Lesson 3: Modelling Word Problems w Equation and Solving

April 30th 2024

Recall: Cross Multiplication (short cut)

e.x. Solve

$$\frac{3}{4} = \frac{2x}{8}$$

$$8 \times 3 = 4 \cdot 2x$$

$$\frac{24}{8} = \frac{8x}{8}$$

$$3 = x$$

$$x = 3$$

Proof of the shortcut of cross multiplication

if $\frac{a}{b} = \frac{c}{d}$

then $ad = bc$

Proof

$\frac{d}{1} \times \frac{a}{b} = \frac{c}{d} \times d$

$b \times \frac{d \cdot a}{b} = c \times b$

$d \cdot a = c \cdot b$

$a \cdot d = b \cdot c$

When to cross multiply.

useful: must since x in bottom

ex. 1 Solve

$$\frac{-x}{4} = \frac{2}{3}$$

$$\frac{-3x}{-3} = \frac{8}{-3}$$

$$x = -2.67$$

check/verification

$$\frac{7}{10} = \frac{-14}{x}$$

$$\frac{7}{10} = \frac{-14}{-20}$$

$$0.7 = 0.7 \checkmark$$

ex. 2 Solve

$$\frac{7}{10} = \frac{-14}{x}$$

$$\frac{7x}{7} = \frac{-140}{7}$$

$$x = -20$$

cross-multiply when there's complex fractions!

e.x. 3 Solve

$$\frac{\left(\frac{2}{9}y+1\right)}{3}=\frac{\left(-\frac{1}{3}y-\frac{3}{2}\right)}{-3}$$

numerator

denominator

tip: put brackets

$$-3\left(\frac{2}{9}y+1\right)=3\left(-\frac{1}{3}y-\frac{3}{2}\right)$$

How to solve for y?

- isolate y ($y=12$)
- evaluate
- bring y's on same side

$$-\frac{2}{3}y-3=-1y-\frac{9}{2}$$

$+y$ $+y$

$$\frac{1}{3}y-3=-\frac{9}{2}+3$$

$+3$

solve! w o.o.

BEDMAS

$$\frac{1}{3}\cdot y=-\frac{3}{2}$$

$1/3$ $1/3$

$$y=-\frac{3}{2}\times\frac{3}{1}$$

$$y=-\frac{9}{2}$$

$y=-4.5$

check:

$$\frac{\frac{2}{9}y+1}{3}=\frac{-\frac{1}{3}y-\frac{3}{2}}{-3}$$

$$\frac{\left(\frac{2}{9}\times\frac{-9}{2}+1\right)}{3}=\frac{-\frac{1}{3}\left(\frac{-9}{2}\right)-\frac{3}{2}}{-3}$$

$0=0$.

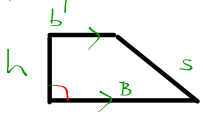
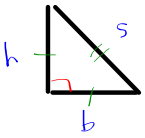
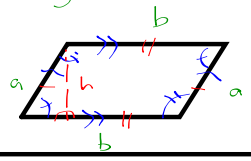
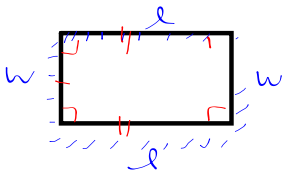
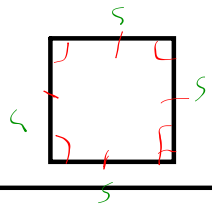
You do:

pg 114 do question c)

* Tasks use Geometry that can be Modelled w Equations. 80%

Recall Activity: In pairs, take the cut-outs and make as many shapes/polygons as possible. Fill out the chart with the appropriate formulas and symbols.

Give real life examples of perimeter and area for two of your polygons (in relation to a 3D solid is okay)

Name of Polygon (plus drawing)	Perimeter + example	Area
Right Trapezoid 	$P = b + B + s + h$ → ex. the wood of the sides of a trapezoidal sandbox	$A = \frac{(b+B) \times h}{2}$ → ex. the sand in the sandbox
Right Isosceles Triangle 	$P = s + h + b$ ex. the rocks of a triangular fire pit	$A = \frac{b \times h}{2}$ ex. the ash and fire of fire pit
Parallelogram 	$P = a + a + b + b$ $P = 2a + 2b$ $P = 2(a+b)$ ex. (sides) of eraser in form of parallelogram	$A = b \times h$ ex. face of the rubber of eraser
Rectangle 	$P = 2l + 2w$ ex. the rocks around a fish pond. * take a walk and do a lap around the pond.	$A = l \cdot w$ ex. the water exposed to air in the pond
Rhombus 	$P = 4s$ ex. the decorative rim of the kite	$A = \frac{d_1 \times d_2}{2}$ ex the fabric of kite
Square 	$P = 4s$ ex. the edge of a desk	$A = s^2$ ex. the wood of the desk

Translating Words into Equation

go on the memory aid

$\times \div + -$

Math Operation / Symbols	Key Words
Addition (+)	plus, sum of, and, total, increased by, a # more than; e.x. 2 more than
Subtraction (−)	minus, decreased by, difference, a # less than, reduced by, subtracted from; e.x. 10 less than
Multiplication (×)	. times, . multiplied by, . double (2x), triple (3x), $\frac{1}{2}$ of, x, fraction of a fraction, 100/50/
Division ($\frac{\circ}{\circ}$)	. divide by, . quotient, . per, . out of, . over, . split
Equality (=)	. equals, . is equal to, . congruent, . corresponds to, . is, . gives, . measures

handout 3
Translating : Difference between sum and a # more than

Translate the following English sentences into algebraic equations:

a) The length of a rectangle measures double the sum of the width and 4.

$\ell = 2 \times (w + 4)$

answer : $\ell = 2(w + 4)$

b) The length measures 4 more than double the width.

$\ell = 2w + 4$

answer : $\ell = 2w + 4$ ✓ Best

answer : $4 \times 2 = \ell$ ✗ $\ell = 4 + (2w)$ ✓

$x = \frac{1}{2} \times (x + 8)$

c) The value of x is half the sum of x and 8.

answer : $x = \frac{1}{2}(x + 8)$ best

$x = x + \frac{8}{2}$

$x = +8$

d) The value of x is 8 more than half of x.

$\frac{1}{2} \times x$

answer : $x = \frac{1}{2}x + 8$

you e) and f)

handout 4

Translating : Difference between Difference and
- a # less than
- a # subtracted from

Translate the following English sentences into algebraic equations:

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

a) Half the difference between the length of a rectangle and 3 gives the product of the width and 2.

(-) (×)

answer : $\frac{1}{2}(\ell - 3) = 2w$

-3 $= \frac{w}{2}$

b) 3 less than half the length of a rectangles gives the quotient of the width and 2.

$\frac{1}{2}\ell$ (—)

answer : $\frac{1}{2}\ell - 3 = \frac{w}{2}$

-3 (+)

c) 3 was subtracted from half the length of a rectangles giving the sum of the width and 2.

$\frac{1}{2}\ell = w + 2$

answer : $\frac{1}{2}\ell - 3 = w + 2$

You do d), e), f)

show me and receive handout 5

- passive voice
- ex. you messed up, so #30 was subtracted from your pay ($100)

∴ (100 − 30) $70

handout 5:

Translate the following English sentences into algebraic equations:

1. The value of x is double the sum of x and 2: _____

$x(x+2)$

$x = 2(x+2)$ ✓

2. A quarter the quotient of y and 2 is y added to 6: _____

$\frac{1}{4} \times \frac{y}{2} = 6 + y$

3. The difference between r and 3 gives half the sum of r and 10: _____

$r - 3 = \frac{r + 10}{2}$ ✓ $r - 3 = \frac{1}{2} \times (r + 10)$

4. One-fifth of the product of 3 and x is 4 less than x: _____

$\frac{1}{5} \times (3x) = x - 4$

5. One-fifth the product of 3 and t is 10 less than t: _____

$\frac{1}{5} (3 \cdot t) = t - 10$

6. Triple the sum of 3 and v results in 5 more than v: _____

$3(3+v) = v+5$

7. Quadruple the sum of a and 5 is 10 more than a: _____

$4(a+5) = a+10$

8. 2 more than t gives a half of t subtracted from 10: _____

$2 + t = 10 - \frac{1}{2}t$

$t + 2 = 10 - \frac{1}{2}t$

9. 2 more than t gives a half of the difference between t and 10: _____

$2 + t = \frac{1}{2} \times (t - 10)$

10. One-fifth of x subtracted from 4 giving 2 less than x: _____

$\frac{1}{5}(4 - x) = x - 2$ ✗ $4 - \frac{1}{5}x = x - 2$ ✓

$\frac{1}{5}x - 4 = 2 - x$ ✗ $(\frac{1}{5}x) - 4$

11. One-fifth of the difference between x and 4 gives 2 less than x: _____

$\frac{1}{5}(x-4) = x-2$

12. 8 more than z is 2 times z: _____

$(z+8) = 2z$ ✓ $z+8=2z$

13. 3 more than x results in 2 times x: _____

$x+3=2x$

Hmwk
book
pg 114 #3.1 pg 216-218 #5.4 and handout
and exit question

14. One-fifth the product of 3 and a is 3 less than a: _____

15. 8 less than the product of 3 and z gives z: _____

16. 6 less than the product of 3 and a is a: _____