Lecture 37: The law of cosines

Russell Brown

Department of Mathematics University of Kentucky

Question 1.

Which of the following is true in our standard naming convention for triangles?

- A We use lower-case letters *a*, *b*, and *c* to name angles and upper case letters *A*, *B* and *C* to name sides.
- B The length of one of the sides adjacent to angle A is b.
- C The sides of length *a* and *b* do not touch.
- D The length of the side opposite angle A is a.
- E The length of one of the sides adjacent to angle A is a.

(B)

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We use upper case letters for angles and the corresponding lower case letter for the side opposite each angle.

Question 2.

Suppose that a triangle has sides of length a = b = 2 and c = 5, find cosine of the angle opposite *c*.

- A -17/8
- **B** 8/17
- C −8/17
- D 17/8
- E There is no such triangle.

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Image: A matrix and a matrix

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E.

If we work out the law of cosines, we obtain that cos(C) = -17/8. However this cannot be since the range of cosine in [-1, 1]. A sketch might convince you that if a = b = 2, then we have to have c < 4 to form a triangle.

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Question 3.

Suppose that a triangle has sides of length 3 and 5 and the cosine of the angle between them is -0.8. Find the length of the third side.

- **A** 4
- $B \sqrt{34}$
- $C \sqrt{10}$
- $D \sqrt{58}$
- E None of the above.

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If we let a = 3, b = 5 and $\cos(C) = -0.8$, then from the law of cosines we have $c^2 = 3^2 + 4^2 - 2 \cdot 3 \cdot 5(\frac{-4}{5}) = 34 + 24 = 58$.

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