Unit 5 Day 20: Tie the Unit (Part A and B) Together Day

Focus Question: How can I use irrational numbers with triangles?

For each right triangle below, some information is given in the table, but other information is missing. Find the missing information and label all information as either rational or irrational.

1.
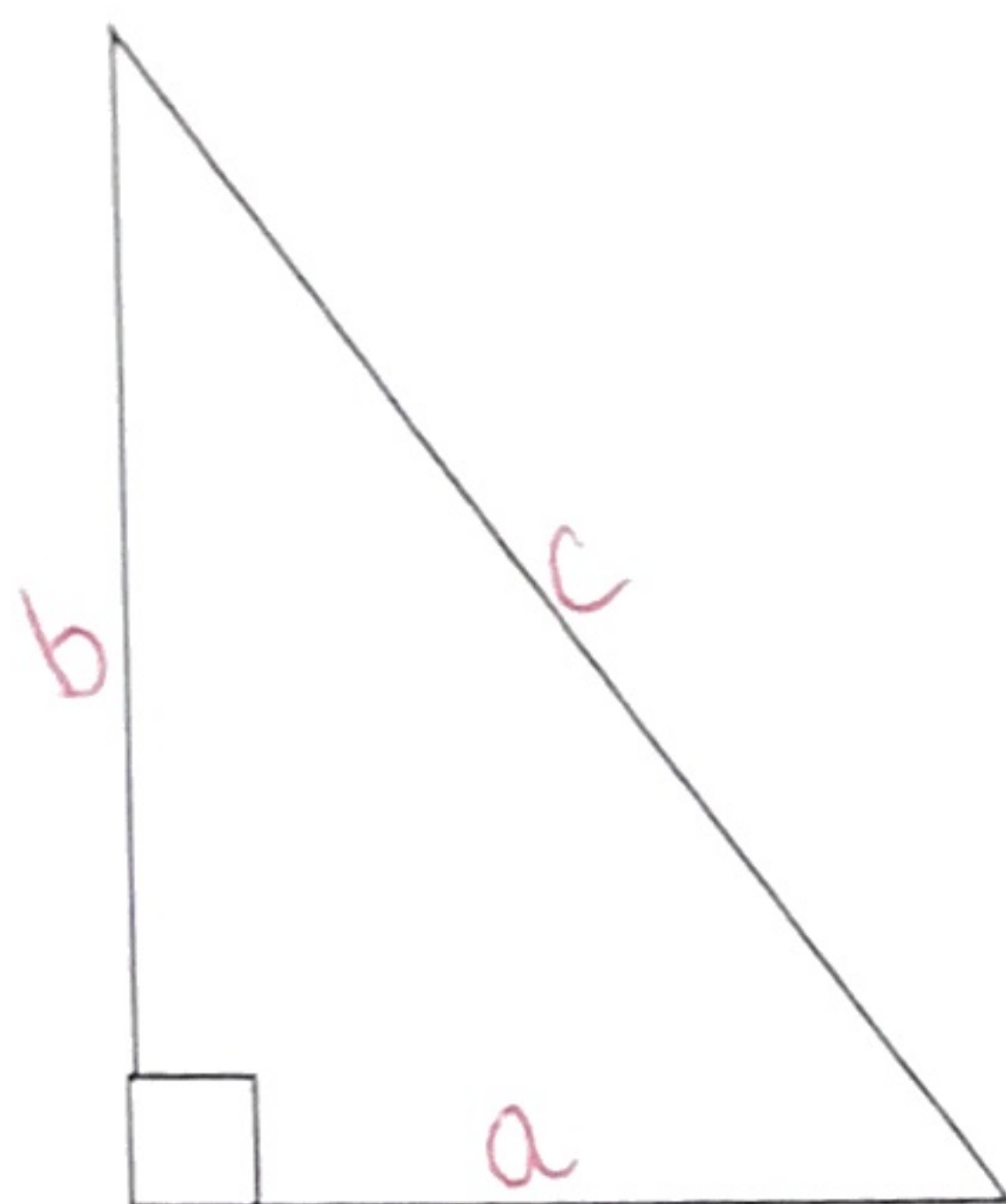
Information	Value	Rational or Irrational
Length of leg (a)	$\sqrt{20}$ cm	Q'
Length of leg (b)	$\sqrt{5}$ cm	Q'
Length of hypotenuse (c)	5 cm	Q
Area of triangle $A=\frac{bh}{2}$	5 cm^2	Q
Perimeter of triangle (sum of sides)	$5 + 3\sqrt{5}$ cm	Q'

$a^2 + b^2 = c^2$

$(\sqrt{20})^2 + (\sqrt{5})^2 = c^2$

$20 + 5 = c^2$

$\sqrt{25} = \sqrt{c^2}$

$\pm 5 = c$

$A = \frac{bh}{2}$

$A = \frac{\sqrt{5} \cdot \sqrt{20}}{2}$

$A = \frac{\sqrt{5 \cdot 20}}{2}$

$A = \frac{\sqrt{100}}{2}$

$A = \frac{10}{2}$

$A = 5$

$P = \sqrt{20} + \sqrt{5} + 5$

$P = \sqrt{4 \cdot 5} + \sqrt{5} + 5$

$P = 2\sqrt{5} + \sqrt{5} + 5$

$P = 5 + 3\sqrt{5}$

2.
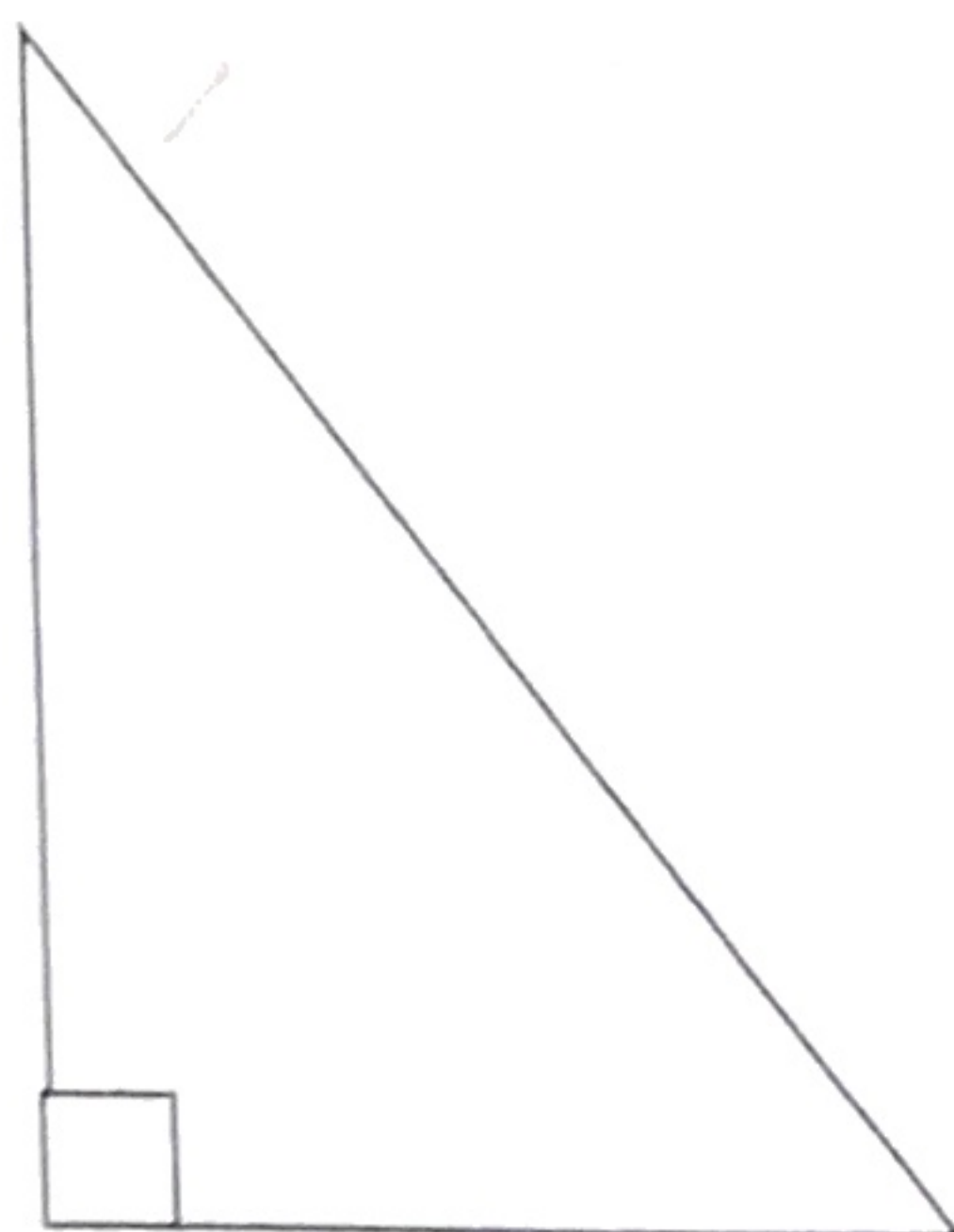
Information	Value	Rational or Irrational
Length of leg	$\sqrt{10}$ yds	Q'
Length of leg	$3\sqrt{10}$ yds	Q'
Length of hypotenuse	10 yds	Q
Area of triangle	15 yds^2	Q
Perimeter of triangle	$10 + 4\sqrt{10}$ yds	Q'

$a^2 + b^2 = c^2$

$(\sqrt{10})^2 + b^2 = 10^2$

$10 + b^2 = 100$

$-10 \qquad -10$

$\sqrt{b^2} = \sqrt{90}$

$b = \sqrt{90}$

$\sqrt{9 \cdot 10}$

$3\sqrt{10}$

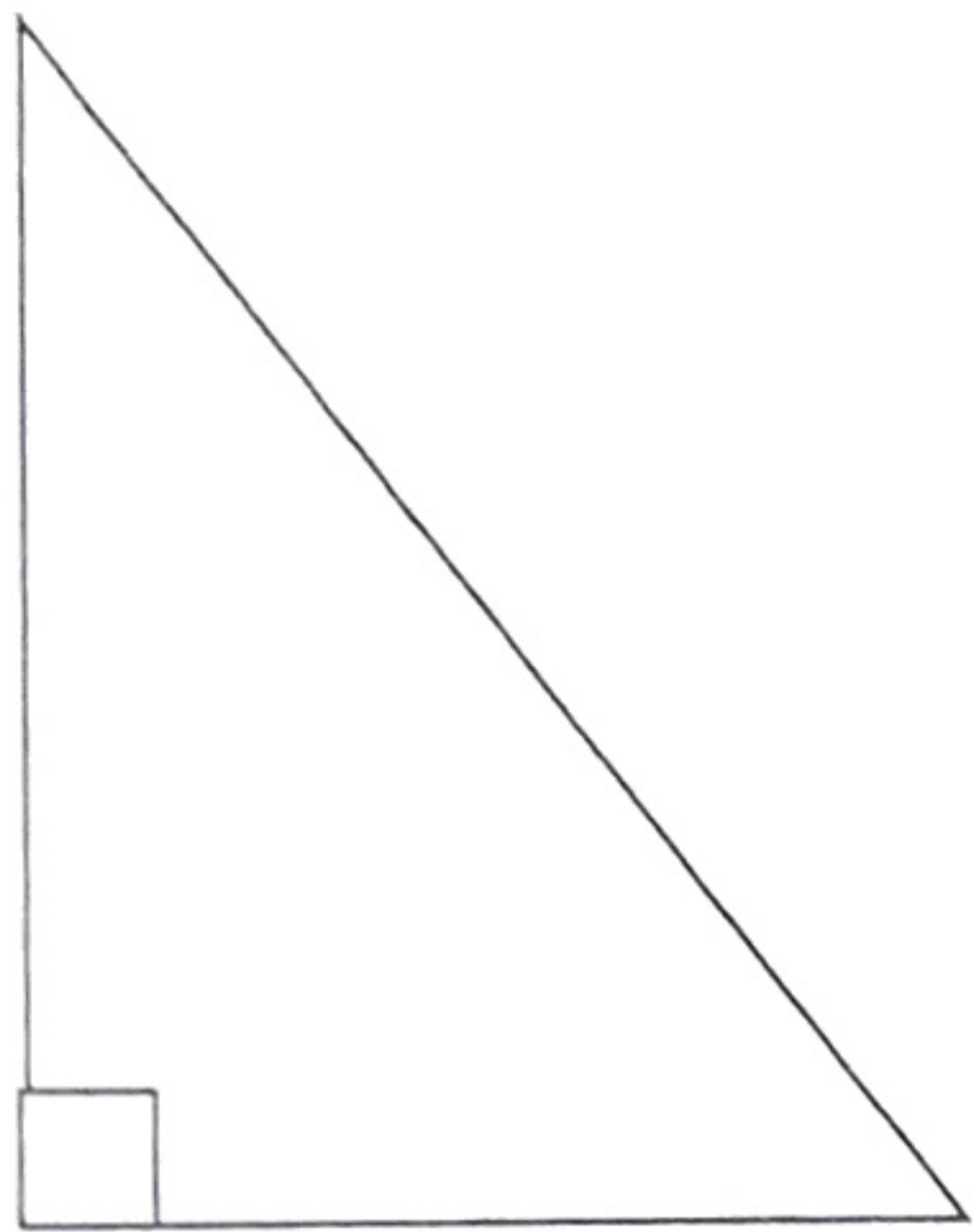$A = \frac{bh}{2}$

$A = \frac{3\sqrt{10} \cdot \sqrt{10}}{2}$

$A = \frac{3\sqrt{10 \cdot 10}}{2}$

$A = \frac{3\sqrt{100}}{2}$

$A = \frac{3 \cdot 10}{2}$

$P = \sqrt{10} + 3\sqrt{10} + 10$

3.

Information	Value	Rational or Irrational
Length of leg	$\sqrt{54}$ m	
Length of leg	$4\sqrt{3}$ m	
Length of hypotenuse	$\sqrt{102}$ m	
Area of triangle	$\sqrt{648}$ square meters	
Perimeter of triangle	$3\sqrt{6} + 4\sqrt{3} + \sqrt{102}$	

(Rational or Irrational: Irrational — circled)

$(\sqrt{54})^2 + (4\sqrt{3})^2 = c^2$

$54 + 16 \cdot 3 = c^2$

$54 + 48 \neq c^2$

$\sqrt{102} = \sqrt{c^2}$

$C = \sqrt{102}$

$A = \frac{bh}{2}$

$2 \cdot \sqrt{648} = \frac{\sqrt{54} \cdot h}{2} \cdot 2$

$\frac{2\sqrt{648}}{\sqrt{54}} = \frac{h\sqrt{54}}{\sqrt{54}}$

$2\sqrt{\frac{648}{54}} = h$

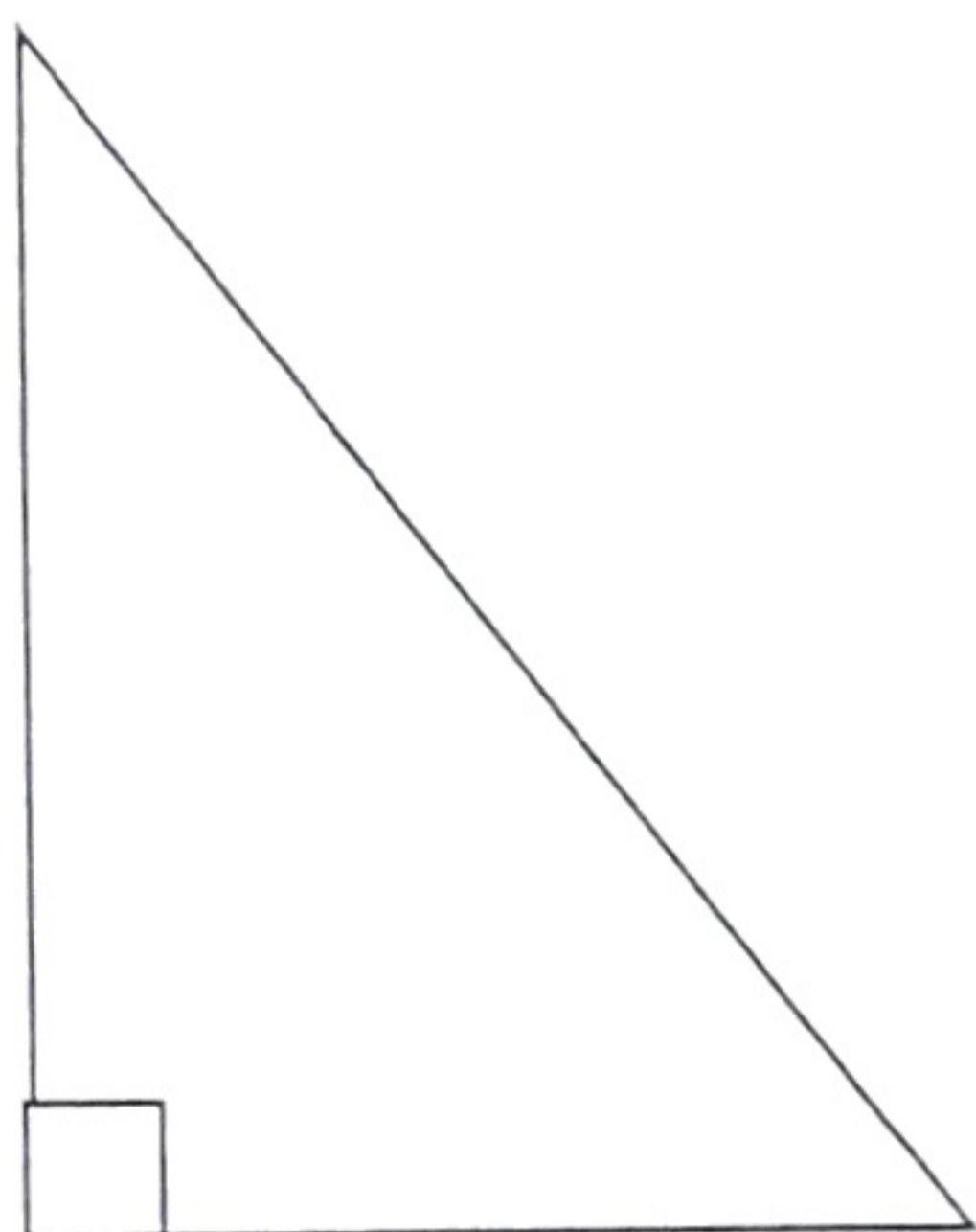$h = 2\sqrt{12}$

$h = 2\sqrt{4 \cdot 3}$

$h = 2 \cdot 2\sqrt{3}$

$h = 4\sqrt{3}$

$P = \sqrt{54} + 4\sqrt{3} + \sqrt{102}$

$P = \sqrt{9 \cdot 6} + 4\sqrt{3} + \sqrt{102}$

$P = 3\sqrt{6} + 4\sqrt{3} + \sqrt{102}$

4.

Information	Value	Rational or Irrational
Length of leg	5 ft	
Length of leg	x + 6 ft or 12 ft.	
Length of hypotenuse	x + 7 ft or 13 ft	
Area of triangle	30 ft²	
Perimeter of triangle	30 ft.	

(Rational or Irrational: Rational — circled)

$a^2 + b^2 = c^2$

$5^2 + (x+6)^2 = (x+7)^2$

$25 + (x+6)(x+6) = (x+7)(x+7)$

$25 + x(x) + x(6) + 6(x) + 6(6) = x(x) + x(7) + 7(x) + 7(7)$

$25 + x^2 + 6x + 6x + 36 = x^2 + 7x + 7x + 49$

$x^2 + 12x + 61 = x^2 + 14x + 49$

$-x^2 \qquad\qquad -x^2$

$12x + 61 = 14x + 49$

$-12x \qquad -12x$

$61 = 2x + 49$

$-49 \qquad -49$

$\frac{2x}{2} = \frac{12}{2}$

$x = 6$

$A = \frac{bh}{2}$

$A = \frac{5 \cdot 12}{2}$

$A = 30$

$P = 5 + 12 + 13$

$P = 30$