

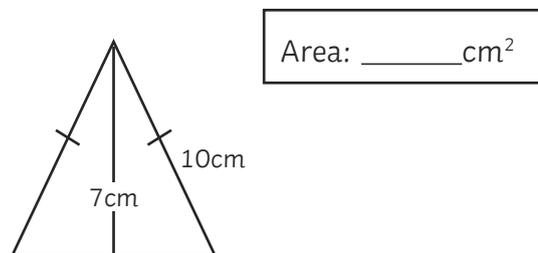
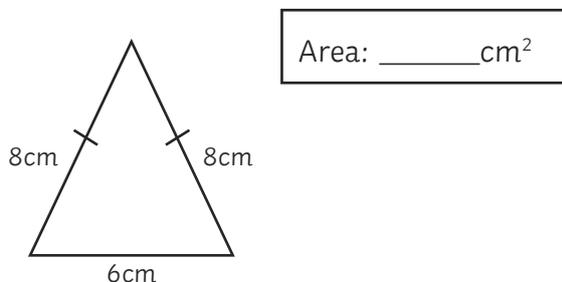
# Solving Problems Using Pythagoras

**A note before you start:**

Give each answer correct to 1 decimal place.

1. Calculate the areas of these isosceles triangles:

**Hint:** You might find it useful to split your triangle down the middle. Draw the triangle you now have.



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2. Calculate the area of an isosceles triangle with sides of 10cm, 10cm and 5cm.

**Hint:** Draw the triangle and label the measurements.

Area: \_\_\_\_\_ cm<sup>2</sup>

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3. How long is the diagonal of a square with a side of 12cm?

**Hint:** Draw your square then draw a diagonal line from corner to corner. Draw the triangle you have just created again and label it.

Answer: \_\_\_\_\_ cm

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4. Calculate the area of an equilateral triangle of side 5cm.

**Hint:** Think about the properties of an equilateral triangle.

Area: \_\_\_\_\_ cm<sup>2</sup>

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5. A ship sets off from port and travels 20 miles west. It then travels 12 miles north to a lighthouse. This journey takes 1 hour. Assuming the ship travels at the same average speed, how much time would be saved by travelling directly to the lighthouse in a straight line?

**Hint:** Draw out the information.

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6. An isosceles triangle has sides of 6cm and 9cm.  
a. Sketch the two different isosceles triangles that fit this description.

- b. Which of the two triangles has the greater area?

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7. A ladder, which is 4m long, is placed against a wall.

a. How far up the wall will it reach when the foot of the ladder is 1m away from the wall?

**Hint:** Draw out the information to help you visualise the question

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Answer: \_\_\_\_\_m

b. When it reaches 2.8m up the wall, how far away is the foot of the ladder from the wall?

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Answer: \_\_\_\_\_m

8. Calculate the area of an equilateral triangle with a side of 10cm.

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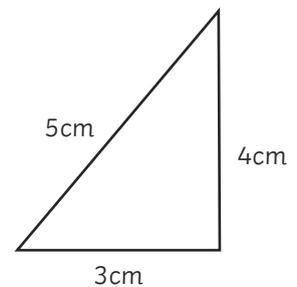
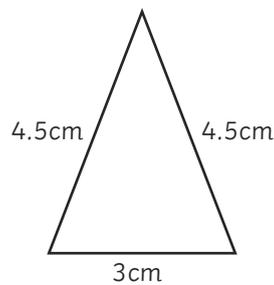
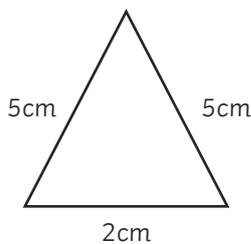
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Area: \_\_\_\_\_cm<sup>2</sup>

9. These triangles have the same perimeter:



a. Do the three triangles have the same area? Justify your answer.

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b. Find another triangle with the same perimeter but with a larger area.

10. A and B are two points on a centimetre squared coordinate grid. The coordinates of A are (12, 5) and the coordinates of B are (2, 3). How long is the line that joins them?

**Hint:** Calculate the difference in your  $x$ -coordinates and then your  $y$ -coordinates. Think about how this could make a triangle.

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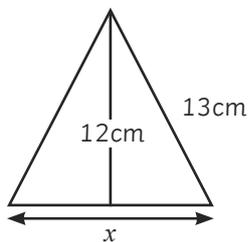


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Answer: \_\_\_\_\_ cm

11. Calculate the length marked  $x$ .

**Hint:** Don't forget to double.




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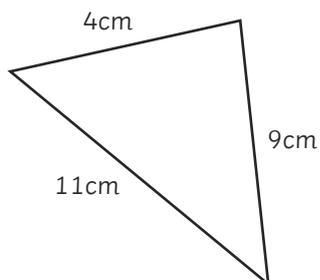


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$x$ : \_\_\_\_\_ cm

12. Is this triangle a right-angled triangle? Give a reason for your answer.

**Hint:** Apply Pythagoras' theorem.




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13. The diagonal of a rectangle measures 8cm. If one of its sides is 6cm long:

a. calculate the perimeter of the rectangle;

Perimeter: \_\_\_\_\_ cm

b. calculate the area of the rectangle.

Area: \_\_\_\_\_ cm<sup>2</sup>

14. Albi is buying a television. It has a 34-inch screen.

a. If it is 14 inches tall, how wide is the screen?

Answer: \_\_\_\_\_ inches

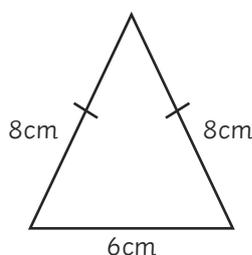
# Solving Problems Using Pythagoras Answers

A note before you start:

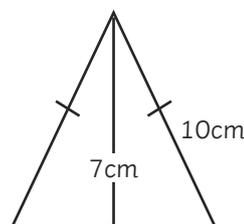
Give each answer correct to 1 decimal place.

1. Calculate the areas of these isosceles triangles:

**Hint:** You might find it useful to split your triangle down the middle. Draw the triangle you now have.



Area: **22.2cm<sup>2</sup>**



Area: **50.0cm<sup>2</sup>**

**Height:**

$$8^2 - 3^2 = 55$$

$$\sqrt{55} = 7.416198487$$

**Area:**

$$\frac{1}{2} \times 6 \times 7.416198487 = 22.24859546$$

**Base:**

$$10^2 - 7^2 = 51$$

$$\sqrt{51} = 7.141428429$$

**Double:** 14.28285686

$$\text{Area: } \frac{1}{2} \times 7 \times 14.28285686 = 49.989999$$

2. Calculate the area of an isosceles triangle with sides of 10cm, 10cm and 5cm.

**Hint:** Draw the triangle and label the measurements.

**Height:**

$$10^2 - 2.5^2 = 93.75$$

$$\sqrt{93.75} = 9.682458366$$

**Area:**

$$\frac{1}{2} \times 9.682458366 \times 5 = 24.20614591$$

Area: **24.2cm<sup>2</sup>**

3. How long is the diagonal of a square with a side of 12cm?

**Hint:** Draw your square then draw a diagonal line from corner to corner. Draw the triangle you have just created again and label it.

$$12^2 + 12^2 = 288$$

$$\sqrt{288} = 16.97056275$$

Answer: **17.0cm**

4. Calculate the area of an equilateral triangle of side 5cm.

**Hint:** Think about the properties of an equilateral triangle.

**Height:**

$$5^2 - 2.5^2 = 18.75$$

$$\sqrt{18.75} = 4.330127019$$

**Area:**

$$\frac{1}{2} \times 5 \times 4.330127019 = 10.82531755$$

Area: <b>10.8cm<sup>2</sup></b>
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5. A ship sets off from port and travels 20 miles west. It then travels 12 miles north to a lighthouse. This journey takes 1 hour. Assuming the ship travels at the same average speed, how much time would be saved by travelling directly to the lighthouse in a straight line?

**Hint:** Draw out the information.

**Speed = 32mph**

$$20^2 + 12^2 = 544$$

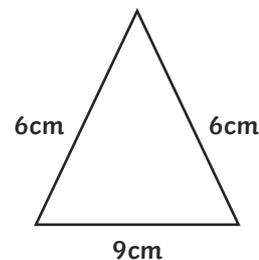
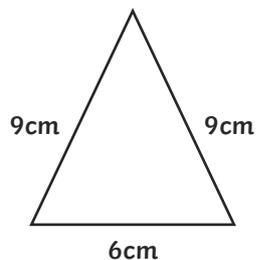
$$\sqrt{544} = 23.32380758$$

$$23.32380758 \div 32 = 0.728868986 \text{ hours}$$

$$= 43 \text{ minutes and } 44 \text{ seconds.}$$

**This way would have saved 16 minutes and 16 seconds.**

6. An isosceles triangle has sides of 6cm and 9cm.  
a. Sketch the two different isosceles triangles that fit this description.



- b. Which of the two triangles has the greater area?

$$9^2 - 3^2$$

$$81 - 9 = 72$$

$$\sqrt{72} = 8.485281374$$

$$\frac{1}{2} \times 8.485281374 \times 6 = 25.45584412$$

$$\text{Area} = 25.5\text{cm}^2$$

$$6^2 - 4.5^2$$

$$36 - 20.25 = 15.75$$

$$\sqrt{15.75} = 3.968626967$$

$$\frac{1}{2} \times 9 \times 3.968626967 = 17.85882135$$

$$\text{Area} = 17.9\text{cm}^2$$

7. A ladder, which is 4m long, is placed against a wall.

a. How far up the wall will it reach when the foot of the ladder is 1m away from the wall?

**Hint:** Draw out the information to help you visualise the question

$$4^2 - 1^2 = 15$$

$$\sqrt{15} = 3.872983346$$

Answer: 3.9m

b. When it reaches 2.8m up the wall, how far away is the foot of the ladder from the wall?

$$4^2 - 2.8^2 = 8.16$$

$$\sqrt{8.16} = 2.856571371$$

Answer: 2.9m

8. Calculate the area of an equilateral triangle with a side of 10cm.

$$10^2 - 5^2$$

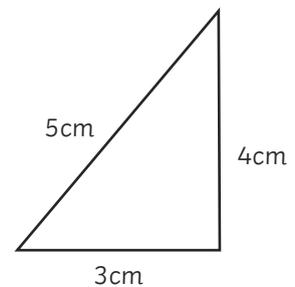
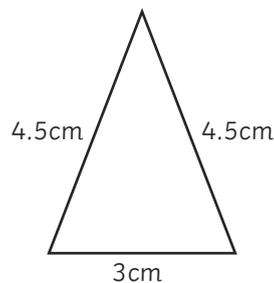
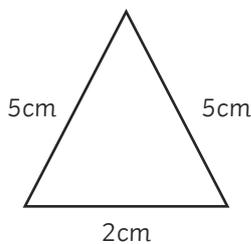
$$100 - 25 = 75$$

$$\sqrt{75} = 8.660254038$$

$$\frac{1}{2} \times 10 \times 8.660254038 = 43.3012701$$

Area: 43.3cm<sup>2</sup>

9. These triangles have the same perimeter:



a. Do the three triangles have the same area? Justify your answer.

**Triangle 1:**

$$5^2 - 1^2$$

$$25 - 1 = 24$$

$$\sqrt{24} = 4.898979486$$

$$\frac{1}{2} \times 4.898979486 \times 2$$

$$= 4.898979486\text{cm}^2$$

$$\text{Area} = 4.9\text{cm}^2$$

**Triangle 2:**

$$4.5^2 - 1.5^2$$

$$20.25 - 2.25 = 18$$

$$\sqrt{18} = 4.242640687$$

$$\frac{1}{2} \times 4.242640687 \times 3$$

$$= 6.363961031\text{cm}^2$$

$$\text{Area} = 6.4\text{cm}^2$$

**Triangle 3:**

$$\frac{1}{2} \times 3 \times 4 = 6.0\text{cm}^2$$

Each triangle has a different area.

b. Find another triangle with the same perimeter but with a larger area.

**For example, an equilateral triangle with sides of 4cm.**

10. A and B are two points on a centimetre squared coordinate grid. The coordinates of A are (12, 5) and the coordinates of B are (2, 3). How long is the line that joins them?

**Hint:** Calculate the difference in your  $x$ -coordinates and then your  $y$ -coordinates. Think about how this could make a triangle.

$$12 - 2 = 10$$

$$5 - 3 = 2$$

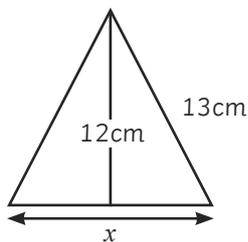
$$10^2 + 2^2 = 104$$

$$\sqrt{104} = 10.19803903$$

Answer: **10.2cm**

11. Calculate the length marked  $x$ .

**Hint:** Don't forget to double.



$$13^2 - 12^2 = 25$$

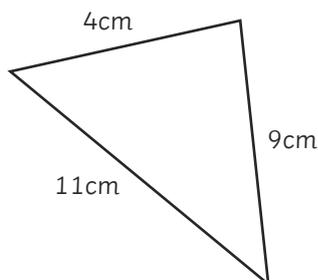
$$\sqrt{25} = 5$$

$$5 \times 2 = 10$$

$x$ : **10.0cm**

12. Is this triangle a right-angled triangle? Give a reason for your answer.

**Hint:** Apply Pythagoras' theorem.



$$9^2 + 4^2 = 97$$

$$\sqrt{97} = 9.848857802$$

**Therefore, this cannot be a right-angled triangle.**

13. The diagonal of a rectangle measures 8cm. If one of its sides is 6cm long:

a. calculate the perimeter of the rectangle;

$$8^2 - 6^2 = 28$$

$$\sqrt{28} = 5.291502622$$

$$6 + 6 + 5.291502622 + 5.291502622 = 22.58300524$$

Perimeter: **22.6cm**

b. calculate the area of the rectangle.

$$6 \times 5.291502622 = 31.74902573$$

Area: **31.7cm<sup>2</sup>**

14. Albi is buying a television. It has a 34-inch screen.

a. If it is 14 inches tall, how wide is the screen?

$$34^2 - 14^2 = 960$$

$$\sqrt{960} = 30.98386677$$

Answer: **31.0 inches**