

Topic test 8

Pythagoras' theorem

- Time allowed: 45 minutes.
- Part A: 20 multiple-choice questions (40 marks)
- Part B: 17 free-response questions (60 marks)

Name: _____

Part A

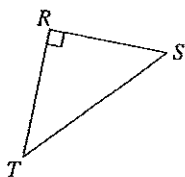
20 multiple-choice questions

2 marks each: 40 marks

Circle the correct answer.

- 1 Which side of this triangle is the hypotenuse?

- A RS
B TR
C ST
D RT

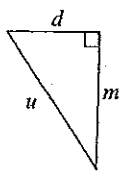


- 2 Which one of these numbers is a surd?

- A $\sqrt{36}$ B $\sqrt{100}$
C $\sqrt{40}$ D $\sqrt{64}$

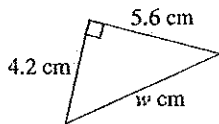
- 3 Which is the correct Pythagoras' theorem for this triangle?

- A $d^2 = m^2 - u^2$
B $d^2 = m^2 + u^2$
C $m^2 = d^2 + u^2$
D $u^2 = m^2 + d^2$



- 4 Find w .

- A 3.70
B 9.8
C 7
D 1.4

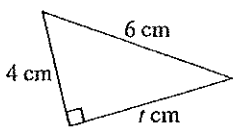


- 5 The value of $\sqrt{1.7^2 - 1.5^2}$ is closest to:

- A 0.64 B 0.8
C 0.20 D 0.45

- 6 Find t .

- A 1.41 B 7.21
C 4.47 D 20



- 7 Pythagoras was a mathematician from which ancient country?

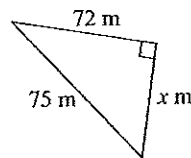
- A Rome B Babylon
C Greece D Egypt

- 8 If $r^2 = 10^2 + 4^2$, what is the value of r ?

- A 196 B 10.77
C 9.17 D 6.32

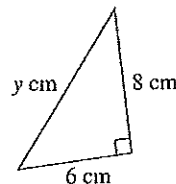
- 9 Find x .

- A 21
B 3
C 15
D 18



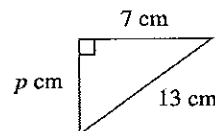
- 10 Find y .

- A 24 B 10
C 7 D 14



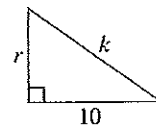
- 11 Find p as a surd.

- A $\sqrt{6}$
B $\sqrt{70}$
C $\sqrt{20}$
D $\sqrt{120}$



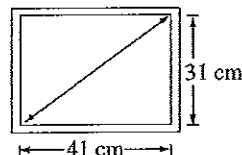
- 12 Which is the correct Pythagoras' theorem for this triangle?

- A $r^2 = 10^2 + k^2$
B $10^2 = r^2 - k^2$
C $r^2 = k^2 - 10^2$
D $k^2 = r^2 - 10^2$



- 13 A TV screen is 41 cm long and 31 cm high. The length of its diagonal is closest to:

- A 49 cm
B 51 cm
C 54 cm
D 48 cm

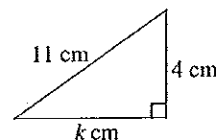


- 14 Which one of these is a Pythagorean triad?

- A (8, 15, 17) B (6, 10, 16)
C (18, 21, 25) D (7, 12, 13)

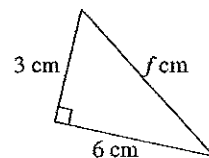
- 15 Find k .

- A 2.65
B 8
C 10.25
D 11.70



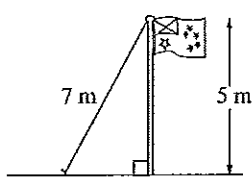
- 16 Find f as a surd.

- A $\sqrt{18}$ B $\sqrt{27}$
C $\sqrt{45}$ D $\sqrt{67}$



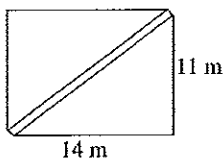
Topic test 8: Pythagoras' theorem continued

17 A flagpole of height 5 metres is tied to the ground by a 7 metre cable. How far from the base of the flagpole is the cable tied?



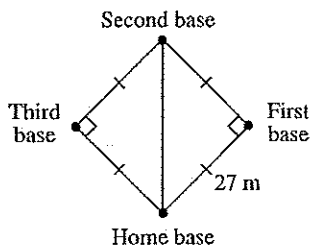
- A 8.60 m
B 4 m
C 1.41 m
D 4.90 m

18 Find the length of the path going through the park.



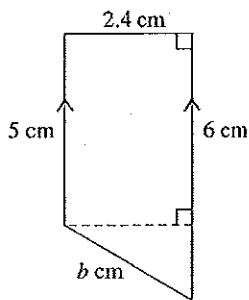
- A 77 m
B 17.80 m
C 12.41 m
D 25 m

19 A baseball field is shaped like a square with a side length of 27 metres. What is the distance between the home plate and second base?



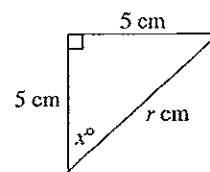
- A 7.35 m
B 52 m
C 40.50 m
D 38.18 m

20 Find b .

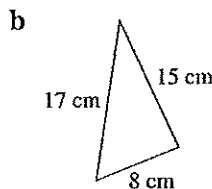
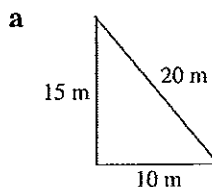


- A 8.17
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C 2.60
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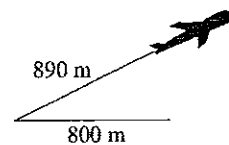
22 (4 marks) Find r and x .



23 (4 marks) Test whether each triangle is right-angled.



24 (2 marks) After taking off, a plane flies 890 metres but covers a ground distance of 800 metres. How high is the plane above the ground?



25 (5 marks)

a Use a ruler to draw a right-angled triangle with the two shorter sides 7.5 cm and 4 cm.

b Measure the length of the hypotenuse.

c Use Pythagoras' theorem to calculate the length of the hypotenuse.

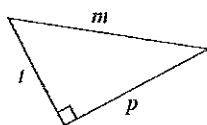
Part B

17 free-response questions

60 marks

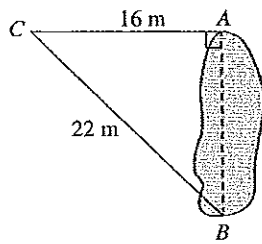
Show working where appropriate.

21 (2 marks) Write Pythagoras' theorem for this triangle.



Topic test 8: Pythagoras' theorem continued

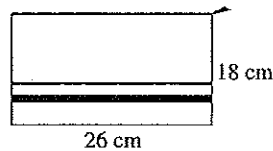
- 26 (2 marks) Rani found the distance across the pond by taking the measurements shown. Find the distance AB correct to one decimal place.



- 31 (3 marks) A 4-metre ladder reaches up a wall to a window 3.2 metres high. Calculate how far the bottom of the ladder is from the bottom of the wall.

- 27 (2 marks) Write the meaning of the word **hypotenuse**.

- 28 (3 marks) Test whether a 30 cm ruler can fit into a rectangular pencil case of dimensions 26 cm by 18 cm.

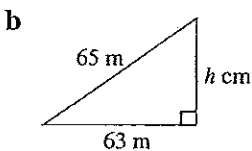
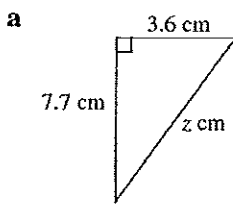


- 32 (2 marks) The numbers 20, 21 and x form a Pythagorean triad. What is the value of x ?

- 29 (4 marks) Complete each sentence with appropriate words.

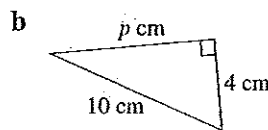
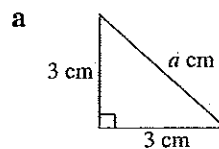
- a Pythagoras' theorem is only true for _____ triangles.
 b Pythagoras' theorem states that the square of the _____ is equal to the _____ of the squares of the other _____ sides.

- 30 (4 marks) Find the value of the pronumeral in each triangle.

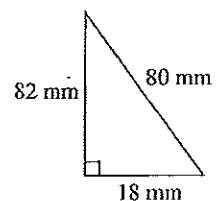


- 33 (3 marks) From home, Saleh walked 1.2 km north before turning and walking 0.9 km west. How far is he directly from home?

- 34 (4 marks) Find the value of the pronumeral as a surd for each triangle.

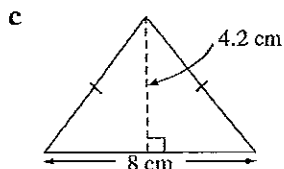
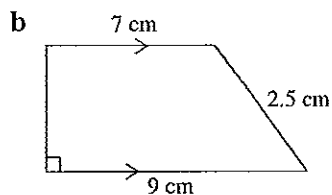
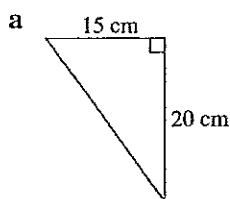


- 35 (2 marks) This diagram could not possibly be a right-angled triangle. Explain why.



Topic test 8: Pythagoras' theorem continued

36 (6 marks) Calculate the perimeter of each figure.



37 (8 marks) One set of formulas for making a Pythagorean triad is x , $\frac{1}{2}(x^2 - 1)$, $\frac{1}{2}(x^2 + 1)$, where x is any odd number.

a Substitute $x = 9$ into the formulas to find a Pythagorean triad.

b Show that this triad follows Pythagoras' theorem.

c Choose a different value of x to find another Pythagorean triad.

END OF TEST.

Use the rest of the page for extra working space.

Topic test 8

Pythagoras' theorem

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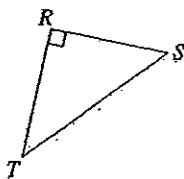
Name: _____

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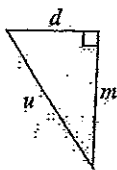


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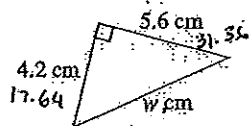
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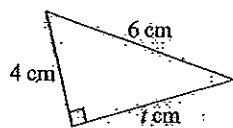


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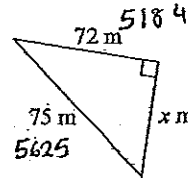
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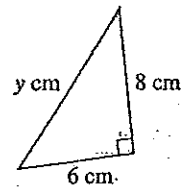
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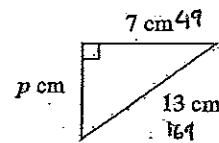
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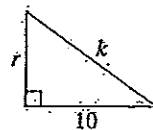
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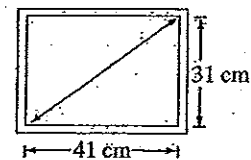
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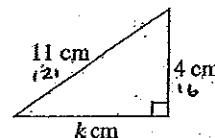


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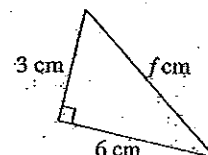
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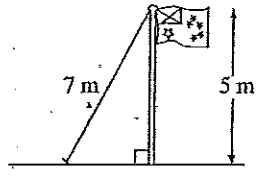
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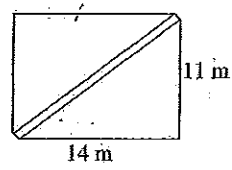
Topic test 8: Pythagoras' theorem continued

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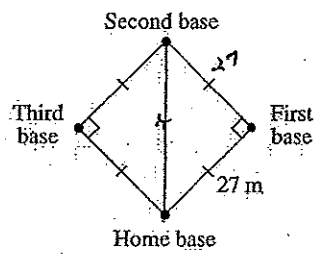
- A 8.60 m
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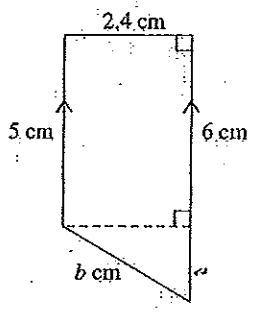
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20 Find b .

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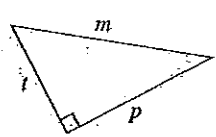


Part B

17 free-response questions
60 marks

Show working where appropriate.

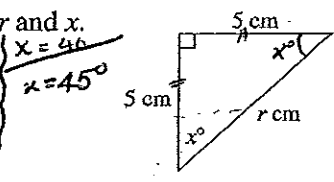
21 (2 marks) Write Pythagoras' theorem for this triangle.



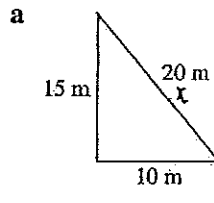
$m^2 = t^2 + p^2$ ✓

22 (4 marks) Find r and x .

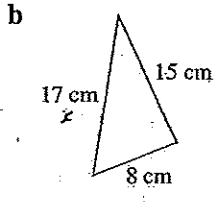
$r^2 = 5^2 + 5^2$
 $r = 25 + 25$
 $r = 50$
 $r = 7.071067812$
 $r = 7 \text{ cm (1 dec)}$



23 (4 marks) Test whether each triangle is right-angled.

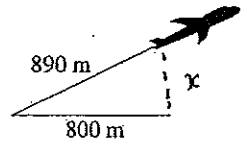


$x^2 = 15^2 + 10^2$
 $x = 225 + 100$
 $x = 325$
 $x = 18.02775638$
 $x = 18 \text{ m (1 dec)}$
 ∴ This is not a right-angled triangle.



$x^2 = 15^2 + 8^2$
 $x = 225 + 64$
 $x = 289$
 $x = 17 \text{ cm}$
 ∴ This is a right-angled triangle.

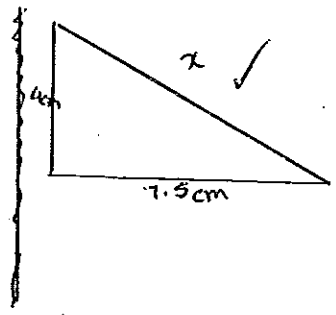
24 (2 marks) After taking off, a plane flies 890 metres but covers a ground distance of 800 metres. How high is the plane above the ground?



$890^2 = 800^2 + x^2$
 $792100 = 640000 + x^2$
 $x^2 = 152100$

25 (5 marks) $x = 390 \text{ m}$

a Use a ruler to draw a right-angled triangle with the two shorter sides 7.5 cm and 4 cm.



b Measure the length of the hypotenuse.

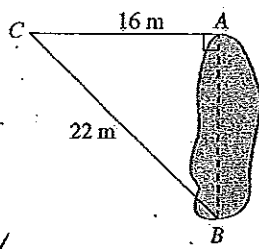
$x = 8.5 \text{ cm}$ ✓

c Use Pythagoras' theorem to calculate the length of the hypotenuse.

$x^2 = 4^2 + 7.5^2$
 $x^2 = 16 + 56.25$
 $x^2 = 72.25$
 $x = 8.5 \text{ cm}$

Topic test 8: Pythagoras' theorem continued

- 26 (2 marks) Rani found the distance across the pond by taking the measurements shown. Find the distance AB correct to one decimal place.

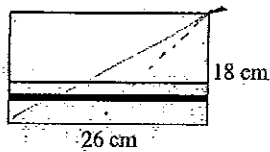


$AB = 15.1 \text{ m}$

- 27 (2 marks) Write the meaning of the word hypotenuse.

The longest part of the triangle.

- 28 (3 marks) Test whether a 30 cm ruler can fit into a rectangular pencil case of dimensions 26 cm by 18 cm. **No** it does not work.



- 29 (4 marks) Complete each sentence with appropriate words.

a Pythagoras' theorem is only true for right-angled triangles.

b Pythagoras' theorem states that the square of the hypotenuse is equal to the sum of the squares of the other two sides.

- 30 (4 marks) Find the value of the pronumeral in each triangle.

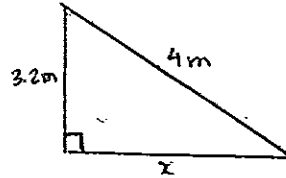
a

$z^2 = 3.6^2 + 7.7^2$
 $z^2 = 12.96 + 59.29$
 $z^2 = 72.25$
 $z = 8.5 \text{ cm}$

b

$65^2 = 63^2 + h^2$
 $4225 = 3969 + h^2$
 $h^2 = 256$
 $h = 16 \text{ cm}$

- 31 (3 marks) A 4-metre ladder reaches up a wall to a window 3.2 metres high. Calculate how far the bottom of the ladder is from the bottom of the wall.

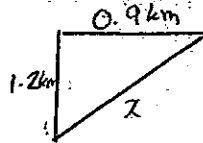


$4^2 = 3.2^2 + x^2$
 $16 = 10.24 + x^2$
 $x^2 = 5.76$
 $x = 2.4$

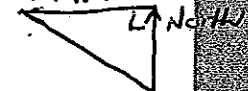
- 32 (2 marks) The numbers 20, 21 and x form a Pythagorean triad. What is the value of x ?

$x = 29$ $\left\{ \begin{array}{l} x^2 = 20^2 + 21^2 \\ x^2 = 400 + 441 \\ x^2 = 841 \\ x = 29 \end{array} \right.$

- 33 (3 marks) From home, Saleh walked 1.2 km north before turning and walking 0.9 km west. How far is he directly from home?



$x^2 = 0.9^2 + 1.2^2$
 $x^2 = 0.81 + 1.44$
 $x^2 = 2.25$
 $x = 1.5 \text{ km}$



- 34 (4 marks) Find the value of the pronumeral as a surd for each triangle.

a

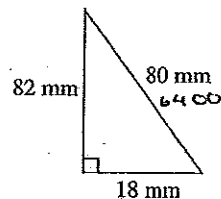
$a^2 = 3^2 + 3^2$
 $a^2 = 9 + 9$
 $a^2 = 18$
 $a = \sqrt{18}$

b

$10^2 = 4^2 + p^2$
 $100 = 16 + p^2$
 $100 - 16 = p^2$
 $84 = p^2$
 $p = \sqrt{84}$

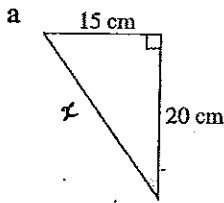
- 35 (2 marks) This diagram could not possibly be a right-angled triangle. Explain why.

$82^2 + 18^2$ doesn't add up to 80^2 because the answer is in a surd or not in a whole number.



Topic test 8: Pythagoras' theorem continued

36 (6 marks) Calculate the perimeter of each figure.

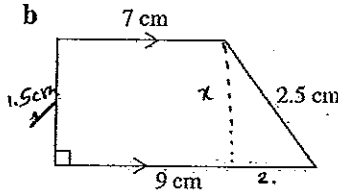


$$\begin{aligned} x^2 &= 15^2 + 20^2 \\ x^2 &= 225 + 400 \\ x^2 &= 625 \\ x &= 25 \end{aligned}$$

∴ The perimeter for this triangle is 60 cm.

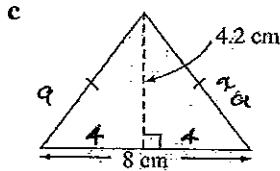
END OF TEST.

Use the rest of the page for extra working space.



$$\begin{aligned} 2.5^2 &= 2^2 + x^2 \\ 6.25 - 4 \\ x^2 &= 2.25 \\ x &= 1.5 \end{aligned}$$

∴ The perimeter for this ~~triangle~~ trapezium is 20 cm.



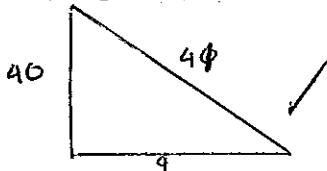
$$\begin{aligned} x^2 &= 4.2^2 + 4^2 \\ x^2 &= 17.64 + 16 \\ x^2 &= 33.64 \\ x &= 5.8 \end{aligned}$$

$$\begin{aligned} a^2 &= 4.2^2 + 4^2 \\ &= 33.64 \\ a &= 5.8 \end{aligned}$$

$$\begin{aligned} \text{Perimeter of triangle} &= 2 \times 5.8 + 8 \\ &= 19.6 \text{ cm} \end{aligned}$$

37 (8 marks) One set of formulae for making a Pythagorean triad is $x, \frac{1}{2}(x^2 - 1), \frac{1}{2}(x^2 + 1)$, where x is any odd number.

a Substitute $x = 9$ into the formulae to find a Pythagorean triad.

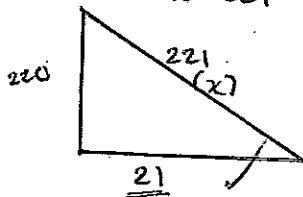


b Show that this triad follows Pythagoras' theorem. $40 = x$

$$\begin{aligned} x^2 &= 40^2 + 9^2 \\ x^2 &= 1600 + 81 \\ x^2 &= 1681 \\ x &= 41 \end{aligned}$$

c Choose a different value of x to find another Pythagorean triad.

$$x = 221$$



$$\begin{aligned} x^2 &= 220^2 + 21^2 \\ x^2 &= 48400 + 441 \\ x^2 &= 48841 \\ x &= 221 \end{aligned}$$