Question 1

Maisy writes down the following theorem:

"If a triangle has sides of length 3 cm, 4 cm, and 5 cm, then it is a right-angled triangle."

(a) State the converse of Maisy's theorem.

The converse of Maisy's theorem states:

"If a triangle is a right-angled triangle, then it has sides of length 3 cm, 4 cm, and 5 cm."

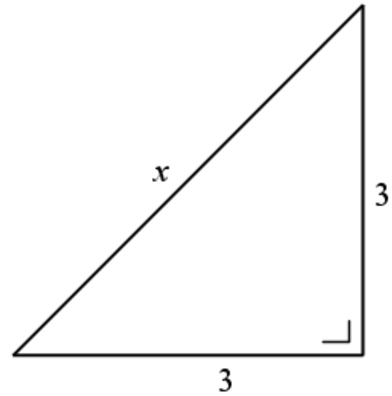
(b) Is the converse of Maisy's theorem true or false? Justify your answer.

The converse is false. For example, a triangle with sides 5 cm, 12 cm and 13 cm is right-angled.

Question 2

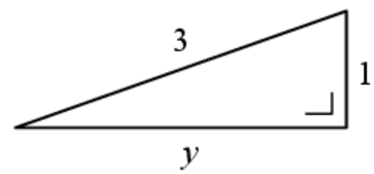
(i) Use the diagram on the right to calculate the value of x. Give your answer in surd form.

$x=\sqrt{3^2+3^2}$ $=\sqrt{18}$ or $3\sqrt{2}$	*Or*: $\sin 45° = \frac{3}{x}$ $\frac{1}{\sqrt{2}} = \frac{3}{x}$ $x = 3\sqrt{2}$



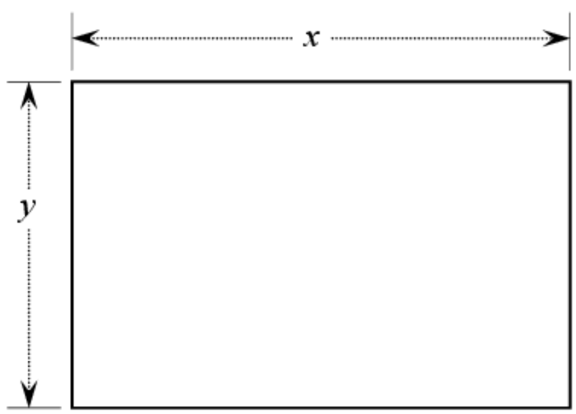
(ii) Use the diagram below to calculate the value of y. Give your answer in surd form.

$y=\sqrt{3^2-1^2}=\sqrt{8}$ or $2\sqrt{2}$.



(iii) A rectangle with sides of length x and y is drawn using the values of x and y from parts **(i)** and **(ii)**, as shown below.

Write the **perimeter** of this rectangle in the form $a\sqrt{2}$, where $a \in \mathbb{N}$.



$$\begin{aligned}\text{Perimeter} &= 2x+2y \\ &= 2\sqrt{18}+2\sqrt{8} \\ &= 2\left(3\sqrt{2}\right)+2\left(2\sqrt{2}\right) \\ &= 10\sqrt{2}.\end{aligned}$$

Question 3

(i) Prove that $\Delta\, MNP$ and $\Delta\, QRP$ are similar.

Proof:	$\lvert\angle MNP\rvert$	$=$	$\lvert\angle PRQ\rvert$	(given)
	$\lvert\angle NPM\rvert$	$=$	$\lvert\angle QPR\rvert$	(vertically opposite)
	$\lvert\angle NMP\rvert$	$=$	$\lvert\angle PQR\rvert$	(third angle)
	$\Rightarrow$ Triangles are similar.			

(ii) Is NM parallel to QR? Give a reason for your answer.

Answer:	Yes
Reason:	$\lvert\angle MNP\rvert = \lvert\angle PRQ\rvert$ *or* $\lvert\angle NMP\rvert = \lvert\angle PQR\rvert$ *or* alternate angles are equal.

Given $|MN| = 6$, $|NP| = 4$, $|QP| = 9$, and $|PR| = 10$, find:

(iii) $|QR|$

By similar triangles $\triangle MNP$ and $\triangle QRP$:

$$\frac{|QR|}{6} = \frac{10}{4}$$

$$\Rightarrow |QR| = 6\times\frac{10}{4} = 15.$$

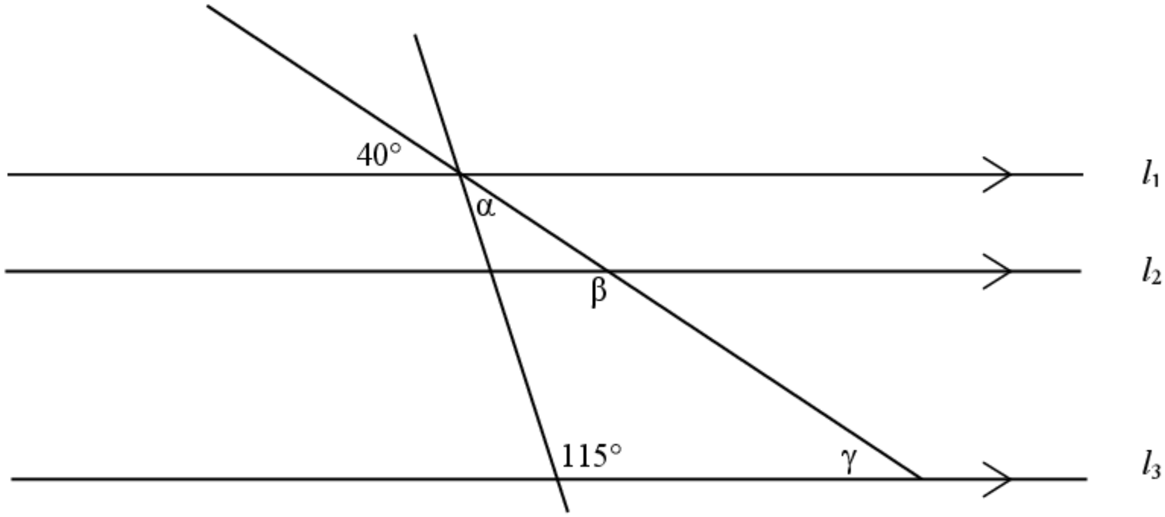
(iv) $|QM|$.

By similar triangles $\triangle MNP$ and $\triangle QRP$:

$\frac{\lvert PM\rvert}{9} = \frac{6}{15}$ or $\frac{4}{10}$	*Or* : $\frac{\lvert PM\rvert}{4} = \frac{9}{10}$
$\Rightarrow \lvert PM\rvert = \frac{18}{5}$ or $3\cdot 6$	$\Rightarrow \lvert PM\rvert = 4\times\frac{9}{10} = \frac{18}{5}$ or $3\cdot 6$
$\Rightarrow \lvert QM\rvert = 9+3\cdot 6 = \frac{63}{5}$ or $12\cdot 6$.	$\Rightarrow \lvert QM\rvert = 9+3\cdot 6 = \frac{63}{5}$ or $12\cdot 6$.

Question 4

If l_1, l_2 and l_3 are parallel lines, find the measure of the angles α, β and γ.



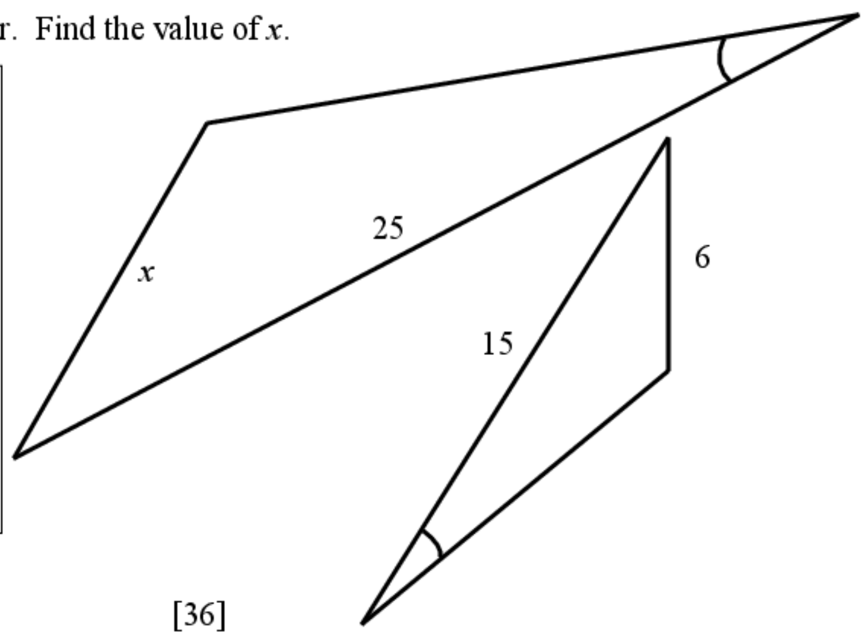
α	$=$	$180 - (115 + 40)$	$=$	$25°$
β	$=$	$180 - 40$	$=$	$140°$
γ	$=$	$40°$		

Question 5

The two triangles shown are similar. Find the value of x.

$$\frac{x}{6} = \frac{25}{15}$$

$$\Rightarrow \quad x = 10$$



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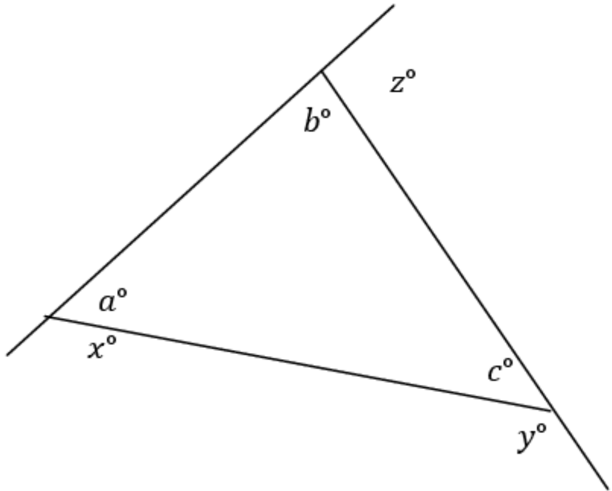
Question 6

(a) Prove that $x+y+z=360$.



$x=b+c$ (external angle)

$y=a+b$ (external angle)

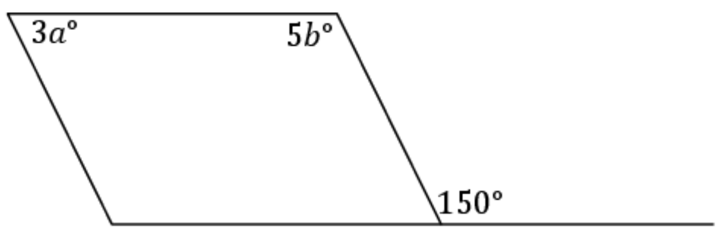
$z=a+c$ (external angle)

$x+y+z=2(a+b+c)$

$a+b+c=180$ (Triangle)

$x+y+z=360$

(b) The diagram below shows a parallelogram and one exterior angle. Find the value of a and the value of b.



$5b=150(alt)$

$b=30$

$3a+5b=180$

$3a=30$

$a=10$

Question 7

$\frac{1}{2}(2x)(x+3) = 10$

$x^2+3x-10 = 0$

$(x+5)(x-2) = 0$

$\Rightarrow x = -5$ (not possible) and $x = 2$cm