Loci (Grade C)

A *locus* is a line, curve or region of points that satisfy a certain rule. The plural of locus is *loci*.
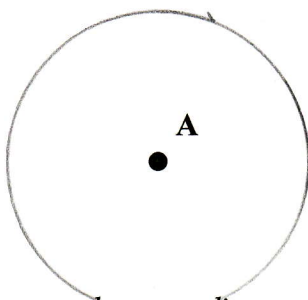
Four important loci
You need to recognise, and know how to construct the following loci:

Locus 1: The locus of points that are the same distance from a given point.
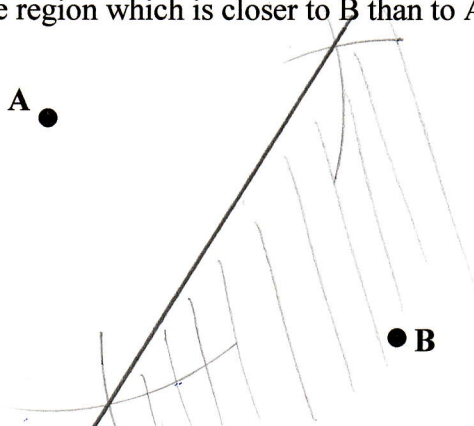**This is a circle.**
eg Draw the locus of points which are 2cm from the point A

Locus 2: The locus of points that are the same distance from two given points
This is a perpendicular bisector
eg Shade the region which is closer to B than to A

① OPEN COMPASS OVER HALF-WAY BETWEEN A+B.
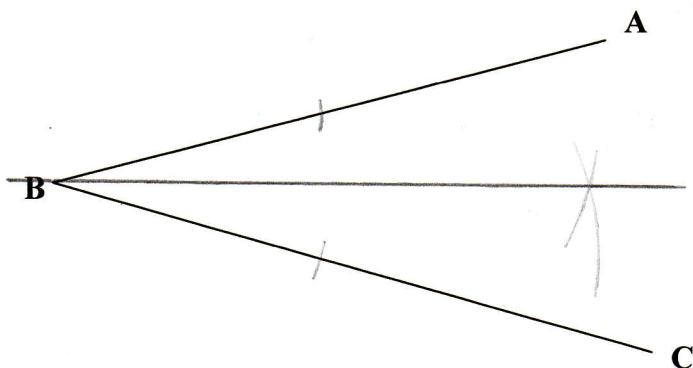
② Place point on A and mark an arc above + below

③ Without adjusting compass, place point on B and draw crossing arcs above + below.

④ Draw a line though the pairs of intersecting arcs. This is a perpendicular bisector.

Locus 3: The locus of points that are the same distance from two intersecting lines
This is an angle bisector
eg Draw the locus of points that are equidistant from the lines AB and BC

① Place compass point on B and open a reasonable distance.

② Mark where compass crosses each line.

③ Without adjusting compass, place point on first mark. Draw an arc.

④ Move compass point on second mark, draw an arc which crosses first arc.

⑤ The line through the intersection of the two lines and arcs is the angle bisector
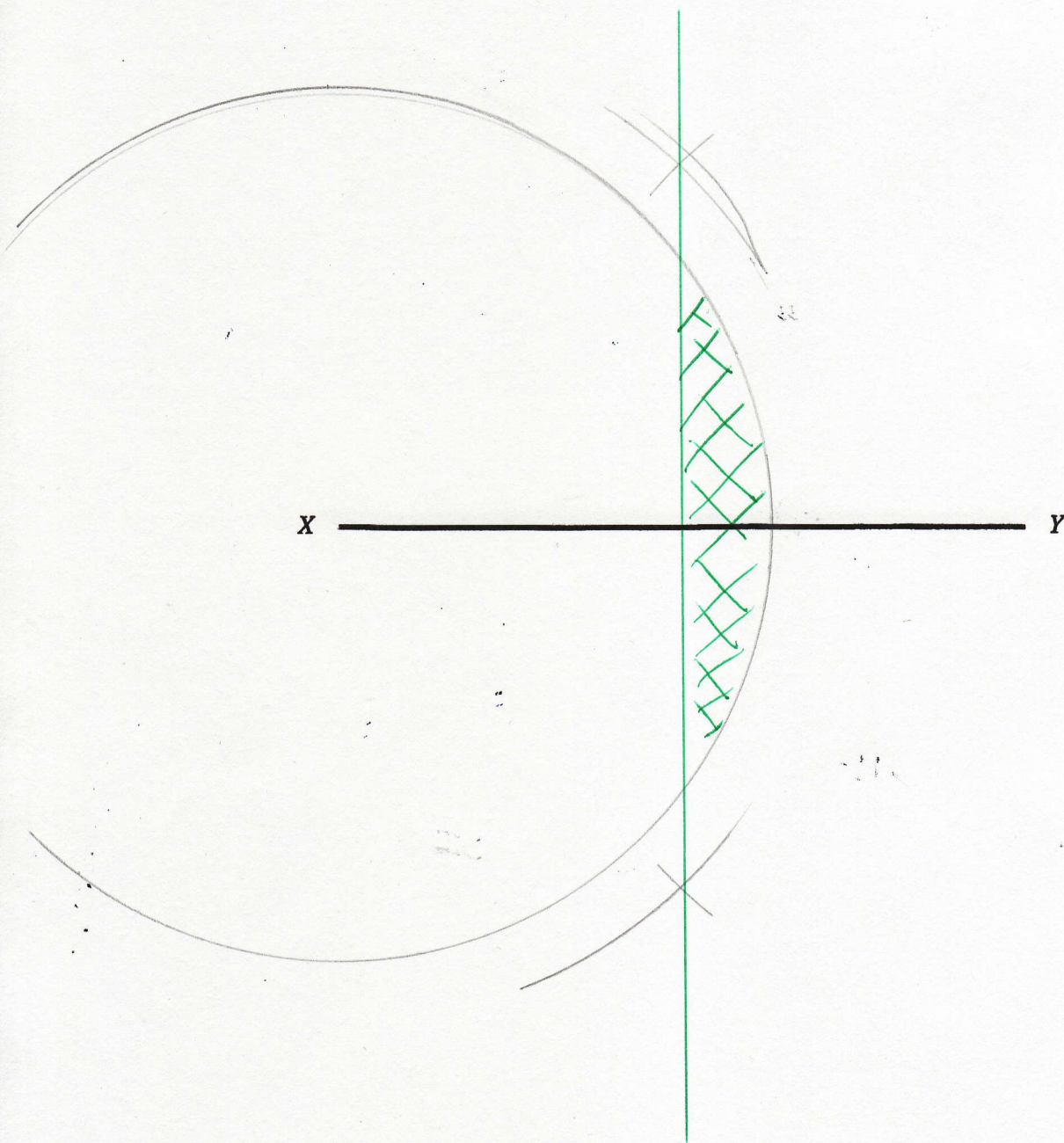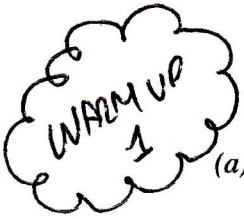
Loci Past Paper Questions

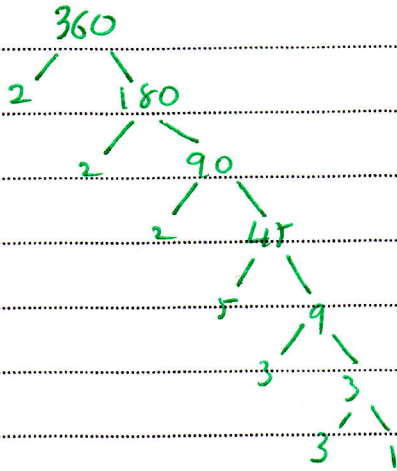(1) Find and shade the region that satisfies both of the following conditions.

(i) The points are less than 6·5 cm from X.
(ii) The points are nearer to Y than to X.

[2]

X ————————————————————— Y

WARM UP 1

(a) Express 360 as a product of prime numbers in index form.

360

2   180

2   90

2   45

5   9

3   3

3   1

$360 = 2^3 \times 3^2 \times 5$

[3]

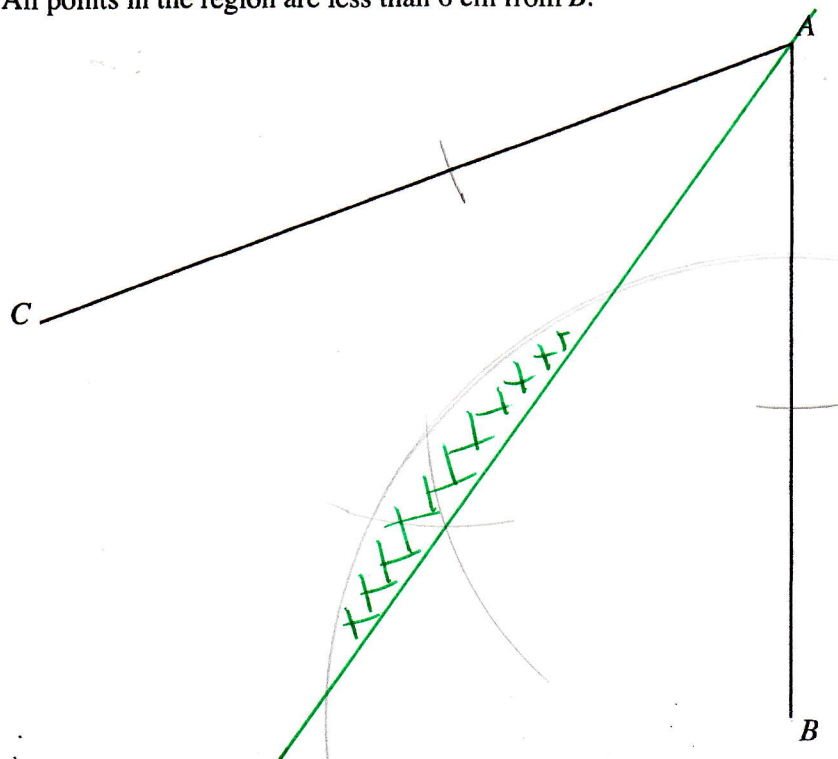*(b)* Explain why $2^5 \times 3^4$ is **not** a perfect square.

Because all the powers in a perfect square are even.

[1]

2 *(a)* The diagram below shows two straight lines AB and AC. Find and **shade** the region which satisfies **both** of the following conditions.

(i)   All points in the region are nearer to AC than to AB.

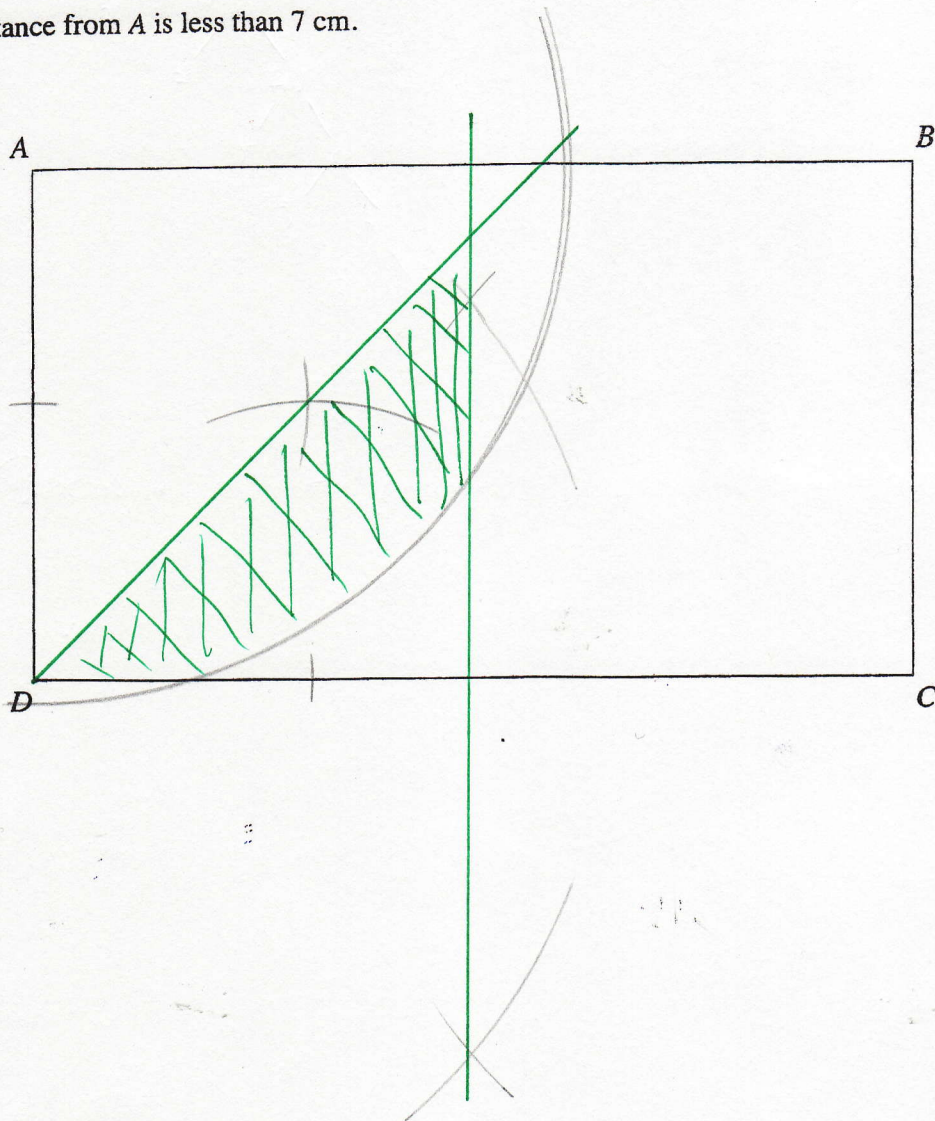(ii)   All points in the region are less than 6 cm from B.

[3]

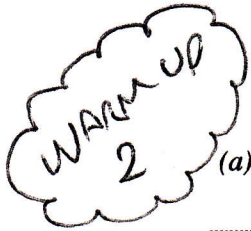In the following diagram, shade the region which satisfies **all** of the following conditions.

The distance from AD is greater than the distance from DC.

The distance from D is less than the distance from C.

The distance from A is less than 7 cm.

[4]

WARM UP 2

(a) Express 756 as a product of prime numbers in index form.

756

2 / 378
2 / 189
3 / 63
3 / 21
3 / 7
7 / 1

$756 = 2^2 \times 3^3 \times 7$

[3]

(b) Write down the least positive whole number that 756 must be **divided** by to make the result a perfect square.
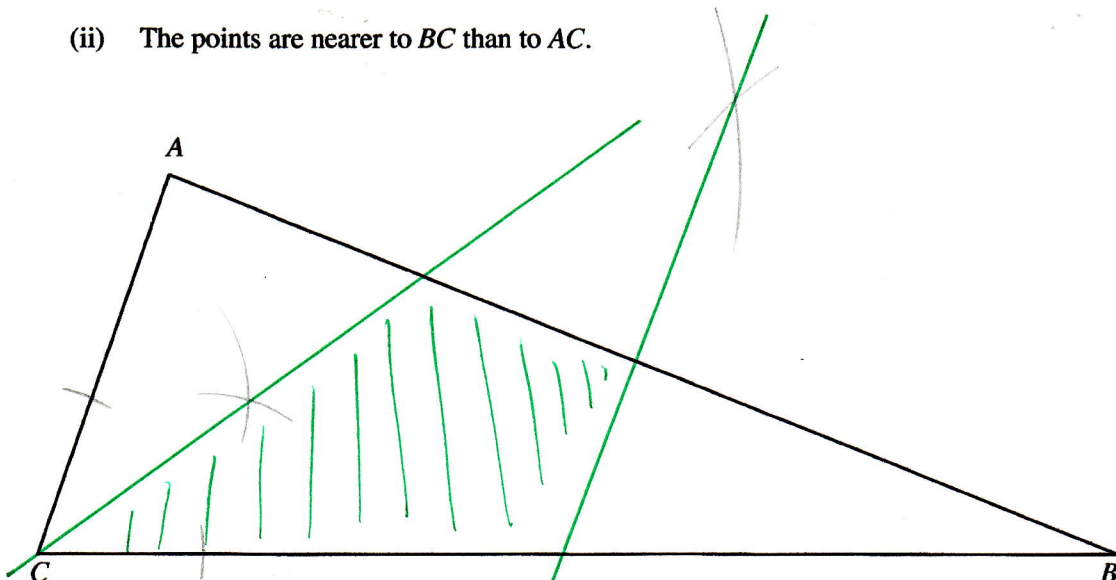
$\div 3 \div 7 = \div 21$

[1]

④ Find and shade the region of points **inside the triangle ABC** that satisfy both of the following conditions.

(i) The points are nearer to *A* than to *B*.

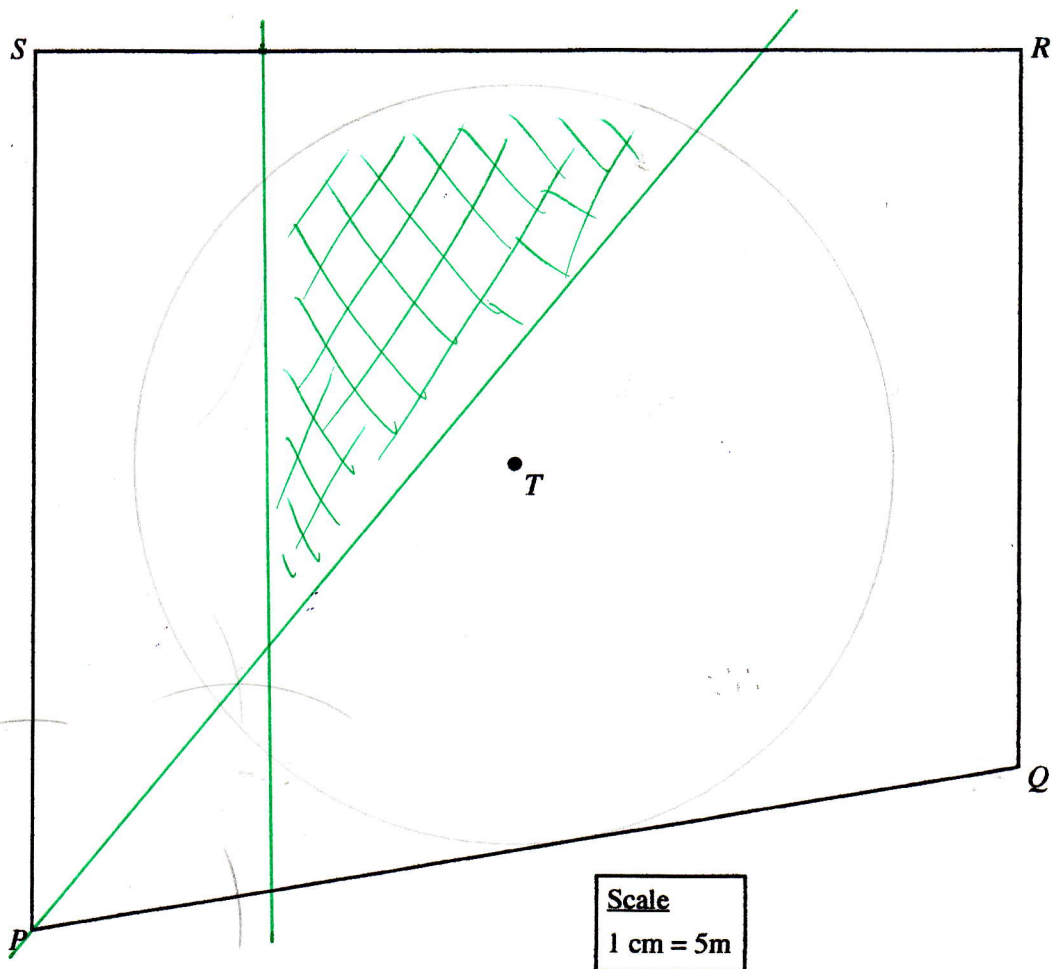(ii) The points are nearer to *BC* than to *AC*.

[3]

5) The diagram represents a plan of a plot of land *PQRS*. There is a tree at the point *T*. The scale used is 1cm represents 5m.

Find the region that satisfies all of the following conditions.

All the points in the region are

(i)   nearer to *PS* than to *PQ*,
(ii) further than 15m from *PS*,
(iii) within 25m of the tree marked as *T*.   [4]

S ─────────────────────────────── R
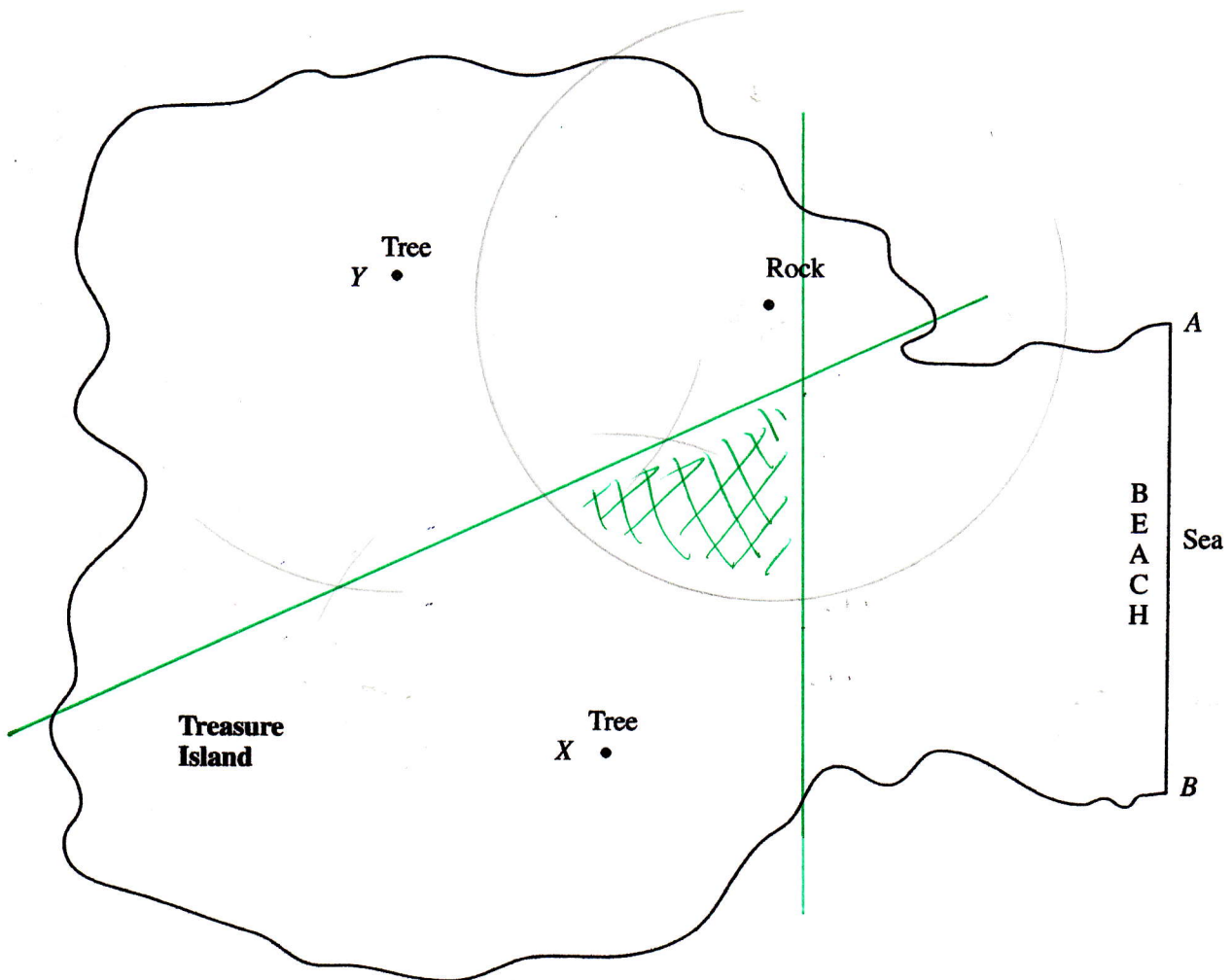
●T

Q

P

Scale
1 cm = 5m

6) Below is a sketch of Treasure Island using a scale of 1cm to represent 10m. Captain Blood has buried the treasure using the following rules.

The treasure is
  (i)   more than 50m away from the straight line beach *AB*,
  (ii)   nearer to the tree at *X* than to the tree at *Y*,
  (iii) less than 40m away from the rock.

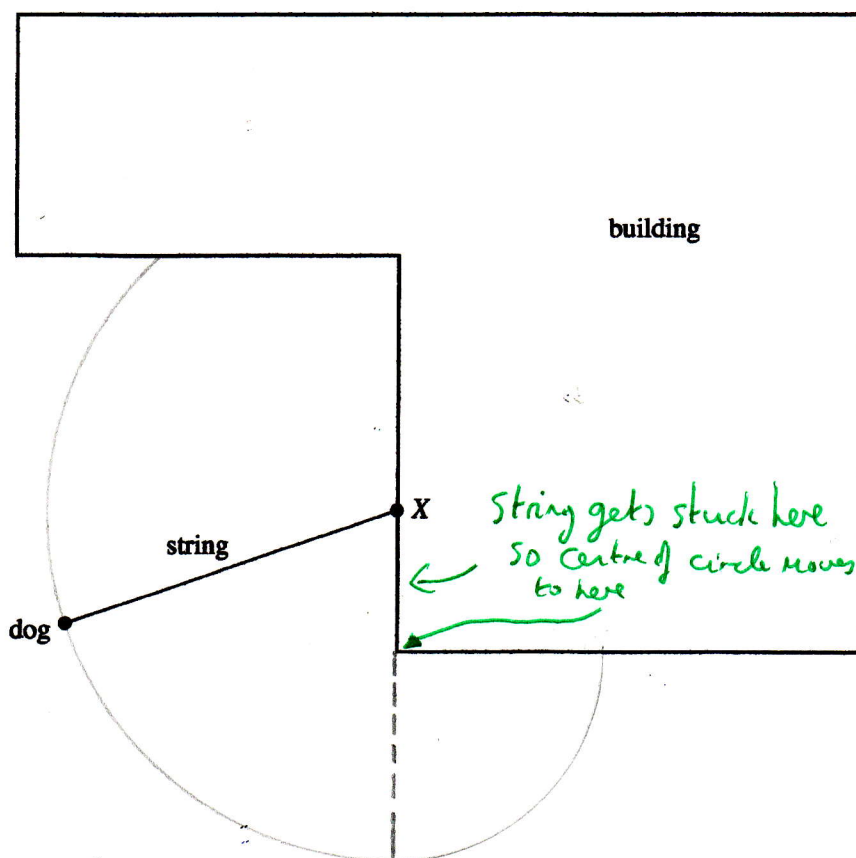Clearly indicate the region in which the treasure has been buried.
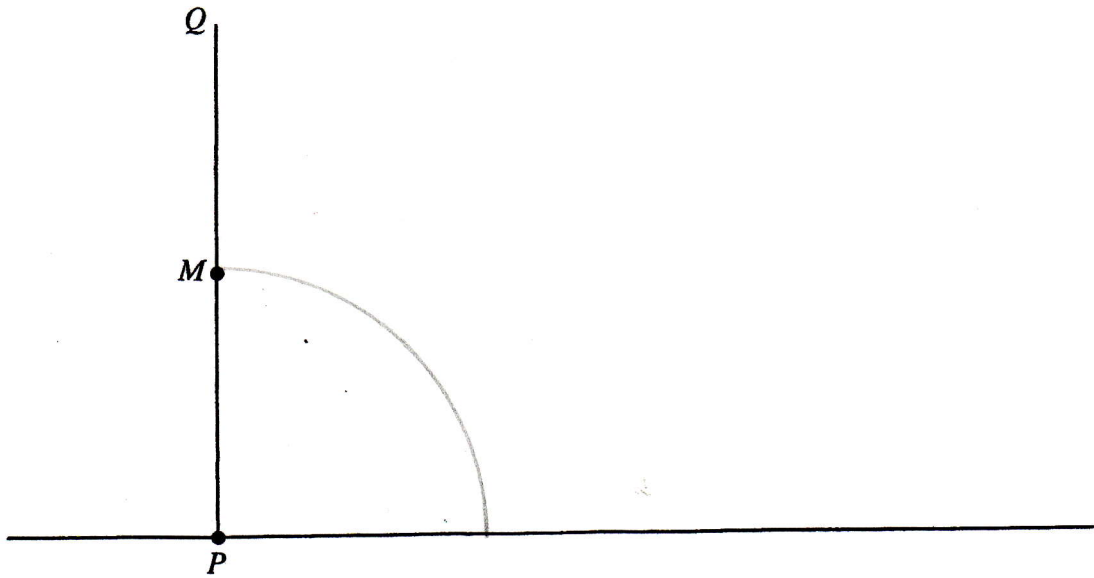
[4]

(7) The diagram represents an aerial view of a building. A dog is tied, by means of a string, to a side
of the building at *X*.
Draw the boundary of the region in which the dog can roam.   [3]
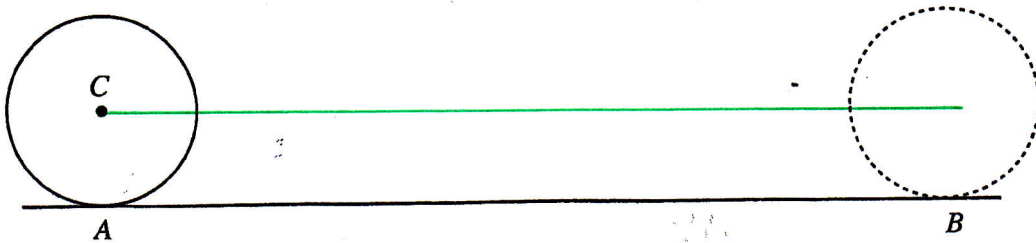
building

X   String gets stuck here
so centre of circle moves
to here

string

dog

8. (a) A rod *PQ* is hinged to the ground at *P*. Draw the locus of its mid-point *M* as it falls to the ground. [1]

(b) A circular disc, centre *C*, is rolled along level ground from *A* to *B*.
Draw the locus of *C*. [1]

(c) A circular disc, centre *D*, is rolled down a slope and then along level ground. Draw the locus of *D* as the disc is rolled from *X* to *Y*. [2]

(0184/7)