Applications of Trig Functions

1) A right triangle has a 42° angle.  The shortest side of the triangle is 17.4 cm.  Find the lengths of the other two sides.

2) A right triangle has a 23° angle.  The hypotenuse of the triangle is 827 cm.  Find the lengths of the other two sides.

3) A right triangle has one leg that is 34.6 inches and its hypotenuse is 62.4 inches.  Find the other side and the angles.

4) A regular pentagon is inscribed in a circle of radius 3.00 meters.  Find the length of each side of the pentagon.  Find its area.  Find the ratio of the pentagon's area to the circle's area.  Find its perimeter.  Find the ratio of the pentagon's perimeter to the circle's circumference.

5) A road sign says "6% grade."  What is the angle of elevation of the road?

6) The slope of a line is 2.  What is the angle of elevation of the line?

7) You walk 12 miles heading N 30° E.  Then you turn right 40° and walk 8 more miles.  How far are you from your starting point?  What is your bearing angle from your starting point?

8) You hold out one finger at arm's length.  What angle does your finger make as seen from your eye?

9) The moon is approximately 3,475 km in diameter, and its distance to Earth varies from about 348,000 km to 399,000 km.  When the moon is closest to Earth, what angle does the moon make as seen from Earth?  When the moon is farthest from Earth, what angle does the moon make as seen from Earth?

10) Can you block the moon (from one eye) with one finger held at arm's length?

11) The sun is approximately 1,392,000 km in diameter, and approximately 150,000,000 km from Earth.  What angle does the sun make as seen from Earth?  When the moon is farthest from Earth, can it block the sun?  When the moon is closest to Earth, can it block the sun?

Three more on the next page...

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12) Frodo and Sam are walking towards Mt. Doom.  At one point, the top of the mountain is 3.16° above the horizon.  They walk 11 more miles, and now the top is 4.28° above the horizon. How tall is Mt. Doom?

13) (Inspired by an actual event, June 23, 2017).  A horse trailer containing 5 horse stalls is 8 feet wide, but a horse stall is 9 feet by 4 feet, so the stalls must be placed diagonally within the trailer. What is the smallest angle (measured perpendicular to the long axis of the trailer) that can be used?  How long must the trailer be?

Bonus, not a RTT problem

14) The central angle (from the center of the Earth) between two points on the surface of the earth is given by ...

$$\theta = \cos^{-1}(\sin(\text{Lat 1})*\sin(\text{Lat 2}) + \cos(\text{Lat 1})*\cos(\text{Lat 2})*\cos(\text{Long 1} - \text{Long 2}))$$

a) Verify that this formula seems to work for two locations on the equator.
b) Verify that this formula seems to work for two locations on the same longitude.
c) Verify that this formula seems to work for the distance from the North Pole to anywhere in the Northern Hemisphere.
d) Verify that this formula seems to work for two locations on opposite sides of the Earth (opposite latitudes and longitudes).
e) Using $s = r\theta$, and $r = 3960$ miles, find the distance between
Sacramento (38.6°N, 121.5°W) and ...
i) The Fred Meyer parking lot on Highway 20 in Albany, Oregon (44.6°N, 123.1°W)
ii) Prince Edward Island (46.5°N, 63.6°W)
iii) Churchill, Manitoba (58.7°N, 94.0°W)
iv) Madagascar (18°S, 47.5°E).  Use negative numbers for these two coordinates.

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One quick fact…
The smallest angle of a triangle is across from the shortest side.
The largest angle of a triangle is across from the longest side.

1) A right triangle has a 42° angle.  The shortest side of the triangle is 17.4 cm.  Find the lengths of the other two sides.

Picture please