1. Let ABCD be a parallelogram. Let P, Q, R, S be the mid-points of sides AB, BC, CD, DA respectively. Consider the following statements:

Area of triangle APS < Area of triangle DSR if BD < AC.

Area of triangle ABC = 4 (Area of triangle BPQ).

Select the correct answer using the code given below:

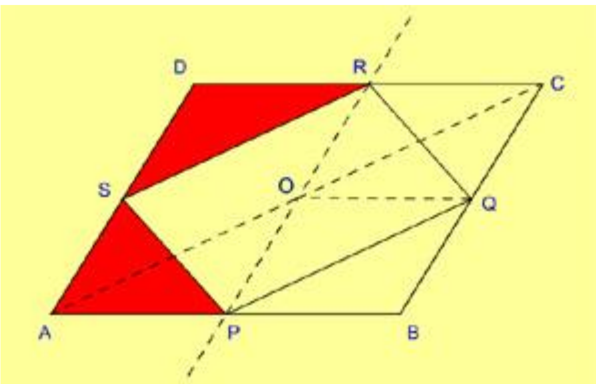
1 only

2 only

Both 1 and 2

Neither 1 nor 2

Answer (c)



For statement 1 we can prove that area of triangle APS = area of triangle BPQ since triangles on same base and between same parallels are equal in area)
We can also see that area of triangle BPQ is equal to area of triangle DSR
Therefore Statement 1 is correct.
For Statement 2 we can see that there are 4 similar triangles AOP, COQ, OPQ and BPQ inside the triangle ABS, hence statement 2 is also correct.

2. Consider the following statements:

Let ABCD be a parallelogram which is not a rectangle. Then $2(AB^2 + BC^2) \neq AC^2 + BD^2$

If ABCD is a rhombus with AB = 4 cm, then $AC^2 + BD^2 = n^3$ for some positive integer n.

Which of the above statements is/are correct?

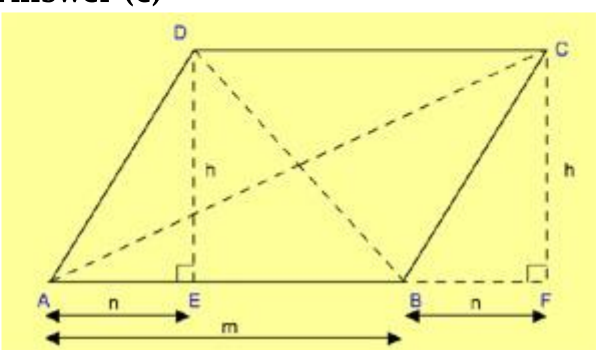
1 only

2 only

Both 1 and 2

Neither 1 nor 2

Answer (c)



Consider statement 1.
$AC^2 = (m + n)^2 + h^2$
$AC^2 = m^2 + n^2 + 2mn + h^2$
$= m^2 + (n^2 + h^2) + 2mn$
$= AB^2 + BC^2 + 2mn$ ..... (1)
$BD^2 = (m - n)^2 + h^2$
$BD^2 = m^2 + n^2 - 2mn + h^2$
$= m^2 + (n^2 + h^2) - 2mn$
$= AB^2 + BC^2 - 2mn$ ..... (2)
Adding (1) and (2)
$AC^2 + BD^2 = 2(AB^2 + BC^2)$
Statement 1 is correct.
Consider statement 2.
Using above result
$AC^2 + BD^2 = 2(n^2 + n^2)$ [since ABCD is now a rhombus]
$= 4 \times n^2$
If Statement 2 is correct then

$4 \times n^2 = n^3$
or $n = 4$
Statement 2 is also correct for $n = 4$.

3. ABCD is a parallelogram. E is a point on BC such that BE : EC = m : n. If AE and DB intersect in F, then what is the ratio of the area of triangle FEB to the area of triangle AFD?

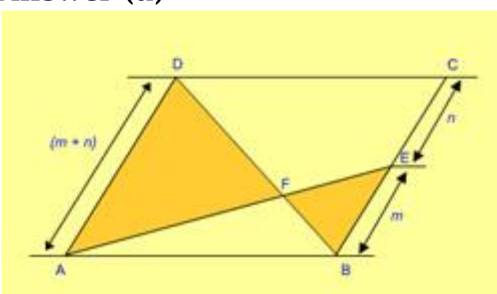
m/n

$(m/n)^2$

$(n/m)^2$

$[m/(m + n)]^2$

Answer (d)



In two similar triangles, the ratio of their areas is the square of the ratio of their sides
Triangle FEB ~ triangle FAD
∴ area of ΔFEB/ area of ΔFAD = $EB^2/ AD^2 = m^2/ (m + n)^2$
$= [m/ m + n]^2$

4. One side of a parallelogram is 8.06 cm and its perpendicular distance from opposite side is 2.08 cm. What is the approximate area of the parallelogram?

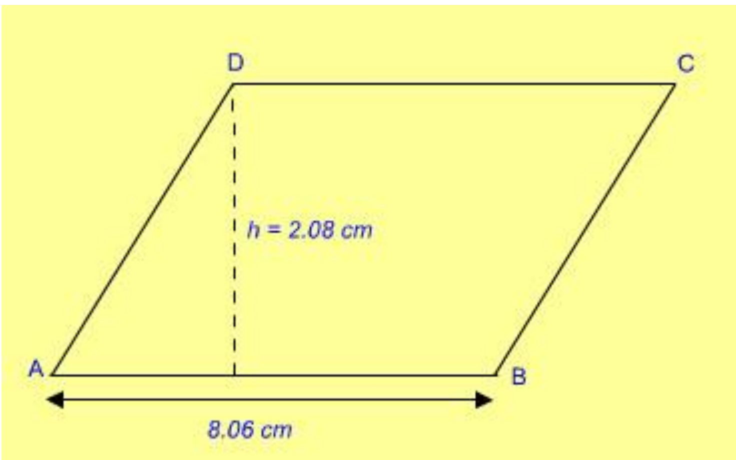
12.56 cm^2

14.56 cm^2

16.76 cm^2

22.56 cm^2

Answer (c)



Area of parallelogram = 8.06 x 2.08 cm^2
= 16.76 cm^2

5. Consider the following statements :

If the diagonals of a parallelogram ABCD are perpendicular, then ABCD may be a rhombus.

If the diagonals of a quadrilateral ABCD are equal and perpendicular, then ABCD is a square.

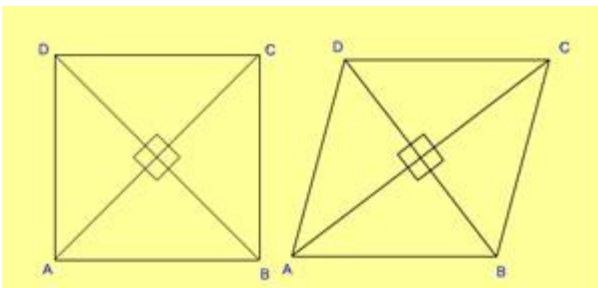
Which of the statements given above is/are correct?

1 only

2 only

Both 1 and 2

Neither 1 nor 2



Answer (c)

The diagonals of both a rhombus and a square are perpendicular to each other, but in a square the diagonals are equal.
∴ if the diagonals of a parallelogram ABCD are perpendicular then ABCD may be a rhombus or a square
and if the diagonals of a quadrilateral ABCD are equal and perpendicular, then ABCD is a square.

6. ABCD is a parallelogram. If the bisectors of the angle A and angle C meet the diagonal BD at points P and Q respectively, then which one of the following is correct?

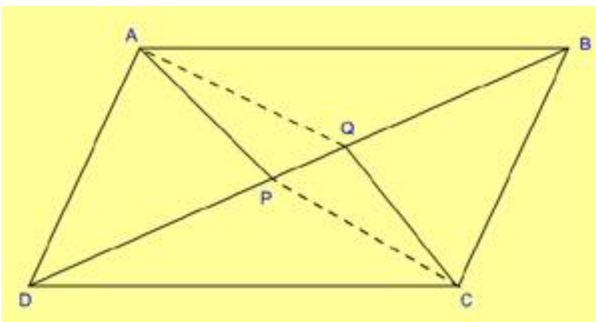
PCQA is a straight line

Triangle APQ is similar to triangle PCQ

AP = CP

AP = AQ

Answer (b)



It can be proven that triangle ADP is congruent with triangle BCQ ..... (1)
In triangle APQ and PCQ
∠APQ = ∠CQP (from statement 1)
PQ = PQ (common side)
AP = CQ (from statement 1)
∴ triangle APQ is similar to triangle PCQ

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7. Let ABCD be a parallelogram. Let m, n be positive integers such that $n < m < 2n$. Let $AC = 2mn$ and $BD = m^2 - n^2$. Let $AB = (m^2 + n^2)/2$.

Statement –I: AC > BD.

Statement- II: ABCD is a rhombus.

Which one of the following is correct in respect of the above statements?

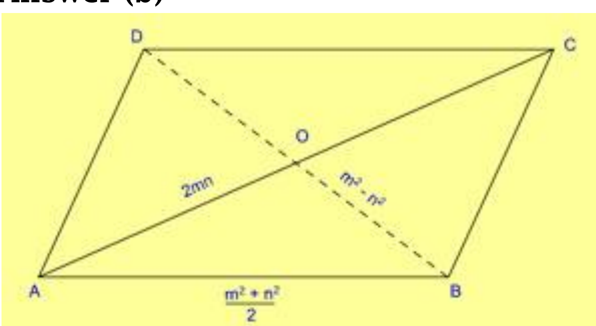
Both statement-I and statement-II are true and statement-II is the correct explanation of statement-I

Both statement-I and statement-II are true but statement-II is not the correct explanation of statement-I

Statement-I is true, but statement-II is false

Statement-II is true, but statement-I is false

Answer (b)



$AC = 2mn$ and $BD = m^2 - n^2$ and $AB = (m^2 + n^2)/2$
$\therefore AO = mn$ and BO $(m^2 - n^2)/2$
If ABCD is a rhombus, then
$AB^2 = AO^2 + BO^2 = (mn)^2 + (m^2$ &ndash $n^2)^2/2^2$
$\therefore AB^2 = m^2n^2 + m^4 + n^4 - 2m^2n^2/4$
$= m^4 + n^4 - 2m^2n^2/4$
$= [(m + n)^2/2)]^2$ which is given
But since AC and BD are diagonals of rhombus AC > BD is true
Hence, both statements are true and statement II is correct explanation of I.

8. The sides of a parallelogram are 12 cm and 8 cm long and one of the diagonals is 10 cm long. If d is the length of other diagonal, then which one of the following is correct?

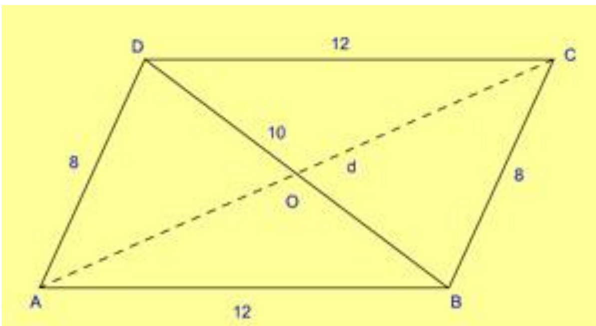
d < 8 cm

8 cm < d < 10 cm

10 cm < d < 12 cm

d > 12 cm

Answer (d)



In triangle ABC.
AC < AB + BC, hence d < 12 + 8 = 20
In triangle OAB, OA + OB > AB
d/2 + 5 > 12
d/2 > 7 or d > 14
∴ the value of d is more than 14 but less than 20

9. Let LMNP be a parallelogram and NR be perpendicular to LP. If the area of the parallelogram is six times the area of triangle RNP and RP = 6 cm, what is LR equal to?

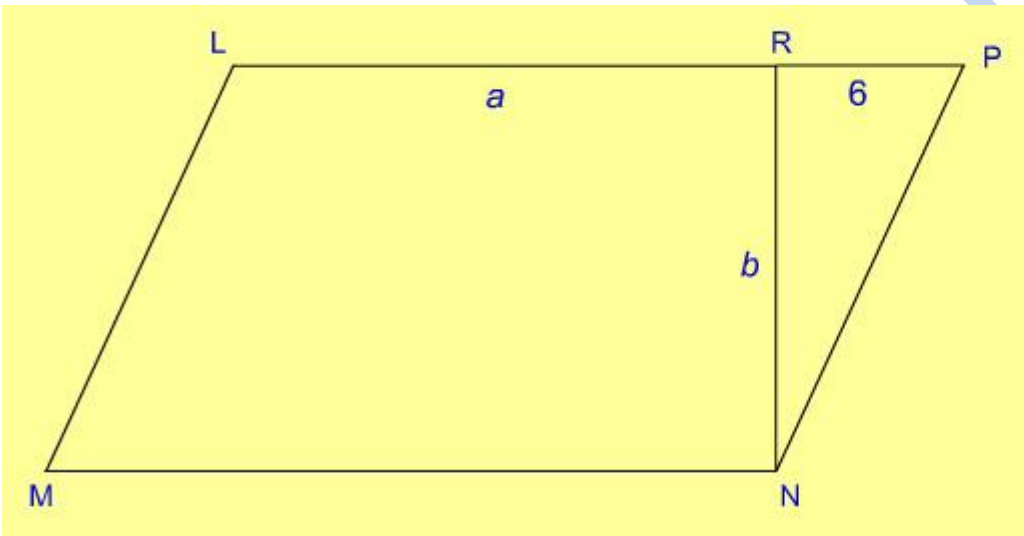
15 cm

12 cm

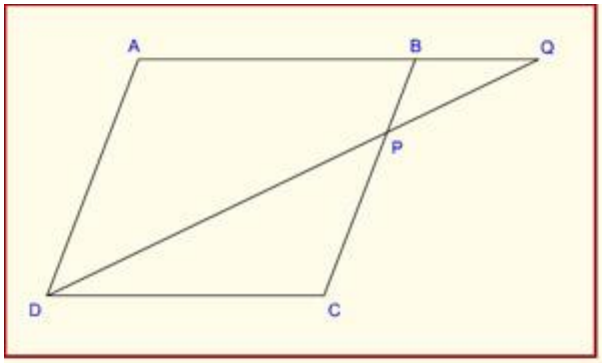
9 cm

8 cm

Answer (b)



LR = a, RN = b
Area of parallelogram = base x height = (a + 6) x b
Area of triangle = (base x height)/2 = 6b/2 = 3b
From the question (a + 6)b = 6 x 3b
=> a + 6 = 18 or a = 12



10. In the figure given above, ABCD is a parallelogram. P is a point on BC such that PB : PC = 1 : 2. DP produced meets AB produced at Q. If the area of the triangle BPQ is 20 square units, what is the area of the triangle DCP?

20 square units

30 square units

40 square units

None of the above

Answer (d)

It can be proven that the triangles DCP and BPQ are similar since the corresponding angles are equal.
We also know that in two similar triangles, the ratio of their areas is the square of the ratio of their sides
Since BP : PC = 1 : 2, so the ratio of area of triangles BPQ and DCP would be 1 : 4
=> The area of the triangle DCP is 4 x 20, i.e. 80 square units.