

Exam 5 will be given on Wednesday, May 16, 2007. The exam will be *cumulative*, with emphasis on the topics covered since the last exam.

Those topics are: law of cosines, law of sines, area of a triangle formula, applications of law of cosines and law of sines, the ambiguous case (determining the number of distinct triangles), “double-triangle” problems, force problems, and binomial probability involving “at least” or “at most.”

The following formulas will be given to you during the exam, so you do not need to memorize them, but you should be able to apply them to problems.

## Formulas

### Area of Triangle

$$K = \frac{1}{2}ab \sin C$$

### Functions of the Sum of Two Angles

$$\sin(A + B) = \sin A \cos B + \cos A \sin B$$

$$\cos(A + B) = \cos A \cos B - \sin A \sin B$$

### Functions of the Difference of Two Angles

$$\sin(A - B) = \sin A \cos B - \cos A \sin B$$

$$\cos(A - B) = \cos A \cos B + \sin A \sin B$$

### Law of Sines

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

### Law of Cosines

$$a^2 = b^2 + c^2 - 2bc \cos A$$

### Functions of the Double Angle

$$\sin 2A = 2 \sin A \cos A$$

$$\cos 2A = \cos^2 A - \sin^2 A$$

$$\cos 2A = 2 \cos^2 A - 1$$

$$\cos 2A = 1 - 2 \sin^2 A$$

### Functions of the Half Angle

$$\sin \frac{1}{2}A = \pm \sqrt{\frac{1 - \cos A}{2}}$$

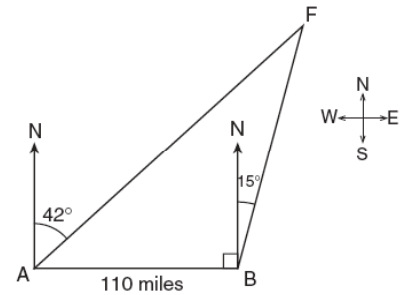
$$\cos \frac{1}{2}A = \pm \sqrt{\frac{1 + \cos A}{2}}$$

In addition to the problems below, be sure to review previous homework assignments, classwork, and exams. (Solutions are posted on the website.)

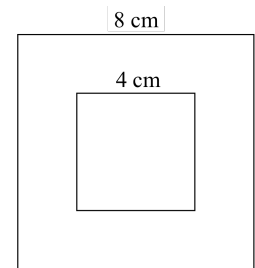
- In  $\triangle ABC$ ,  $AC = 18$ ,  $BC = 10$ , and  $\cos C = \frac{1}{2}$ . Find the area of  $\triangle ABC$  to the nearest tenth of a square unit.
- How many distinct triangles can be formed if  $a = 20$ ,  $b = 30$  and  $m\angle A = 30^\circ$ ?
- Solve for  $b$ :  $4^{2b-3} = 8^{1-b}$
- The members of the Delta Delta Delta Sorority want to take a picture of themselves standing in a triangle formation. They determined that the three sides of the triangle must measure 20 feet, 22 feet, and 24 feet. To the nearest hundredth of a degree, what is the measure of the smallest angle of the triangle?
- If  $\log_3(2 \cot x) = 2$ , find all values of  $x$  in the interval  $180^\circ \leq x < 360^\circ$ .
- Solve algebraically for all values of  $\theta$  in the interval  $0^\circ \leq \theta < 180^\circ$  that satisfy the equation  $\cos 2\theta + \sin 2\theta = -1$ .

7. The owner of an amusement park wants to add a screening room to the Haunted House attraction, but he does not want the movie screen to be a rectangular one. Instead he has asked the designer to create a 22-foot by 12-foot screen in the shape of a parallelogram with a longer diagonal equal to 28 feet.
- Find the measure of the angles, both acute and obtuse, between adjacent sides of the parallelogram, to the nearest tenth of a degree.
  - Find, to the nearest tenth of a square foot, the area the special-order screen will fill.

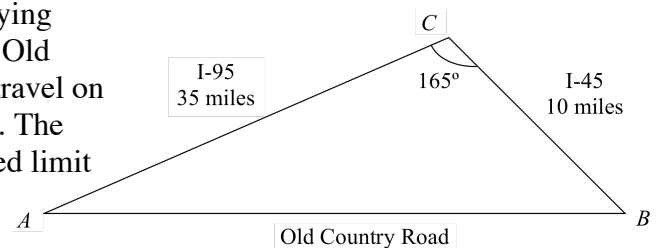
8. As shown in the accompanying diagram, two tracking stations,  $A$  and  $B$ , are on an east-west line 110 miles apart. A forest fire is located at  $F$ , on a bearing  $42^\circ$  northeast of station  $A$  and  $15^\circ$  northeast of station  $B$ . How far, to the nearest mile, is the fire from station  $A$ ?



9. The accompanying diagram shows a square piece of paper with a smaller square drawn in the center. If 6 darts randomly hit the paper, what is the probability that at least 4 darts will hit the smaller square?

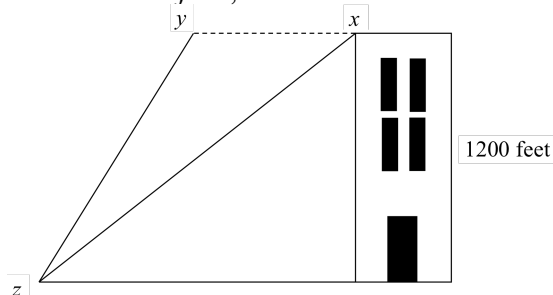


10. Dani is traveling from town  $A$  to town  $B$ . As the accompanying map indicates, Dani could drive directly from  $A$  to  $B$  along Old Country Road at an average speed of 30 miles per hour or travel on the interstates, 35 miles along I-95 and 10 miles along I-45. The interstates intersect at an angle of  $165^\circ$  at  $C$  and have a speed limit of 55 miles per hour.



How much time will Dani save by traveling along the interstates at an average speed of 55 miles per hour?

11. The diagram below represents the building where Benson works. The angle of depression is  $32^\circ$  from point  $x$  to point  $z$ . If the building is moved so that point  $x$  has a new location at point  $y$ , the angle of depression becomes  $41^\circ$ . Find, to the nearest foot, the distance that the building is moved from point  $x$  to point  $y$ .



12. Two forces are applied to an object. The measure of the angle between the 30.2-pound applied force and the 50.1-pound resultant is  $25^\circ$ .
- Find the magnitude of the second applied force to the nearest tenth of a pound.
  - Find the measure of the angle between the second applied force and the resultant to the nearest degree.