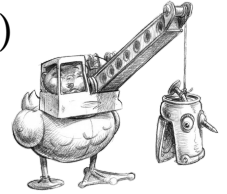


Test — Similar triangles, enlargements and reductions (Year 10)

Time allowed: 50 min

Calculator allowed. Write your answers on a separate sheet of paper. Every proof must be structured with “We know that... / Now... / Therefore...”; every numerical answer must be justified by showing full working. The figures are not drawn to scale. Marked out of 20.



Exercise 1: Identifying similar triangles and finding a scale factor

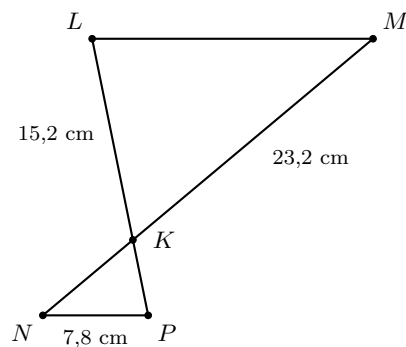
(4,5 marks)

- a) A triangle ABC has two angles of 31° and 93° ; a triangle DEF has two angles of 56° and 93° . Are these two triangles similar? Justify by calculation. (1 mark)
- b) A triangle GHI has sides $GH = 9,2$ cm, $HI = 13,6$ cm and $GI = 18,4$ cm. A triangle JKL has sides $JK = 50,6$ cm, $KL = 25,3$ cm and $JL = 38,4$ cm. Are these two triangles similar? Justify. (1 mark)
- c) A triangle MNP has an area of 13 cm^2 and a perimeter of $18,2$ cm. Its enlargement $M'N'P'$ has an area of $177,97 \text{ cm}^2$. Find the scale factor k of this enlargement, then calculate the perimeter of triangle $M'N'P'$. (1,5 marks)
- d) A triangle XYZ is isosceles and one of its angles measures 14° . A triangle UVW has two angles of 152° and 14° . Yanis claims: “Triangles XYZ and UVW are necessarily similar.” Is he right? Justify. (1 mark)

Exercise 2: Bow-tie configuration and length calculations

(5 marks)

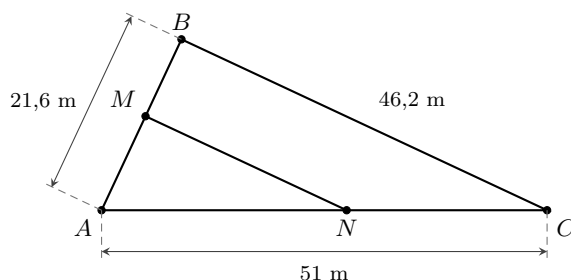
In the figure below, segments $[LP]$ and $[MN]$ intersect at K , and lines (LM) and (NP) are parallel. We are given: $KL = 15,2$ cm, $LP = 20,9$ cm, $KM = 23,2$ cm and $NP = 7,8$ cm.



- a) Prove that angles $\widehat{KLM}$ and $\widehat{KPN}$ have the same measure. (1,5 marks)
- b) Prove that triangles KLM and KPN are similar, and state the corresponding vertices. (1,5 marks)
- c) Deduce the lengths KN and LM . (2 marks)

Exercise 3: Problem, the museum canopy and its scale model**(6,5 marks)**

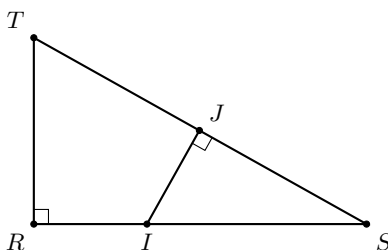
To cover the forecourt of a museum, an architect designs a glazed canopy in the shape of a triangle ABC , together with an outdoor pool. On this canopy, a straight beam $[MN]$ connects a point M on the edge $[AB]$ to a point N on the edge $[AC]$. The actual dimensions of the canopy are $AB = 21,6$ m, $BC = 46,2$ m and $AC = 51$ m.



- Prove that triangle ABC is right-angled at B , then calculate the actual area of the canopy ABC , in m^2 . (1,5 marks)
- The fixing points of the beam $[MN]$ are placed at $AM = 11,88$ m and $AN = 28,05$ m. Prove that triangles AMN and ABC are similar, then calculate the actual length of the beam $[MN]$. (2 marks)
- On the presentation scale model of the project, the edge $[BC]$ is represented by a segment of 30,8 cm. Find the scale of this model in the form $\frac{1}{n}$, then calculate the area of the canopy ABC on the scale model, in cm^2 . (1,5 marks)
- The actual pool planned on the forecourt will hold 378 m^3 of water. An intern claims that 16,8 L of water will be needed to fill to the brim the pool of the scale model, which is built to the same scale. Is he right? Justify by calculating the exact capacity of the scale model's pool, in millilitres. (Reminder: $1 \text{ m}^3 = 1\,000 \text{ L}$ and $1 \text{ L} = 1\,000 \text{ mL}$.) (1,5 marks)

Exercise 4: Proof in a right-angled triangle**(4 marks)**

Let RST be a triangle right-angled at R . A point I is placed on the segment $[RS]$, distinct from R and S , and J denotes the foot of the perpendicular to the line (ST) passing through I (point J lies on the segment $[ST]$). No lengths are given.



- Prove that triangles SRT and SJI are similar, and state the corresponding vertices. (2 marks)
- Deduce the equality $SI \times RT = ST \times IJ$. (1,5 marks)
- Maël matches the points according to their position in the figure (I on $[SR]$, J on $[ST]$) and writes $\frac{SI}{SR} = \frac{SJ}{ST}$. Explain his mistake in one sentence, then write the correct equality of quotients relating these four lengths. (0,5 marks)

Bonus question**(+1 bonus mark)**

In a triangle DEF with $DE = 29,6$ cm, a point G is placed on the segment $[DE]$ and a point H on the segment $[DF]$ so that the lines (GH) and (EF) are parallel. At what distance from vertex D must point G be placed so that the area of quadrilateral $EFHG$ is equal to $\frac{15}{64}$ of the area of triangle DEF ? Justify each step.

_____ END OF THE TEST _____