

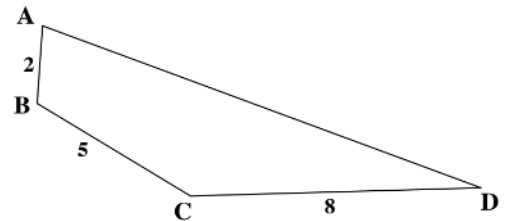
## Event C

Problem #3 ("Textbook with a twist"; 2 points)

Try to solve each problem within three minutes.

3.  $\triangle ABC$  has a right angle at  $B$ . If  $BC = 1$  and  $\cos A = \frac{1}{3}$ , determine exactly the perimeter of the triangle. (MSHSML 2019-20 1C #3)

3. In the figure,  $AB = 2$ ,  $BC = 5$ , and  $CD = 8$ . Angles  $A$  and  $D$  are acute and angles  $B$  and  $C$  are obtuse. If  $\sin C = \frac{3}{5}$  and  $\cos B = -\frac{3}{5}$ , determine exactly  $AD$ . (MSHSML 2018-19 1C #3)



3. Determine exactly the value of  $\sin 30^\circ + \sin 60^\circ + \sin 90^\circ + \cdots + \sin 300^\circ$ . (MSHSML 2017-18 1C #3)

3. If  $\sin^2 A = \frac{9}{16}$  and  $A$  is in the second quadrant, determine exactly the value of  $\tan A$ . (MSHSML 2016-17 1C #4)

## Event D

Problem #3 ("Textbook with a twist"; 2 points)

Try to solve each problem within three minutes.

3.  $f(x) = ax^2$  with  $a > 0$ . An equilateral triangle with side length  $k$  is placed on the parabola so that one of its vertices is on the vertex of the parabola and the other two vertices are on  $f(x)$ . Write a formula for  $a$ , the leading coefficient of  $f(x)$ , in terms of  $k$ . (Be sure to simplify). [calculator allowed] (MSHSML 2019-20 1D #3)

3. The function  $f(x) = x^3 + bx^2 + cx + 52$  has  $\frac{13}{2-3i}$  as one of its zeros. Determine exactly the ordered pair  $(b, c)$ .  
(MSHSML 2018-19 1D #3)

3. For what values of  $p$  will the quadratic function  $f(x) = x^2 - 4px - 9$  have a minimum value of  $-333$ ? (MSHSML 2017-18 1D #3)

3. Determine exactly all values of  $k$  for which the polynomials  $x^2 + 2x - 5k$  and  $x^2 - 10x - k$  share a common zero. (MSHSML 2016-17 1D #3)