FOR THE EXAMINER

EXAM. NUMBER:

Total Marks:

Coimisiún na Scrúduithe Stáit
State Examinations Commission

JUNIOR CERTIFICATE EXAMINATION, 2009

MATHEMATICS - ORDINARY LEVEL - PAPER 2 (300 marks)

MONDAY, 8 JUNE - MORNING, 9:30 to 11:30

Time: 2 hours

Attempt **ALL** questions. Each question carries 50 marks.

Answers and supporting work should be written into the boxes provided.

Extra paper and graph paper can be obtained from the Superintendent, if needed.

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

Make and model of calculator used:

For Superintendent/Examiner use only:

Centre Stamp

Question	Mark
1	
2	
3	
4	
5	
6	
Total	
Grade	

1. **(a)** Subtract 430 m from 6780 m and give your answer in km.

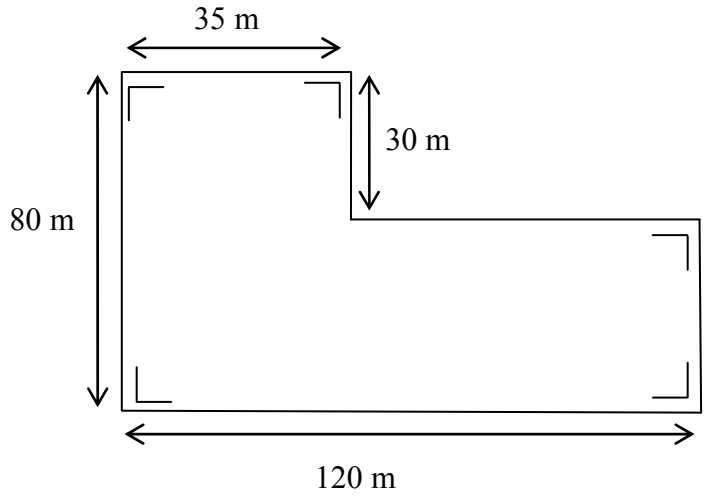
1(b) Tara went by car from Dublin to Wexford, a journey of 150 kilometres.
Tara took 2 hours and 30 minutes to complete the journey.

(i) Tara left Dublin at 10:15. At what time did she arrive in Wexford?

(ii) Calculate the average speed, in km/h, for Tara's journey.

(iii) Tara's car emitted 19 500 grammes of carbon dioxide gas in travelling from Dublin to Wexford.
How many grammes of carbon dioxide did Tara's car emit for every kilometre travelled?

1(c) A field has shape and measurements as shown in the diagram.



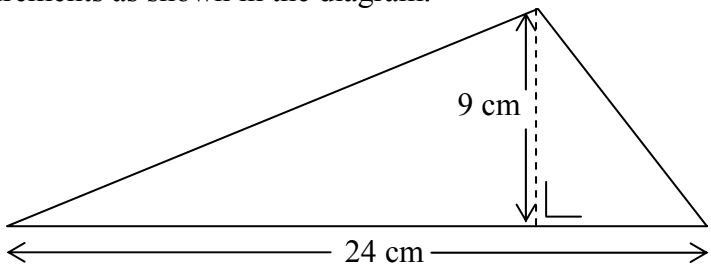
(i) Find, in metres, the length of the perimeter of the field.

(ii) Find, in m^2, the area of the field.

(iii) Tim bought the field at a cost of €41 000 per hectare.
How much did Tim pay for the field?

[1 hectare = 10 000 m^2]

2. **(a)** A triangle has measurements as shown in the diagram.



Find, in cm^2, the area of the triangle.

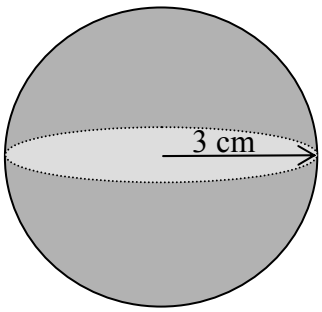
2(b) A bicycle wheel has a diameter of 60 cm.

(i) Calculate, in cm, the radius of the bicycle wheel.

(ii) Taking π as 3·142 calculate, in cm, the circumference of the bicycle wheel.

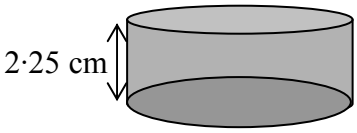
(iii) How far does the bicycle travel when the wheel makes 340 complete turns? Give your answer to the nearest metre.

2(c) A solid metal sphere has a radius 3 cm.



(i) Taking π as 3·142 find, in cm^3, the volume of the solid metal sphere.

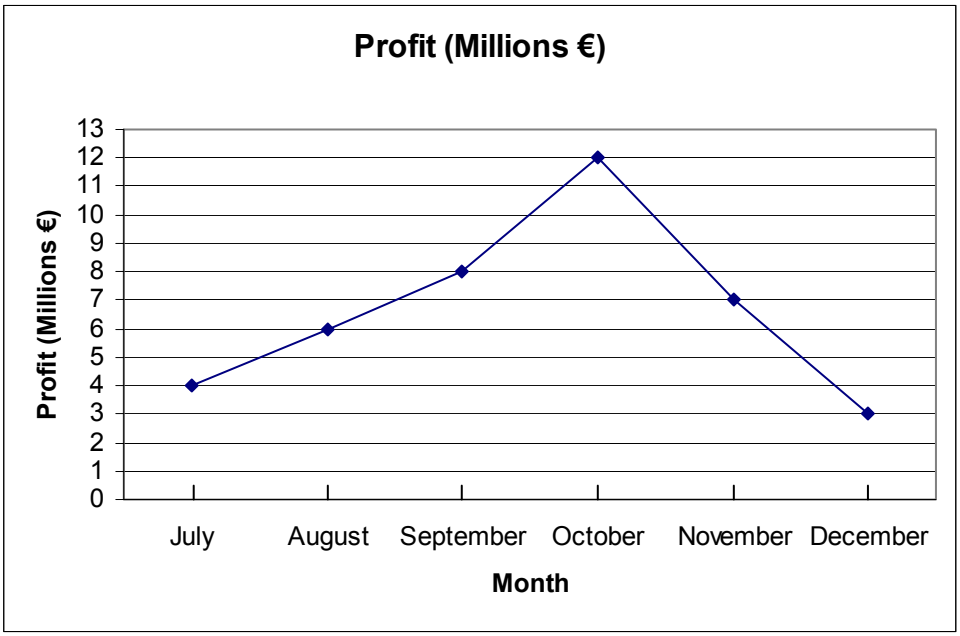
(ii) The solid metal sphere was melted down and a quarter of the metal was recast to form a cylinder of height 2·25 cm. Taking π as 3·142 calculate, in cm, the radius of this cylinder.



3. **(a)** Find the mean of the numbers 0·2, 4·6, 8·3, 10·2 and 11·7.

Mean =

3(b) The trend graph shows the profit, in millions of euro, made by a company during the last six months of last year.



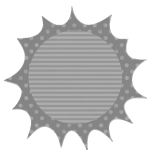
Use the trend graph to answer the following questions.

(i) In which month did the company make the lowest profit?

(ii) What was the total profit, in millions of euro, made by the company in the given six months?

(iii) What percentage of the overall profit was made in July?

3(c) The highest temperatures, in degrees Centigrade, of each of the days in June, 2006, were:



18°C	18°C	20°C	19°C	20°C	19°C
19°C	18°C	18°C	19°C	18°C	21°C
20°C	22°C	20°C	22°C	21°C	20°C
18°C	19°C	19°C	20°C	22°C	19°C
18°C	18°C	19°C	18°C	22°C	21°C

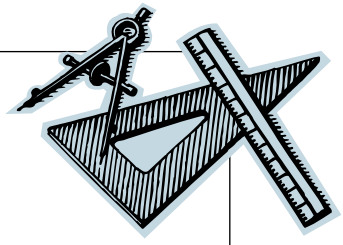
(i) Complete the following frequency table:

Temperature °C	18	19	20	21	22
Number of Days					

(ii) Draw a bar chart of the data.

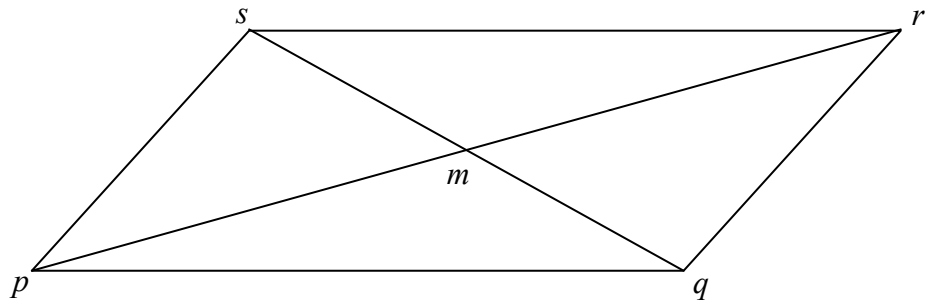
(iii) Calculate the mean daily temperature for the month of June, 2006.

4. **(a)** Construct a triangle abc with $|ab| = 9$ cm, $|ac| = 8$ cm and $|bc| = 7$ cm.
Label your diagram clearly.



4(b) *pqrs* is a parallelogram.

The diagonals [*sq*] and [*pr*] intersect at *m*.



(i) The Δpqr has area 18 cm^2.
Write down the area of the parallelogram *pqrs*.
Give a reason for your answer.

Area of the parallelogram *pqrs* =

Reason:

(ii) Given that $|pr| = 10{\cdot}6$ cm, find $|mr|$.
Give a reason for your answer.

$|mr| =$

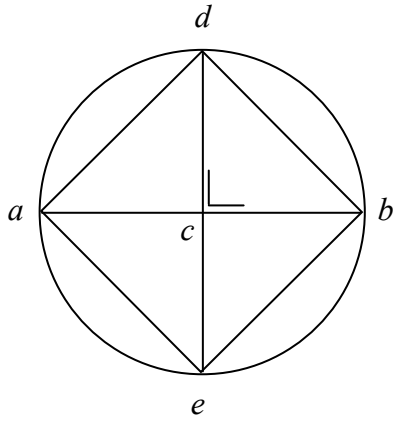
Reason:

(iii) Complete the following reasons for the fact that the triangles $\Delta\ smp$ and $\Delta\ qmr$ are congruent.

Reasons:	In $\Delta\ smp$		In $\Delta\ qmr$
		=	
		=	
		=	

Part (c) on next page

4(c) [*ab*] and [*de*] are diameters of a circle with centre c.
$de \perp ab$



(i) Name the image of the $\Delta\ dbc$ under S_c, the central symmetry in the point *c*.

(ii) Write down $|\angle cdb|$. Give a reason for your answer.

$|\angle cdb| =$

Reason:

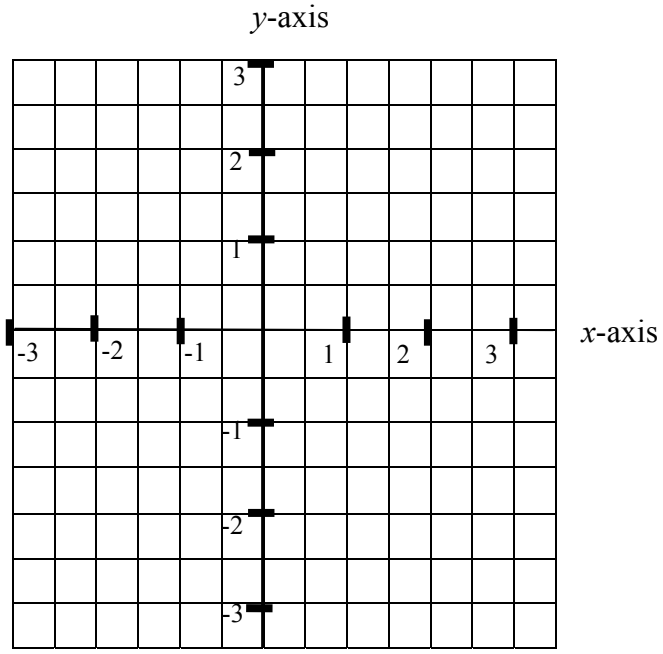
(iii) Given that $|ab| = 10$ cm, use the Theorem of Pythagoras to find $|db|$.

5. *Note: Coordinate Geometry Formulae are given on Page 13.*

(a) *a* is the point (-2, 1)

b is the point (3, -2)

Plot the points *a* and *b*.



5(b) *p* is the point (5, 3) and *q* is the point (-3, 1). Find each of the following:

(i) the slope of pq

(ii) the midpoint of $[pq]$

(iii) the length of $[pq]$

If you wish to draw a diagram, use the next page

5(c) **(i)** The line K contains the point (-1, 6).
K has a slope of 2.
Find the equation of K.

(ii) By letting $x = 0$, find the coordinates of s, the point of intersection of the line K and the y-axis.

Formulae

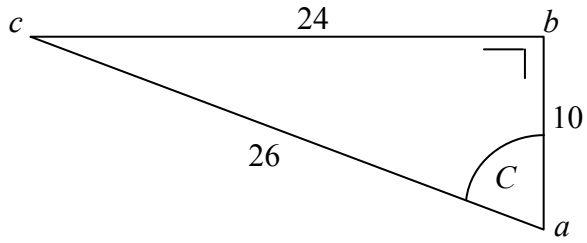
Midpoint of a line segment: $\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$

Slope of a line: $m = \frac{y_2 - y_1}{x_2 - x_1}$

Length of line segment: $\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

Equation of a line: $y - y_1 = m(x - x_1)$

6. **(a)** The right-angled triangle *abc* has measurements as shown.



(i) Write down the length of the side opposite to the angle C.

Length of the side opposite to the angle C =

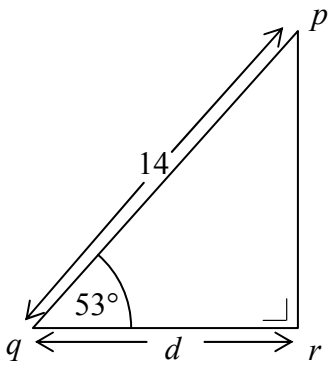
(ii) Write down the value of tan C, as a fraction.

tan C =

6(b) In the right-angled triangle *pqr*,

$|pq| = 14$ and $|\angle pqr| = 53°$.

Let $|qr| = d$.



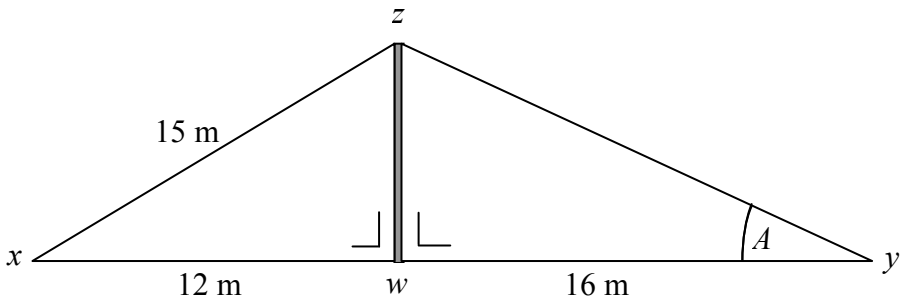
(i) Using the diagram write down the value of cos 53°, as a fraction.

(ii) Using your calculator, or otherwise, write down the value of cos 53°, correct to one decimal place.

cos 53° =

(iii) Hence find d, the value of $|qr|$.

6(c)



$[zw]$ is a vertical television aerial mast.

$[zx]$ and $[zy]$ are supporting cables.

$|zx| = 15$ m, $|xw| = 12$ m and $|wy| = 16$ m.

(i) In Δxwz, use the Theorem of Pythagoras, to find $|zw|$, the height of the television aerial mast.

(ii) Hence find the measure of the angle marked A in the diagram, correct to the nearest degree.

Space for extra work