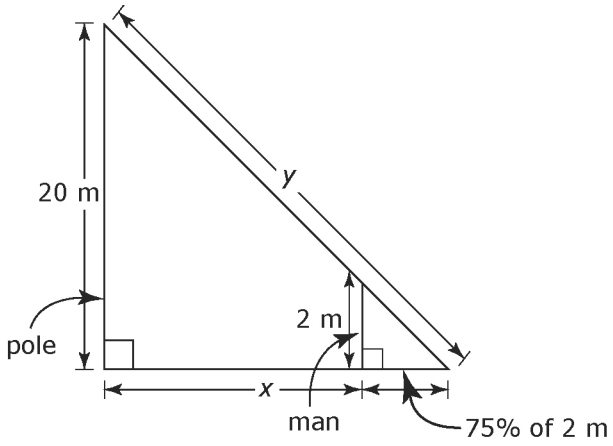
Chapter 3 Gifted and Enrichment Answers

1. Measure the lengths of the three sides in a triangle, and then square each length. If the sum of the squares of the two shorter sides is equal to the square of the longest side, then the angle opposite the longest side is a right angle and the two shorter sides are perpendicular.

2. Sketch a diagram of what is known and add information to the diagram.

Let x be the distance of the man from the pole in metres.

Let y be the distance of the top of the pole from the end of the shadow in metres.



The length of the man's shadow
is 75% of 2
$= 0.75 \times 2$
$= 1.5$
The length of the pole's shadow is in the same ratio of shadow to height, or
$= 75\%$ of 20
$= 0.75 \times 20$
$= 15$
So, $x + 1.5 = 15$
$x = 15 - 1.5$
$x = 13.5$
The man is 13.5 m from the pole.
The distance from the top of the pole to the end of the shadow is the hypotenuse of the right triangle created by the pole, its shadow, and the ground.
So, $y^2 = 20^2 + 15^2$
$y^2 = 400 + 225$
$y^2 = 625$
$y = \sqrt{625}$
$y = 25$
The top of the pole is 25 m from the end of the shadow.

3. If the longest side is 1.25 times as long as the middle-length side and the shortest side is 0.75 times as long as the middle-length side, then the middle-length side could be considered 1.

As fractions, the side lengths are $\frac{5}{4}, \frac{4}{4}$, and $\frac{3}{4}$. So the triangle is a 3-4-5 triangle, and we know that is a right triangle because $3^2 + 4^2 = 5^2$.

4. The hypotenuse CD of triangle CDG is a radius of the circle.
$C = \pi d$, but it is given that $C = 10\pi$, so $10\pi = \pi d$, thus $d = 10$ and $r = 5$
The hypotenuse CD of triangle CDG is 5 cm.
It is given that side CG of triangle CDG is 3 cm, so triangle CDG is a right triangle with one leg 3 and hypotenuse 5, so the other leg is 4 (3-4-5 right triangle).
Side GD of triangle CDG is 4 cm.
But, side GD is one side of square DEFG.
A(square DEFG) $= s^2$
$= 4^2$
$= 16$
The area of square DEFG is 16 cm^2.
AC is also a radius, so AC = 5 cm.
AG = AC + CG
$= 5 + 3$
$= 8$
Side AG of rectangle AGHI is 8 cm.
Since GF = 4 and GF = GB + BF and GB = BF, then, GB = BF = 2
but, it is given that GB = BF = GH, so, GH = 2
Side GH of rectangle AGHI is 2 cm.
Area (rectangle AGHI)
$= lw$
$= 8 \times 2$
$= 16$
The area of rectangle AGHI is the same as the area of square DEFG, 16 cm^2.
Instead of finding side DG using the Pythagorean relation, find side GF using:
CB is a radius, so CB = 5
Since CB = CG + GB
$5 = 3 + GB$
$2 = GB$
but, it is given that GB = BF
side GF of square DEFG
$= GB + BF$
$= 2 + 2$
$= 4$