1. Which ones of the following triples cannot represent the data of a triangle?

(1) $AB = 2, BC = 3, AC = 5$

(2) $AB = 11, BC = 13, AC = 15$

(3) $AB = 25, BC = 17, AC = 9$

(4) $AB = 20, BC = 35, AC = 17$

(5) $\angle A = 10°, \angle B = 10°, \angle C = 90°$

(6) $\angle A = 50°, \angle B = 30°, \angle C = 100°$

2. Prove that the sum of the angles of a triangle is $180°$.

3. Let ABC and $A'B'C'$ be triangles such that $\angle A = \angle A'$, $AB = 3A'B'$ and $BC = 3B'C'$. If $AC = 2$, what is the value of $A'C'$?

4. Explain why none of the following functions is an isometry:

(1) $4z$

(2) $\frac{z}{5}$

(3) $e^{|z|}$

5. Let $ABCD$ be a trapezoid such that $AB \parallel DC$, $BD = 6$, $AB = 12$ and $\angle ADB = 90°$. What is $\angle ADC$?

6. Prove that given a circle Γ and a point P outside of Γ there exist exactly two lines through P tangent to Γ.

7. Classify the following isometries of the Euclidean plane. In other words, which of the following isometries is a rotation, translation, line reflection or none of these?

(A) $-z + 2$

(B) $iz + 17$

(C) $z + 5$

(D) $\bar{z} + 2i$

(E) $i\bar{z} + 2i$

8. Let Γ_1 and Γ_2 be two distinct circles centered at O_1 and O_2. Let l be a line tangent to Γ_1 and Γ_2 at P_1 and P_2 and suppose that the line containing O_1O_2 does not intersect l. Prove that $O_1O_2P_2P_1$ is a trapezoid.

9. Let ABC be a right triangle such that $\angle A = 90^\circ$, $AB = 2$ and $AC = 3$. Suppose that ABC is inscribed in a circle of radius r. What is r?

10. Recall that the general form of a Euclidean isometry is $az + b$ or $a\bar{z} + b$ where both a and b are complex numbers and $|a| = 1$. Recall that $z = x + iy$ where x and y are real numbers. Let $f(z)$ be the isometry which is the reflection across the line $y = 2x + 1$. Write down a formula for $f(z)$.

11. Let ABC be an equilateral triangle, $AB = 5$, inscribed in a circle. What is the radius of the circle?

12. Let ABC be an isosceles triangle, $AB = AC$. Let M be a point on BC. Prove that M is the midpoint if and only if AM is perpendicular to BC.