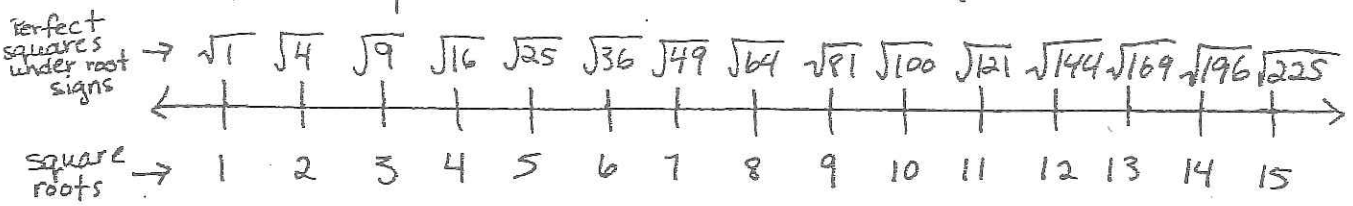
Pythagorean Relationship - Review

1. Make sure you have memorized the perfect squares and their square roots from 1 to 15.



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2. Understand that squaring a number means that you multiply the number by itself (NOT by 2!) and the answer is the square of that number.

eg) $3^2 = 3 \times 3 = 9$

↑ 3 squared ↑ answer is 9

Calculate the following:

a) $5^2 = 5 \times 5 = 25$ b) $13^2 = 169$ c) $48^2 = 2304$

3. Know how to estimate square roots using perfect squares, and how to calculate them with a calculator.

$\sqrt{81} = 9$ ← This is the square root of 81 (ie. The # that when multiplied by itself equals 81).

this symbol means you need to find the square root of the # beneath it.

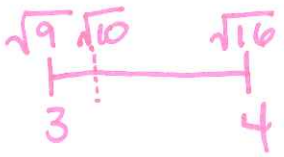
↑ This is the square

Find the following square roots. Round to the nearest tenth if necessary.

a) $\sqrt{225} = 15$ b) $\sqrt{64} = 8$ c) $\sqrt{158} = 12.6$

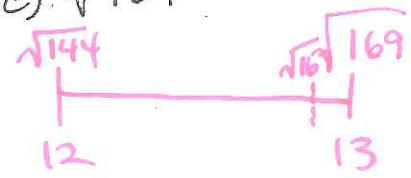
Estimate the following square roots:

a) $\sqrt{10} = 3.2$



b) $\sqrt{78} = 8.9$

c) $\sqrt{167} = 12.9$



Give an example of a whole number with a square root between:

a) 10 and 11 → So any # from 101–120

$\sqrt{100}$ ... $\sqrt{121}$

10 11

b) 3 and 4

$\sqrt{9}$ $\sqrt{16}$ So 10–15

3 4

c) 6 and 7 → So, 37–48

$\sqrt{36}$ $\sqrt{49}$

6 7

4. Be sure you know how to use the sidelength of a square to find it's area and the area to find the sidelength.

ie) $A = s^2$ $s = \sqrt{A}$

So $A = 4m^2$ $s = \sqrt{A} = \sqrt{4} = 2m$

OR $A = s^2 = 2^2 = 4m^2$, $s = 2m$

Find the following areas:

a) $s = 7cm$ $A = s^2 = 7^2 = 49cm^2$

b) $s = 10m$ $A = s^2 = 10^2 = 100m^2$

c) $s = 113cm$ $A = s^2 = 113^2 = 12769cm^2$

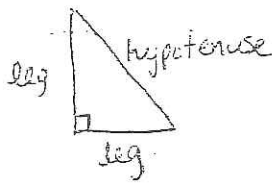
Find the following sidelengths:

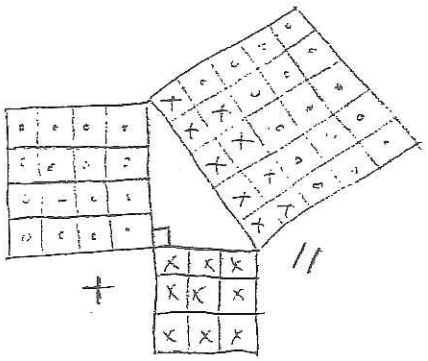
a) $A = 169cm^2$ $s = \sqrt{A} = \sqrt{169} = 13cm$

b) $A = 36m^2$ $s = \sqrt{A} = \sqrt{36} = 6m$

c) $A = 1\ km^2$ $s = \sqrt{A} = \sqrt{1} = 1km$

5. The Pythagorean Relationship states that the area of the square on one leg of a right triangle added to the area of the square on the other leg, equals the area of the square on the hypotenuse.





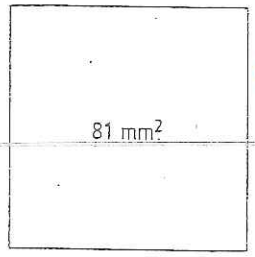
Practice Questions

1. Which number is a perfect square?

A 10 B 20

C 50 D 100 because it's root is a whole #. ie) $\sqrt{100} = 10$

2. What is the side length of the square in the diagram?



$s = \sqrt{A}$
$= \sqrt{81}$
$= 9\text{mm}$

A 6 mm B 9 mm

C 12 mm D 18 mm

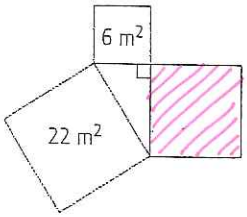
3. A square has a side length of 7 cm. What is the area of the square?

$A = s^2$
$= 7^2$
$= 49\text{cm}^2$

A 14 cm² B 21 cm²

C 28 cm² D 49 cm²

4. A right triangle has squares on each of its sides. What is the area of the blue square?



$c^2 - a^2 = b^2$
$22 - 6 = 16\text{m}^2$
or $6 + \_ = 22$

A 4 m² B 14 m²

C 16 m² D 28 m²

5. The value of $\sqrt{51}$ is closest to which whole number?

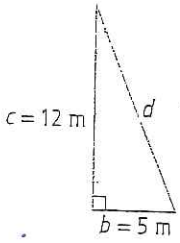
$\sqrt{49}$ 51 $\sqrt{64}$
7 8

A 7 B 8

C 49 D 51

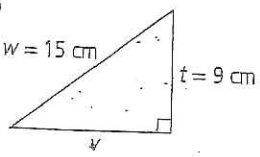
14. Find the missing side length of each triangle.

a)



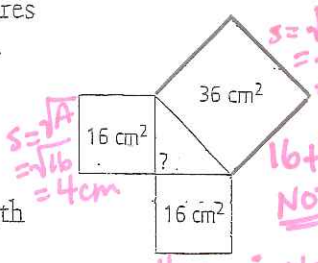
$\text{leg}^2 + \text{leg}^2 = \text{hyp}^2$
$5^2 + 12^2 = \text{hyp}^2$
$25 + 144 = \text{hyp}^2$
$\sqrt{169} = \sqrt{\text{hyp}^2}$
$13\text{m} = \text{hyp}$

b)



$\text{hyp}^2 - \text{leg}^2 = \text{leg}^2$
$15^2 - 9^2 = \text{leg}^2$
$225 - 81 = \text{leg}^2$
$\sqrt{144} = \sqrt{\text{leg}^2}$
$12\text{cm} = \text{leg}$

9. A triangle has squares on each of its sides.

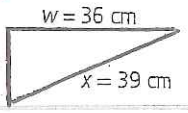


a) Is the triangle a right triangle? Explain.

$s = \sqrt{A} = \sqrt{16} = 4\text{cm}$
$s = \sqrt{A} = \sqrt{36} = 6\text{cm}$
$16 + 16 = 32$ NOT 36
$s = 4\text{cm}$
∴ NOT a right triangle

b) What is the length of each of the three sides?

10. Is the triangle a right triangle? Explain.



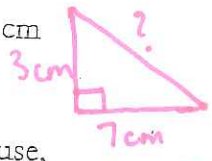
$a^2 + b^2 = c^2$
$15^2 + 36^2 = 39^2$
$225 + 1296 = 1521$
$1521 = 1521$
So yes, it is a right triangle.

11. The table shows the side lengths of four triangles. Which triangles are right angled?

Triangle	Side x (leg)	Side y (leg)	Side z (hyp)
✓ A	$9^2 = 81$	$12^2 = 144$	$15 = 225$
✗ B	$5^2 = 25$	$6^2 = 36$	$7^2 = 49$
✓ C	$12^2 = 144$	$35^2 = 1225$	$37^2 = 1369$
✓ D	30000^2	40000^2	50000^2

$81 + 144 = 225$
$25 + 36 = 61$
$144 + 1225 = 1369$

8. The legs of a right triangle measure 3 cm and 7 cm.



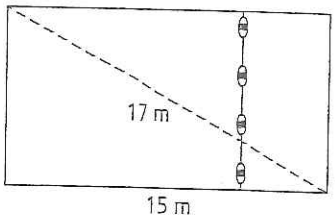
a) Use a calculator to determine the approximate length of the hypotenuse, to the nearest tenth of a centimetre.

$3^2 + 7^2 = \text{hyp}^2$
$9 + 49 = \text{hyp}^2$
$\sqrt{58} = \sqrt{\text{hyp}^2}$
$7.6 = \text{hyp}$

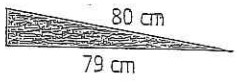
b) Explain why the length is an approximation both before and after you round the answer.

Because it is a non-terminating decimal (has no end) and then you round it, so even less accurate.

9. The rectangular pool at Wild Water World has a length that measures 15 m and a diagonal that measures 17 m. A float line divides the shallow end and deep end. What is the length of the float line?

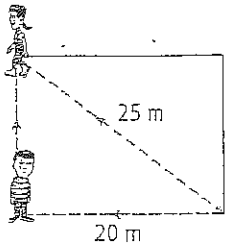


7. What is the height of the wheelchair ramp? Give your answer to the nearest tenth of a centimetre.



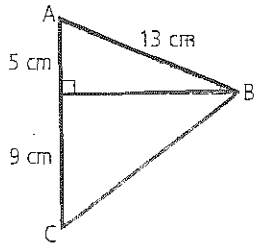
11. Use the Pythagorean relationship to determine whether a triangle with sides of 14 mm, 48 mm, and 50 mm is a right triangle. Show your work.

12. Josie skated diagonally across a rectangular ice rink. Han is skating along two sides of the rink and has just reached the first corner. How much farther does he have to skate to meet up with Josie?

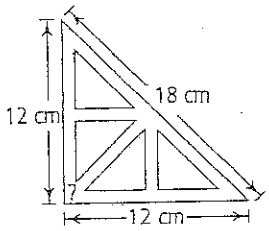


Extended Response

13. Determine the perimeter of $\triangle ABC$.

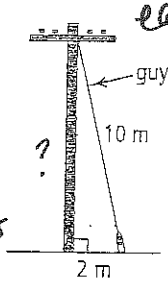


14. A carpenter's square is a tool in the shape of a right triangle. Joe thinks there may be something wrong with the one he bought. Determine whether the carpenter's square shown is a right triangle. Explain your reasoning.



$a^2+b^2=c^2$
$12^2+12^2=18^2$
$144+144=324$
$288 \neq 324$
Not a right triangle because a^2+b^2 does not equal c^2

4. Find the height of the pole where the guy wire is attached, to the nearest tenth of a metre.

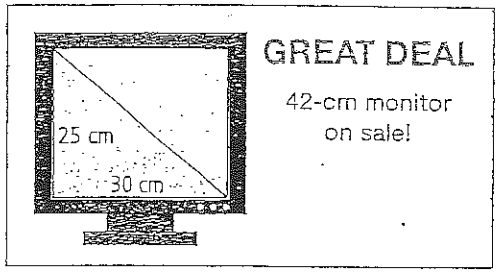


The height at which the guy wire attaches is 9.8m.

$hyp^2-leg^2=leg^2$
$10^2-2^2=leg^2$
$100-4=leg^2$
$\sqrt{96}=\sqrt{leg^2}$
$9.8_m = leg$

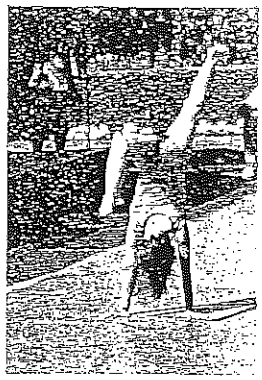
5. Martin measured a rectangle and wrote:
Width: 9 cm Length: 22 cm Diagonal: 23.8 cm
Could these measurements form a rectangle? Justify your answer.

8. Shanniar knows that the size of a computer monitor is based on the length of the diagonal of the screen. He thinks that the diagonal is not as large as the ad says. Is he correct? Explain.

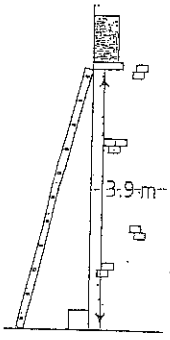


9. A checkerboard is made of 64 small squares that each have a dimension of 3 cm × 3 cm. The 64 small squares are arranged in eight rows of eight.
   a) What is the length of the diagonal of a small square? Give your answer to the nearest tenth of a centimetre.
   b) What is the total length of the diagonal of the board? Give your answer to the nearest centimetre.

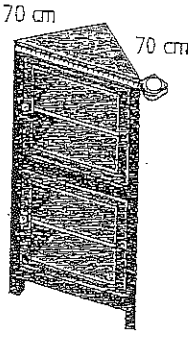
10. A gymnast requires a distance of 16 m for her tumbling routine. If the gymnast is competing on a 12 m × 12 m square mat, does she have enough room to do her routine safely? Explain your answer.

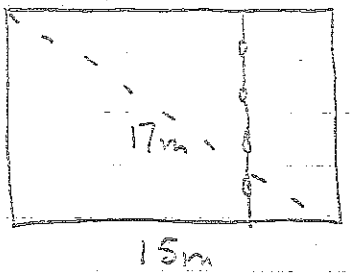


16. A 4-m ladder is being used for a production of *Romeo and Juliet*. The bottom of the ladder will be placed 1 m from the base of Juliet's house. Will the ladder reach the window? Show your work.

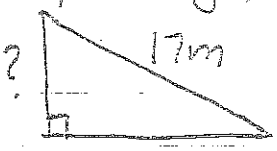


17. Yosef wants to buy a hutch. It must fit in the 90° corner of his dining room. Yosef measures as shown. What should his measurement be? Give your answer to the nearest tenth of a centimetre.





Look for your right triangle.



$hyp^2 - leg^2 = leg^2$

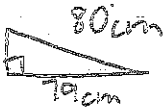
$17^2 - 15^2 = leg^2$

$289 - 225 = leg^2$

$\sqrt{64} = \sqrt{leg^2}$

$8m = leg$

∴ The length of the float line is 8m.

7. 

$hyp^2 - leg^2 = leg^2$

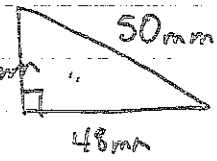
$80^2 - 79^2 = leg^2$

$6400 - 6241 = leg^2$

$\sqrt{159} = \sqrt{leg^2}$

$12.6cm = leg$

∴ The height of the ramp is 12.6 cm.

11. 

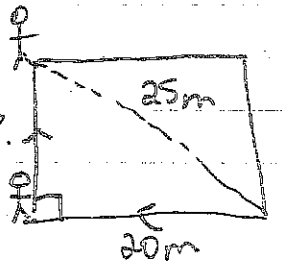
$a^2 + b^2 = c^2$

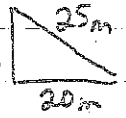
$14^2 + 48^2 = 50^2$

$196 + 2304 = 2500$

$2500 = 2500$

∴ Yes it is a right-triangle because $a^2 + b^2 = c^2$.

12. 



$hyp^2 - leg^2 = leg^2$

$25^2 - 20^2 = leg^2$

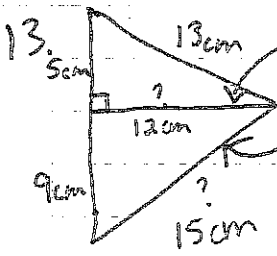
$625 - 400 = leg^2$

$\sqrt{225} = \sqrt{leg^2}$

$15m = leg$

∴ Han needs to skate 15m more to meet up with Josie.

Extended Response

13. 

find 1st

$hyp^2 - leg^2 = leg^2$

$13^2 - 5^2 = leg^2$

$169 - 25 = leg^2$

$\sqrt{144} = \sqrt{leg^2}$

$12cm = leg$

$leg^2 + leg^2 = hyp^2$

$12^2 + 9^2 = hyp^2$

$144 + 81 = hyp^2$

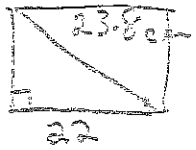
$\sqrt{225} = \sqrt{hyp^2}$

$15cm = hyp$

Perimeter

$13 + 15 + 9 + 5$

$= 42cm$

5. 

$9^2+22^2=23.8^2$
$81+484=566.44$
$565=566.44$

Not exact, but pretty close, so yes, it could be a rectangle!

or 9^2+22^2
$81+484$
$\sqrt{565}$
23.8

8. 

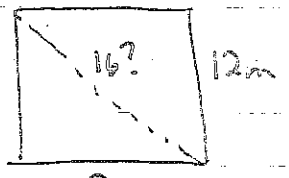
a) $a^2+b^2=c^2$
$25^2+30^2=c^2$
$625+900=c^2$
$\sqrt{1525}=\sqrt{c^2}$
$39.1\text{ cm}=c$

He is correct, it is 39.1cm NOT 42cm, as advertised.

9. 

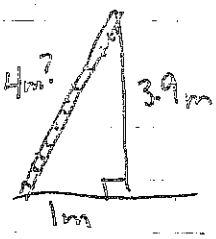
a) $3^2+3^2=c^2$
$9+9=c^2$
$\sqrt{18}=\sqrt{c^2}$
$4.2\text{cm}=c$

b) $4.2\times 8=33.6\text{ cm}$ so 37
The length of the diagonal of the board is 37cm

10. 

$a^2+b^2=c^2$
$12^2+12^2=c^2$
$144+144=c^2$
$\sqrt{288}=\sqrt{c^2}$
$17\text{m}=c$

So yes, she can safely do her routine on a mat of this size.

16. 

$a^2+b^2=c^2$
$1^2+3.9^2=c^2$
$1+15.21=c^2$
$\sqrt{16.21}=\sqrt{c^2}$
$4\text{m}=c$

Yes, the ladder will reach.

17. 

$a^2+b^2=c^2$
$70^2+70^2=c^2$
$4900+4900=c^2$
$\sqrt{9800}=\sqrt{c^2}$
$99.0=c$

Yosef should measure 99.0 cm.