Geometrical constructions

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Tools: Straightedge and compass. That is, given two points you can construct the straight line through them and the circle having one as center and passing through the other one. (**Warning:** One of the tasks is not just difficult but provably impossible.)

1. Given a line segment, construct a segment which is

   (a) twice as long
   (b) 3 times as long
   (c) half as long
   (d) a third as long

2. Given an angle, construct an angle which is

   (a) twice as big
   (b) 3 times as big
   (c) half as big
   (d) a third as big

3. Given a line segment, construct

   (a) its midpoint normal
   (b) its normal in an arbitrary point on the segment
   (c) a square with the segment as its side

4. Given a square, construct the side in a square of which the area is

   (a) twice as big
   (b) 3 times as big
   (c) half as big
   (d) a third as big

5. Given a straight line and a point not on the line, construct

   (a) the normal to the line through the point
   (b) the straight line through the point parallel to the given one

6. Given a rectangle, construct a square with the same area.

7. Given a parallelogram, construct a square with the same area.

8. Given a triangle, construct a square with the same area.

9. Given two squares, construct a square the area of which is the sum of the two given ones.

10. Given a polygonal region, construct a square with the same area.