Measurements in Radiography

In traditional film-based radiography, there is always some magnification of the anatomy in the recorded image.
This is because the X-rays are emitted as a diverging beam from the focal spot of the X-ray tube, the focal spot being a close approximation to a point source.
The degree of magnification is determined by the ratio between the focus-film distance and the focus-object distance – if the part imaged lies very close to the exposed film, these distances will be nearly equal, and the magnification will be very small (magnification ratio a little above 1).
In practice, the joints of small parts (hands, feet) do lie very close to the film – with the part touching the radiographic cassette, object-film distance may only be a centimetre or two, while the focus-film distance may be a metre. Hence magnification of these joints would only be a few percent (magnification ratio ~1.01 - 1.03).

For larger joints (hips, shoulders, knees), the object-film distance is necessarily larger, and so is the magnification, especially in larger patients.
In common practice, this magnification is often ignored for measurement purposes, unless very accurate measurements are required; orthopaedic surgeons and other clinicians could mentally correct for the inherent magnification when selecting prostheses, etc.

Where accuracy is regarded as critical (eg in some research studies), the magnification can be substantially corrected for by either :

(a) Measuring the focus-object and object film distances – which still requires an estimate of the position of the joint (or part of the joint of interest) within the patient ; or

(b) Placing a scale marker next to the imaged part, at the same distance from the film, and measuring the size of its image on the exposed film. Then (Image size of scale bar)/(Known true size of scale bar) = magnification factor.

In digital radiography, the same process of magnification applies to the image recorded on the detector plate (because a diverging X-ray beam is still used).
However, there is an additional complication, in that the image displayed (whether on screen or on film) is not necessarily the same size as the image recorded on the detector – it may be digitally magnified or minified to fit the available display space. If this has been done, it is good practice for the image annotations to report what size manipulation has been applied.

Because the equipment vendor has no control over patient positioning, any scale bar or measurements made on the digital image will usually refer to the (magnified) size of the image on the detector, not the 'true size' of the anatomical part. This is analogous to the situation with film radiography – measurements on the film are inherently magnified relative to the actual anatomy.
Note that the term 'true size' can be used in confusing ways – most often it refers to the 'true size' on the detector, NOT the 'true size' of the part.

Note also that in cross-sectional imaging (such as CT or MRI), magnification due to beam divergence is eliminated by the reconstruction algorithm, but the size of the image display is arbitrary.
However, the displayed image can be (and usually is) accompanied by a scale bar, and most viewing software allows specific measurements to be made on the images with a high degree of accuracy; if the CT (or MRI) scanner is correctly calibrated, length measurements made from the images should correspond very closely to physical reality.