Lesson 5 : Multiplying Two Binomials (FOIL) and Perimeter, Area, and Polynomials (and Pythagoras theorem)

May 29th 2023

Recall : monomial x Binomial

$2x(3x-4)$ Not same as: $2x^1 \cdot 3x^1 - 4$

$6x^2 - 8x$ $6x^2 - 4$

Binomial x Binomial : (pg 35)

$(4x^1 + 2)(x^1 + 3)$

note : each "arm" represents a multiplication

$4x^2 + 12x + 2x + 6$

$4x^2 + 14x + 6$

careful w/ negative signs!

e.x.

$(2x - 3)(4x - 5)$

1st way (@ beginning)

$(2x - 3)(4x - 5)$

$2x \cdot 4x + 2x(-5) + (-3)(4x) + (-3)(-5)$

$8x^2 - 10x - 12x + 15$

$8x^2 - 22x + 15$

2nd way (when it's rare you make a mistake)

$(2x - 3)(4x - 5)$

$8x^2 - 10x - 12x + 15$

$8x^2 - 22x + 15$

Recall: law of signs for $\times, \div$ adjacent signs

$+ \; + \; = \; +$

$- \; + \; = \; -$

$- \; - \; = \; +$

Recall: law of signs for addition

$+ \; + \; = \; +$

$- \; - \; = \; -$

$+ \; - \; =$ same sign as the "bigger" #

even bigger negative #

ex $-10 + (-12) = -22$

ex $10 + (-12) = -2$

ex $-10 + 12 = 2$

You do:

#1. $(3x + 4)(x + 2)$

$= 3x^2 + 10x + 8$

#2. $(2x + 3)(-x - 5)$

$= -2x^2 - 13x - 15$

#3. $(4x - 1)(3x + 3)$

$= 12x^2 + 9x - 3$

#4 $(x - 5)^2 \neq x^2 - 5^2$

$(x - 5)(x - 5)$

$x^2 - 5x - 5x + 25$

$x^2 - 10x + 25$

#5 $3x + 4(x + 2)$

$3x + 4x + 8$

$7x + 8$

. not law 6

$(ab)^n = a^n b^n$

. instead definition of squaring:

$a^2 = a \times a$

$(ab)^2 = ab \times ab$

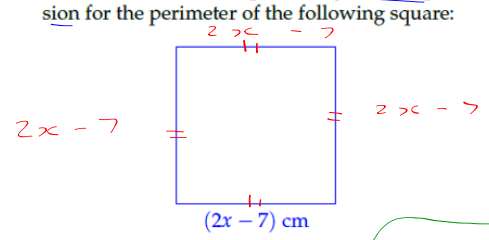
$(a+b)^2 = (a+b)(a+b)$

Evaluating Perimeter w/ Polynomials

e.x. : 2 + 3 ex 4x + 1

Evaluate

(1) Determine the simplified algebraic expression for the perimeter of the following square:



→ numeric perimeter cannot be found

→ question wants perimeter in terms of x.

not a multiplication

$P = s + s + s + s$

① $P = 4s$

② $s = 2x - 7$

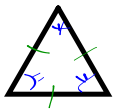
sub ② into ①

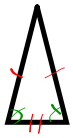
$P = 4(2x - 7)$

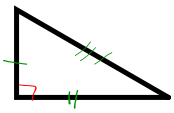
$P = 8x - 28$

$\therefore P = (8x - 28)\text{ cm}$

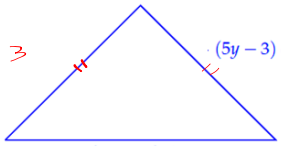
equilateral isosceles scalene







(2) Determine the simplified algebraic expression for the perimeter of the following isosceles triangle:



③ $s = 5y - 3$ $(5y-3)\text{ dm} = s$

② $b = (10y+8)\text{ dm}$

sub ② + ③ into ①

① $P = b + s + s$

can drop brackets.

$P = (10y + 8) + (5y - 3) + (5y - 3)$

$P = 20y + 2$

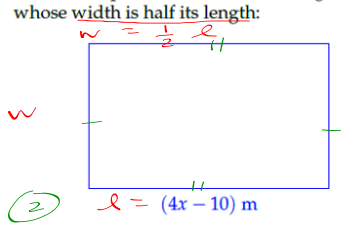
or $P = b + 2s$

$P = (10y + 8) + 2(5y - 3)$

$P = 10y + 8 + 10y - 6$

$P = 20y + 2$

(3) Determine the simplified algebraic expression for the perimeter of the following rectangle whose width is half its length:



$P = \ell + \ell + w + w$

sub (2) + (4) into (1)

(1) $P = 2\ell + 2w$

$P = 2(4x - 10) + 2(2x - 5)$

$P = 8x - 20 + 4x - 10$

$P = 12x - 30$

BIDMAS

- Find width 1st.
- Translate sentences into algebraic eq.

sub (2) into (3)

(3) $w = \frac{1}{2} \cdot \ell$

$w = \frac{1}{2} \cdot (4x - 10)$

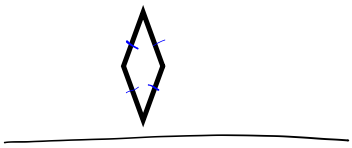
(4) $w = 2x - 5$

You do 4 - 6

check answers !

(4) Determine the simplified algebraic expression for the perimeter of an isosceles triangle with a base measuring $(2x^2 - 8x)\ m$ and one congruent side measuring $(3x + 4)m$

(5) Determine the perimeter of a rhombus with a side measuring $(3x^2 - 4x + 10)\ cm$.



$P = l + l + w + w$

$P = 2l + 2w$

$P = 2x(x^4 - 12) + 2x(\frac{1}{4} \cdot x^4 - 3)$

$P = 2x^4 - 24 + \frac{1}{2}x^4 - 6$

$P = 2.5x^4 - 30$

(6) Determine the perimeter of a rectangle whose width is a quarter its length which measures $(x^4 - 12)\ cm$.

(2) $w = \frac{1}{4} \times l$

(1) $l = x^4 - 12$

sub (1) into (2)

$w = \frac{1}{4} \cdot l$

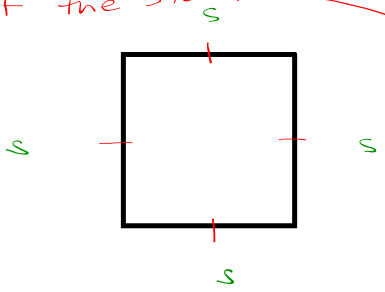
$w = \frac{1}{4}(x^4 - 12)$

(2) $w = \frac{x^4}{4} - 3$ or $\frac{1}{4} \cdot x^4 - 3$

Solving for missing measures w Polynomials + Perimeter

$P = 24x - 12$

(1) If the perimeter of a square is $(24x - 12)$ dam, then what is the measure of one of its sides? (then what is the algebraic exp. of the side's)



WANT: 1 unk – (s)

TOOL: 1 eq

② $P = 4s$

INFO:

① $P = 24x - 12$

have all info

find side (s) in terms of x.

sub ① into ②

$$\frac{24x - 12}{4} = \frac{4s}{4}$$

① into ②

keep reminding yourself you're isolating s (NOT x)

w O.O: to both sides

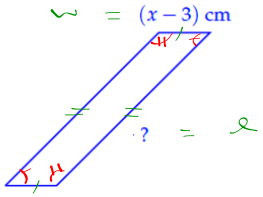
$$\frac{24x}{4} - \frac{12}{4} = s$$

$$6x - 3 = s$$

$$s = 6x - 3$$

$\therefore$ s is $(6x - 3)$ dam

(2) Determine the measure of the missing side if the perimeter of the following parallelogram is $(6x+8)$ cm:



want = ℓ

tool = 1 eq

③ $P = 2\ell + 2w$

INFO

① $P = 6x + 8$

② $w = x - 3$

have all info (in terms of x)

sub ① and ② into ③

$6x + 8 = 2\ell + 2(x-3)$

$6x + 8 = 2\ell + 2x - 6$ (−2x, +6)

$\frac{4x + 14}{2} = \frac{2\ell}{2}$

$\ell = \frac{4x}{2} + \frac{14}{2}$

$\ell = 2x + 7$

isolating ℓ

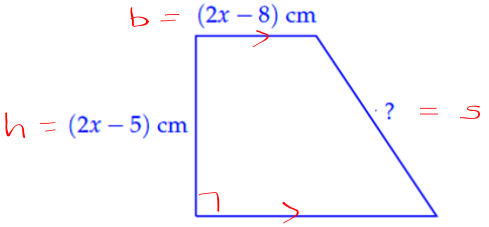
Break!

TIP! simplify after substitution (if possible) before solving

BEDMAS

do o.o. to both sides

(3) The large base of the following trapezoid is twice the measure of the small base. Determine the measure of the missing side if the perimeter is $(11x - 27)\ cm$:



WANT: s link

TOOL: 1 eq

(5) $P = b + B + h + s$

INFO

(1) $P = 11x - 27$

(2) $b = 2x - 8$

(3) $B = 4x - 16$

(4) $h = 2x - 5$

sub into

$B = 2 \times b$

$B = 2(2x - 8)$

$B = 4x - 16$

$11x - 27 = 2x - 8 + 4x - 16 + 2x - 5 + s$

$11x - 27 = 8x - 29 + s$

- simplify 1st
- solve for s

$3x + 2 = s$

$\therefore s = (3x + 2)\ cm$

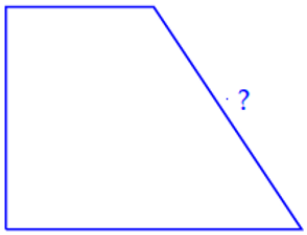
You 4 - 6 and start 4.3

You do!

(4) If the perimeter of an equilateral triangle is $(4x - 21)\ m$, then what is the measure of one of its sides?

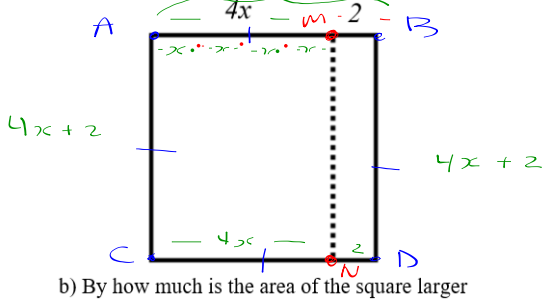
(5) Determine the missing measure of the length of a rectangle if its perimeter measures $(12x - 10)\ cm$ and if one of its widths measures $(2x + 1)\ cm$.

(6) The small base of the following trapezoid is half the measure of the large base which measures $(4x - 12)\ m$. Determine the measure of the missing side if the perimeter measures $(24x + 10)\ m$ and if its height measures $(x - 1)\ m$:



Evaluating Area w Polynomials

(1) a) The following square is composed of two rectangles whose widths (in cm) are indicated below. Determine the simplified algebraic expression for the area of the square:



b) By how much is the area of the square larger than the area of the biggest rectangle?

$x + x + x + x + 2$

$4x + 2 = s$ (2)

(1) $A = s^2$

sub (2) into (1)

$A = (4x + 2)^2$

$A = (4x + 2)(4x + 2)$

$A = 16x^2 + 8x + 8x + 4$

$A = 16x^2 + 16x + 4$

$\therefore A_{square} = (16x^2 + 16x + 4)\ cm^2$

e.x.

$A_{square} = 80\ cm^2$

$A_{rect\ AMCN} = 60\ cm^2$

WANT / TOOL

How much larger = $A_{square} - A_{rect}$ (3)

INFO:

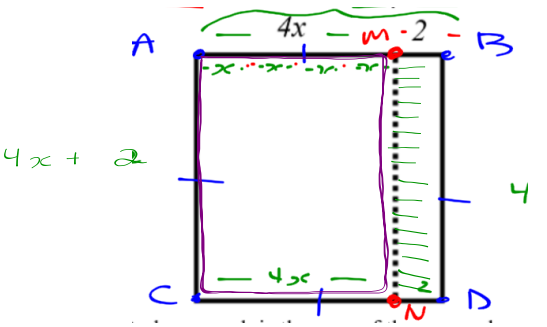
$A_{rect\ AMCN} = l \cdot w$

$l = 4x + 2$

$w = 4x$

$A_{rect} = (4x + 2) \cdot 4x$ (2)

$A_{rect} = 16x^2 + 8x$



sub (1) and (2) into (3)

How much larger $= (16x^2 + 16x + 4) - (16x^2 + 8x)$

$= 16x^2 + 16x + 4 - 16x^2 - 8x$

$= (8x + 4)\ cm^2$ larger

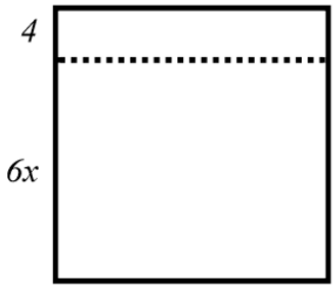
* which also equal area of rect MBND

You do #21.

Lunch 11:40

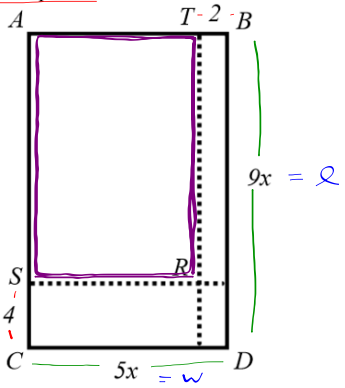
(shaded region) $= A_{\square} - A_{\square}$

(2) a) The following square is composed of two rectangles whose widths (in cm) are indicated below. Determine the simplified algebraic expression for the area of the square:



b) By how much is the area of the square larger than the area of the biggest rectangle?

(3) a) The following rectangular floor ABCD is composed of four rectangles with a few indicated measures. Determine the simplified algebraic expression for the area of the floor:



in terms of x.

b) By how much is the area of floor ABCD larger than the area of rectangle SRTA?

$A_{ABCD} = \ell \cdot w$

$A_{ABCD} = 9x \cdot 5x$

$A_{ABCD} = 45x^2$ a) (1)

for ex: $A_{ABCD} = 100\,cm^2$

b) $A_{SRTA} = 60\,cm^2$

larger $= 40\,cm^2$

WANT / TOOL: How much larger $= A_{ABCD} - A_{SRTA}$ (2)

w = 5x − 2

INFO: $A_{SRTA} = \ell \cdot w$

$A_{SRTA} = (9x - 4)(5x - 2)$

$A_{SRTA} = 45x^2 - 18x - 20x + 8$

(3) $A_{SRTA} = 45x^2 - 38x + 8$

(1) $A_{ABCD} = 45x^2$

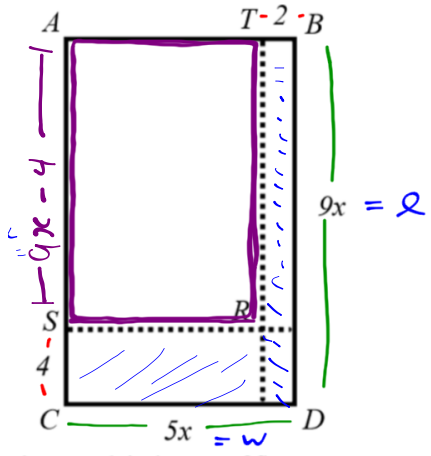
(2) larger $= A_{ABCD} - A_{SRTA}$

sub (3) + (1) into (2)

larger $= 45x^2 - (45x^2 - 38x + 8)$

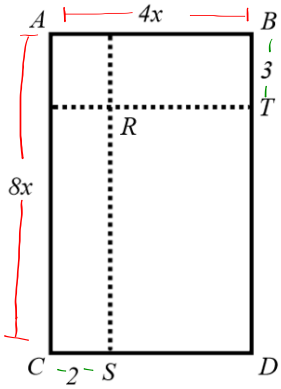
larger $= 45x^2 - 45x^2 + 38x - 8$

Area of shaded region $= (38x - 8)$ cm larger



You do #4, #5, #6 for 10 − 15 mins

(4) a) The following rectangular floor ABCD is composed of four rectangles with a few indicated measures. Determine the simplified algebraic expression for the area of the floor:

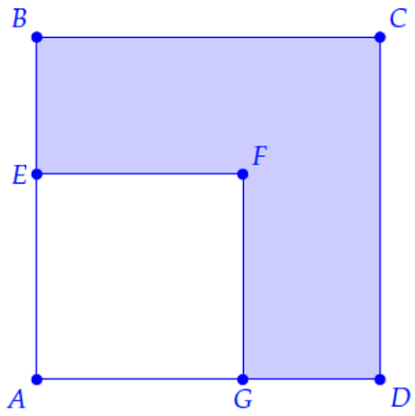


b) By how much is the area of floor ABCD larger than the area of rectangle ~~SRTA~~?

SRTD

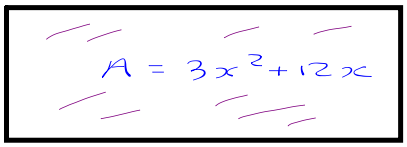
You do

(5) ABCD and AEFG are squares. Moreover $m\overline{AE} = (3x + 9)cm$ *and* $m\overline{BE} = \frac{2}{3}\overline{AE}$.
Determine the area of the shaded region:



Finding missing measures w Area and Polynomials

(1) If the area of a ~~square~~ rectangle is $(3x^2 + 12x)$ dam^2, and its length is $(3x)$ dam, what is the width of the rectangle?



WANT = w (1 unk)

TOOL = 1 eq

③ $A = \ell \cdot w$

① $A = 3x^2 + 12x$

② $\ell = 3x$

sub in ① + ② into ③

$$\frac{3x^2 + 12x}{3x} = \frac{3x \cdot w}{3x}$$

Solve/isolate w!

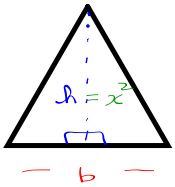
w o.o.

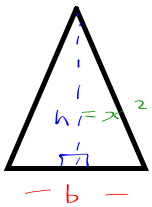
$$\frac{3x^2}{3x} + \frac{12x}{3x} = w$$

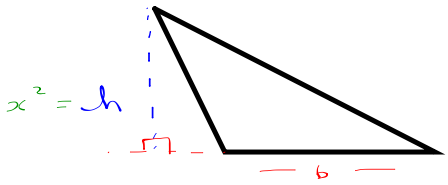
$$x + 4 = w$$

$$w = (x + 4) \text{ dam}$$

(3) Determine the base of a triangle whose area is $(4x^4 - x^3 + 2x^2)$ m^2 and height is (x^2) m.







③ $A_\Delta = \frac{b \times h}{2}$

① $A_\Delta = 4x^4 - x^3 + 2x^2$

② $h = x^2$

sub ① and ② into ③

$2 \times \left(4x^4 - x^3 + 2x^2\right) = \left(\frac{b \times x^2}{2}\right) \cdot 2$

whole side →

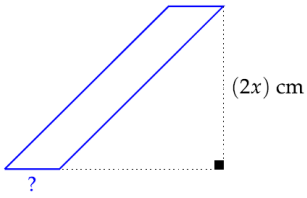
$\frac{(8x^4 - 2x^3 + 4x^2)}{x^2} = \frac{b \times x^2}{x^2}$

$\frac{8x^4}{x^2} = \frac{8 \times x \times x \times x}{x \times x}$

$\frac{8x^4}{x^2} - \frac{2x^3}{x^2} + \frac{4x^2}{x^2} = b$

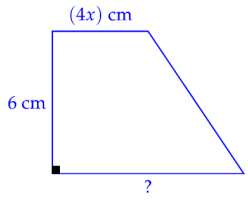
$8x^2 - 2x + 4 = b$

(2) Determine the measure of the base of the following parallelogram if its area is $(16x^3 + 8x^2 - 10x)$ cm:



(4) The area of the following right trapezoid is $(18x + 24)$ cm^2. Determine the measure of the large base:

you do



HMWK:

pg 16

pg 36

pg 37

and pg 30 #1.26 only

(and finish handout from lesson 4)