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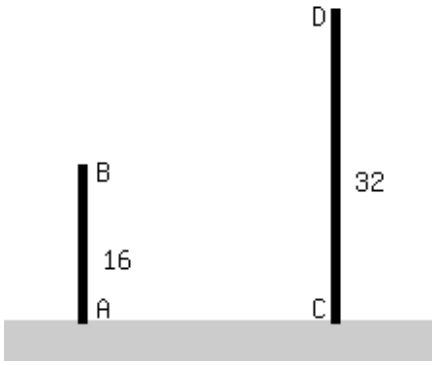
Class 7

Pythagoras' Theorem

Choose correct answer(s) from the given choices

(1) If the distance between B and D is 34 meters, find the distance between A and C.



a. 30 meters

b. 38 meters

c. 29 meters

d. 33 meters

(2) If the base and height of a right-angled triangle are 60 m and 91 m, respectively. What is the length of the hypotenuse?

a. 109 m

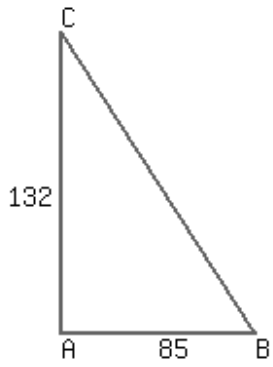
b. 107 m

c. 110 m

d. 113 m

Fill in the blanks

(3) If $\angle A$ is a right angle, the perimeter of the triangle is _____ meters (All dimensions are in meters).



(4) Gita (height 86 cm) and Vandita (height 205 cm) are standing in a ground. If the distance between their toes is 120 cm, the distance between their heads is _____ cm.

(5) Ashish is walking in the north direction. After walking for 85 meters, he takes a left turn and walks for another 132 meters. He is at a distance of _____ meters from the starting point.

(6) Ridhima is walking in the south direction. After walking for 9 meters, she takes a right turn and walks for another 3 meters. She then takes a left turn and walks for 3 meters. She again takes a right turn and walks for another 13 meters. She is at a distance of _____ meters from the starting point.

Check True/False

(7) Sides measuring 56 cm, 68 cm, and 33 cm make a right-angled triangle.

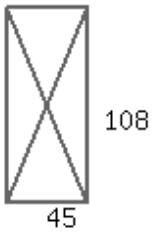
○ True ○ False

Answer the questions

(8) Find the length of the longest straight line that can be drawn on a paper of size 5 cm X 12 cm.

(9) The hypotenuse of a right-angled triangle is 40 m long. If one of the remaining sides is 24 m long, what is the length of the remaining side?

(10) Find the total length of all the lines shown in the figure.
(All dimensions are in cm).



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Class 7

Pythagoras' Theorem

(1) **a.** 30 meters

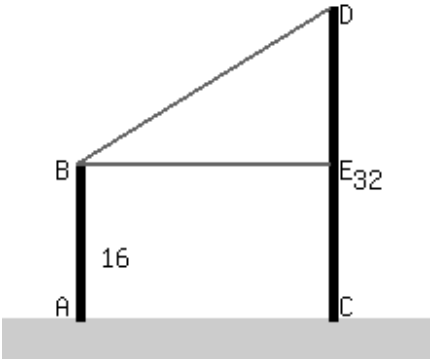
Step 1

According to the question, the distance between B and D is 34 meters and we have to find the distance between A and C.

Let us assume the distance between A and C is *x meters*.

Step 2

Let us connect the point B to point D as shown in the following figure.



If we look at the figure carefully, we will notice that ΔBED is a right-angled triangle and the distance between A and C is equal to the distance between B and E,

DE = CD - AB = 32 - 16 = 16 meters

In ΔBED,

$BD^2 = BE^2 + DE^2$ *(Pythagorean Theorem)*

$\Rightarrow 34^2 = x^2 + 16^2$

By solving it, $x = 30$.

Step 3

Hence, the distance between A and C is **30 meters**.

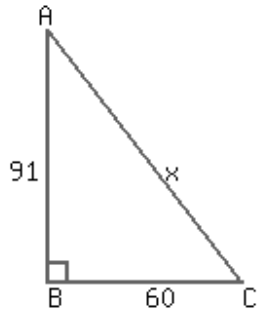
(2) **a.** 109 m

Step 1

Let us assume the length of the hypotenuse of the given triangle to be x m.

Step 2

According to the question, the base and height are 60 m and 91, respectively, as shown below:



Step 3

Since, ΔABC is a right angle triangle,
therefore,

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

$\Rightarrow x^2 = 60^2 + 91^2$

$\Rightarrow x^2 = 3600 + 8281$

$\Rightarrow x^2 = 3600 + 8281$

$\Rightarrow x^2 = 11881$

$\Rightarrow x^2 = 109^2$

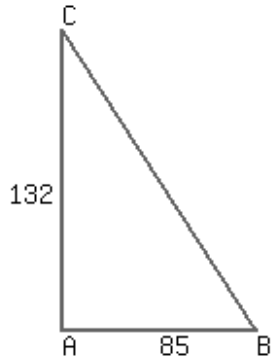
$\Rightarrow x = 109$

Step 4

Hence, the length of the hypotenuse is **109 m**.

(3) 374

Step 1



According to the question, in triangle ΔABC, $\angle$A is a right angle.
Therefore, triangle ΔABC is a right-angled triangle.

Step 2

Let us assume that the length of AC is *x meters*.
In ΔABC,

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

$\Rightarrow x^2 = 85^2 + 132^2$

By solving it, $x = 157$.
The length of AC is *157 meters*.

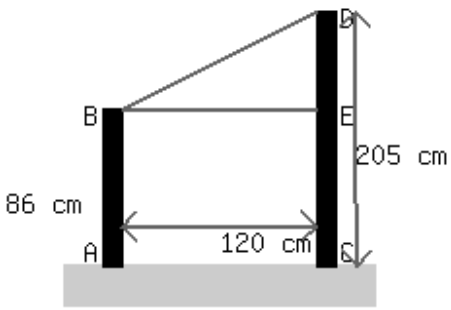
Step 3

The perimeter of the given triangle ΔABC = AB + AC + BC
= 85 + 132 + 157
= **374 meters**

(4) 169

Step 1

Let us assume AB, CD, BD, and BE are the height of Gita, height of Vandita, distance between their heads, and distance between their toes, respectively, as shown in the figure.



If we look at the figure carefully, we notice that ΔBED is a right-angled triangle, and
BE = 120 cm,
DE = CD - AB = 205 - 86 = 119 cm.
In the right-angled triangle BDE,

$BD^2 = BE^2 + ED^2$ *(Pythagorean Theorem)*

$\Rightarrow BD^2 = 120^2 + 119^2$

$\Rightarrow BD^2 = 14400 + 14161$

$\Rightarrow BD^2 = 28561$

$\Rightarrow BD^2 = 169^2$

$\Rightarrow BD = 169$ cm

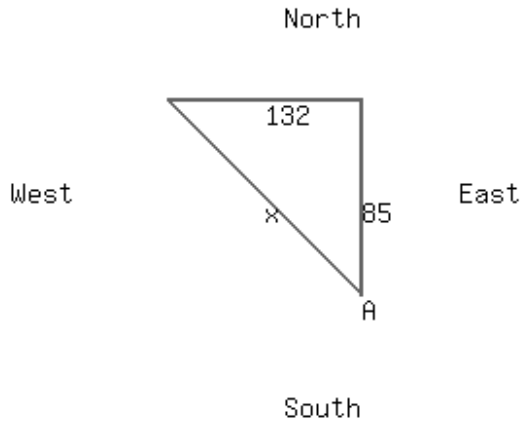
Step 2

Hence, the distance between their heads is **169 cm**.

(5) 157

Step 1

Let us assume Ashish is walking in the north direction from the point A.
After walking for 85 meters, he takes a left turn and walks for another 132 meters.
Now, he is *x* meters from the starting point as shown in the following figure.



If we look at the figure carefully, we notice that the given figure is a right-angled triangle.

Therefore, we can say that $x^2 = 85^2 + 132^2$ *(Pythagorean Theorem)*

$\Rightarrow x^2 = 7225 + 17424$

$\Rightarrow x^2 = 24649$

$\Rightarrow x^2 = 157^2$

$\Rightarrow x = 157$

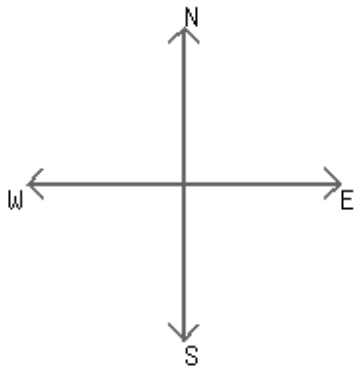
Step 2

Hence, Ashish is **157 meters** far from the starting point.

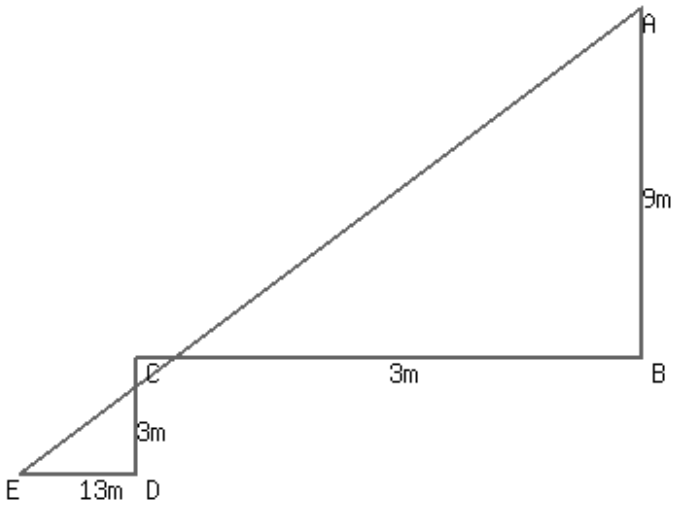
(6) 20

Step 1

Let us use the conventional map directions while making the figure to represent the distances traveled by Ridhima:

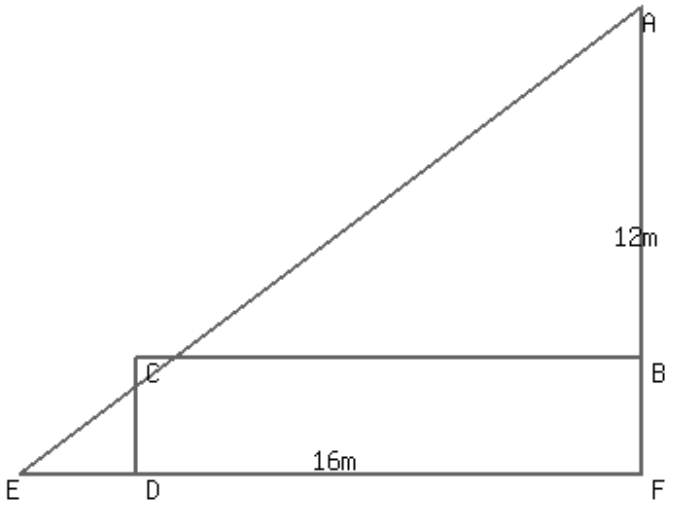


Assuming Ridhima started from point A and finally reached point E, the path traveled by Ridhima can be drawn as below:



Step 2

Let us extend the segments ED and AB to meet at F as shown below:



Here,
AF = 9 + 3 = 12
EF = 3 + 13 = 16

Step 3

By applying the Pythagorean Theorem, the distance between starting point A and ending point E:

$(AE)^2 = (AF)^2 + (EF)^2$

$\Rightarrow (AE)^2 = 12^2 + 16^2$

$\Rightarrow (AE)^2 = 144 + 256$

$\Rightarrow (AE)^2 = 400$

$\Rightarrow AE = \sqrt{400}$

$\Rightarrow AE = 20$

Step 4

Therefore, Ridhima is **20 meters** from the starting point.

(7) False

Step 1

We know that the square of the largest side of a right-angled triangle is equal to the sum of squares of the other two sides.

Step 2

Applying the Pythagorean Theorem, we get:

$68^2 = 33^2 + 56^2$

$\Rightarrow 4624 = 1089 + 3136$

$\Rightarrow 4624 = 4225$

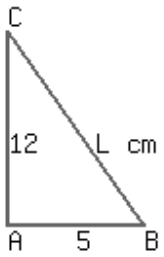
Step 3

We notice that the square of the largest side is not equal to the sum of squares of the other two sides.
Hence, the statement *"Sides measuring 33 cm, 56 cm and 68 cm make a right-angled triangle"* is **False**.

(8) 13 cm

Step 1

Let us assume the length of the longest straight line that can be drawn on a paper of size 5 cm X 12 cm is *L* cm, as shown in the following figure.



Step 2

Now, in the right-angled triangle ΔABC,

$L^2 = 5^2 + 12^2$ *(Pythagorean Theorem)*

$\Rightarrow L^2 = 25 + 144$

$\Rightarrow L^2 = 169$

$\Rightarrow L^2 = 13^2$

$\Rightarrow L = 13$ cm

Step 3

Hence, the length of the longest straight line that can be drawn on a paper of size 5 cm X 12 cm is **13 cm.**

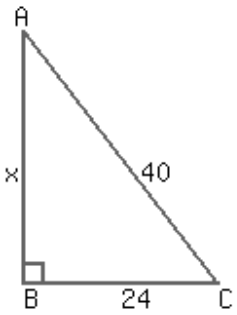
(9) 32 m

Step 1

Let us assume that the length of the remaining side of the triangle is x m.

Step 2

According to the question, the hypotenuse of the right-angled triangle is 40 m long and one of the remaining sides is 24 m long as shown below:



Step 3

Since, ΔABC is a right-angled triangle,
therefore,

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

$\Rightarrow x^2 + 24^2 = 40^2$

$\Rightarrow x^2 + 576 = 1600$

$\Rightarrow x^2 = 1600 - 576$

$\Rightarrow x^2 = 1024$

$\Rightarrow x^2 = 32^2$

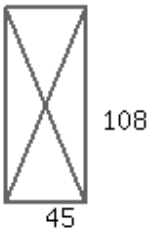
$\Rightarrow x = 32$

Step 4

Hence, the length of the remaining side is **32 m**.

(10) 540 cm

Step 1



If we look at the given figure carefully, we will notice that it is a rectangle and the line inside the rectangle is its diagonal.
Let us assume the length of diagonal to be *d cm.*
Length of the rectangle = 45 cm
Breadth of the rectangle = 108 cm

Step 2

We know that the square of the length of the diagonal of a rectangle is equal to the sum of squares of the length and breadth of the rectangle.
So, we can write as:

$d^2 = 45^2 + 108^2$ *(Pythagorean Theorem)*

$\Rightarrow d^2 = 2025 + 11664$

$\Rightarrow d^2 = 13689$

$\Rightarrow d^2 = 117^2$

$\Rightarrow d = 117$ cm

Step 3

Now, the total length of all the lines shown in the figure = 2(length of the rectangle + breadth of the rectangle + length of the diagonal of the rectangle)
= 2(45 + 108 + 117)
= 2(270)
= **540 cm**