

Where appropriate, give angle measures to the nearest tenth of a degree and lengths of sides in simplest radical form or to the nearest hundredth.

1. Find the area of  $\Delta PQR$  if  $q = 6$ ,  $r = 7$ , and  $\angle P = 50^\circ$ . Also find  $p$ .
  1. Area= \_\_\_\_\_
  - $p =$  \_\_\_\_\_
  
2. Find the measure of the largest angle in a triangle with sides having lengths  $3\sqrt{6}$ ,  $6\sqrt{3}$  and  $9\sqrt{2}$ .
  2. \_\_\_\_\_
  
3. In  $\Delta RST$ ,  $\angle R = 75^\circ$ ,  $\angle S = 45^\circ$ , and  $t = 3$ . Find  $r$  and  $s$ .
  3.  $r =$  \_\_\_\_\_
  - $s =$  \_\_\_\_\_
  
4. Three measurements in  $\Delta ABC$  are given as  $\angle A = 60^\circ$ ,  $a = 4$ , and  $b = 5$ . Show that at least one of the measurements is incorrect.
  
5. A regular polygon with 180 sides is inscribed in a circle with radius 1. Find its area. Compare your answer with  $\pi$ .
  5. \_\_\_\_\_
  
6. A submarine dives at an angle of  $16^\circ$  with the horizontal. If it takes 4 minutes to dive from the surface to a depth of 300 feet, how fast does it move along its sloping path downward? Give your answer in feet per minute. Then convert it to nautical miles per hour. Note: 1 nautical mile per hour  $\approx$  6080 feet per hour).
  6. \_\_\_\_\_
  
7. In  $\Delta XYZ$ ,  $\angle X = 21.1^\circ$ ,  $x = 6$ , and  $y = 9$ . Find the measure(s) of  $\angle Y$ .
  7.  $\angle Y =$  \_\_\_\_\_

8. In parallelogram  $ABCD$ ,  $\angle A = 60^\circ$ ,  $AB = 5$ , and  $AD = 8$ .

a. Find the area of  $ABCD$ .

8a. \_\_\_\_\_

b. Find the lengths of both diagonals.

8b. \_\_\_\_\_

9. A triangle has an area of  $21 \text{ cm}^2$  and two of its sides are 9 cm and 14 cm long. Find the possible measures of the angle formed by these sides.

9. \_\_\_\_\_

10. In the diagram given below,  $\triangle ABC$  is similar to  $\triangle DEF$  and  $\angle A = 120^\circ$ .

10.  $a =$  \_\_\_\_\_

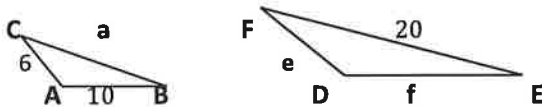
a. Find the lengths  $a$ ,  $e$  and  $f$ .

$e =$  \_\_\_\_\_

b. Find the ratio of the areas of the triangles.

$f =$  \_\_\_\_\_

ratio = \_\_\_\_\_



11. The diagonals of a parallelogram have lengths 8 and 14 and they meet at a  $60^\circ$  angle. Find the area and perimeter of the parallelogram.

11. Area = \_\_\_\_\_

Perimeter = \_\_\_\_\_

12. An obtuse triangle with area 12 has two sides of lengths 4 and 10. Find the length of the third side. There are two answers.

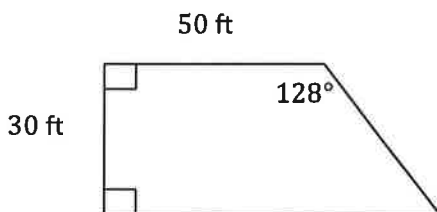
12. \_\_\_\_\_

13. The perimeter of a regular decagon (10 sides) is 240. Find its area.

13. \_\_\_\_\_

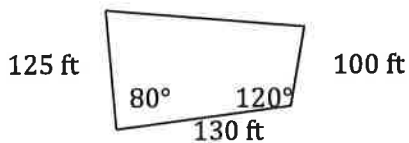
14. If fencing costs \$2.50 per foot, how much will it cost to buy fencing to go around the plot of land shown below?

14. \_\_\_\_\_



15. In the township of Madison, rural undeveloped land is taxed at a rate of \$115 per acre. Find the tax on the plot of land shown.

Note: 1 acre  $\approx$  43,560 ft<sup>2</sup>



15. \_\_\_\_\_

16. A ship is steaming north at 6 knots (6 nautical miles per hour) when the captain sights a small island at an angle of  $15^\circ$  to the east of the ship's course. After 10 minutes, the angle is  $28^\circ$ . How far away is the island at this moment (in nm)?

16. \_\_\_\_\_

17. In  $\triangle ABC$ ,  $a = 5$ ,  $b = 8$  and  $c = 7$ .

a. Solve  $\triangle ABC$ .

17a.  $\angle A =$  \_\_\_\_\_

$\angle B =$  \_\_\_\_\_

$\angle C =$  \_\_\_\_\_

b. Find the area of  $\triangle ABC$ .

17b. Area = \_\_\_\_\_

c. Find the length of the altitude to  $\overline{AC}$ .

17c. \_\_\_\_\_

18. Ship  $A$  sights ship  $B$  on a compass bearing of  $080^\circ$ . Make a sketch and give the compass bearing of ship  $A$  from ship  $B$ .

18. \_\_\_\_\_

19. Ship  $X$  sights ship  $Y$  on a bearing of  $308^\circ$ . What is the bearing of  $X$  from  $Y$ ?

19. \_\_\_\_\_

20. An airplane flies on a course of  $110^\circ$  at a speed of 1200 km/h. How far east of its starting point is it after 2 hours?

20. \_\_\_\_\_

21. A hunter walks east for 1 hour and then north for  $1\frac{1}{2}$  hours. What course should the hunter take to return to his starting point? What assumptions do you make to answer the question? 21. \_\_\_\_\_
22. Point  $B$  is 10 km north of point  $A$ , and point  $C$  is 10 km north of point  $B$  on a bearing of  $060^\circ$  from  $B$ . Find the bearing and distance of  $C$  from  $A$ . 22. Bearing \_\_\_\_\_  
Distance \_\_\_\_\_
23. Point  $S$  is 4 km west of point  $R$ , and point  $T$  is 4 km southwest of  $S$ . Find the bearing and distance of  $R$  from  $T$  23. Bearing \_\_\_\_\_  
Distance \_\_\_\_\_
24. Traveling at a speed of 10 knots, a ship proceeds south from its port for  $1\frac{1}{2}$  hours and then changes course to  $130^\circ$  for  $\frac{1}{2}$  hours. At this time, how far from port is the ship? 24. \_\_\_\_\_
25. A sailboat leaves its dock and proceeds east for 2 miles. It then changes course to  $205^\circ$  until it is due south of its dock. How far south is this? 25. \_\_\_\_\_
26. Two ships,  $A$  and  $B$ , leave port at the same time. Ship  $A$  proceeds at 12 knots on a course of  $040^\circ$ , while ship  $B$  proceeds at 9 knots on a course of  $115^\circ$ . After 2 hours, ship  $A$  loses power and radios for help. How far and on what course must ship  $B$  travel to reach ship  $A$ . 26. Bearing \_\_\_\_\_  
Distance \_\_\_\_\_

**Sketch each plot of land described, and find its AREA.**

27. From an iron post, proceed 500 meters northeast to the brook, then 300 meters east along the brook to the old mill, then 200 meters  $S 15^\circ E$  to a post on the edge of Wiggin's Road, and finally along Wiggin's Road back to the iron post.

27. Area=\_\_\_\_\_

28. From a granite post, proceed 195 ft east along Tasker Hill Road, then along a bearing of  $S 32^\circ E$  for 260 ft, then along a bearing of  $S 68^\circ W$  for 385 ft, and finally along a line back to the granite post.

28. Area=\_\_\_\_\_

29. From a cement marker, proceed 260 m southwest to the river, then 240 m south along the river to the bridge, then 280 m  $N 40^\circ E$  to a sign on the edge of Sycamore Lane, and finally along Sycamore Lane back to the cement marker.

29. Area=\_\_\_\_\_

**Answers: Law of Sines and Cosines Applications**

1. Area = 16.1;  $p = 5.57$

2.  $90^\circ$

3.  $r \approx 3.35$ ,  $s \approx 2.45$

4. Sine cannot be greater than 1

5. 3.141 sq. units

6. 2.69 nmh

7.  $32.7^\circ$ ,  $147.3^\circ$

8a. A = 34.6 sq. units

8b. 7 and 11.4

9.  $19.5^\circ$ ,  $160.5^\circ$

10a.  $a = 14.0$ ,  $e = 8.57$ ,  $f = 14.3$

10b. 49:100

11. A = 48.5 sq. units P = 31.4 units

12. 13.4, 7.21

13.  $\approx 4424.38$  sq. units

14. \$478.75

15. A = 15765 sq. ft.; Tax = \$41.40

16. 1.15 nm

17a.  $\angle A = 38.2^\circ$ ,  $\angle B = 81.8^\circ$ ,  $\angle C = 60^\circ$

17b. 17.32 sq. units

17c.  $\frac{5\sqrt{3}}{2} \approx 4.33$

18.  $260^\circ$  or S  $80^\circ$  W

19.  $128^\circ$  or S  $38^\circ$  E

20. 2255.3 km

21. Assumption: Rate is constant; Bearing:  $213.7^\circ$  or S  $33.7^\circ$  W

22.  $030^\circ$ , 17.3 km

23. Bearing:  $67.5^\circ$ ; TR = 7.4

24. 18.6 nm

25. 4.3 miles

26. 26 nm;  $358^\circ$

27.  $\approx 125,319.98 \text{ m}^2$

28. 84,828.82  $\text{ft}^2$

29. 40,540.06  $\text{m}^2$