Pythagorean Theorem

In a right triangle, the side opposite the right angle is called the hypotenuse.

The square of the length of the hypotenuse, \( c \), is equal to the sum of the squares of the lengths of the other two sides, \( a \) and \( b \).

\[ c^2 = a^2 + b^2 \]
\[ 5^2 = 3^2 + 4^2 \]
\[ 5^2 = 9 + 16 \]
\[ 25 = 25 \]

I. Use the Pythagorean Theorem to find the missing side. (Show work on separate sheet of paper)

1. \( \triangle \) with sides 15 and 12
2. \( \triangle \) with sides \( b \) and 41
3. \( \triangle \) with sides \( c \) and 21
4. \( \triangle \) with sides \( b \) and 77
5. \( \triangle \) with sides \( a \) and 84
6. \( \triangle \) with sides 15 and \( b \)

II. Use the Pythagorean theorem to find the missing measure for each right triangle. (Show work on separate sheet)

7. \( \triangle \) with sides 9 and 15
8. \( \triangle \) with sides \( c \) and 8
9. \( \triangle \) with sides 10 and 8
10. \( \triangle \) with sides 5 and 12
11. \( \triangle \) with sides 20 and \( c \)
12. \( \triangle \) with sides \( b \) and 25
13. What is $x$?

$$\begin{array}{c}
27 \text{ cm} \\
45 \text{ cm} \\
x
\end{array}$$

A. 18 cm  
B. 20 cm  
C. 24 cm  
D. 36 cm

14. What is $a$?

$$\begin{array}{c}
a \\
34 \text{ in.} \\
30 \text{ in.}
\end{array}$$

A. 4 in.  
B. 10 in.  
C. 14 in.  
D. 16 in.

15. What is the length of the third side of this triangle?

$$\begin{array}{c}
16 \text{ cm} \\
12 \text{ cm}
\end{array}$$

A. 4 cm  
B. 14 cm  
C. 20 cm  
D. 28 cm

16. A rectangular park measures 30 meters by 40 meters. How long will a diagonal path from one corner of the park to the other corner measure?

A. 10 m  
B. 26.5 m  
C. 50 m  
D. 70 m
Pythagorean Theorem

In a right triangle, the side opposite the right angle is called the hypotenuse.

The square of the length of the hypotenuse, \( c \), is equal to the sum of the squares of the lengths of the other two sides, \( a \) and \( b \).

\[
c^2 = a^2 + b^2
\]

\[
5^2 = 3^2 + 4^2
\]

\[
5^2 = 9 + 16
\]

\[
25 = 25
\]

I. Use the Pythagorean Theorem to find the missing side. (Show work on separate sheet of paper)

1. \( a^2 + b^2 = c^2 \)
   \( a^2 + 12^2 = 15^2 \)
   \( a^2 + 144 = 225 \)
   \( a^2 = 81 \)
   \( a = 9 \)

2. \( a^2 + b^2 = c^2 \)
   \( 8^2 + b^2 = 85^2 \)
   \( 64 + b^2 = 7225 \)
   \( b^2 = 7161 \)
   \( b = 81 \)

3. \( a^2 + b^2 = c^2 \)
   \( 29^2 + 16^2 = c^2 \)
   \( 841 + 256 = c^2 \)
   \( 1107 = c^2 \)
   \( c = 33 \)

II. Use the Pythagorean theorem to find the missing measure for each right triangle. (Show work on separate sheet)

7. \( a^2 + b^2 = c^2 \)
   \( 9^2 + 15^2 = c^2 \)
   \( 81 + 225 = c^2 \)
   \( 306 = c^2 \)
   \( c = 17.5 \)

8. \( a^2 + b^2 = c^2 \)
   \( 8^2 + 15^2 = c^2 \)
   \( 64 + 225 = c^2 \)
   \( 289 = c^2 \)
   \( c = 17 \)

9. \( a^2 + b^2 = c^2 \)
   \( 5^2 + 12^2 = c^2 \)
   \( 25 + 144 = c^2 \)
   \( 169 = c^2 \)
   \( c = 13 \)

10. \( a^2 + b^2 = c^2 \)
    \( 20^2 + 15^2 = c^2 \)
    \( 400 + 225 = c^2 \)
    \( 625 = c^2 \)
    \( c = 25 \)

11. \( a^2 + b^2 = c^2 \)
    \( 24^2 + 7^2 = c^2 \)
    \( 576 + 49 = c^2 \)
    \( 625 = c^2 \)
    \( c = 25 \)
Pythagorean Theorem

7) \(a \quad b \quad c\)
\[a^2 + b^2 = c^2\]
\[9^2 + b^2 = 15^2\]
\[81 + b^2 = 225\]
\[b^2 = 144\]
\[b = 12\]

8) \(a \quad b \quad c\)
\[a^2 + b^2 = c^2\]
\[8^2 + 15^2 = c^2\]
\[64 + 225 = c^2\]
\[289 = c^2\]
\[c = 17\]

9) \(a \quad b \quad c\)
\[a^2 + b^2 = c^2\]
\[a^2 + 8^2 = 10^2\]
\[a^2 + 64 = 100\]
\[-64\]
\[a^2 = 36\]
\[a = 6\]

10) \(a \quad b \quad c\)
\[a^2 + b^2 = c^2\]
\[5^2 + 12^2 = c^2\]
\[25 + 144 = c^2\]
\[169 = c^2\]
\[c = 13\]

11) \(a \quad b \quad c\)
\[a^2 + b^2 = c^2\]
\[15^2 + 20^2 = c^2\]
\[225 + 400 = c^2\]
\[625 = c^2\]
\[c = 25\]

12) \(a \quad b \quad c\)
\[a^2 + b^2 = c^2\]
\[7^2 + b^2 = 25^2\]
\[49 + b^2 = 625\]
\[-476\]
\[b^2 = 576\]
\[b = 24\]
B. What is $x^2$?

A. 18 cm  
B. 20 cm  
C. 24 cm  
D. 36 cm

$36^2 \times 36^2 = 1296$

15. What is the length of the third side of this triangle?

A. $18 \text{ cm}$  
B. $20 \text{ cm}$  
C. $24 \text{ cm}$  
D. $36 \text{ cm}$

$x^2 + b^2 = c^2$

$27^2 + b^2 = 45^2$

$729 + b^2 = 2025$

$729 - b^2 = 2025 - 729$

$b = 36 \text{ cm}$  
$b^2 = 1296$

16. A rectangular park measures 30 meters by 40 meters. How long will a diagonal path from one corner of the park to the other corner measure?

A. 10 m  
B. 26.5 m  
C. 50 m  
D. 70 m

$a^2 + b^2 = c^2$

$30^2 + 40^2 = c^2$

$900 + 1600 = c^2$

$2500 = c^2$

$c = 50 \text{ m}$