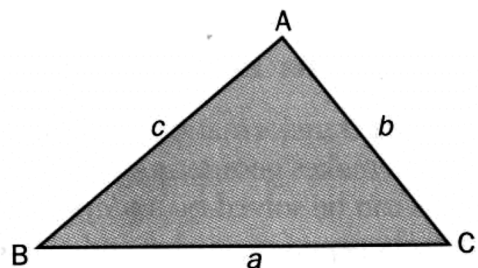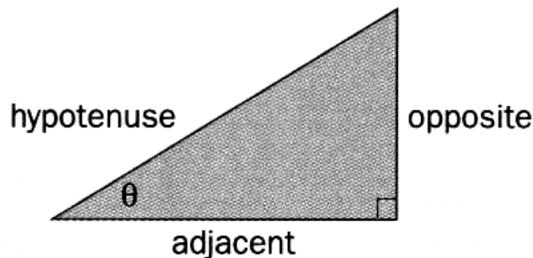# Basic Trigonometry, Law of Sines/Cosines

Trigonometry is used in Physics to solve a variety of problems from vector and vector components to Optics.

The three Primary Trigonometric Ratios (for Right Triangles) are

$$\sin\theta = \frac{opposite}{hypotenuse}$$

$$\cos\theta = \frac{adjacent}{hypotenuse}$$

$$\tan\theta = \frac{opposite}{adjacent}$$

The Law of Sines states

$$\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c} \quad \text{or} \quad \frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$
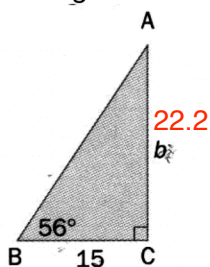
The Law of Cosines states that

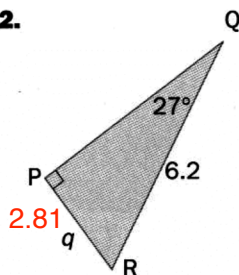$$a^2 = b^2 + c^2 - 2bc\cos A$$

$$b^2 = a^2 + c^2 - 2ac\cos B$$

$$c^2 = a^2 + b^2 - 2ab\cos C$$

Find the length of the indicated side
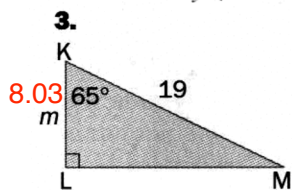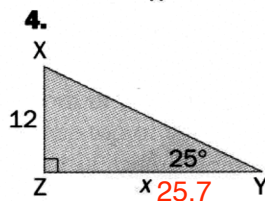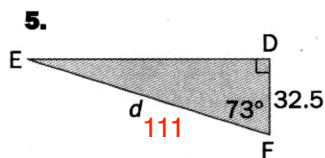
1. 22.2 b, 56°, B 15 C, A

2. 27°, P, 6.2, 2.81 q, R, Q

3. K, 8.03 65° m, 19, L, M

4. X, 12, 25°, Z x 25.7 Y

5. E, D, d 111, 73° 32.5, F

6. W 9.9 U, 12.9 w, 50°, V
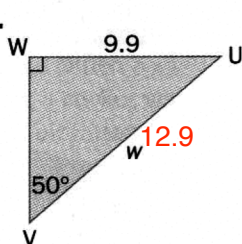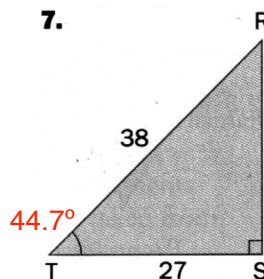
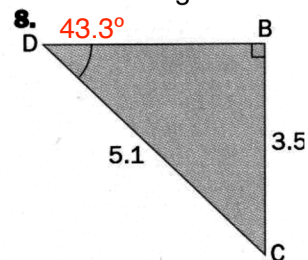Find the measure of the indicated angle

7. R, 38, 44.7°, T 27 S
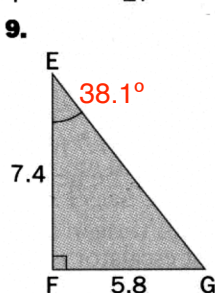
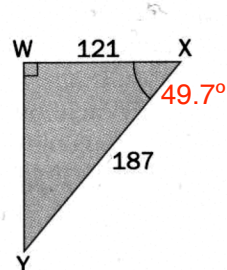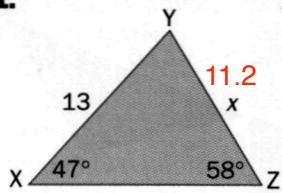**8.** 43.3° D, B, 5.1, 3.5, C
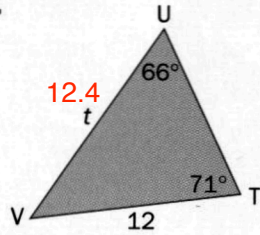
9. E, 38.1°, 7.4, F 5.8 G

10. W 121 X, 49.7°, 187, Y

Find the length of the indicated side

11.

Y
11.2
13   *x*
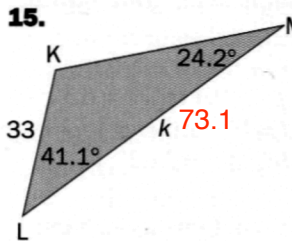X 47°   58° Z

12.

U
66°
12.4
t
71° T
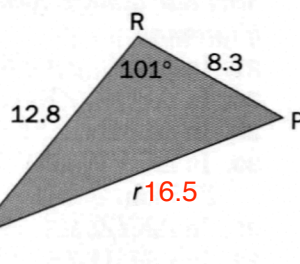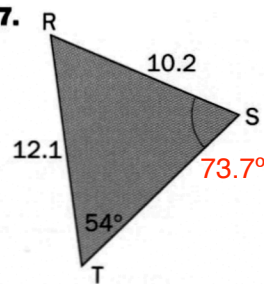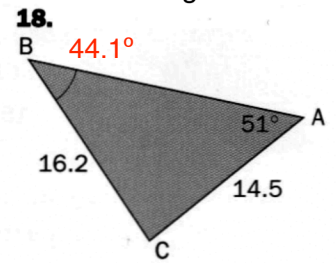V   12

Find the measure of the indicated angle

17.

R
10.2
S
12.1
73.7°
54°
T

18.

B   44.1°
51° A
16.2
14.5
C

13.

B
112°   27° A
a
2.35   4.8
C

14.

E
60.2°
f 11.6
8.3
75.9°
F   D

15.

K
24.2° M
33
k 73.1
41.1°
L

16.

R
101° 8.3
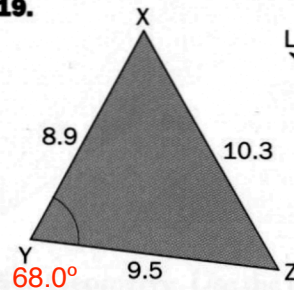12.8
P
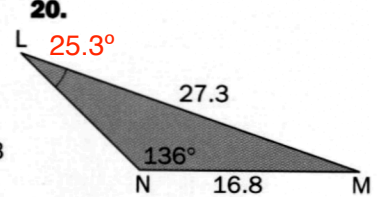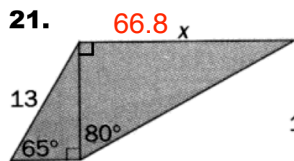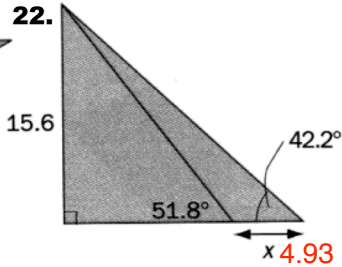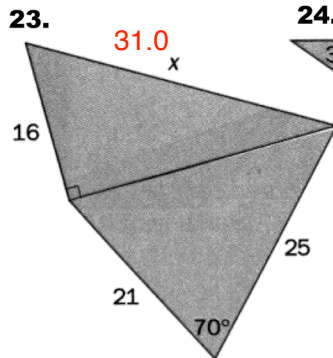*r* 16.5
Q

19.

X
8.9   10.3
Y
68.0°   9.5   Z

20.

L   25.3°
27.3
136°
N   16.8   M

Find the length of the indicated side

21.

66.8 *x*
13
65° 80°

22.

15.6
42.2°
51.8°
x 4.93

25.

10 m
20 m
9.73°
θ
45 m

26.

39.0°
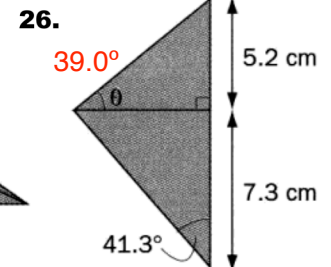θ   5.2 cm
7.3 cm
41.3°

23.

31.0
x
16
25
21
70°

24.

35° 125°
x
10
5.74

Find the measure of the indicated angle

27.

104°
θ
41.6°
4.3
63.2°
2.7

28.

θ   49.5°
7.9 m   9.5 m
12.3 m   9.8 m