

EUCLIDIAN GEOMETRY TEST



Grade 10

Mathematics

Marks: 75

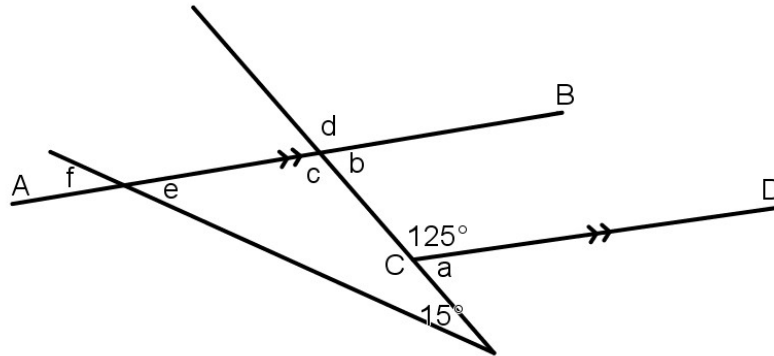
Time: 1,5 hours

Name: _____ **MEMORANDUM** _____

QUESTION 1

R8101

Consider the diagram below. It is given that $AB \parallel CD$.



Determine the size of a , b , c , d , e and f giving reasons for your statements.

(14)

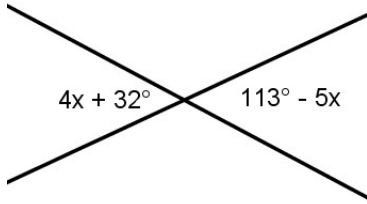
Statement	Reason
$a + 125^\circ = 180^\circ$ ✓	$\angle s$ on a str. line ✓
$a = 55^\circ$ ✓	
$b = 55^\circ$ ✓	co-int. $\angle s$ $AB \parallel CD$ ✓ OR corresp. $\angle s$ $AB \parallel CD$
$c = 125^\circ$ ✓	alt. $\angle s$ $AB \parallel CD$ OR $\angle s$ on str. line ✓
$d = 125^\circ$ ✓	vert. opp. $\angle s$ OR $\angle s$ on str. line ✓ OR corresp. $\angle s$ $AB \parallel CD$
$e + 15^\circ = 55^\circ$ ✓	ext. \angle of Δ OR $\angle s$ of a Δ ✓
$e = 40^\circ$ ✓	
$f = 40^\circ$ ✓	vert. opp. $\angle s$ ✓

[14]

QUESTION 2

2.1 Study the following diagram.

R8101



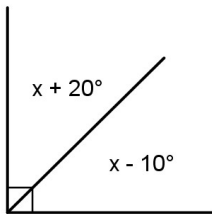
Determine the value of x with reasons.

(3)

Statement	Reason
$4x + 32^\circ = 113^\circ - 5x$ ✓	<i>vert. opp. \angles</i> ✓
$4x + 5x = 113^\circ - 32^\circ$	
$9x = 81^\circ$	
$x = 9^\circ$ ✓	

2.2 Study the diagram below.

R8101



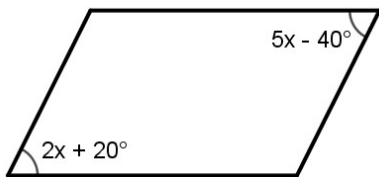
Determine the value of x with reasons.

(3)

Statement	Reason
$x + 20^\circ + x - 10^\circ = 90$ ✓	<i>Compl. \angles</i> ✓
$2x = 90^\circ - 20^\circ + 10^\circ$	
$2x = 80^\circ$	
$x = 40^\circ$ ✓	

2.3 ABCD is a **Parallelogram**

R9101



Calculate x with reasons.

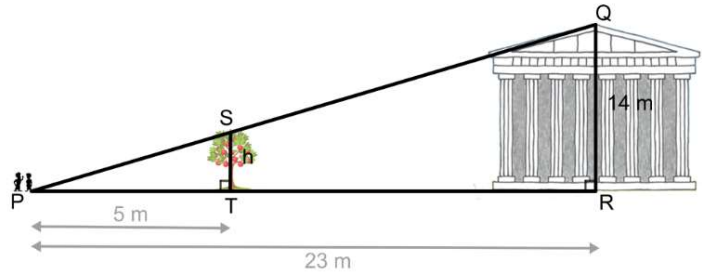
(3)

Statement	Reason
$2x + 20^\circ = 5x - 40^\circ$ ✓	<i>opp. \angles of \parallel^m equal</i> ✓
$2x - 5x = -40^\circ - 20^\circ$	
$-3x = -60^\circ$	
$x = 20^\circ$ ✓	

[9]

QUESTION 3

One summer's day very long ago, two Greek Mathematicians named Pythagoras and his friend Thales of Miletus went for a walk. They walked from the Parthenon past an apple tree and sat down on the grass. At that point they were 5 meters away from the apple tree and 23 meters away from the Parthenon.



Thales of Miletus: "Pythagoras, how high is the Parthenon?"

Pythagoras: "I think it is 14 m high."

Thales of Miletus: "I bet you can't tell me how far we are from the top of the Parthenon."

Pythagoras: "Challenge accepted! In fact, it is so easy a grade 10 student can do it! Here's how..."

- 3.1 Do the calculation that Pythagoras would do to show Thales how far they are from the top of the Parthenon. i.e. the length of PQ.

R8102

$$PQ^2 = 23^2 + 14^2 \quad \checkmark$$

$$PQ = \sqrt{23^2 + 14^2}$$

$$= 26,93 \text{ m} \quad \checkmark$$



(2)

- 3.2 Prove that $\Delta PST \parallel \Delta PQR$

R9102

In ΔPST and ΔPQR :

① $\hat{P} = \hat{P}$	common	\checkmark
② $\hat{PTS} = \hat{PRQ} = 90^\circ$	Given	\checkmark
③ $\hat{PST} = \hat{PQR}$	corresp. \angle s $ST \parallel QR$ OR 3 rd \angle of Δ	\checkmark
$\therefore \Delta PST \parallel \Delta PQR$	(AAA) \checkmark	

(4)

Pythagoras: "Okay Thales, your turn! Since you are the expert on similar triangles, tell me how high is that apple tree over there."

Thales of Miletus: "Piece of cake!"

- 3.3 Calculate the height h of the tree.

R9102

$$\frac{ST}{QR} = \frac{PT}{PR} \quad \checkmark$$

$$\frac{ST}{14} = \frac{5}{23} \quad \checkmark$$

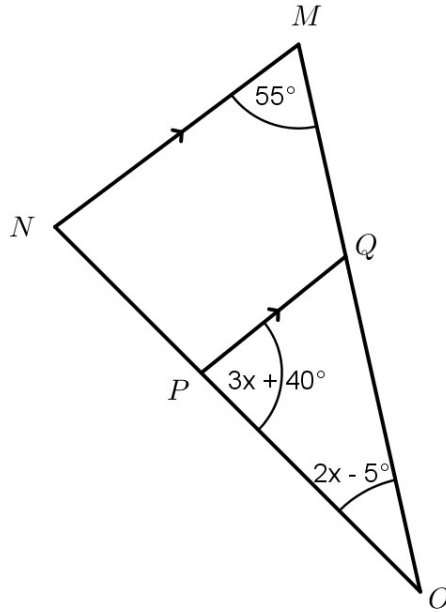
$$\therefore ST = 3,04 \text{ m} \quad \checkmark$$

[9]

QUESTION 4

In the diagram below, $\triangle MNO$ is drawn.

$MN \parallel QP$, $\widehat{M\hat{O}N} = 55^\circ$, $\widehat{Q\hat{P}O} = 3x + 40^\circ$ and $\widehat{M\hat{O}N} = 2x - 5^\circ$



4.1 Determine the size of $\widehat{P\hat{Q}O}$, giving reasons for your answer.

(2) R8101

$\widehat{P\hat{Q}O} = \widehat{M\hat{N}O} = 55^\circ$ ✓ *Corresp. \angle s; $MN \parallel PQ$* ✓

4.2 Calculate the value of x . Give reasons for your answer.

(4) R8101

$\widehat{P\hat{Q}O} + \widehat{Q\hat{P}O} + \widehat{P\hat{O}Q} = 180^\circ$ ✓ *\angle s of a Δ* ✓
 $55^\circ + 3x + 40^\circ + 2x - 5 = 180^\circ$ ✓
 $5x + 90^\circ = 180^\circ$ ✓
 $5x = 90^\circ$
 $x = 18^\circ$ ✓

4.3 Calculate the actual size of $\widehat{M\hat{O}N}$.

(2)

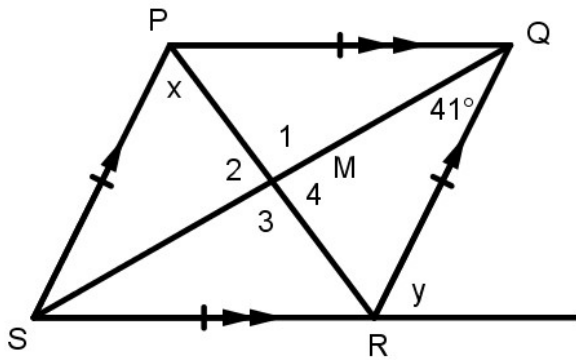
$\widehat{M\hat{O}N} = 2x - 5^\circ$
 $= 2(18^\circ) - 5^\circ$
 $= 31^\circ$ ✓

[8]

QUESTION 5

5.1 PQRS is a rhombus with diagonals intersecting at M. $\widehat{SQR} = 41^\circ$

R9101



5.1.1 Write down the size of \widehat{M}_2 (1)

$$\widehat{M}_2 = 90^\circ \checkmark$$

5.1.2 Calculate the value of x (5)

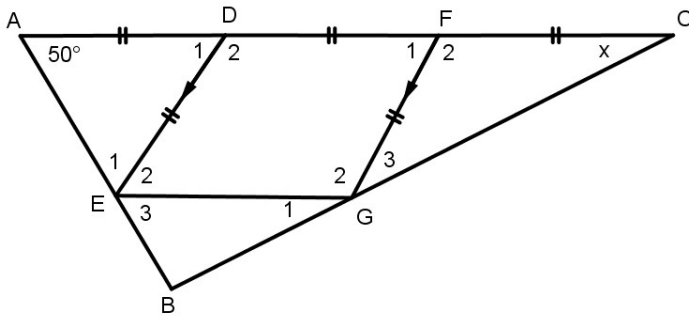
$$\begin{aligned} \widehat{PSQ} &= 41^\circ \checkmark & \text{alt. } \angle s ; PS \parallel QR \checkmark \\ x + 90^\circ + 41^\circ &= 180^\circ \checkmark & \angle s \text{ of a } \Delta \checkmark \\ x &= 49^\circ \checkmark \end{aligned}$$

5.1.3 Calculate y (4)

$$\begin{aligned} \widehat{QSR} &= 41^\circ \checkmark & = \text{sides} ; = \angle s \checkmark \\ y &= 41^\circ + 41^\circ \checkmark & \text{ext. } \angle \text{ of a } \Delta \checkmark \\ y &= 82^\circ \checkmark \end{aligned}$$

5.2 DEGF is a rhombus.

R9101



Calculate the value of x

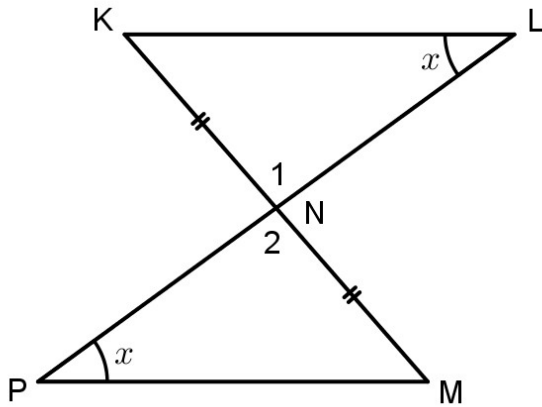
(10)

$\hat{E}_1 = 50^\circ$ ✓ = sides ; = $\angle s$ ✓
 $\hat{D}_1 + 50^\circ + 50^\circ = 180^\circ$ $\angle s$ of a Δ ✓
 $\hat{D}_1 = 80^\circ$ ✓
 $\hat{F}_1 = 80^\circ$ ✓ corresp. $\angle s$; $DE \parallel FG$ ✓
 $\hat{G}_3 = x$ ✓ = sides ; = $\angle s$ ✓
 $\hat{F}_1 = x + x$ ext. \angle of a Δ ✓
 $x + x = 80^\circ$
 $2x = 80^\circ$
 $x = 40^\circ$ ✓

[20]

QUESTION 6

In the figure $KN = NM$ and $\hat{L} = \hat{P}$.



6.1 Prove that $\triangle KNL \equiv \triangle MNP$

(4) R9102

In $\triangle KNL$ and $\triangle MNP$:

- ① $KN = NM$ *given* ✓
- ② $\hat{L} = \hat{P}$ *given* ✓
- ③ $\hat{N}_1 = \hat{N}_2$ *vert. opp. \angle s* ✓
- $\therefore \triangle KNL \equiv \triangle MNP$ (SAA) ✓

6.2 Hence, prove that $NL = PN$.

(1)

- $\triangle KNL \equiv \triangle MNP$ *proven above* ✓
- $\therefore NL = PN$

6.3 Prove that the quadrilateral, formed by the points K, L, M and P, is a parallelogram.

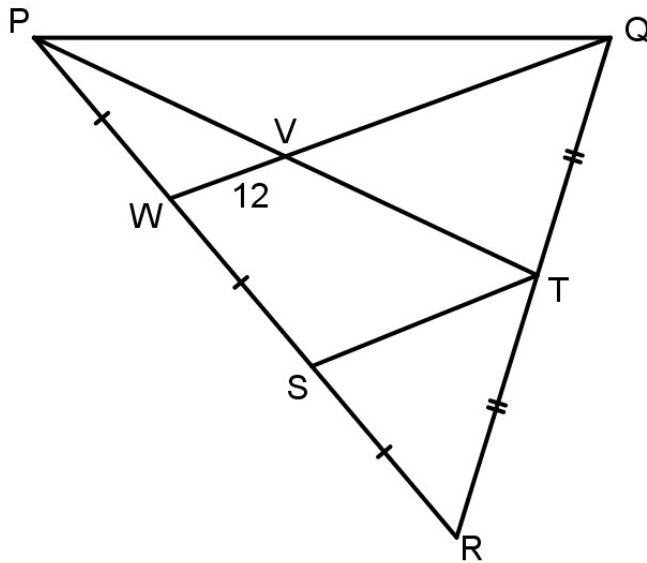
(3) R1101

- $\hat{P} = \hat{L} = x$ *given*
- $\therefore KL \parallel PM$ *alt. \angle s =* ✓
- $KL = PM$ $\triangle KNL \equiv \triangle MNP$ ✓
- 1 pair of opp. sides = and \parallel**
- $\therefore KLMP$ is a \parallel^m ✓

QUESTION 7

In ΔPQR : $QT = TR$, $WV = 12$ cm and $PW = WS = SR$.

R1102



7.1 Give a reason why $ST \parallel WQ$. (1)

The Midpoint Theorem ✓

7.2 Calculate the length of VQ. (6)

$ST = 24$ ✓ *Midpt. Theorem* ✓
 $WQ = 48$ ✓ *Midpt. Theorem* ✓
 $VQ = 48 - 12$ ✓
 $= 36\text{cm}$ ✓

[7]

Total: 75 Marks