Coimisiún na Scrúduithe Stáit
State Examinations Commission

JUNIOR CERTIFICATE EXAMINATION, 2012

MATHEMATICS – HIGHER LEVEL

PAPER 2 (300 marks)

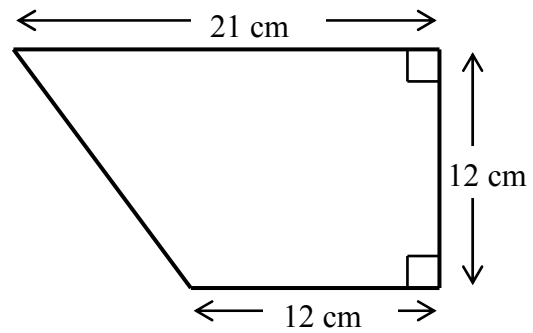**MONDAY, 11 JUNE – MORNING, 9.30 to 12.00**

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Attempt **ALL** questions.

Each question carries 50 marks.

Graph paper may be obtained from the Superintendent.

The symbol ✍ indicates that supporting work **must** be shown to obtain full marks.

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1. **(a)** ✍ Find the perimeter of the shape shown in the diagram.

21 cm

12 cm

12 cm

(b) A drinking glass is in the shape of a cylinder of diameter 7·5 cm and of height 10 cm.
It has a hemispherical base as shown in the diagram.

(i) ✍ Calculate the curved surface area of the cylindrical part of the glass, correct to two decimal places.

(ii) ✍ Calculate the total surface area of the glass correct to two decimal places.
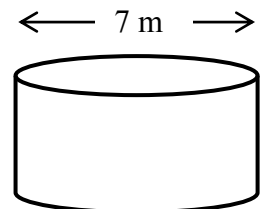
10 cm

7·5 cm
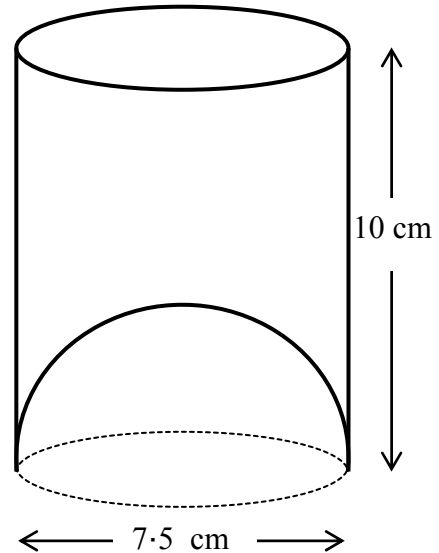
(c) A large building has a flat roof of length 50 m and of width 40 m.
On average there are 5 mm of rainfall on the roof in a week.

(i) ✍ Calculate the average volume of rain that will fall on the roof in a week. Give your answer in m^3.

The rain is harvested in a cylindrical tank of diameter 7 m.

7 m

(ii) ✍ Calculate the average rise in the level of the water in the tank in a week.
Give your answer in metres correct to two decimal places.

The tank is emptied when the water reaches a height of 3·38 m.

(iii) ✍ How many times a year, on average, will the tank be emptied?

2. **(a)** **(i)** ✍ Using graph paper, draw the triangle with vertices
A (-2, 0), B (3, 0) and C (1, 4).

(ii) ✍ Calculate the area of the triangle ABC.

(b) l is the line $2x - 11y = -16$ and k is the line $x + 2y = -8$.

(i) ✍ Find P, the point of intersection of l and k.

Q (3, 2) is on the line l and R (2, -5) is on the line k.

(ii) ✍ Prove that the triangle PQR is isosceles.

(c) S is the point (-4, -2) and T is the point (2, 6).
(i) ✍ Find the equation of the perpendicular bisector of $[ST]$.

(ii) ✍ Verify that (-5, 5) is a point on the perpendicular bisector.

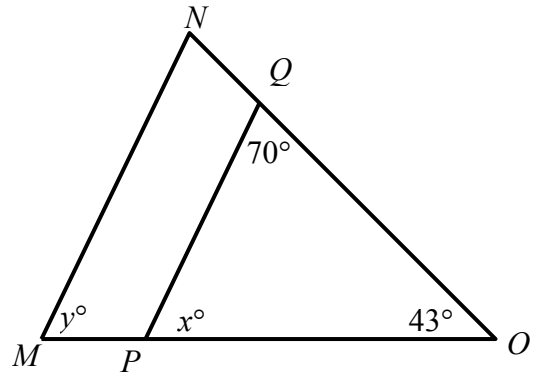**(iii)** ✍ Find the coordinates of the image of (-5, 5) under the axial symmetry

in ST.

3. **(a)** In the diagram [*MN*] is parallel to [*PQ*] .

$|\angle POQ| = 43°$ and $|\angle OQP| = 70°$.

Find

(i) ✍ the value of *x*

(ii) the value of *y*.

(b) **(i)** ✍ Prove that opposite sides and opposite angles of a parallelogram are respectively equal in measure.

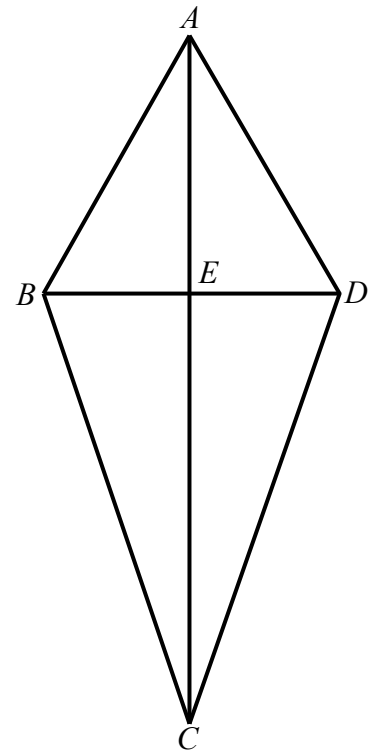**(ii)** ✍ Show how to divide a line segment into three equal parts.

All construction lines must be clearly shown.

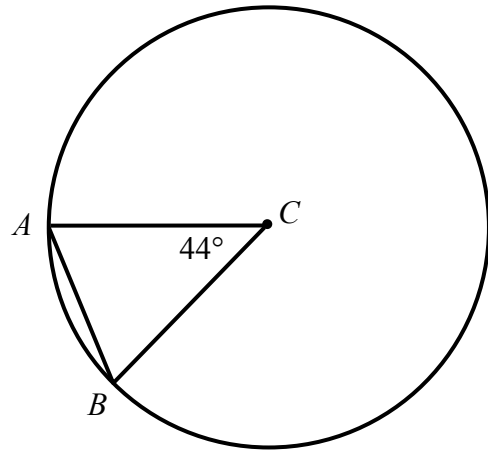**(c)** In the diagram $|AB| = |AD|$ and $|BC| = |DC|$.

AC intersects *BD* at *E*.

(i) ✍ Prove $|\angle BAC| = |\angle DAC|$.

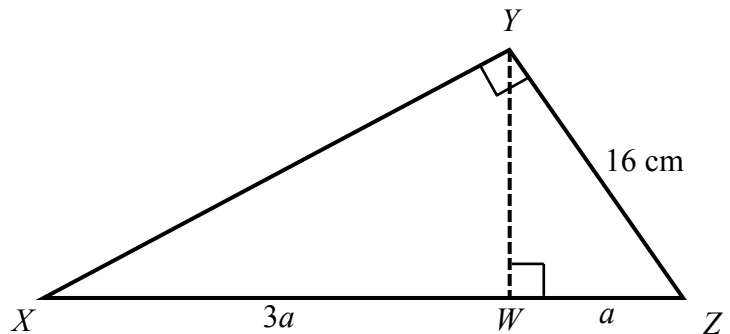**(ii)** ✍ Prove *E* is the midpoint of [*BD*].

4. **(a)** *A* and *B* are points on a circle with centre *C*.
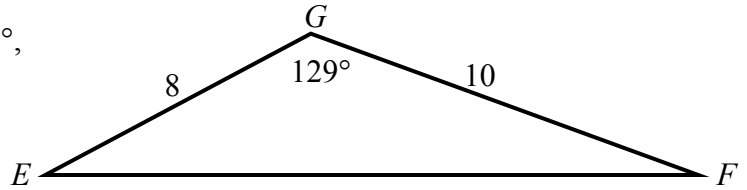
$|\angle BCA| = 44°$.

✍ Find $|\angle BAC|$.

(b) ✍ Prove that if two triangles are equiangular, the lengths of corresponding sides are in proportion.

(c) *XYZ* is a right angled triangle with $|\angle XYZ| = 90°$. *W* is a point on [*XZ*], such that *YW* is perpendicular to *XZ*.
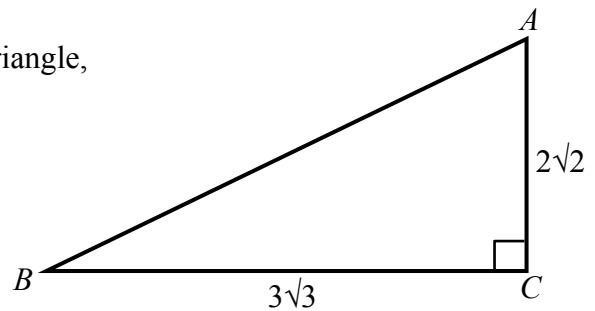

(i) ✍ Prove $\triangle XYZ$ and $\triangle WYZ$ are equiangular.

(ii) ✍ Given that $|WZ| = a$ cm, $|XW| = 3a$ cm and $|YZ| = 16$ cm, find *a*.

5. (a) In the diagram $|\angle EGF| = 129°$, $|EG| = 8$ and $|FG| = 10$.

G

129°

8

10

E

F

✎ Calculate the area of the triangle *EFG*, giving your answer correct to one decimal place.

(b) In the diagram *ABC* is a right angled triangle, with *AC* perpendicular to *BC*.
$|AC| = 2\sqrt{2}$ and $|BC| = 3\sqrt{3}$.

A

$2\sqrt{2}$

B

$3\sqrt{3}$

C

Calculate

(i) ✎ $|AB|$, leaving your answer in surd form

(ii) ✎ $|\angle ABC|$, correct to the nearest degree.

(c) In the triangle *PQR*, $|PR| = 70$, $|QR| = 50$ and $|\angle PQR| = 116°$.

(i) ✎ Find $|\angle QPR|$, giving your answer correct to the nearest degree.

(ii) ✎ Find $|PQ|$, giving your answer correct to the nearest whole number.

P

70

116°

Q

50

R
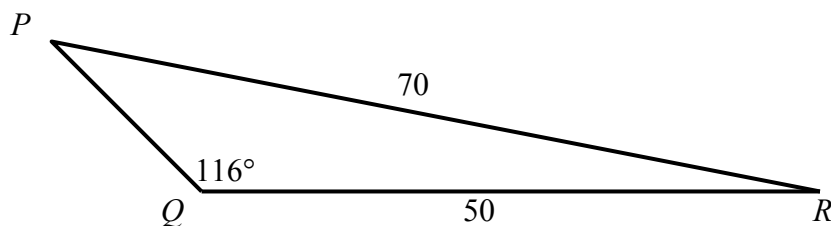
6. **(a)** The pie chart shows how Mary spends her time over a typical 24 hour period.

✎ Copy and complete the following table in your answer book.
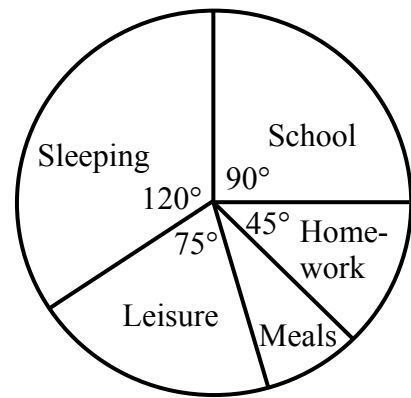
	Sleeping	School	Homework	Meals	Leisure
No. of hours					

(b) The table below shows the results of a survey of the amount of money (in euro) that 150 people spent in a supermarket.

Amount (€)	0 – 10	10 – 15	15 – 20	20 – 30	30 – 50
No. of people	15	30	50	45	10

[Note: 10 – 15 means 10 or more but less than 15, etc.]

(i) ✎ Taking mid-interval values, calculate the mean amount of money spent in the supermarket.

(ii) ✎ Calculate the maximum percentage of the people who could have spent between €5 less than the mean and €5 more than the mean.

(c) A speed camera, situated in a 50 km/h speed limit zone, recorded the speed of the cars, in km/h, passing it over a one hour period. The following are the results:

36 72 43 62 56 57 65 50 47 56 62 59 46 43
25 54 47 51 56 52 48 53 49 39 57 76 37 49

(i) Copy and complete the cumulative frequency table in your answer book.

Speed	< 30	< 40	< 50	< 60	< 70	< 80
No. of cars		4		23		28

(ii) ✎ Use your cumulative frequency table to construct the ogive.

(iii) ✎ Use your ogive to estimate the number of cars with speeds between 45 and 55 km/h.

(iv) ✎ What is the difference between your estimate and the actual number of cars with speeds between 45 and 55 km/h?

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