

High School Mathematics Test 2015

Year 8

Pythagoras Theorem

Calculator Allowed
Short Answer
Test

Skills and Knowledge Assessed:

- Investigate Pythagoras' theorem and its application to solving simple problems involving right angled triangles (ACMMG222)
- Investigate the concept of irrational numbers, including π (ACMMG186)

Name _____

Answer all questions in the spaces provided on this test paper by:

Writing the answer in the box provided.

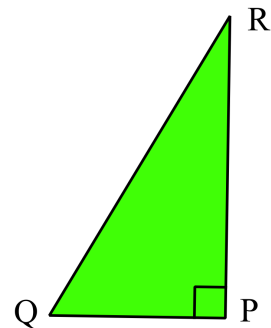
or

Shading in the bubble for the correct answer from the four choices provided.

Show any working out on the test paper. Calculators are **not** allowed.

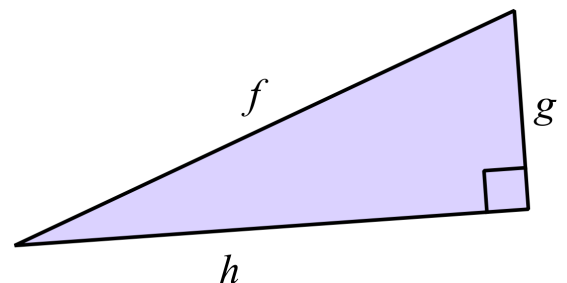
Diagrams are not to scale unless otherwise stated.

1. Name the hypotenuse of the right triangle PQR.



2. Which is a correct statement of Pythagoras Theorem for the triangle shown below.

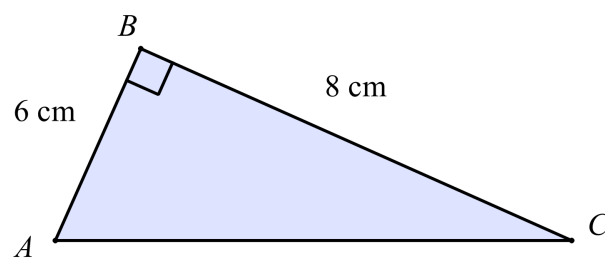
- ☐ $f^2 = g^2 + h^2$
- ☐ $g^2 = f^2 + h^2$
- ☐ $h^2 = f^2 + g^2$
- ☐ $f^2 = g^2 - h^2$



3.

Which calculation could be used to find the length of AC ?

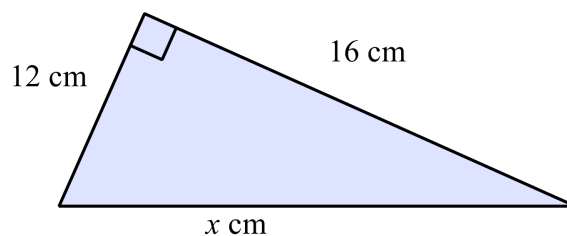
- ☐ $AC^2 = 16 - 12$
☐ $AC^2 = 16 + 12$
☐ $AC^2 = 64 - 36$
☐ $AC^2 = 64 + 36$



4.

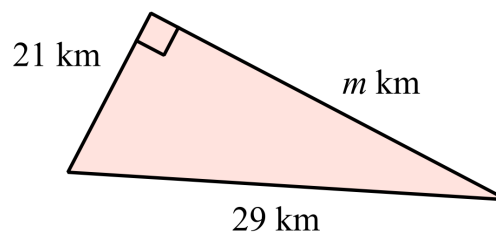
Find the value of x .

$x =$



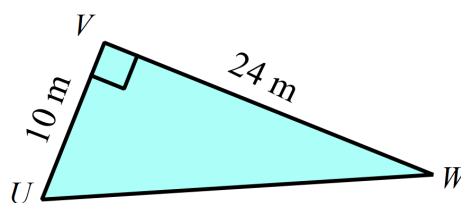
5.

Find the value of m .



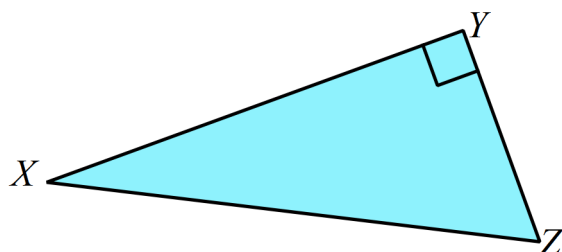
6.

What is the length of UW ?



7.

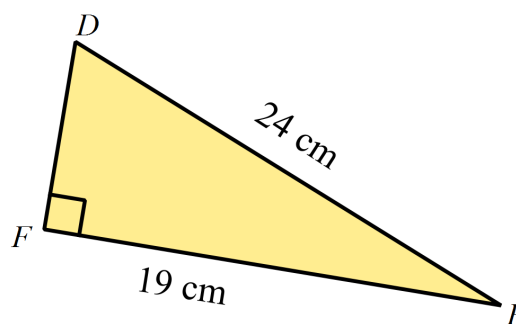
Write a statement of Pythagoras Theorem for triangle XYZ , shown.



8.

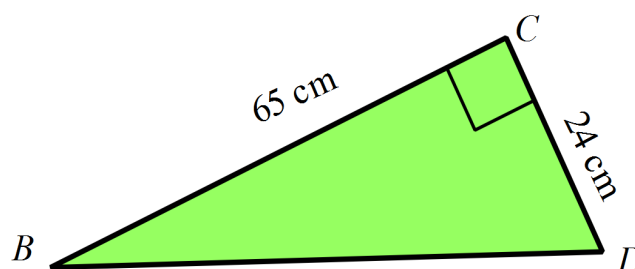
The length of DF (correct to 1 decimal place) in the triangle below is:

- ☐ 5.0 cm
☐ 12.5 cm
☐ 14.7 cm
☐ 30.6 cm



9.

Find the distance BD to the nearest cm.



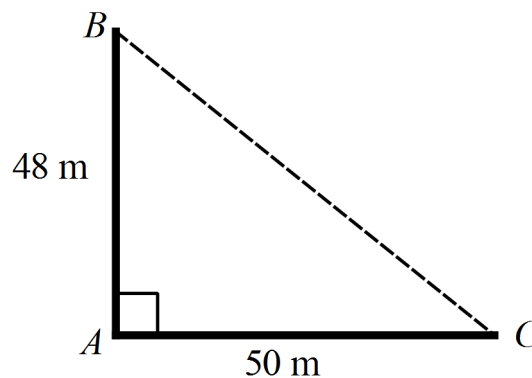
10.

Which of these is not a rational number?

- ☐ $\sqrt{289}$ ☐ $\sqrt{441}$ ☐ $\sqrt{641}$ ☐ $\sqrt{841}$

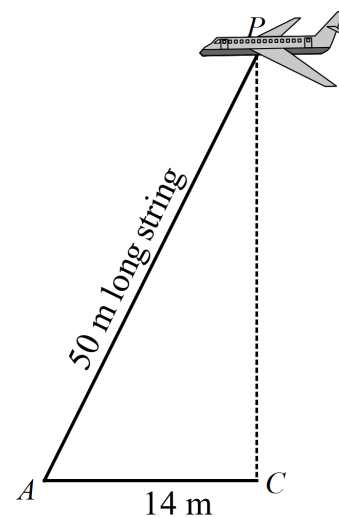
11.

From an intersection A , Bella walks 48 m due north and Carina walks 50 m due east. Calculate the distance BC between the two girls, correct to the nearest 10^{th} metre.



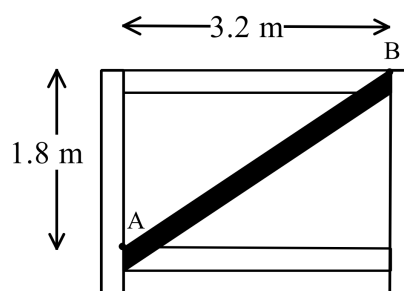
12.

A model plane P is attached at A to a 50 m long string and is directly above point C . A is 14 m horizontally from C . What is the altitude of the plane, PC ?

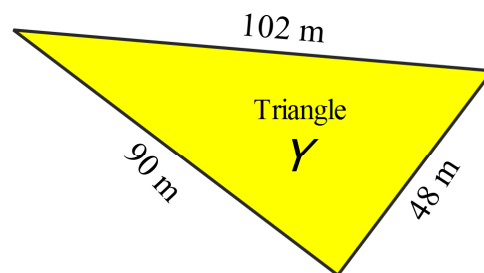
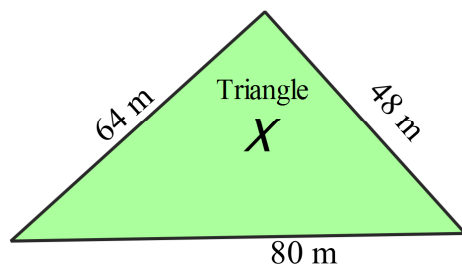


13.

A fence needs a length of timber to act as a brace, to go from A to B on the diagram. What is the length of the brace (correct to one decimal place)?



14. Which of the triangles below are right angled?



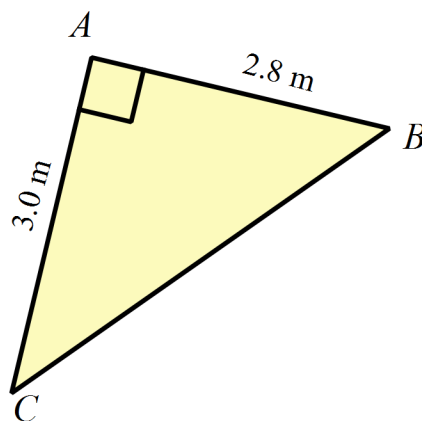
- ☐ Both triangles are right angled.
☐ Neither triangle is right angled.
☐ Only triangle X is right angled.
☐ Only triangle Y is right angled.

15. Which of the following are Pythagorean triads?
More than one could be a Pythagorean triad, so mark all that are.

- ☐ {60, 63, 87}
 ☐ {60, 80, 100}
 ☐ {60, 91, 109}
 ☐ {60, 84, 105}

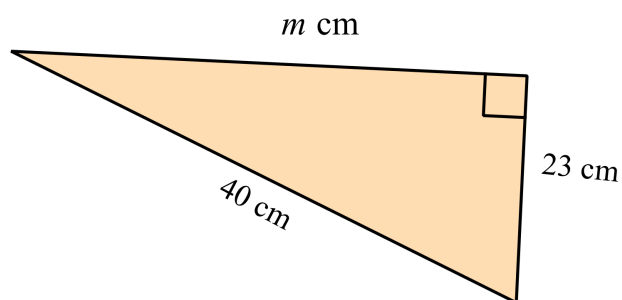
16. Find the length of BC .

- ☐ 1.1 m
☐ 4.1 m
☐ 7.8 m
☐ 16.8 m



17. Find the value of m .

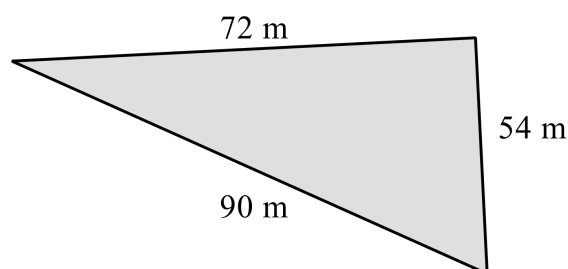
- ☐ $m = 32.7$
☐ $m = 46.1$
☐ $m = 53.4$
☐ $m = 63.0$



18.

Is a triangle with the dimensions below, right angled?

Explain why.



.....

.....

19.

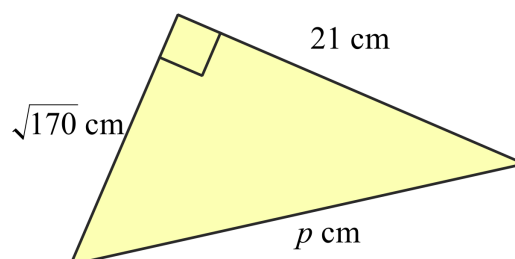
What is the value of p in the triangle shown?

☐ $p = \sqrt{191}$

☐ $p = \sqrt{176}$

☐ $p = \sqrt{212}$

☐ $p = \sqrt{611}$

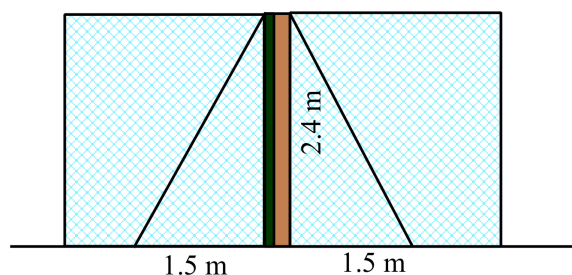


20.

The 2.4 m tall fence post is shown, which is supported by two wires which are attached to the top of the post and to the ground 1.5 m from the base of the post.

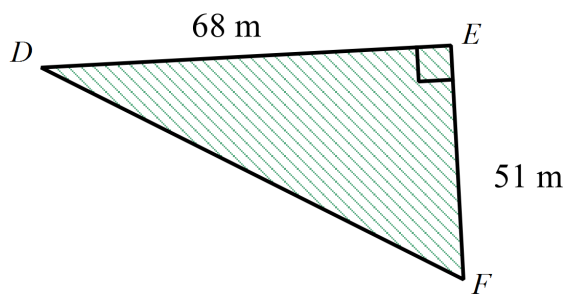
What is the total length of the two wires, not including the amount needed to secure the wire?

(Answer correct to the nearest 10th of a metre)



21. What is the perimeter of the triangle DEF ?

- ☐ 85 m
☐ 119 m
☐ 204 m
☐ 289 m

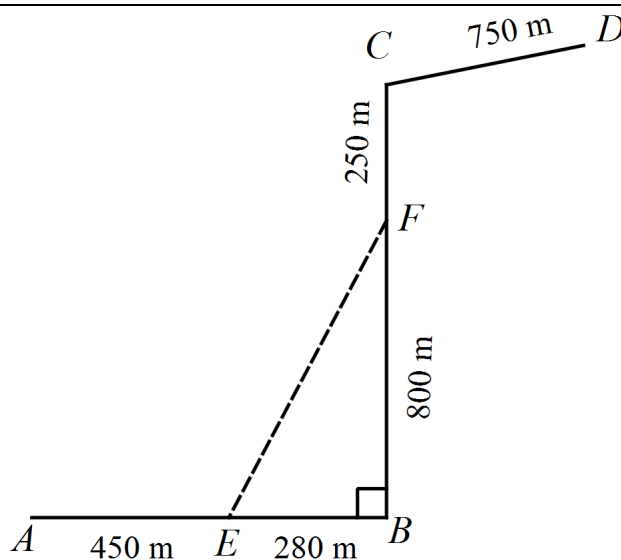


22. A course in a running race has three legs, the first is from A to B, the second from B to C and the third from C to D as shown on the diagram

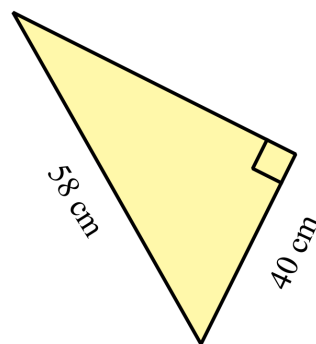
Marcus starts from A and follows the race, filming the runners, but when he reaches E, he takes a shortcut to F, where he follows the race to the end.

How many metres does he save by taking the shortcut?

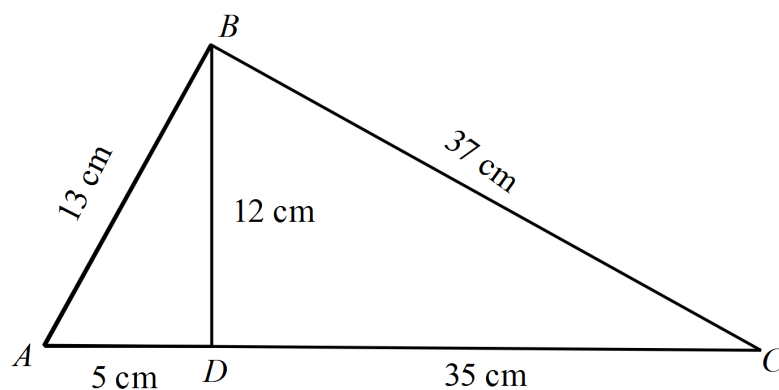
- ☐ 140 m.
☐ 232 m.
☐ 520 m.
☐ 848 m.



23. What is the area of the triangle?

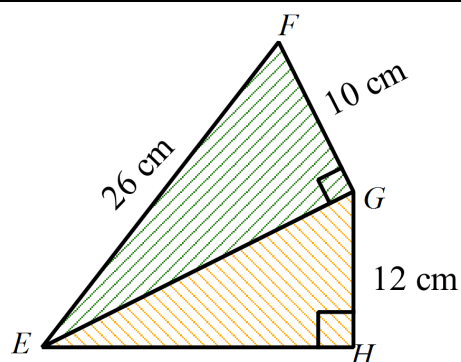


24. Which of the triangles below are right angled?



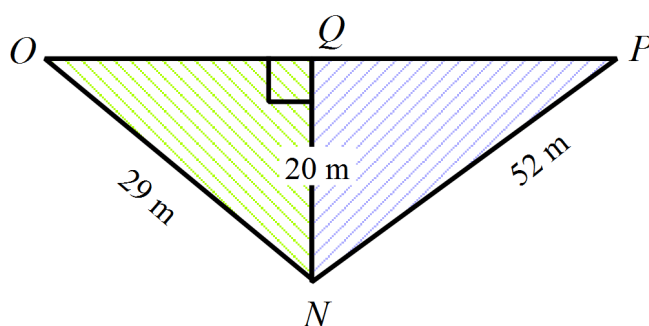
- ☐ Only $\triangle ABD$ is right angled.
- ☐ Only $\triangle ABC$ is right angled.
- ☐ Both $\triangle ABD$ and $\triangle BCD$ are right angled.
- ☐ Both $\triangle ABD$ and $\triangle ABC$ are right angled.

25. What is the length of EH , correct to 1 decimal place?

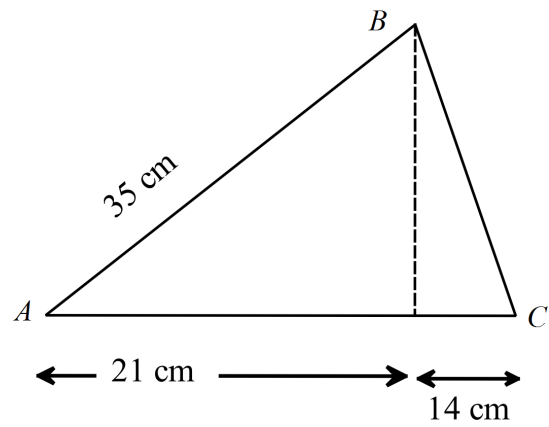


26. Calculate the distance OP .

- ☐ 21 m
- ☐ 32 m
- ☐ 48 m
- ☐ 69 m



27. Find the area of triangle ABC , to the nearest 10^{th} of a square centimetre.



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Pythagoras Theorem

Calculator
Allowed Test

ANSWERS

No.	WORKING	ANSWER
1.	Hypotenuse is QR (or RQ)(or p)	QR
2.	f is the hypotenuse, so $f^2 = g^2 + h^2$	1 st answer
3.	$AC^2 = 64 + 36$	4 th answer
4.	$x^2 = 12^2 + 16^2$ $= 144 + 256$ $= 400$ $x = \sqrt{400} = 20$	20
5.	$m^2 = 29^2 - 21^2$ $= 841 - 441$ $= 400$ $m = \sqrt{400} = 20$	20
6.	$AB^2 = 10^2 + 24^2$ $= 100 + 576$ $= 676$ $AB = \sqrt{676} = 26 \text{ m}$	26 m
7.	$XY^2 + YZ^2 = XZ^2$ or variations on the same equation. or $x^2 + z^2 = y^2$	$XY^2 + YZ^2 = XZ^2$ or $x^2 + z^2 = y^2$

8.	$AB^2 = 24^2 - 19^2$ $= 576 - 361$ $= 215$ $AB = \sqrt{215}$ $= 14.66287 = 14.7 \text{ cm}$	14.7 cm
9.	$BD^2 = 65^2 + 24^2$ $= 4225 + 576$ $= 4801$ $BD = \sqrt{4801}$ $= 69.2892 = 69 \text{ cm (nearest cm)}$	69 cm
10.	Using a calculator, 641 is not a perfect square, so $\sqrt{641}$ is not rational.	3 rd answer
11.	$BC^2 = 48^2 + 50^2$ $= 2304 + 2500$ $= 4804$ $BC = \sqrt{4804}$ $= 69.31089 = 69.3 \text{ (nearest 10th)}$	69.3
12.	$PC^2 = 50^2 - 14^2$ $= 2500 - 196$ $= 2304$ $AP = \sqrt{2304} = 48 \text{ m}$	48 m
13.	$AB^2 = 1.8^2 + 3.2^2$ $= 13.48$ $AB = \sqrt{13.48}$ $= 3.671511 = 3.7 \text{ m}$	3.7 m
14.	$48^2 + 64^2 = 80^2$ $48^2 + 90^2 = 102^2$ <p>Both are right angled.</p>	1 st answer

15.	$60^2 + 63^2 = 87^2$ $60^2 + 80^2 = 100^2$ $60^2 + 91^2 = 109^2$ $60^2 + 84^2 \neq 105^2$	1 st , 2 nd and 3 rd answers
16.	$BC^2 = 2.8^2 + 3.0^2$ $= 7.84 + 9$ $= 16.84$ $BC = \sqrt{16.84} = 4.1 \text{ m}$	2 nd answer
17.	$m^2 = 40^2 - 23^2$ $= 1600 - 529$ $= 1071$ $m = \sqrt{1071}$ $= 32.7261 = 32.7 \text{ (1 dec place)}$	1 st answer
18.	$54^2 + 72^2 = 8100$ $90^2 = 8100$ <p>\therefore it is a right triangle because the sum of the squares of the shorter sides is equal to the square of the longer side.</p>	Explanation and some working needed to be correct
19.	$p^2 = (\sqrt{170})^2 + 21^2$ $= 170 + 441$ $= 611$ $p = \sqrt{611}$	4 th answer
20.	<p>Let l be the length of one wire.</p> $l^2 = 2.4^2 + 1.5^2$ $= 5.76 + 2.25$ $= 8.01$ $l = \sqrt{8.01} = 2.8301$ <p>length of 2 wires = $2.8301 \times 2 = 5.6602$</p> $= 5.7 \text{ m (nearest 10th metre)}$	5.7 m

21.	$DF^2 = 51^2 + 68^2$ $= 2601 + 4624$ $= 7225$ $DF = \sqrt{7225}$ $= 85 \text{ m}$ $\text{Perimeter} = 51 + 68 + 85$ $= 204 \text{ m}$	3 rd answer
22.	$EF^2 = 280^2 + 800^2$ $= 78400 + 640000$ $= 718400$ $EF = \sqrt{718400} = 847.6$ $\text{Distance saved} = (280 + 800) - 847.6$ $= 1080 - 847.6$ $= 232.4 \text{ m}$	2 nd answer
23.	$x^2 = 58^2 - 40^2$ $= 3364 - 1600$ $= 1764$ $x = \sqrt{1764} = 42 \text{ cm}$ $\text{Area} = \frac{1}{2} \times 40 \times 42$ $= 840 \text{ cm}^2$	840 cm ²
24.	$5^2 + 12^2 = 13^2 \text{ so } \Delta ABD \text{ is right angled.}$ $12^2 + 35^2 = 37^2 \text{ so } \Delta BDC \text{ is right angled. (or angles on straight line)}$ $13^2 + 37^2 \neq 40^2 \text{ so } \Delta ABC \text{ is not right angled.}$ $\Delta ABD \text{ and } \Delta BCD \text{ are right angled.}$	3 rd answer

25.	$EG^2 = 26^2 - 10^2$ $= 676 - 100$ $= 576$ $EG = \sqrt{576} = 24$ $EH^2 = 24^2 - 12^2$ $= 576 - 144 = 432$ $EH = \sqrt{432} = 20.8 \text{ (1 d p)}$	20.8
26.	$OQ^2 = 29^2 - 20^2$ $= 441$ $OQ = \sqrt{441} = 21 \text{ m}$ $QP^2 = 52^2 - 20^2$ $= 2304$ $QP = \sqrt{2304} = 48 \text{ m}$ $OP = 21 + 48 = 69 \text{ m}$	4 th answer
27.	$BD^2 = 35^2 - 21^2$ $= 784$ $BD = \sqrt{784} = 28$ $\text{Area} = \frac{1}{2} \times 28 \times 35$ $= 490 \text{ cm}^2$	490 cm ²