



(1) Use the ordinary planar Pythagorean Theorem to get c (in mm) from a and b.  $c =$

(2) The scale of this map is 1000 ft = 18mm. Convert a, b, and c to feet:

a =                      b =                      c =

(3) The radius of the Earth is 20,900,000 feet. Convert a and b to radians. Keep all digits that your calculator displays.

a =    b =

(4) The Earth is a sphere. In Part (1) shouldn't we have used  $\cos c = \cos a \cos b$  instead of the ordinary Pythagorean Theorem? Try getting c using the formula  $c = \arccos(\cos a * \cos b)$ :

c =

Your calculator may not be able to deal with the very small angles well. I don't know what you will have gotten. On the flip side of this page, I have had Mathematica get c while keeping all intermediate values to 20 decimal places.

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aRadians = 6000 / 20 900 000;
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bRadians = 4500 / 20 900 000;
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In[81]:= cRadians = ArcCos[Cos[aRadians] * Cos[bRadians]];
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In[82]:= N[cRadians, 20]
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Out[82]= 0.00035885167286664768253
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In[83]:= cFeet = cRadians * 20 900 000;
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In[84]:= N[cFeet, 20]
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Out[84]= 7499.9999629129365648
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