EVENT 4: TRIGONOMETRY -- Triangles with Scientific Calculators
   (2005-06 & EVERY OTHER YEAR)

Note: This event requires the use of a <u>non</u>-graphing, scientific calculator.
           Students should be instructed to round intermediate answers to 5
           decimal places.

Include: (1)   Ambiguous case of law of sines (SSA)
           (2)   Heron's area formula: $A = \sqrt{s(s-a)(s-b)(s-c)}$
           (3)   SAS area formula: $A = \dfrac{1}{2}ab\sin C$
           (4)   Word problems
           (5)   Navigational bearings (examples: S 22° E or N 50° W)
           (6)   Specific instructions about the precision of the answer (example:
                 Round final answer to 3 decimal places.)
Exclude: (1)   Law of tangents
   (2) $D°M'S''$ angle measures

Sample problems:

A-1. A parallelogram has sides of length 25.9 cm and 32.5 cm. The longer diagonal
     is 57.8 cm long. Find the measure of the angle opposite the longer diagonal.
     Round the final answer to 1 decimal place, and express it in degrees.

                    ANSWER: _____ 163.5° _____

A-2. A painter must paint a triangular wall. The sides of the wall measure 75 m,
     65 m and 85 m. One can of paint will cover 50 m². How many cans of paint does
     the painter need? Give the answer in whole numbers.

                    ANSWER: _____ 47 cans _____

B-1.   Find the measure of $\angle D$. Round the final answer to 1 decimal place, and
express it in degrees.
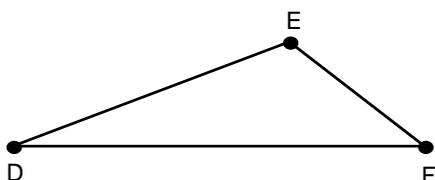
Given:
 $DE=9$; $EF=5$; $m\angle E=130°$

                    ANSWER: _____ 17.4° _____

B-2. Forest fire tracking stations A and B are 200 km apart, with A directly north
     of B. Rangers at Station A locate a fire of N 42° E while rangers at Station B
     locate the same fire on a bearing of N 13° E. How far is the fire from
     Station B? Round the final answer to 2 decimal places.

                    ANSWER: _____ 276.04 km _____

C.   Find all possible areas of triangle *ABC* if *CB* = 22.8, *AC* = 24.9, and
      $m\angle A$ = 55.167°. Round the final answer(s) to 3 decimal places.

                    ANSWER: _____ 248.608, 42.078 _____

Event 4:   TRIGONOMETRY – Triangles with Scientific Calculators   2008

A. (2 pts)   The base of an isosceles triangle is 52.36 inches. The base angles are 36.42°. Find the length of either of the two equal sides. Round to the nearest hundredth of an inch.

ANSWER _____ inches

B. (3 pts)   An 18 foot ladder is resting against a sloping wall so that the ladder makes an angle of 51° with the (level) ground. If the ladder touches the wall 14 feet along the wall, find the acute angle the wall makes with the ground. Round to the nearest hundredth of a degree.

ANSWER _____ °

C. (5 pts)   Two factories blow their whistles at 5 p.m. exactly. A man hears the two blasts at 3 seconds and 6 seconds after 5 p.m., respectively. The angle between his lines of sight to the two whistles is 42°10'. If sound travels at 344 meters/second, how far apart are the whistles to the nearest meter?

ANSWER _____ meters

Event 4:   Trigonometry - Triangles with Scientific Calculators 2006

A. (2 pts)   A plane flying at 15,000 feet starts to descend and touches down after it has flown 30,000
                       feet. What is its angle of descent?

ANSWER: _____ o

B. (3 pts)   At midnight, two search planes set out from Hilo to find a boat in distress. Plane A travels
                       due east at 400 km/hr and plane B travels north-east at 500 km/hr. At 2 AM, plane A spots
                       a flare from the boat and radios plane B to come and assist the rescue. How far is plane
                       B from plane A at this time? Assume both planes are at the same altitude. Compute the
                       answer to the nearest kilometer.

ANSWER: _____ km

C. (5 pts)   In Triangle PQR, $PQ = 5$, $QR = 4$, and $\angle P = 50°$.

                       Find all possible perimeters for Triangle PQR to the nearest tenth of a unit.

ANSWER: _____

A. (2 pts)   Given triangle ABC with angle $B = 42.8°$, side $a = 12.3$, and side $b = 8.28$. Find all possible measures of angle A to the nearest tenth of a degree.

ANSWER: _____

B. (3 pts)   Given a triangle with sides of length 10.5 cm, 12.7 cm, and 15.9 cm, find the length of the altitude to the longest side to the nearest tenth of a cm.

ANSWER: _____ cm

C. (5 pts)   A surveyor finds the angle of elevation of the top of a mountain to be 35°. After he moved 1200 ft closer, the angle of elevation is 42°. What is the height of the mountain? Round your final answer to 3 decimal places.

ANSWER: _____ feet

A. (2 pts)   A vertical 25 foot flagpole casts a 10 foot shadow. Find the angle of elevation of the sun
                     to the nearest tenth of a degree.

ANSWER: _____ °

B. (3 pts)   In $\triangle$ ABC, $m\angle A = 30°$, $a = 15$, and $b = 20$. Find all possible $m\angle B$ to the nearest ~~minute~~.
                                                                                  TENTH OF A
                                                                                    DEGREE

ANSWER: _____

C. (5 pts)   Two campers plan to hike directly to a lookout 5 miles north of their starting point. After
                     walking for one and a half miles, they stop to rest and realize that they are a quarter mile
                     west from the direct route. How many degrees east of north (to the nearest degree) should
                     their new heading be in order to walk directly to the lookout from the rest stop? How far
                     are they from the lookout (to the nearest tenth of a mile)?

ANSWER: _____ ° , _____ miles

<u>2008</u>

A. 32.53
B. 87.69
C. 1469

<u>2006</u>

A. 30°
B. 713 km
C. 11.1, 13.4

<u>2004</u>

A. no solution
B. 8.4 cm
C. 3779.105 feet

<u>2002</u>

A. 68.2°
B. 41°49′ , 138°11′ or 41.8°, 138.2°
C. 4°, 3.5 miles

Note: Answers are shown as they appear on the original answer keys. There may be inconsistencies with the formatting
            of these answers. In all cases, consult the Guidelines for Forms of Answers to determine the correct formatting.