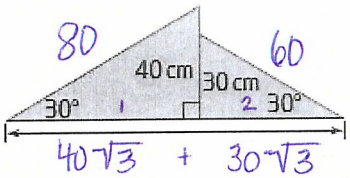
NAME = ANSWERS =

WORD PROBLEMS WITH RADICAL EXPRESSIONS

#1

Consider the design shown for a skateboard ramp. What is the exact distance across the base?



$70\sqrt{3}$

80 60

$40\sqrt{3} + 30\sqrt{3} = 70\sqrt{3}$

$\sin 30 = \frac{40}{h}$ $\sin 30 = \frac{30}{h}$

$.5(40) = h$ $\frac{h(.5)}{.5} = \frac{30}{.5}$

$h = 80$ $h = 60$

$80^2 - 40^2 = (1)^2$ $60^2 - 30^2 = (2)^2$

$6400 - 1600 = (1)^2$ $3600 - 900 = (2)^2$

$\sqrt{4800} = 1$ $\sqrt{2700} = 2$

simplify simplify

$\sqrt{4800}$

$\sqrt{100 \cdot 16 \cdot 3}$

$10 \cdot 4\sqrt{3}$

$40\sqrt{3}$

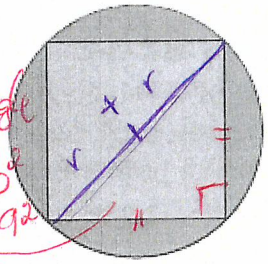
$\sqrt{2700}$

$\sqrt{100 \cdot 9 \cdot 3}$

$10 \cdot 3\sqrt{3}$

$30\sqrt{3}$

#2 A square is inscribed in a circle. The area of the circle is 38π m².



$A_{circle} = 38\pi$ m²

Isoceles Right Triangle

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

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

$c^2 = 2a^2$

a) $2\sqrt{38}$ m

b) $8\sqrt{19}$ m

a) What is the exact length of the diagonal of the square?

b) Determine the exact perimeter of the square.

a) $A = \pi r^2$

$\frac{38\pi}{\pi} = \frac{\pi r^2}{\pi}$

$\sqrt{38} = \sqrt{r^2}$

$\sqrt{38}$ = radius

$\sqrt{38} + \sqrt{38} = 2\sqrt{38}$

or

$2 \cdot \sqrt{38} = 2\sqrt{38}$ m

b) $(2\sqrt{38})^2 = 2a^2$

$4(38) = 2a^2$

$\frac{152}{2} = \frac{2a^2}{2}$

$\sqrt{76} = \sqrt{a^2}$

$\sqrt{4 \cdot 19} = a$

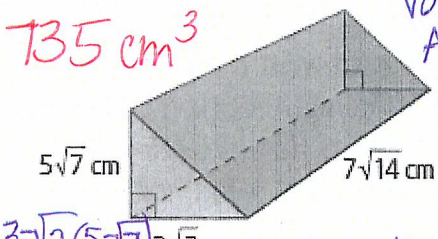
$2\sqrt{19} = a$

Perimeter = 45

$4 * 2\sqrt{19} = P$

$8\sqrt{19}$ m $= P$

#3. What is the volume of the right triangular prism?



735 cm³

Volume = Area of Base × h

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

$A = \frac{3\sqrt{2}(5\sqrt{7})}{2}$

$A = \frac{15\sqrt{14}}{2}$

$V = B \cdot h$

$V = \frac{15\sqrt{14}}{2} \times 7\sqrt{14}$

$V = \frac{105\sqrt{196}}{2}$

$V = \frac{105(14)}{2}$

$V = \frac{1470}{2}$

$V = 735$ cm³

#4 The period, T, in seconds, of a pendulum is related to its length, L, in metres. The period is the time to complete one full cycle and can be approximated with the formula $T = 2\pi\sqrt{\frac{L}{10}}$.

$T = \frac{\pi \cdot \sqrt{10L}}{5}$

a) Write an equivalent formula with a rational denominator.

$\frac{9\pi\sqrt{3}}{5}$

b) The length of the pendulum in the HSBC building in downtown Vancouver is 27 m. How long would the pendulum take to complete 3 cycles?

a) $2\pi\sqrt{\frac{L}{10}}$

$\frac{2\pi\sqrt{L}}{\sqrt{10}}\left(\frac{\sqrt{10}}{\sqrt{10}}\right)$

$\frac{2\pi\sqrt{10L}}{10}$

$\frac{2\pi\sqrt{10L}}{5}$

$T = \frac{\pi\sqrt{10L}}{5}$

b) $T = \frac{\pi\sqrt{10(27)}}{5}$

$T = \frac{\pi\sqrt{270}}{5}$

$T = \frac{\pi\sqrt{9 \cdot 30}}{5}$

$T = \frac{3\pi\sqrt{30}}{5}$

only 1 cycle

$3\left(\frac{3\pi\sqrt{30}}{5}\right) = \frac{9\pi\sqrt{30}}{5}$

11.1 m

#5 Collision investigators can approximate the initial velocity, v, in kilometres per hour, of a car based on the length, l, in metres, of the skid mark. The formula $v = 12.6\sqrt{l} + 8$, $l \geq 0$, models the relationship. What length of skid is expected if a car is travelling 50 km/h when the brakes are applied? Express your answer to the nearest tenth of a metre.

velocity

approximate

$v = 12.6\sqrt{l} + 8$

$50 = 12.6\sqrt{l} + 8$

$-8 \quad -8$

$\frac{42}{12.6} = \frac{12.6\sqrt{l}}{12.6}$

$(3.333)^2 = (\sqrt{l})^2$

$11.1\text{m} = l$

#6 Two more than the square root of a number, n, is equal to the number. Model this situation using a radical equation. Determine the value(s) of n algebraically.

square root two more = the #

$\sqrt{n} + 2 = n - 2$

-2

$(\sqrt{n})^2 = (n-2)^2$

$n = (n-2)(n-2)$

$n = n^2 - 4n + 4$

$-n \quad -n$

$0 = n^2 - 5n + 4$ Factor!

$0 = (n-4)(n-1)$

$n-4=0 \quad n-1=0$

answer: $n = 4 \quad n = 1$

Verify!

$\sqrt{4} + 2 = 4$

$2 + 2 = 4$

$4 = 4$

TRUE!

$\sqrt{1} + 2 = 1$

$1 + 2 = 1$

$3 \neq 1$

FALSE!

$8\sqrt{6}$ Km

#7. The city of Yorkton, Saskatchewan, has an area of 24.0 km^2. If this city were a perfect square, what would its exact perimeter be? Express your answer as a mixed radical in simplest form.

Area of a square $\Rightarrow A = s^2$

$P = 4s$

$\sqrt{24} = \sqrt{s^2}$

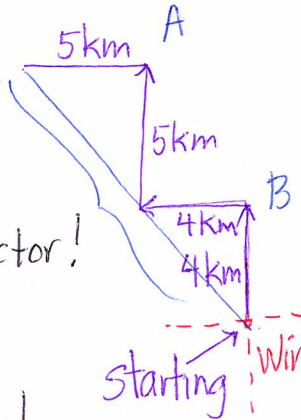
$\sqrt{4 \cdot 6} = s$

$2\sqrt{6} = \text{side length}$

$P = 4 \times (2\sqrt{6})$

$P = 8\sqrt{6}$ Km

#8 For sailboats to travel into the wind, it is sometimes necessary to tack, or move in a zigzag pattern. A sailboat in Lake Winnipeg travels 4 km due north and then 4 km due west. From there the boat travels 5 km due north and then 5 km due west. How far is the boat from its starting point? Express your answer as a mixed radical. $9\sqrt{2}$ Km



ΔA $c^2 = 5^2 + 5^2$

$c^2 = 25 + 25$

$c^2 = 50$

$c = \sqrt{50}$

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

$c = 5\sqrt{2}$

$\Delta B =$

$c^2 = 4^2 + 4^2$

$c^2 = 16 + 16$

$c^2 = 32$

$c = \sqrt{32}$

$c = \sqrt{16 \cdot 2}$

$c = 4\sqrt{2}$

total distance $5\sqrt{2} + 4\sqrt{2}$

$9\sqrt{2}$