Angles and geometry

1. Fill in the blanks

   a) A _____ is a closed figure formed by three or more line segments all of which are in the same plane. The line segments are called the _____ of the polygon. Each side is joined to two other sides at its endpoints, and the endpoints are called _____.

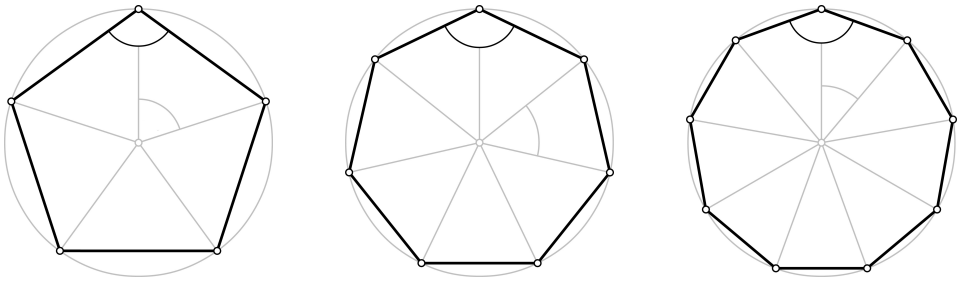
   b) A polygon in which the sides are equal and all angles are equal is called a _____ polygon.

   c) The _____ of a polygon is the sum of the lengths of its sides.

   d) Every _____ has three sides and three interior angles.

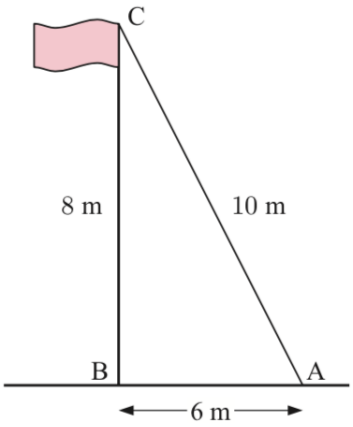
   e) Pythagoras' theorem states that in a right-angled triangle, the square of the length of the _____ is equal to the sum of the squares of the lengths of the other two sides.

2. Name each of the following regular polygons and determine the missing angles (in degrees).

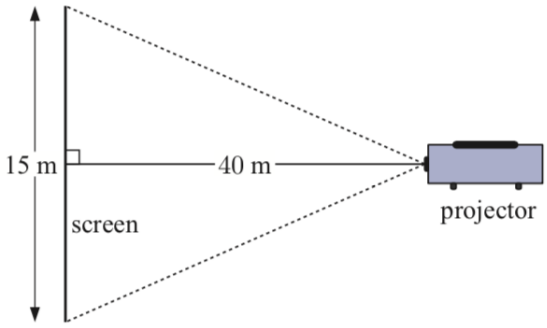


3. After takeoff, an aeroplane climbs at a constant angle until it reaches an elevation of 8,000 m. If the flight distance reads 17 km, how much ground has the plane covered?

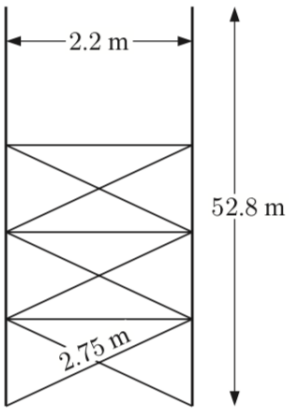
4. To make sure that the flag pole in this diagram is not leaning to one side, determine whether triangle ABC is right angled at B. (The dimensions marked are correct, but the triangle may not be drawn to scale.)



5. A projector is 40 m from the middle of a screen which is 15 m high. How much further away from the projector is the top edge than the centre of the screen?



6. A steel frame office building has the framework section shown in the diagram below. The vertical supports are 2.2 m apart and 52.8 m high. If the diagonal braces have length 2.75 m, how many are needed for this section? You may notice that this diagram is very far from being to scale.

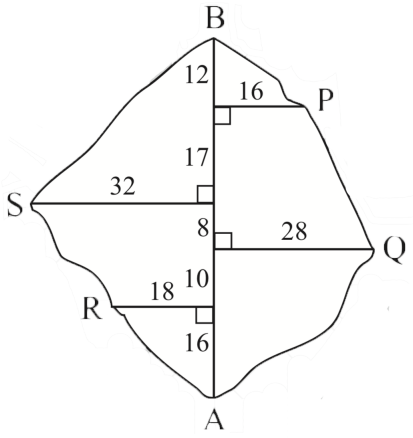


7. Traverse surveys are used by surveyors to measure irregular blocks of land and the measurements recorded are used to make estimates of the perimeter or area of the block. In the figure below, imagine drawing straight lines between every pair of adjacent points; the result would be that you have divided the block of land into six areas that are either right angled triangles or trapezia.

   a) Use Pythagoras' Rule to find the length BP, PQ, QA, etc.

   b) Hence find an estimate of the perimeter of the block.

   c) Find an estimate of the area of the block by finding the areas of the four triangles and two trapezia.



8. Prove Thales' theorem: If A, B, C are points on a circle and AC is a diameter then the angle $\angle ABC$ is a right angle.

9. Fill in the blanks

   a) The simplest polygon is a _____.

   b) A _____ has three sides of equal length.

   c) Note that a _____ can be divided into 2 triangles by drawing a diagonal

   d) Two or more circles with the same centre are called _____ circles

10. **Interior angle:** An interior angle of a polygon is an angle inside the polygon at one of its vertices.
    Exterior angle: An exterior angle of a polygon is an angle outside the polygon formed by one of its sides and the extension of an adjacent side.
    A convex polygon is a polygon in which the line segment between any two points of the polygon is contained in the polygon.

    a) Give an example of a convex and a non-convex polygon.

b) Prove by induction that the sum of the angles in any convex polygon with n vertices is $(n-2)\cdot 180°$.

c) What is the sum of the exterior angles of a convex polygon?

The convex hull of a set S is the smallest convex polygon containing S.

a) Draw a number of points and its convex hull.

b) Draw a non-convex polygon nad its convex hull. Does it have the same number of sides as the original polygon?