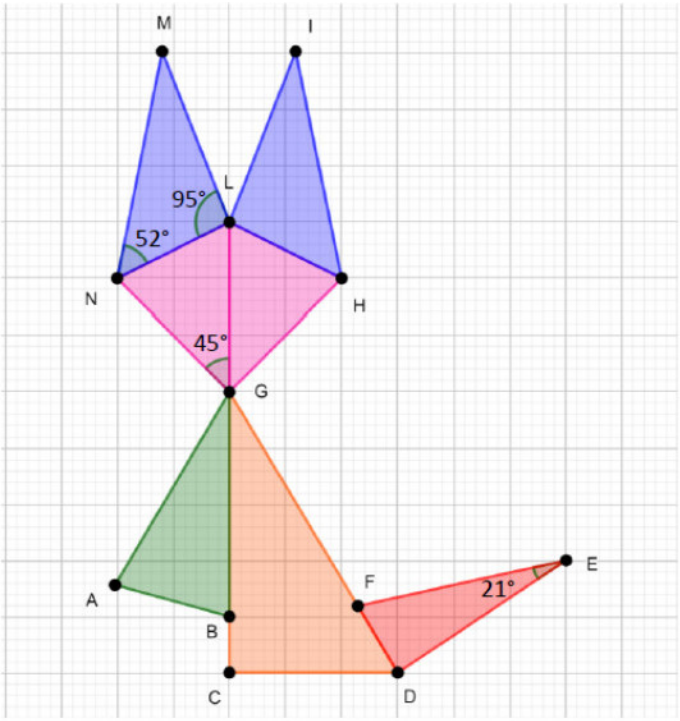
Exercise 1 Calc. : ✓

Martina wants to decorate her bedroom door with the outline of a cat, as shown in the figure below.



The cat's ears are two congruent triangles MLN and ILH, with MN = 40 cm, $\widehat{MLN}$ = 95ř and $\widehat{MNL}$ = 52ř.
Martina wants to edge the two ears with blue ribbon.

1. Determine the length of the sides ML and NL and calculate how many centimetres of blue ribbon are needed to edge both ears. — 4 marks

The cat's face NGHL is formed by two congruent triangles NGL and HGL, with NG = 28 cm, GL = 30 cm and $\widehat{NGL}$ = 45ř. Martina wants to paint the cat's face pink.

2. Determine the surface area of the cat's face (round to the nearest unit). — 2 marks

The cat's tail consists of the triangle FDE, with FE = 38 cm, DE = 36 cm and $\widehat{FED}$ = 21ř. Martina cuts the tail from a piece of cardboard and then glues the base FD to the cat's body.

3. Determine the length of the base FD (round to 1 dp). — 2 marks

Exercise 2 Calc. : ✓

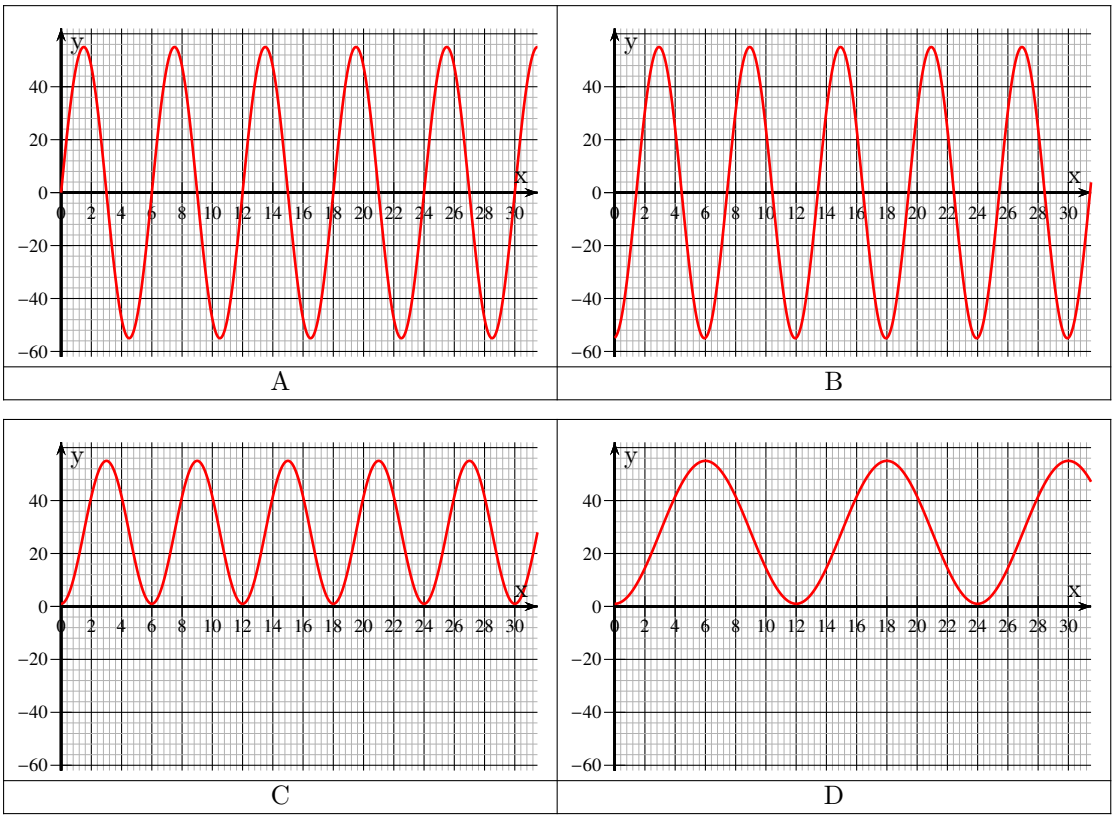
Rimini's Ferris wheel has 42 transparent capsules that reach an altitude of 55 m from where you can see the Romagna coast, from Gabicce to Cesenatico.
The ticket costs 9 and the trip lasts 30 minutes, during which the wheel completes 5 turns.
The motion of a capsule is described by the function

$$h(t) = 28 - 27 \cdot \cos\left(\frac{\pi}{3}t\right)$$

where $h(t)$ is the altitude of the capsule in metres and t is time in minutes, with $t = 0$ when the trip starts.

1. Determine the time taken for a complete turn and explain the meaning of the coefficient $\frac{\pi}{3}$ in the equation of $h(t)$. — 2 marks
2. Check that the maximum altitude is 55 m and determine after how many minutes is attained. — 3 marks
3. Determine the altitude of the capsule when the trip starts, hence determine the radius of the wheel. — 2 marks

4. Among the following diagrams, find the one that represents the graph of the function h. Justify your answer. — 3 marks

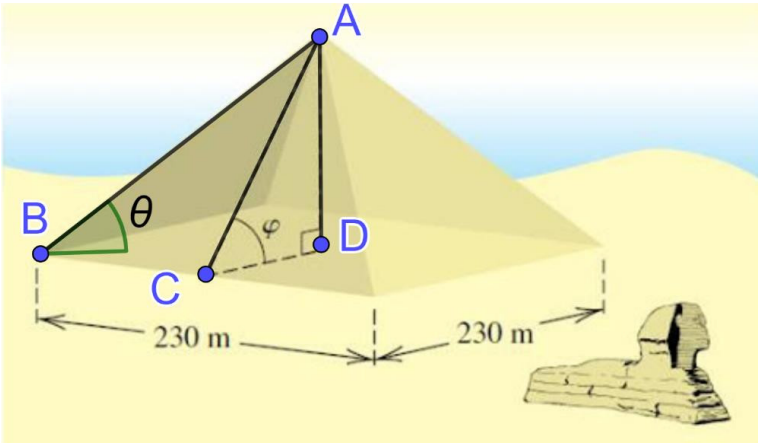


5. Determine the altitude of the capsule after 2 minutes. — 2 marks

6. Determine the time in minutes when the capsule reaches an altitude of 14.5 m from the ground. — 3 marks

Exercise 3 — Calc. : ✓

The Great Pyramid of Giza is a square-base pyramid, with base-length 230 m.
The angle formed by the slant height AC with the plane of the base is $\phi = 50.3$ř.



1. Determine the slant height AC of the pyramid (round to the nearest metre). — 3 marks

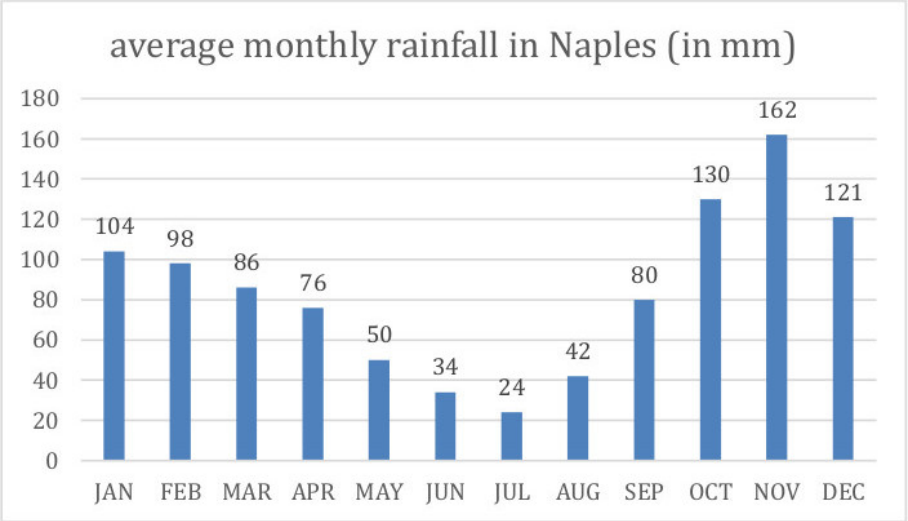
2. Show that the height AD of the pyramid is 138.5 m. — 2 marks

3. Determine the edge AB of the pyramid (round to the nearest metre). — 3 marks

4. Determine the angle θ formed by the edge AB with the plane of the base. — 2 marks

Exercise 4 Calc. : ✓

If you think of Naples, you probably picture it on a sunny day. Milan, instead, it is often imagined in the rain. But this is not an accurate description of the weather in the two cities.
The bar chart below shows the average monthly rainfall (in mm) in Naples, according to statistics of the last 30 years.



1. Determine min, Q1, median, Q3 and max of the data set shown in the bar chart. — 3 marks

2. Given the formulas — 3 marks

$$\bar{x} = \frac{1}{n}\sum_{i=1}^{n} x_i \quad \text{and} \quad \sigma = \sqrt{\frac{1}{n}\sum_{i=1}^{n}(x_i - \bar{x})^2}$$

Calculate the mean value $\bar{x}$ and the standard deviation σ for the monthly rainfall in Naples (round to 1 dp).

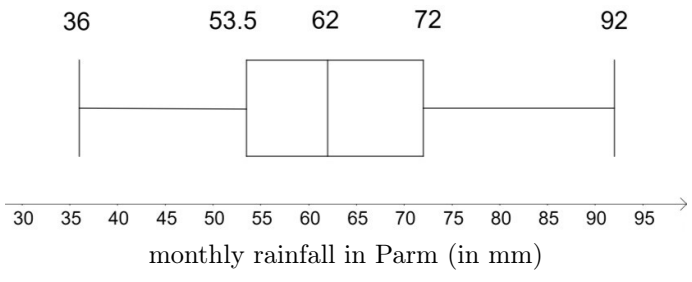
The table below presents data referring to the average monthly rainfall (in mm) in Milan, according to statistics acquired over the last 30 years.

min	Q1	median	Q3	max	$\bar{x}$	σ
60.0	64.5	75.5	95.0	101	78.7	15.7

3. On the same diagram, draw the box-plots representing the average monthly rainfall in Naples and in Milan. — 2 marks

4. "Total rainfall in one year in Naples is 25% higher than in Milan". Use the information provided to explain whether this claim is correct or not. — 2 marks

The following box-plot refers to average monthly rainfall in mm as recorded in Parma over the last thirty years.



5. In which one of these three cities data referring to rainfall show highest homogeneity? Explain your answer. — 2 marks