Name: KEY Date: _____

3.4 Using the Pythagorean Relationship

***MathLinks 8*, pages 101–105**

Key Ideas Review

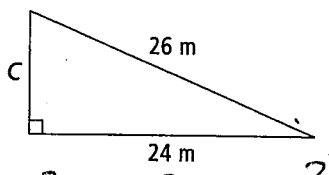
Choose from the following terms to complete #1.

hypotenuse | legs | length | Pythagorean

1. The Pythagorean relationship can be used to determine the length of the hypotenuse of a right triangle when the lengths of the two legs are known.

2. Use the relationship to determine the length of C in each triangle, to the nearest whole number. Show your work.

a)



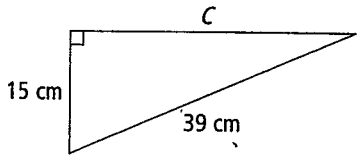
$c^2 + 24^2 = 26^2$

$c^2 + 576 = 676$ (−576)

$c^2 = 100$

$c = \sqrt{100} = 10$

b)



$15^2 + c^2 = 39^2$

$225 + c^2 = 1521$

$c^2 = 1296$

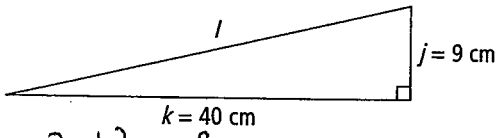
$c = \sqrt{1296}$

$c = 36$

Practise and Apply

3. Determine the length of each hypotenuse. Show your work.

a)



$k^2 + j^2 = l^2$

$9^2 + 40^2 = l^2$

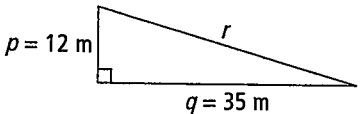
$81 + 1600 = l^2$

$1681 = l^2$

$l = \sqrt{1681}$

$l = 41$ cm

b)



$p^2 + q^2 = r^2$

$12^2 + 35^2 = r^2$

$144 + 1225 = r^2$

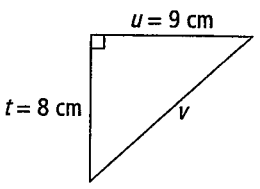
$1369 = r^2$

$\sqrt{1369} = r$

$r = 37$ m

4. What is the length of each hypotenuse, to the nearest centimetre? Show your work.

a)



$u^2 + t^2 = v^2$

$9^2 + 8^2 = v^2$

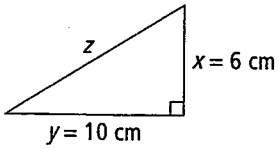
$81 + 64 = v^2$

$145 = v^2$

$12.04 = v$

$12 \text{ cm} = v$

b)



$x^2 + y^2 = z^2$

$6^2 + 10^2 = z^2$

$36 + 100 = z^2$

$136 = z^2$

$\sqrt{136} = z$

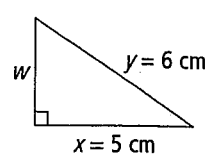
$11.66 = z$

$12 \text{ cm} = z$

Name: _____ **Date:** _____

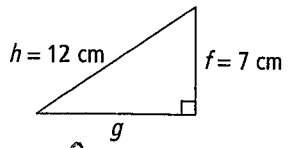
5. Calculate the missing side length for each right triangle, to the nearest tenth of a centimetre. Show your work.

a)



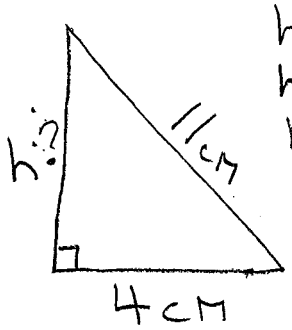
$w^2 + x^2 = y^2$
$w^2 + 5^2 = 6^2$
$w^2 + 25 = 36$
$w^2 + 25 - 25 = 36 - 25$
$w^2 = 11$
$\sqrt{w} = \sqrt{11}$
$w = 3.3166$
$w = 3.3\text{ cm}$

b)



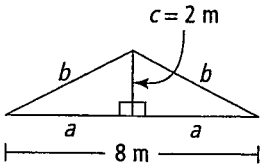
$f^2 + g^2 = h^2$
$7^2 + g^2 = 12^2$
$49 + g^2 = 144$
$49 - 49 + g^2 = 144 - 49$
$g^2 = 95$
$g = 9.74679$
$g = 9.7\text{ cm}$

6. Find the height of a triangle with a base of 4 cm and a hypotenuse of 11 cm. Round to the nearest tenth of a centimetre. Show your work.



$h^2 + 4^2 = 11^2$
$h^2 + 16 = 121$
$h^2 + 16 - 16 = 121 - 16$
$h^2 = 105$
$h = \sqrt{105}$
$h = 10.24695$
$h = 10.3\text{ cm}$

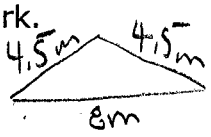
7. A triangle is made up of two smaller congruent right triangles.



a) Find the length of the hypotenuse for the right triangles, to the nearest tenth of a metre. Show your work.

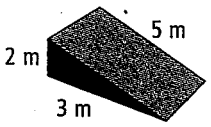
$8 \div 2 = 4$
$a^2 + c^2 = b$
$4^2 + 2^2 = b^2$
$16 + 4 = b^2$
$20 = b^2$
$\sqrt{20} = b$
$b = 4.4721359$
$b = 4.5\text{ m}$

b) Calculate the perimeter of the large triangle, to the nearest tenth of a metre. Show your work.



$4.5 + 4.5 + 8$
$9 + 8$
17 m
$\approx 17.0\text{ m}$

8. Ellie and Lucas are going to the skateboard park to try out the new ramp.



Is the new ramp a right triangle? Explain your thinking.

$a^2 + b^2 = c^2$
$3^2 + 2^2 = 5^2$
$9 + 4 = 25$
$13 \neq 25$

no, this is not a right triangle!

Name: KEY Date: _____

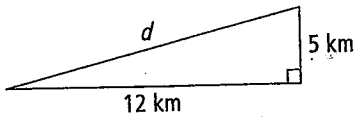
3.5 Applying the Pythagorean Relationship

MathLinks 8, pages 106–111

Key Ideas Review

Use the diagrams provided to complete the equations for #1.

1. a)



$d^2 = 12^2 + 5^2$

$d^2 = 144 + 25$

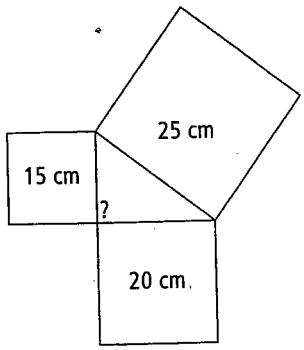
$d^2 = 169$

$d = \sqrt{169}$

$d = 13$

The hypotenuse is 13 km long.

b)



$15^2 + 20^2 = 25^2$

Left side: $15^2 + 20^2$

$= 225 + 400$

$= 625$

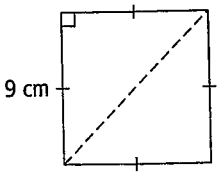
Right side: $25^2 = 625$

Are both sides equal?
YES ✓ NO _____

Is this a right triangle?
YES ✓ NO _____

Practise and Apply

2. What is the length of the diagonal of a square whose sides measure 9 cm? Give the answer to the nearest tenth of a centimetre. Show your work.



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

$9^2+9^2=c^2$

$81+81=c^2$

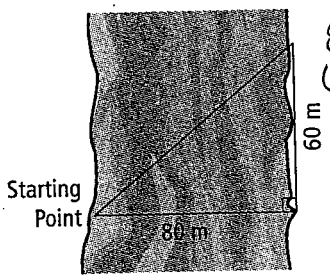
$162=c^2$

$\sqrt{162}=c$

$12.7279=c$

$12.7\text{cm}=c$

3. Aden decides to swim across a river that is 80 m wide. As he begins to swim the current carries him 60 m downstream. How far did he actually swim?



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

$80^2+60^2=c^2$

$6400+3600=c^2$

$10{,}000=c^2$

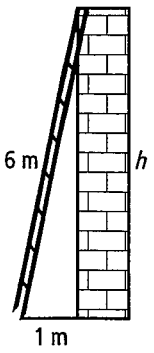
$\sqrt{10000}=c$

$100\text{m}=c$

100 meters

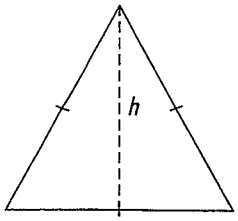
Name: _____ **Date:** _____

4. The foot of a ladder is 1 m from a wall. If the ladder is 6 m long, how far up the wall does the ladder reach? Give the answer to the nearest tenth of a metre. Show your work.



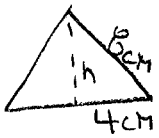
$h^2+1^2=6^2$
$h^2+1=36-1$
$h^2=35$
$h=\sqrt{35}$
$h=5.9161\text{m}$
$h=5.9\text{m}$

5. The perimeter of an equilateral triangle is 24 cm.



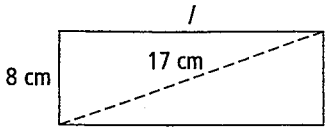
Calculate the height of the triangle to the nearest tenth of a centimetre. Show your work.

equilateral triangle: all 3 sides are the same. $24\div3=8$



$a^2+b^2=c^2$
$4^2+h^2=8^2$
$16+h^2=64$ (−16)
$h^2=48$
$h=\sqrt{48}$
$h=6.9282\text{cm}$
$h=6.9\text{cm}$

6. The width of a rectangle is 8 cm, and its diagonal is 17 cm.



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

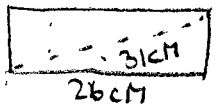
a) Calculate the length of the rectangle. Show your work.

$8^2+l^2=17^2$
$64+l^2=289-64$ (−64)
$l^2=225$ $l=\sqrt{225}$ $l=15\text{cm}$

b) Calculate the area of the rectangle. Show your work.

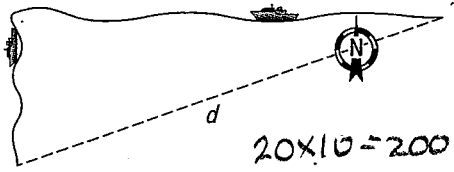
$A=LXW$
$A=15\times8$
$A=120\text{cm}^2$

7. A quadrilateral has a width of 17 cm and a length of 26 cm. A diagonal is 31 cm. Is the quadrilateral a rectangle? Justify your answer.



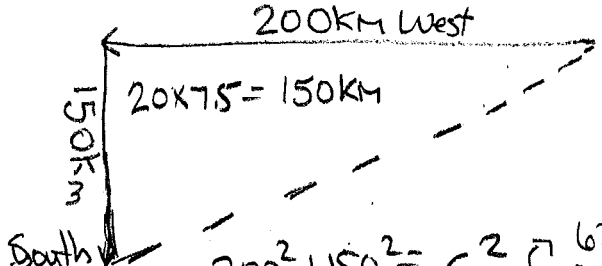
$a^2+b^2\neq c^2$
$17^2+26^2=31^2$
$289+676=961$
$965\neq961$

8. A ship leaves port heading due west. After travelling at a speed of 20 km/h for 10 h, the ship makes a 90° turn and heads south, travelling at the same speed. After travelling south for $7\frac{1}{2}$ h, how far is the ship from the port? Show your work.



$20\times10=200\text{ km}$

The ship 250km from the port.



$20\times7.5=150\text{km}$

$200^2+150^2=c^2$
$40000+22500=c^2$
$62500=c^2$
$\sqrt{62500}=c$
$c=250\text{ km}$