

So, Reason is correct

$$\Rightarrow \frac{ar(\Delta ABC)}{ar(\Delta DEF)} = \frac{AB^2}{DE^2}$$

$$\Rightarrow \frac{36}{49} = \frac{AB^2}{DE^2}$$

$$\Rightarrow \frac{AB}{DE} = \frac{6}{7}$$

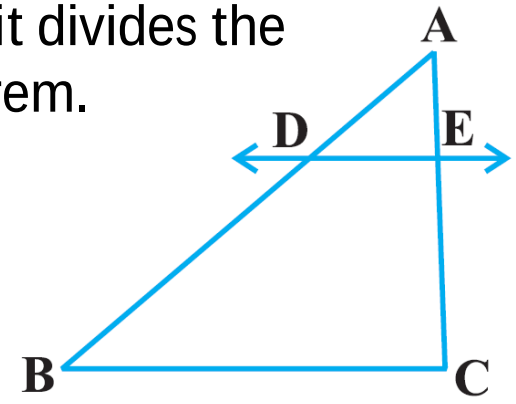
So, Assertion is correct

Correct option is (a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).

6. Assertion : If a line intersects sides AB and AC of a Δ ABC at D and E respectively and is parallel to BC, then $\frac{AD}{AB} = \frac{AE}{AC}$

Reason : If a line is parallel to one side of a triangle then it divides the other two sides in the same ratio.

Ans: We know that If a line is parallel to one side of a triangle then it divides the other two sides in the same ratio. This is Basic Proportionality theorem.



So, Reason is correct.

By Basic Proportionality theorem, we have $\frac{AD}{DB} = \frac{AE}{EC}$

$\Rightarrow \frac{DB}{AD} = \frac{EC}{AE} \Rightarrow \frac{DB}{AD} + 1 = \frac{EC}{AE} + 1$

$\Rightarrow \frac{DB+AD}{AD} = \frac{EC+AE}{AE} \Rightarrow \frac{AB}{AD} = \frac{AC}{AE} \Rightarrow \frac{AD}{AB} = \frac{AE}{AC}$

So, Assertion is correct

Correct option is (a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).

7. Assertion : In the ΔABC , $AB = 24$ cm, $BC = 7$ cm and $AC = 25$ cm, then ΔABC is a right angle triangle.

Reason : The ratio of the areas of two similar triangles is equal to the square of the ratio of their corresponding sides.

Ans : We know that the ratio of the areas of two similar triangles is equal to the square of the ratio of their corresponding sides.

So, Reason is correct

Now, $AB^2 + BC^2 = 24^2 + 10^2$

$= 576 + 49 = 625$

$= AC^2$

$\Rightarrow AB^2 + BC^2 = AC^2$

By converse of Pythagoras theorem, ΔABC is a right angled triangle.

So, Assertion is also correct.

But reason (R) is not the correct explanation of assertion (A).

Correct option is (b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).

8. Assertion : ABC is an isosceles triangle with AC = BC. If $AB^2 = 2\,AC^2$, then ΔABC is a right triangle.

Reason : If in a triangle, square of one side is equal to the sum of the squares of the other two sides, then the angle opposite the first side is a right angle.

Ans : We know that If in a triangle, square of one side is equal to the sum of the squares of the other two sides, then the angle opposite the first side is a right angle. This is converse of Pythagoras theorem.

So, Reason is correct

$AB^2 = 2AC^2 = AC^2 + AC^2$

$= BC^2 + AC^2$ [∵ AC = BC Given]

$\Rightarrow AB^2 = BC^2 + AC^2$

By converse of Pythagoras theorem, ΔABC is a right angled triangle.

So, Assertion is also correct.

Correct option is (a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).

9. Assertion : ABC is an isosceles triangle right angled at C then $AB^2 = 2AC^2$.
Reason : If in a triangle, square of one side is equal to the sum of the squares of the other two sides, then the angle opposite the first side is a right angle.

Ans : We know that If in a triangle, square of one side is equal to the sum of the squares of the other two sides, then the angle opposite the first side is a right angle. This is converse of Pythagoras theorem.
So, Reason is correct

By Pythagoras theorem, we have $AB^2 = AC^2 + BC^2$

$= AC^2 + AC^2$ [$\because$ AC = BC Given]

$\Rightarrow AB^2 = 2AC^2$

So, Assertion is also correct.
But reason (R) is not the correct explanation of assertion (A).
Correct option is (b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).

10. Assertion : In ΔABC , AB = 6√3, AC = 12 cm and BC = 6cm then ∠B = 90^0.
Reason : If in a triangle, square of one side is equal to the sum of the squares of the other two sides, then the angle opposite the first side is a right angle.

Ans : We know that If in a triangle, square of one side is equal to the sum of the squares of the other two sides, then the angle opposite the first side is a right angle. This is converse of Pythagoras theorem.
So, Reason is correct

Now, $AB^2 = (6\sqrt{3})^2 = 108$
$AC^2 = 12^2 = 144$
and $BC^2 = 6^2 = 36$
$\therefore AC^2 = AB^2 + BC^2$
By converse of Pythagoras theorem, ∠B = 90^0
So, Assertion is also correct.
Correct option is (a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).

11. Assertion : The areas of two similar triangles *ABC* and *PQR* are in the ratio 9 :16. If *BC* = 4.5 cm, then the length of *QR* is 6 cm.
Reason : The ratio of the areas of two similar triangles is equal to the ratio of their corresponding sides.

Ans : We know that the ratio of the areas of two similar triangles is equal to the square of the ratio of their corresponding sides.
So, Reason is not correct

$$\Rightarrow \frac{ar(\Delta ABC)}{ar(\Delta PQR)} = \frac{BC^2}{QR^2}$$

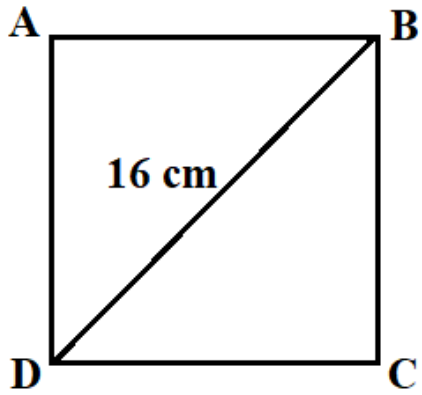
$$\Rightarrow \frac{9}{16} = \frac{BC^2}{QR^2}$$

$$\Rightarrow \frac{BC}{QR} = \frac{3}{4} \Rightarrow \frac{4.5}{QR} = \frac{3}{4} \Rightarrow QR = \frac{4.5 \times 4}{3} \Rightarrow QR = 6 \text{ cm}$$

So, Assertion is correct
Correct option is (c) Assertion (A) is true but reason (R) is false.

12. Assertion : The length of the side of a square whose diagonal is 16 cm, is $8\sqrt{2}$ cm
Reason : In a right triangle, the square of the hypotenuse is equal to the sum of the squares of the other two sides.

Ans : We know that In a right triangle, the square of the hypotenuse is equal to the sum of the squares of the other two sides. This is Pythagoras theorem.
So, Reason is correct



Let the side of square be x cm.
In ΔABD, by Pythagoras theorem, we have $BD^2 = AB^2 + AD^2$
$\Rightarrow 16^2 = x^2 + x^2$
$\Rightarrow 2x^2 = 256 \quad \Rightarrow x^2 = 128 \quad \Rightarrow x = 8\sqrt{2}$ cm
So, Assertion is also correct.
Correct option is (a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).