Achievement Standard 91256 (Mathematics and Statistics 2.1)

Apply coordinate geometry methods in solving problems

Practice assessment

William's mother is a primary school teacher and has been given the task of designing a children's playground. She has discussed the project with William who is enthusiastic about helping her.
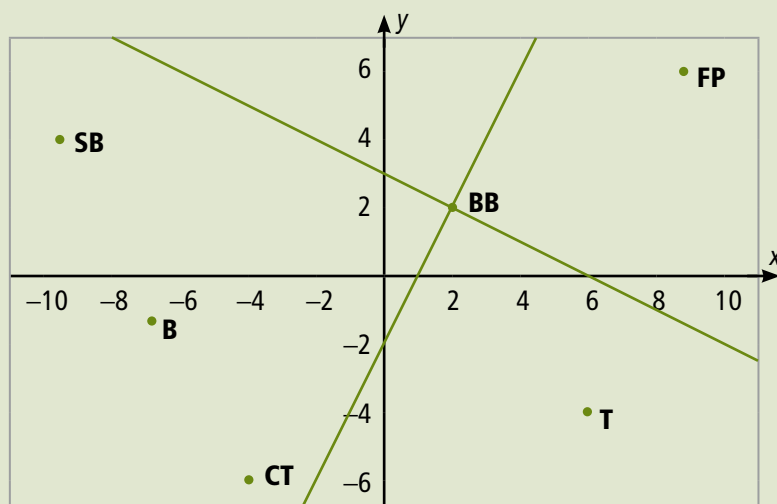
They have drawn up a preliminary list of six activities:

- Basketball net for shooting practice (BB)
- Swinging car tyres (CT)
- Swing boats (B)
- Trampoline with safety net (T)
- Suspension bridge, with chains (SB)
- Fort with a fireman's pole for ascending and descending (FP)

A piece of land has been allocated in the shape of a rectangle 20 metres by 16 metres.

William makes a scale drawing of the playground area on a sheet of paper, and plans where to place the activities.

The playground plan is drawn below but it is not to scale so do not take measurements off it.

Answer the following questions about the playground plan and show working to obtain your answers. All points have positions relative to the axes drawn on the plan.

1. The suspension bridge (SB) is placed at the point (–10,4) and the swinging car tyres at the point CT(–4,–6). Find the distance in metres between SB and CT. Give answer in metres to 1 decimal place.

2. The fort with the fireman's pole is at the point FP(9,6). Find the gradient of the straight line joining FP with SB (–10,4).

3. The swing boats B are at a point that is half way between SB (–10,4) and CT (–4,–6). What are the coordinates of B?

4. There are two footpaths through the playground area, and their equations relative to the axes are $y = -\frac{1}{2}x + 3$ and $y = 2x - 2$. William decides to place the basketball net at the point where the footpaths intersect.
   Using algebra, find the coordinates of this point marked BB.

5. The trampoline is placed at the point T(6,–4) and it is decided to lay another footpath to pass through T.

This footpath will be at right angles to the footpath whose equation is $y = -\dfrac{1}{2}x + 3$.

Find the equation of this new footpath.