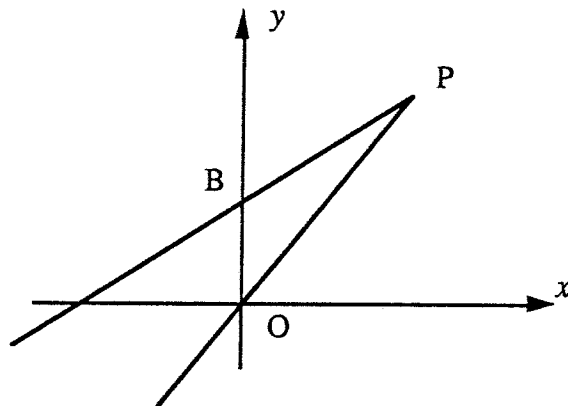


South Sydney High School  
LOCUS PROBLEMS  
3 Unit Worksheet

1.  $C(1,-3)$  is a point on a number plane. The point  $P(x,y)$  moves on the plane so that the length of the interval  $CP$  remains 2 units. What is the equation of the locus of  $P$ ?
2.  $A(4,0)$  and  $B(0,5)$  are points on a number plane. The point  $P(x,y)$  moves on the plane so as to remain equidistant from  $A$  and  $B$ . Show that the locus of  $P$  is a straight line and that this line
  - (a) contains the mid-point of  $AB$
  - (b) is perpendicular to  $AB$ .
3. The variable point  $P(x,y)$  moves on a number plane so that its distance from  $A(4,0)$  is twice its distance from  $B(1,0)$ . Show that the locus of  $P$  is a circle and state its centre and radius.

4.

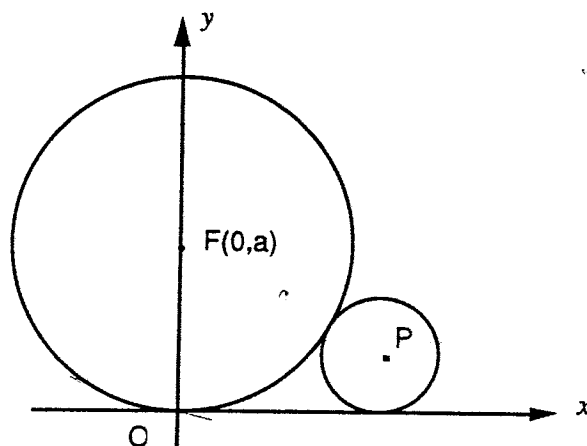


$B$  is the point  $(0,3)$ , the gradient of  $BP$  is  $m$  and the gradient of  $OP$  is  $2m$

- (a) Write down the equations of the lines  $BP$  and  $OP$ .
  - (b) Find the co-ordinates of  $P$ .
  - (c) Describe the locus of  $P$  as the value of  $m$  varies.
5.  $R$  is the point  $(0,4)$ . The point  $P$  moves on the number plane so that its distance from  $R$  is equal to its distance from the  $x$  axis. Find the equation of the locus of  $P$  and describe its shape.
6.  $L(0,4)$  and  $N(6,0)$  are points on a number plane. The variable point  $M$  moves on the plane so that  $ML$  and  $MN$  remain perpendicular. Find the equation of the locus of  $M$ , prove that it is a circle and state its centre and radius.

7. The point P moves on a number plane so that  $PA = \sqrt{2} PB$  where A is  $(-3,0)$  and B is  $(0,1)$ . Show that the locus of P is a circle, find the co-ordinates of its centre, C and show that A, B and C are collinear.
8. A point moves on a number plane so that its distance from the point  $(0,3)$  is equal to its perpendicular distance from the line  $y = -3$ . Determine the equation of the locus of the point.
- † 9. (a) What is the perpendicular distance between the point  $(x,y)$  and the line  $x + y - 1 = 0$  ?  
 (b) S is the point  $(1,1)$ . P moves on the plane so that PS is  $\sqrt{2}$  times the perpendicular distance between P and the line  $x + y - 1 = 0$ . Find, in simplest form, the equation of the locus of P.

† 10.



$F(0,a)$  is the centre of a fixed circle which touches the  $x$  axis at the origin. P is the centre of a variable circle that touches both the fixed circle and the  $x$  axis. Find the equation of the locus of P.

- † 11.  $A(a,0)$  and  $B(0, \frac{b}{k})$  are points on a number plane with  $a, b$  and  $k$  positive.
- (a) Write down the co-ordinates of P, the point dividing AB in the ratio  $k : 1$
- (b) Show that, as  $k$  varies, P moves on the straight line
- $$\frac{x}{a} = \frac{y}{b}$$
- (c) By considering the situation when
- (i)  $k$  approaches zero
  - (ii)  $k$  increases without limit
- determine the precise locus of P.

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**LOCUS**

1.  $(x-1)^2 + (y+3)^2 = 4$    2.  $8x - 10y + 9 = 0$
3. Centre  $(0,0)$ , radius 2.
4. (a)  $y = mx + 3$ ,  $y = 2mx$  (b)  $x = \frac{3}{2m}$ ,  $y = 3$   
(c) The line  $y = 3$
5.  $8y = x^2 + 16$ , parabola
6.  $(x-3)^2 + (y-2)^2 = 13$ , Centre  $(3,2)$   
radius  $\sqrt{13}$ .
7.  $C(3,2)$    8.  $x^2 = 12y$
9. (a)  $\frac{|x+y-1|}{\sqrt{2}}$  (b)  $2xy = 1$
10.  $x^2 = 4ay$
11. (c) The interval between  $(0,0)$  and  $(a,b)$ .