Worksheet 15 Memorandum: Pythagoras

Grade 8 Mathematics

1. only c – the right-angled triangle.

2. a) $A^2 = B^2 + C^2$

   OR $A^2 = C^2 + B^2$

   b) $H^2 = R^2 + L^2$

   OR $H^2 = L^2 + R^2$

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

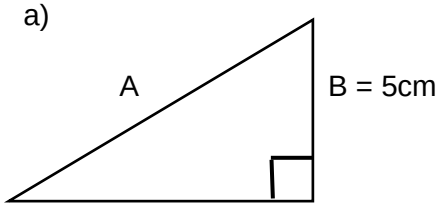
   OR $x^2 = z^2 + y^2$

   d) $n^2 = m^2 + p^2$

   OR $n^2 = p^2 + m^2$

   (Remember when adding the order doesn't matter).

3. a)



$A^2 = B^2 + C^2$

$A^2 = 5^2 + 11^2$

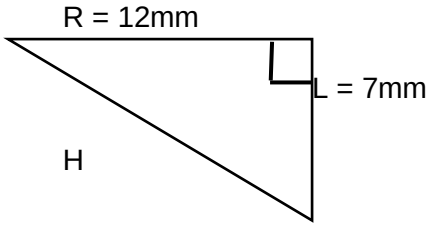
$A^2 = 25 + 121$

$A = \sqrt{146}\ cm$

$A = 12.08cm$

Either answer is acceptable.

b)



$H^2 = R^2 + L^2$

$H^2 = 12^2 + 7^2$

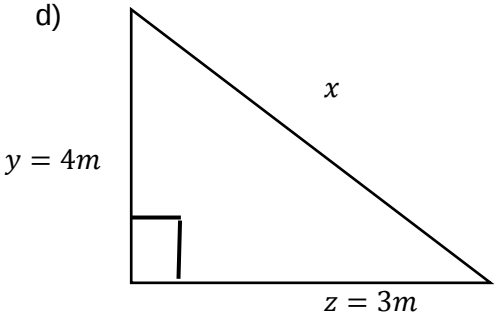
$H^2 = 144 + 49$

$H = \sqrt{193}$

$H = 13.89mm$

(Don't forget your units ☺)

d)



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

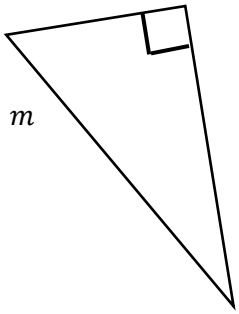
$x^2 = 4^2 + 3^2$

$x^2 = 16 + 9$

$x = \sqrt{25}$

$x = 5m$

e) $p = 39cm$



$m^2 = p^2 + n^2$

$m^2 = 39^2 + 52^2$

$m^2 = 1\,521 + 2\,704$

$m = \sqrt{4225}$

$m = 65cm$

4. a) $a = 11cm,\ b = 17cm,\ c = ?$

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

$c^2 = 11^2 + 17^2$

$c^2 = 121 + 289$

$c = \sqrt{410}cm$

b) $d = 12mm,\ e = 9mm,\ f = ?$

$f^2 = d^2 + e^2$

$f^2 = 12^2 + 9^2$

$f^2 = 144 + 81$

$f = \sqrt{225}$

$f = 15mm$

c) $g = 6m,\ h = 12m,\ i = ?$

$i^2 = g^2 + h^2$

$i^2 = 6^2 + 12^2$

$i^2 = 36 + 144$

$i = \sqrt{180}\,m$

d) $j = 34mm,\ k = 46mm,\ l = ?$

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

$l^2 = 34^2 + 46^2$

$l^2 = 1\,156 + 2\,116$

$l = \sqrt{3272}\,mm$

e) $m = 14m, \quad n = 25m, \quad o = ?$

$o^2 = m^2 + n^2$

$o^2 = 14^2 + 25^2$

$o^2 = 196 + 625$

$o = \sqrt{821}\, m$

f) $p = 9\, cm, \quad q = 43cm, \quad r = ?$

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

$r^2 = 9^2 + 43^2$

$r^2 = 81 + 1\,849$

$r = \sqrt{1\,930}\, cm$

g) $s = 30m, \quad t = 2m, \quad u = ?$

$u^2 = s^2 + t^2$

$u^2 = 30^2 + 2^2$

$u^2 = 900 + 4$

$u = \sqrt{904}\, m$

h) $v = 12mm, \quad w = 22mm, \quad x = ?$

$x^2 = v^2 + w^2$

$x^2 = 12^2 + 22^2$

$x^2 = 144 + 484$

$x = \sqrt{628}\, mm$

i) $x = 3cm, \quad y = 31cm, \quad z = ?$

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

$z^2 = 3^2 + 31^2$

$z^2 = 9 + 961$

$z = \sqrt{970}\, cm$

j) $m = 21m, \quad n = 32m, \quad p = ?$

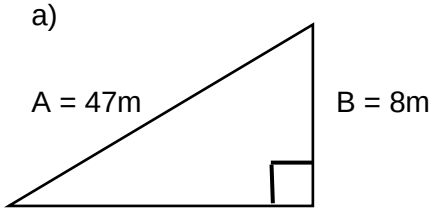
$p^2 = m^2 + n^2$

$p^2 = 21^2 + 32^2$

$p^2 = 441 + 1\,024$

$p = \sqrt{1\,465}\, m$

5. a)



$A^2 = B^2 + C^2$

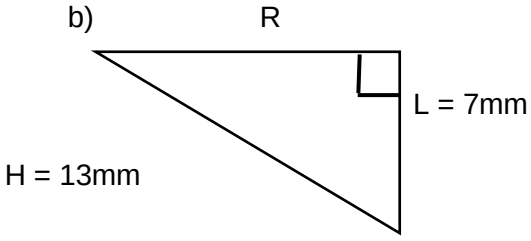
$C^2 = A^2 - B^2$

$C^2 = 47^2 - 8^2$

$C^2 = 2\,209 - 64$

$C = \sqrt{2\,145}\, m$

b)



$H^2 = R^2 + L^2$

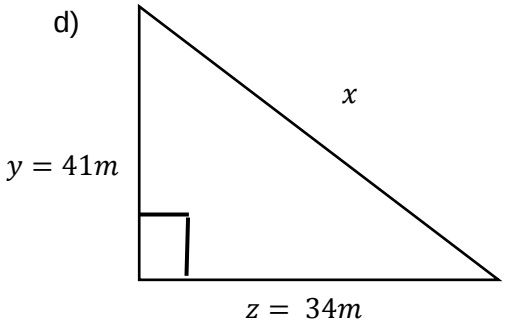
$R^2 = H^2 - L^2$

$R^2 = 13^2 - 7^2$

$R^2 = 169 - 49$

$R = \sqrt{120}\, mm$

d)



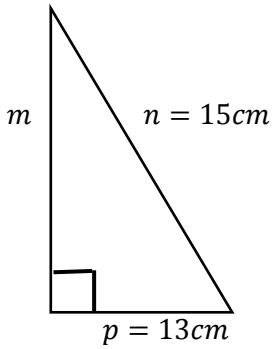
$x^2 = y^2 + z^2$

$x^2 = 41^2 + 34^2$

$x^2 = 1\,681 + 1\,156$

$x = \sqrt{2\,837}\,m$

e)



$n^2 = m^2 + p^2$

$m^2 = n^2 - p^2$

$m^2 = 15^2 - 13^2$

$m^2 = 225 - 169$

$m = \sqrt{56}\,cm$

6. a) a = 26cm, b = 33cm, c = 40cm

Is $c^2\ (longest\ side) = a^2 + b^2\ \ (two\ shortest\ sides)$?

$c^2 = 40^2$ and $a^2 + b^2 = 26^2 + 33^2$

$c^2 = 1\,600\ cm^2$ $a^2 + b^2 = 676 + 1\,089 = 1\,765\ cm^2$

So $c^2 \neq a^2 + b^2$ and Δabc is therefore **not** a right-angled triangle.

b) d = 20m, e = 48m, f = 43,63m

Is $f^2 = d^2 + e^2$?

$f^2 = 48^2$ and $d^2 + e^2 = 20^2 + 43{,}63^2$

$f^2 = 2\,304\ m^2$ $d^2 + e^2 = 400 + 1\,903{,}58 = 2\,303{,}58 \approx 2\,304\ m^2$

So $f^2 = d^2 + e^2$ and Δdef **is** a right-angled triangle.

c) g = 47mm, h = 5mm i = 24mm

Is $g^2 = h^2 + i^2$?

$g^2 = 47^2$ and $h^2 + i^2 = 5^2 + 24^2$

$g^2 = 2\,209\ mm^2$ $h^2 + i^2 = 25 + 576 = 601\ mm^2$

So $g^2 \neq h^2 + i^2$ and Δghi is **not** a right-angled triangle.

d) j = 30m, k = 37m, l = 47,63m

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

$l^2 = 47{,}63^2$ and $j^2 + k^2 = 30^2 + 37^2$

$l^2 = 2\,268{,}62 \approx 2\,269\ m^2$ $j^2 + k^2 = 900 + 1369 = 2\,269\ m^2$

So $l^2 = j^2 + k^2$ and Δjkl **is** a right-angled triangle

e) m = 33cm, n = 28cm, o = 39cm

Is $o^2 = m^2 + n^2$?

$o^2 = 39^2$ and $m^2 + n^2 = 33^2 + 28^2$

$o^2 = 1\,521\ cm^2$ $m^2 + n^2 = 1089 + 784 = 1\,873\ cm^2$

So $o^2 \neq m^2 + n^2$ and Δmno is **not** a right-angled triangle.

f) p = 42cm, q = 27cm, r = 19cm

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

$p^2 = 42^2$ and $q^2 + r^2 = 27^2 + 19^2$

$p^2 = 1\,764\ cm^2$ $q^2 + r^2 = 729 + 361 = \ 1\,090\ cm^2$

So $p^2 \neq q^2 + r^2$ and Δpqr is **not** a right-angled triangle.

g) s = 2mm, t = $\sqrt{20}$ mm, u = 4mm

Is $t^2 = s^2 + u^2$?

$t^2 = \left(\sqrt{20}\right)^2$ and $s^2 + u^2 = 2^2 + 4^2$

$t^2 = 20\ mm^2$ $s^2 + u^2 = 4 + 16 = 20\ mm$

So $t^2 = s^2 + u^2$ and Δstu **is** a right-angled triangle.

h) v = 11m, w = 24m, x = 28m

Is $x^2 = v^2 + w^2$?

$x^2 = 28^2$ and $v^2 + w^2 = 11^2 + 24^2$

$x^2 = 784\ m^2$ $v^2 + w^2 = 121 + 576 = 697\ m^2$

So $x^2 \neq v^2 + w^2$ and Δvwx is **not** a right-angled triangle.

i) x = 1 300mm, y = 1 200mm, z = 500mm

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

$x^2 = 1\ 300^2$ and $y^2 + z^2 = 1\ 200^2 + 500^2$

$x^2 = 1\ 690\ 000mm^2$ $y^2 + z^2 = 1\ 440\ 000 + 250\ 000$

$= 1\ 690\ 000\ mm^2$

So $x^2 = y^2 + z^2$ and Δxyz **is** a right-angled triangle.

j) a = 31cm, b = 21cm, c = 40cm

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

$c^2 = 40^2$ and $a^2 + b^2 = 31^2 + 21^2$

$c^2 = 1\ 600\ cm^2$ $a^2 + b^2 = 961 + 441 = 1\ 402\ cm^2$

So $c^2 \neq a^2 + b^2$ and Δabc is **not** a right-angled triangle.

k) d = 27cm, e = 3cm, f = 21cm

Is $d^2 = e^2 + f^2$?

$d^2 = 27^2$ and $e^2 + f^2 = 3^2 + 21^2$

$d^2 = 729\ cm^2$ $e^2 + f^2 = 9 + 441 = 450\ cm^2$

So $d^2 \neq e^2 + f^2$ and Δdef is **not** a right-angled triangle.

l) g = 24m, h = 25m, j = 7m

Is $h^2 = g^2 + j^2$

$h^2 = 25^2$ and $g^2 + j^2 = 24^2 + 7^2$

$h^2 = 625\ m^2$ $g^2 + j^2 = 576 + 49 = 625\ m^2$

So $h^2 = g^2 + j^2$ and Δghj **is** a right-angled triangle.