

## PULLING A TRIANGLE

In the high jump in track and field, the jumper's main concern is a powerful vertical takeoff. This takeoff is developed from a two-part approach: a straight one and a curved one. The approach is developed from a simple Euclidean geometric construction from which three main checkpoints are formed. One checkpoint is the starting point of the approach, another is a main focal point in the approach, and the third is the turning point in the approach. This construction allows the jumper to judge the curve he or she must develop for the approach.

To understand the use of the simple construction, one must first know a little background on the high jump. The purpose of the high jump is to jump over the crossbar without knocking it off the standards. The standards are the adjustable poles, which hold the crossbar up (object 1 in the figure). The crossbar is a bar, made of fiberglass, which extends from one standard to the other (object 2 in the figure). There is also a landing pit (rectangle in the figure) behind the crossbar, which pads the jumper's landing. The crossbar is raised after successful jumps by adjusting the standards. The jumper who clears the highest height wins.

The following steps are for a jumper who prefers to jump off the left foot. The first thing an athlete does to develop the straight part of the approach is to measure from the right standard (checkpoint A in the figure). (It would be the exact opposite for a jumper who prefers to jump off the right foot). From this point ninety feet of measuring tape is rolled out. One person remains at the checkpoint A, holding the zero and ninety footmarks of the measuring tape. A second person then walks away from the crossbar, but parallel to it, holding the thirty-foot mark, establishing checkpoint B. A third person places checkpoints A and B. The first and second person remain standing at their respective checkpoints A and B. The third person who stand at checkpoint C and holds the tape by only the 60 footmark, and perpendicular to line A and B. Thus, "pulling a triangle." When the tape is pulled tight checkpoint D is established. An equilateral triangle has then been formed, with each side being 30 feet long. From Euclidean geometry, in an equilateral triangle the line joining a vertex (D) of an angle to the midpoint (C) of the opposite side (AB) is perpendicular to the opposite side. Perpendicular lines form right angles. From checkpoint D the high jumper steps off five steps along the altitude DC, away from the crossbar and establishes checkpoint E. Now the three main checkpoints, the starting point E, the turning point D, and the main focal point C, of the high jump have been formed by a simple geometric construction.

The high jumper is now ready to perform the high jump. The straight part of the approach is first. The jumper begins it by leading with the right foot heading for checkpoint D, but focusing on checkpoint C. Running along a curve the jumper heads for checkpoint A by changing focus from C to F, a point at the far corner of the landing pit. When the jumper reaches checkpoint A, he or she jumps off left foot heading for point F. The following gauge helps the jumper decide whether he or she needs to run a tighter or looser curve. If in previous tries the jumper has been hitting the crossbar on the way up, a

looser curve away from the right angle is needed. If the jumper is hitting the crossbar on the way down, a tighter curve is needed.

One might be surprised to see such a practical use of geometry employed in track and field. The simple geometric construction is used every day in practice and at all track meets.

