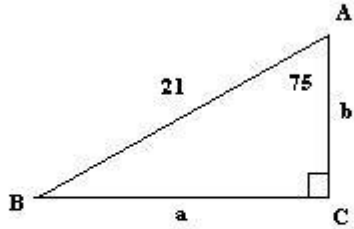Solve the following triangles:

(1.) A = 75° ; c = 21

     Here is the diagram:

(i.) sin 75 = a/21   use this trig equation

a/21 = sin 75   rearrange like this

 a = 21 sin 75   multiply each side by 21, cancel

  a = 20   use calculator and round

(ii.) cos 75 = b/21   use this trig equation

   b/21 = cos 75   just rearrange like this

   b = 21 cos 75   multiply each side by 21, cancel

   b = 5.4   use calculator and round

(iii.) A + B + C = 180   use the triangle sum theorem

     75 + B = 90 = 180   make substitutions

   B + 165 = 180   combine like terms

-165   - 165   subtract 165 from each side
   _____
      B   =   15   subtract

results: A = 75 ;   B = 15 ; C = 90

           a = 20 ;   b = 5.4   ;   c = 21

(2.)   B = 52° ; a = 32

        Here is the diagram:
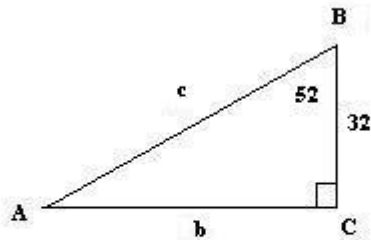
(i.)   cos 52 = 32/c   use this trig equation

        c cos 52 = 32   multiply each side by c, cancel

       _____ _____
        cos 52   cos 52   divide each side by cos 52

        c = 52   use calculator, round, and cancel

(ii.)   tan 52 = b/32   use this trig equation

        b/32 = tan 52   just rearrange like this

        b = 32 tan 52   multiply each side by 32, and cancel

         b = 41   use calculator, round, and cancel

(iii.)   A + B + C = 180   use the triangle sum theorem

        A + 52 + 90 = 180   make substitutions

         A + 142 = 180   combine like terms

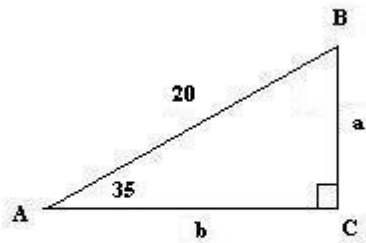   - 142 -142   subtract 142 from each side
        _____
            A   =   38   subtract

results: A = 38 ;   B = 52 ;   C = 90

          a = 32 ; b = 41 ;   c = 52

(3.)   A = 35° ;   c = 20

      Here is the diagram:

(i.)   sin 35 = a/20   use this trig equation

      a/20 = sin 35   just rearrange like this

     a = 20 sin 35   multiply each side by 20, cancel

```
        a = 11.5         use calculator, round, and cancel

  (ii.)  cos 35 = b/20   use this trig equation

      b/20 = cos 35    just rearrange like this

       b = 20 cos 35    multiply each side by 20 and cancel

       b = 16.4      use calculator, round, and cancel

  (iii.)  A + B + C = 180  use the triangle sum theorem

          35 + B + 90 = 180   make substitutions

          B + 125 = 180        combine like terms

           -125  -125           subtract 125 from each side
        _____
          B   =    55          subtract

  results:  A = 35;   B = 55;   C = 90

          a = 11.5  ;  b = 16.4  ;  c = 20

  (4.)  B = 81° ;   c = 40

  Here is the diagram:
```
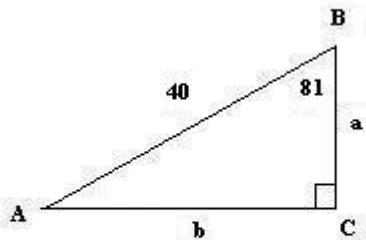
(i.)   sin 81 = b/40   use this trig equation

    b/40 = sin 81   just rearrange like this

     b = 40 sin 81   multiply each side by 40, cancel

    b = 39.5   use calculator and round

(ii.)   cos 81 = a/40   use this trig equation

        a/40 = cos 81   just rearrange like this

          a = 40 cos 81   multiply each side by 40, cancel

         a = 6.257   use calculator, round, and cancel

(iii.) A + B + C = 180   use the triangle sum theorem

      A + 81 + 90 = 180   make substitutions

      A + 171 = 180   combine like terms

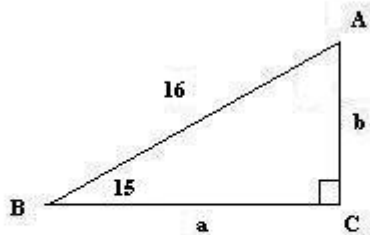   -171   -171   subtract 171 from each side
    _____
      A   = 9   subtract

results: A = 9 ;   B = 81 ;   C = 90

          a = 6.257 ;   b = 39.5 ;   c = 40

(5.) B = 15° ;   c = 16

Here is the diagram:

(i.)   sin 15 = b/16   use this trig equation

        b/16 = sin 15   just rearrange like this

          b = 16 sin 15   multiply each side by 16, cancel

           b = 4   use calculator, round, and cancel

(ii.)   cos 15 = a/16   use this trig equation

         a/16 = cos 15   just rearrange like this

           a = 16 cos 15   multiply each side by 16, cancel

           a = 15.5   use calculator, round, cancel

(iii.) A + B + C = 180   use the triangle sum theorem

       A + 15 + 90 = 180   make substitutions

        A + 105 = 180   combine like terms

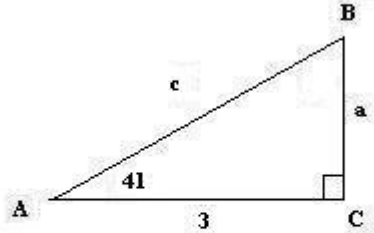   -105 -105   subtract 105 from each side
     _____
           A =   75   subtract

results: A = 75 ;   B = 15 ;   C = 90

a = 15.5 ; b = 4;   c = 16

(6.)   A = 41° ; b = 3

Here is the diagram:

(i.)   tan 41 = a/3   use this trig equation

   a/3 = tan 41   just rearrange like this

   a = 3 tan 41   multiply each side by 3 and cancel

   a = 2.6   use calculator and round

(ii.)   cos 41 = 3/c   use this trig equation

      c cos 41 = 3   multiply each side by c and cancel
   _____ _____
     cos 41   cos 41   divide each side by cos 41

        c = 4   use calculator and cancel and round

A + B + C = 180   use the triangle sum theorem

41 + B + 90 = 180   make substitutions

   B + 131 = 180   combine like terms

```
        -131   -131           subtract 131 from each side
_____
    B        =    49             subtract

results:   A = 41  ;   B = 49;   C = 90

          a = 2.6  ;   b = 3;   c = 4
```

Solve the following triangle:

(7.)
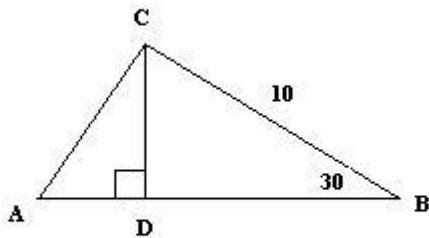
(i.)   cos 30 = BD/10   use this trig equation

   BD/10 = cos 30   just rearrange like this

   BD = 10 cos 30   multiply each side by 10 and cancel

   BD = 8.7   use calculator, round

(ii.)   sin 30 = CD/10   use this trig equation

      CD/10 = sin 30   just rearrange like this

   CD = 10 sin 30   multiply each side by 10, cancel

CD = 5   use calculator

(iii.)   tan 30 = AC/10   use this trig equation

    AC/10 = tan 30   just rearrange like this

   AC = 10 tan 30   multiply each side by 10 and cancel

   AC = 5.8   use calculator and round

(iv.)   sin 30 = AD/AC   use this trig equation to find AD

      AC sin 30 = AD   multiply each side by AC and cancel

     AD = 5.8(0.5)   rearrange and make substitutions

   AD = 2.9   multiply

DCB + CBD + BDC = 180   use the triangle sum theorem

DCB + 30 + 90 = 180   make substitutions

DCB + 120 = 180   combine like terms

    -120 -120   subtract 120 from each side
_____
DCB   =   60   subtract

(v.)   ACD = 30   [the comlement of 60]

(8.)   A bridge joins two points, B and C, on the opposite

      banks of a river. A highway engineer stands at point

      A, 300 feet from point C, and measures <CAB to be 36° .

      Find the length of the line of sight from the engineer

      to point B on the opposite bank of the river.

Here is the diagram:
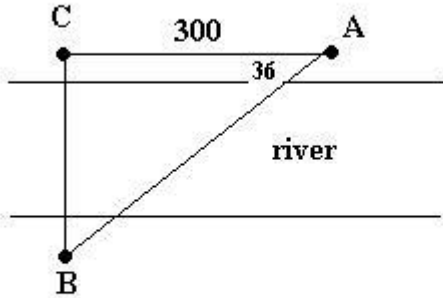
Let c = AB

cos 36 = 300/c   use this trig equation

c cos 36 = 300   multiply each side by c and cancel

_____ _____
  cos 36   cos 36   divide each side by cos 36

  c = 370.8   use calculator, round, and cancel
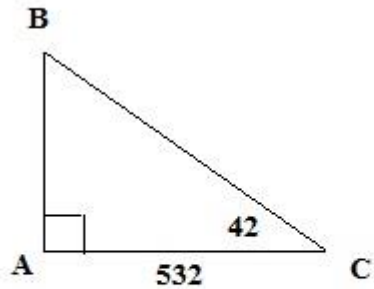
AB = 370.8   replace c with AB

result: AB = 370.8

(9.) The distance AB can be found by placing stakes at A, B,

and C in such a way as to make <A a right angle, and by

measuring AC and < C. AC is 532 meters and C is 42° .

How long is AB?

Here is the diagram:

```
tan 42 = AB/532           use this trig equation

532 tan 42 = AB       multiply each side by 532

AB = 532 tan 42        rearrange like this

AB = 479        use calculator and round
```

(10.) A guy wire 40 meters long runs from the ground to the

top of a pole. It makes a 64° angle with the line

drawn to the foot of the pole. Find the height of the

pole.

Here is the diagram:
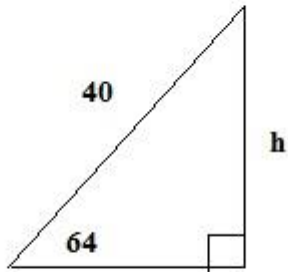
```
sin 64 = h/40     use this trig equation

h/40 = sin 64          just rearrange like this

 h = 40 sin 64      multiply each side by 40 and cancel

 h = 36                 use calculator and round
```
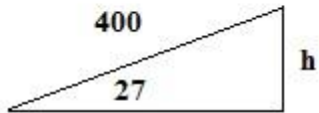
(11.) The railroad that runs to the summit of Pikes Peak makes,

at the steepest place, a 27° angle with the horizontal.

How many meters would you rise in going 400 meters up

this track?

Here is the diagram:

```
    sin 27 = h/400              use this trig equation

  h/400 = sin 27                just rearrange like this

    h = 400 sin 27              multiply each side by 400, cancel

    h = 181.6          use calculator and round
```
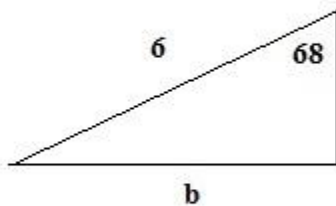
(12.) A ladder 6 meters long leans against a building and makes

      an angle of 68° with the ground. How far from the

        building is the base of the ladder?

Here is the diagram:

```
   sin 68 = b/6    use this trig equation

  b/6 = sin 68         just rearrange like this

  b = 6 sin 68     multiply each side by 6, cancel

  b = 5.56             multiply and round ; use calculator
```

(13.)   A balloon is anchored at point E by a cable.   The

        cable makes an angle of 52° with the ground.   Point

        D, on the ground directly under the balloon, is 265

        feet from E.   Find the length of the cable.

Here is the diagram:
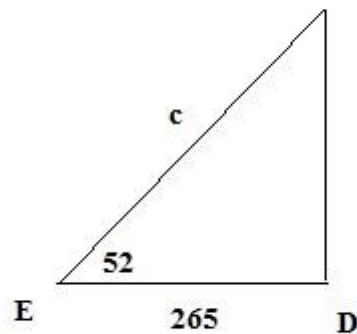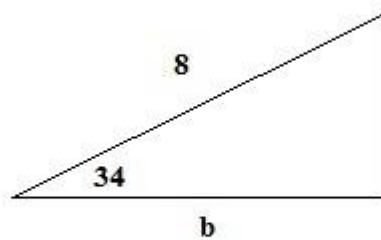


```
  cos 52 = 265/c         use this trig equation

   c cos 52 = 265     multiply each side by c, cancel
  _____  _____
   cos 52      cos 52      divide each side by cos 52

  c = 430.4          use calculator and round
```

(14.)   An 8 meter pole is leaning against a tree.   The pole

makes an angle of 34° with the tree.   Find the distance

from the foot of the pole to the foot of the tree.

Here is the diagram:

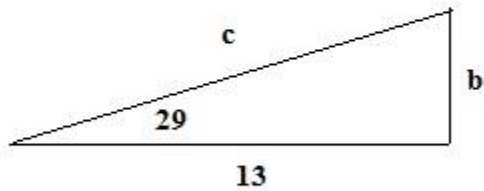cos 34 = b/8   use this trig equation

b/8 = cos 34   rearrange like this

b = 8 cos 34   multiply each side by 8, cancel

b = 6.6   use calculator and round

(15.)   A tree is broken by the wind.   The top of the tree

touches the ground 13 meters from the base and makes

an angle of 29° with the ground. Find the original

height of the tree.

Here is the diagram:

(i.)   tan 29 = b/13   use this trig equation to find b

           b/13 = tan 29   just rearrange like this

          b = 13 tan 29   multiply each side by 13, cancel

          b = 7.2   use calculator and round

(ii.)   cos 29 = 13/c   use this trig equation to find c

           c cos 29 = 13   multiply each side by c, cancel

           _____ _____
            cos 29   cos 29   divide each side by cos 29

           c = 15   use calculator, round, cancel

(iii.)   b + c   use this expression to find

                         the original height of the tree

```
=        7.2 + 15    make substitutions

=        22.2            add
```