

Grade 12 Essential

Week 2 Quiz Debrief

Car Purchase

Problem Solve

23-04-13

MRF

GRADE 12 ESSENTIAL
QUIZ – 23-04-13
CAR PURCHASE

Quiz!

Name: _____
Date: _____

Study Notes; 'Cheat Sheet'. Use your (mine for now) doubled – sided study notes (cheat sheet) to its full effect. **OPEN BOOK** this time, but that is the purpose of a cheat sheet for the future!

Show work / **Show Method** for best mark (better marks if you make a brain fart and easier for you to organize your thoughts). Simply stating an answer gets no mark

Round decimal answers to nearest 0.01 unless otherwise indicated.
Each individual question is worth 2 marks each.

Formulae and tables have been provided in issued courseware.

For this one quiz you may Collaborate with a classmate if you want, but show your own work. (ie: not copy!) ← collaborate is Not Copy!

Put a check mark here if you read these instructions. [1 mark]

You will need your own cheat sheet 5% of course mark!

Start working on your own cheat sheet!

MY GRADE 12 ESSENTIAL – STUDY NOTES (Cheat Sheet)

Swan

My Study Notes (cheat sheet) Do your own, or copy these out, or add to them!

To Evaluate expression: BEDMAS order of operations (Brackets, Exponents, Mult & Divide, Add & Sub)

Algebra: work backwards, (un-evaluate, un-BEDMAS, reverse order)

Problem Solve: Guess and Check, Work Backwards, Use a Formula, Draw Diagram, Use Logic, Use a Table, Make a List and Count, Find a Pattern, Act it out (model it), etc....

VEHICLE FINANCE

Final Vehicle Cost =

(Dealer price after eco fees, freight, options, etc – Trade in)* tax factor

Vehicle Finance. TDSR (Total Debt Service Ratio) = $\frac{\text{Debts and Expenses (monthly)}}{\text{Total Gross Income (monthly)}} * 100$; max 40%

Cannot have more than 40% of your gross income going towards debt and mandatory payments.

Monthly Amount = Weekly Amt * 52 / 12 = BiWeekly Amount * 26 / 12

Exponential Decay (depreciation) of a car's value:

Final Value = Original Value * (1 - annual depreciation rate)^{years}. Original Value does not include taxes or 'extras'. Eg: $\$30,000 * 0.85^{12\text{years}} = \4267.25 for 15% depreciation after 12 yrs

Monthly Loan Payment = table value * $\frac{\text{borrowed amount}}{1,000}$

One year = 52 weekly periods = 26 bi-weekly periods

Fuel Economy expressed as ratio: $\frac{\text{How many litres used}}{100\text{km}}$; Example: $\frac{31\text{L}}{390\text{km}} = \frac{x\text{L}}{100}$, where x is the

consumption of fuel for 100km. Should be somewhere around 8 to 12L/100 for a normal family car!

Time. 1hr 45min = 1hr + 45/60hr = 1.75 hrs; 3hr20min = 3+20/60 = 3.33 hrs

Fuel Prices at pump already include taxes!!

Formulae:

$$\text{Fuel Economy} = \frac{\text{Liters Used}}{100 \text{ km Driven}}$$

$$\text{Depreciated value of item} = \text{Original Value} * \text{retained percentage}^{\text{years}}$$

$$\text{Price of Car} = (\text{MSRP} + \text{Options} + \text{Eco Fees} + \text{etc} - \text{Trade-In}) * \text{Tax Factor}$$

$$\text{Overall Cost of Car} = \text{Down Payment} + \text{Total of Monthly Payments on Loan}$$

At end!

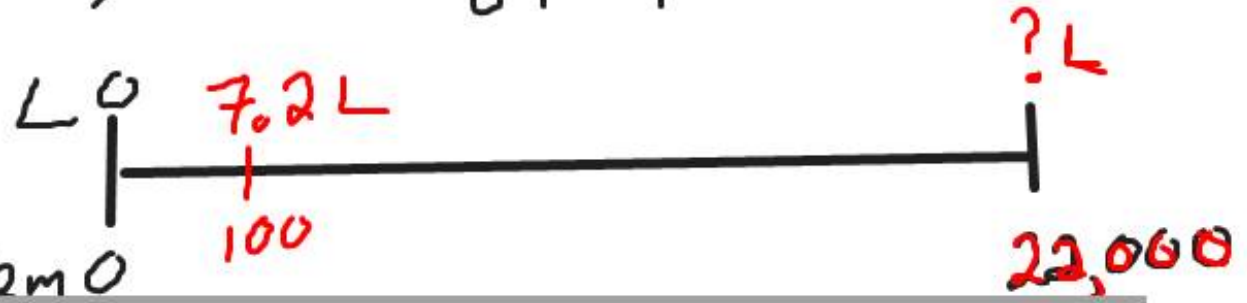
Always flip thru the entire package when given something

1. The fuel 'economy' [fuel consumption rate] of a certain two-door convertible is **7.2 L/100 km**.

a. Determine how many litres of gasoline are required to drive a normal yearly **22,000 km**.

b. Given the cost of gasoline averages **\$1.079** per litre (which includes all taxes), calculate the cost of fuel to drive the convertible on a road trip for 2,800 km (to Edmonton and back).

a) Solve by proportions



$$\frac{7.2 \text{ L}}{100 \text{ km}} = \frac{x \text{ L}}{22,000 \text{ km}}$$

cross multiply

$$\frac{7.2 \text{ L} \cdot 22,000 \text{ km}}{100 \text{ km}} = 1,584 \text{ L}$$

Solve properly with Algebra

$$22,000 \text{ km} \cdot \frac{7.2 \text{ L}}{100 \text{ km}} = \frac{x}{22,000 \text{ km}} \cdot 22,000 \text{ km}$$

$$1,584 \text{ L} = x$$

b)

$$\frac{7.2 \text{ L}}{100 \text{ km}} = \frac{x \text{ L}}{2,800 \text{ km}} ; x = \frac{7.2 \text{ L} \cdot 2,800 \text{ km}}{100 \text{ km}}$$

$$x = 201.6 \text{ L for Trip}$$

Cost of gas for trip

$$201.6 \text{ L} \cdot \frac{\$1.079}{1 \text{ L}} = \$217.53$$

$$2,800 \text{ km} \cdot \frac{7.2 \text{ L}}{100 \text{ km}} \cdot \frac{\$1.079}{1 \text{ L}} = \$217.53$$

2. **Car Purchase.** The car you chose costs **\$34,500** MSRP (Manufacturer's Suggested Retail Price). You want the fancy stereo system option for an extra **\$600**. The car has to be shipped from Toronto and incurs a freight charge of **\$750**. There is an ecology 'fee' (excise tax) of **\$100** on its air conditioner. You have **no trade-in** vehicle. You make a **down payment** of **\$2,000** and finance the remainder with a loan.

a. Determine the final dealer's **price** of your car with the options and freight and ecology 'fee'.

$$\begin{array}{r}
 34,500 \\
 + \quad 600 \\
 + \quad 750 \\
 + \quad 100 \\
 \hline
 36,850
 \end{array}$$

$$36,850 - \underset{\substack{\uparrow \\ \text{Trade-in}}}{0} = \$36,850$$

Price of car before taxes

b. Calculate the final **price** of the car with the retail taxes included. (7% PST and 5% GST)

$$36,850 \cdot 1.12 = \$41,272.00 \text{ with taxes}$$

c. You make the down payment of \$2,000 and then take a loan on the remaining balance at 8% for 5 years. Determine your monthly payments.

$$\begin{array}{r}
 41,272 \\
 - 2,000 \text{ down} \\
 \hline
 39,272 \text{ loan to finance}
 \end{array}$$

From tables: 20.28 per thousand

$$\$20.28 \cdot \frac{39,272}{1000} = \$796.44 \text{ monthly payment}$$

d. Determine how much you ended up paying total for the car overall.

$$\begin{array}{r}
 \text{Paid } 796.44/\text{month} \cdot 60 \text{ month} = 47786.40 \\
 + 2000.00 \text{ down} \\
 \hline
 49,786.40
 \end{array}$$

Loan amount

\$39,272



Enter the total amount you want to borrow.

Payment frequency

Monthly



How often would you like to make payments?

Interest rate

8

Enter an interest rate.

Amortization

5 years



Select the number of years you'll need to pay back your loan.

Any bank website will say your monthly loan payment!

Your estimated monthly loan payment

\$796

Monthly Vehicle Loan Payments

per Thousand Borrowed

Same as
Grade 11

Interest Rate	Years to Repay Loan						
	1	2	3	4	5	6	7
4.00%	\$85.15	\$43.42	\$29.52	\$22.58	\$18.42	\$15.65	\$13.67
4.25%	\$85.26	\$43.54	\$29.64	\$22.69	\$18.53	\$15.76	\$13.78
4.50%	\$85.38	\$43.65	\$29.75	\$22.80	\$18.64	\$15.87	\$13.90
4.75%	\$85.49	\$43.76	\$29.86	\$22.92	\$18.76	\$15.99	\$14.02
5.00%	\$85.61	\$43.87	\$29.97	\$23.03	\$18.87	\$16.10	\$14.13
5.25%	\$85.72	\$43.98	\$30.08	\$23.14	\$18.99	\$16.22	\$14.25
5.50%	\$85.84	\$44.10	\$30.20	\$23.26	\$19.10	\$16.34	\$14.37
5.75%	\$85.95	\$44.21	\$30.31	\$23.37	\$19.22	\$16.46	\$14.49
6.00%	\$86.07	\$44.32	\$30.42	\$23.49	\$19.33	\$16.57	\$14.61
6.50%	\$86.30	\$44.55	\$30.65	\$23.71	\$19.57	\$16.81	\$14.85
7.00%	\$86.53	\$44.77	\$30.88	\$23.95	\$19.80	\$17.05	\$15.09
7.50%	\$86.76	\$45.00	\$31.11	\$24.18	\$20.04	\$17.29	\$15.34
8.00%	\$86.99	\$45.23	\$31.34	\$24.41	\$20.28	\$17.53	\$15.59
10.00%	\$87.92	\$46.14	\$32.27	\$25.36	\$21.25	\$18.53	\$16.60
15.00%	\$90.26	\$48.49	\$34.67	\$27.83	\$23.79	\$21.15	\$19.30
20.00%	\$92.63	\$50.90	\$37.16	\$30.43	\$26.49	\$23.95	\$22.21
25.00%	\$95.04	\$53.37	\$39.76	\$33.16	\$29.35	\$26.94	\$25.31

3. **Depreciation.** You buy a car that is valued at \$34,500. You wonder what your car will be worth after 5 years in case you want to trade it in for a newer one. The model you bought depreciates in value at about 23% per year, year on year (exponential decay) from its original value. Determine the value of your car after the 5 years.

$$\text{Value} \quad \text{Depreciation}$$

$$34,500 - 34,500 \cdot \frac{23}{100} = 26565$$

better

$$34,500 \cdot \frac{77}{100} = 26565$$

$$34,500 \cdot 0.77 \cdot 0.77 \cdot 0.77 \cdot 0.77 \cdot 0.77$$

after 1 yr

after 2 yr

after 3 yr etc...

$$34,500 \cdot 0.77^5$$

$$34500 \cdot 0.77^5$$

← exponent

$$= 9338.4053$$

Value = \$9,338.41 after 5 years

$34500 \cdot 0.77$

$= 26565$

or if you do not know how an exponent works,
just keep multiply by 0.77 each year

$= 20455.05$



$\boxed{26565} \cdot 0.77$

$\boxed{20455.05} \cdot 0.77$

$= 15750.3885$



$\boxed{15750.3885} \cdot 0.77$

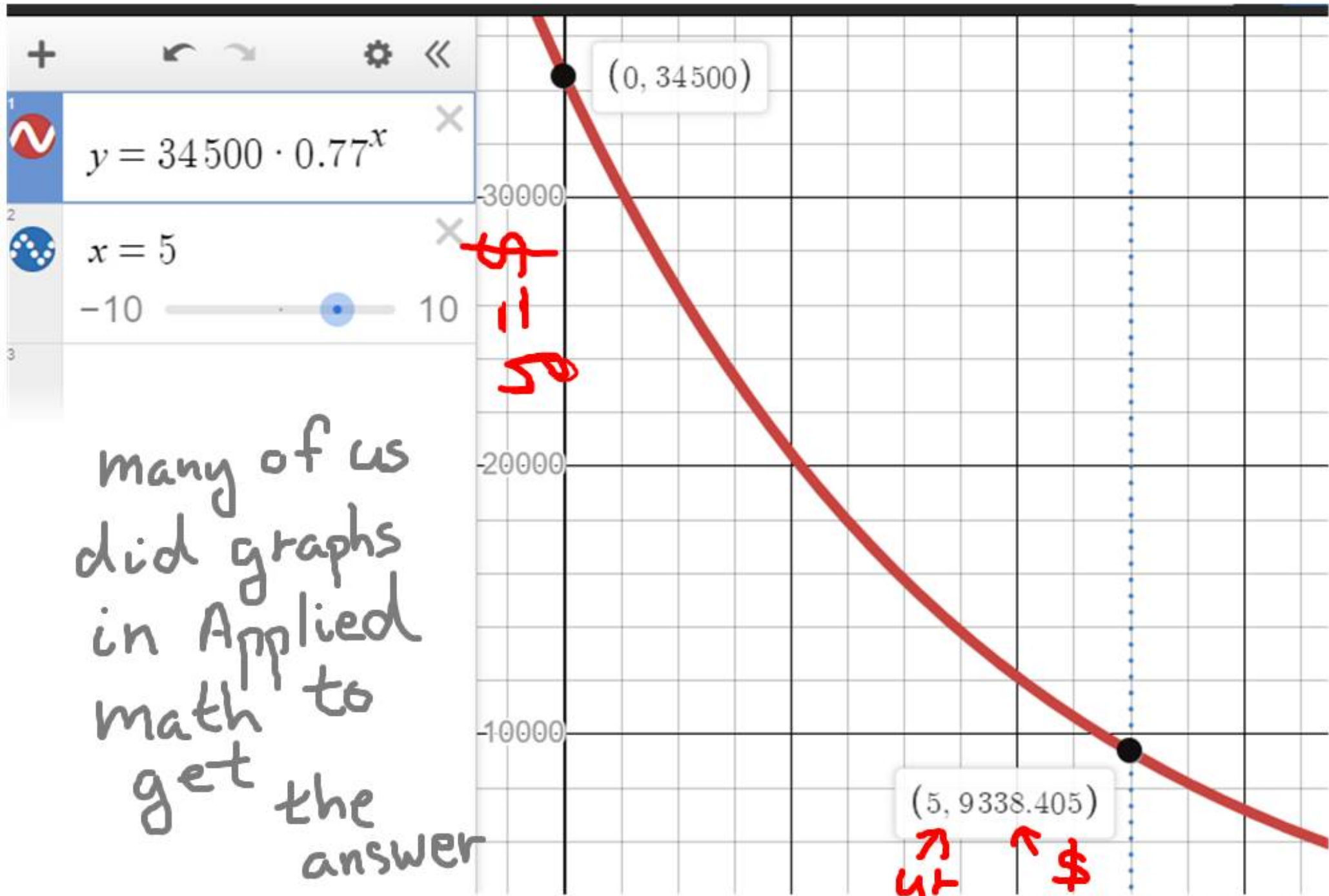
$= 12127.79915$

$\boxed{12127.79915} \cdot 0.77$

$= 9338.405342$

Have you
a decent
calculator?
That does
stuff like
this?





many of us
 did graphs
 in Applied
 math to
 get the
 answer

$y \uparrow$
 $\$$
 $x = y \text{ years}$

4. **Problem Solving.** A farmer has 60 animals, pigs and chickens. He forgets how many of each he has, but he does remember there are 150 legs. Determine how many pigs the farmer has

OMG! Fun!
Guess & Check

pigs + chicks = Animals

$\overset{\text{too low}}{\times} 10 + 50 = 60$
WRONG

LEGS

$10 \cdot 4 + 50 \cdot 2 = 40 + 100 = 140 \times$

$\times 20 + 40 = 60$
too high

$20 \cdot 4 + 40 \cdot 2 = 80 + 80 = 160 \text{ legs } \times$

$(15) + 45 = 60 \checkmark$

$15 \cdot 4 + 2 \cdot 45 = 60 + 90 = 150 \checkmark$
pig legs + chick legs = 150 legs

↑ There are 15 pigs

↑ Checks!

Here is how you would do it in Applied or Pre-Calculus Grade 10

Be aware there
is way more elegant
ways to do math

let p = # of pigs
let c = # of chickens

Animals
fact

$$p + c = 60 \quad ; \quad \text{so } c = (60 - p)$$

Legs
fact

$$4p + 2c = 150 \text{ legs}$$

of pig legs # of chick legs

Logically then $4p + 2 \cdot (60 - p) = 150$ OK!?

$$\therefore 4p + 120 - 2p = 150$$

$$\therefore 2p + 120 = 150$$

$$\therefore 2p = 30$$

$$p = \frac{30}{2} = 15$$

There are 15 Pigs.

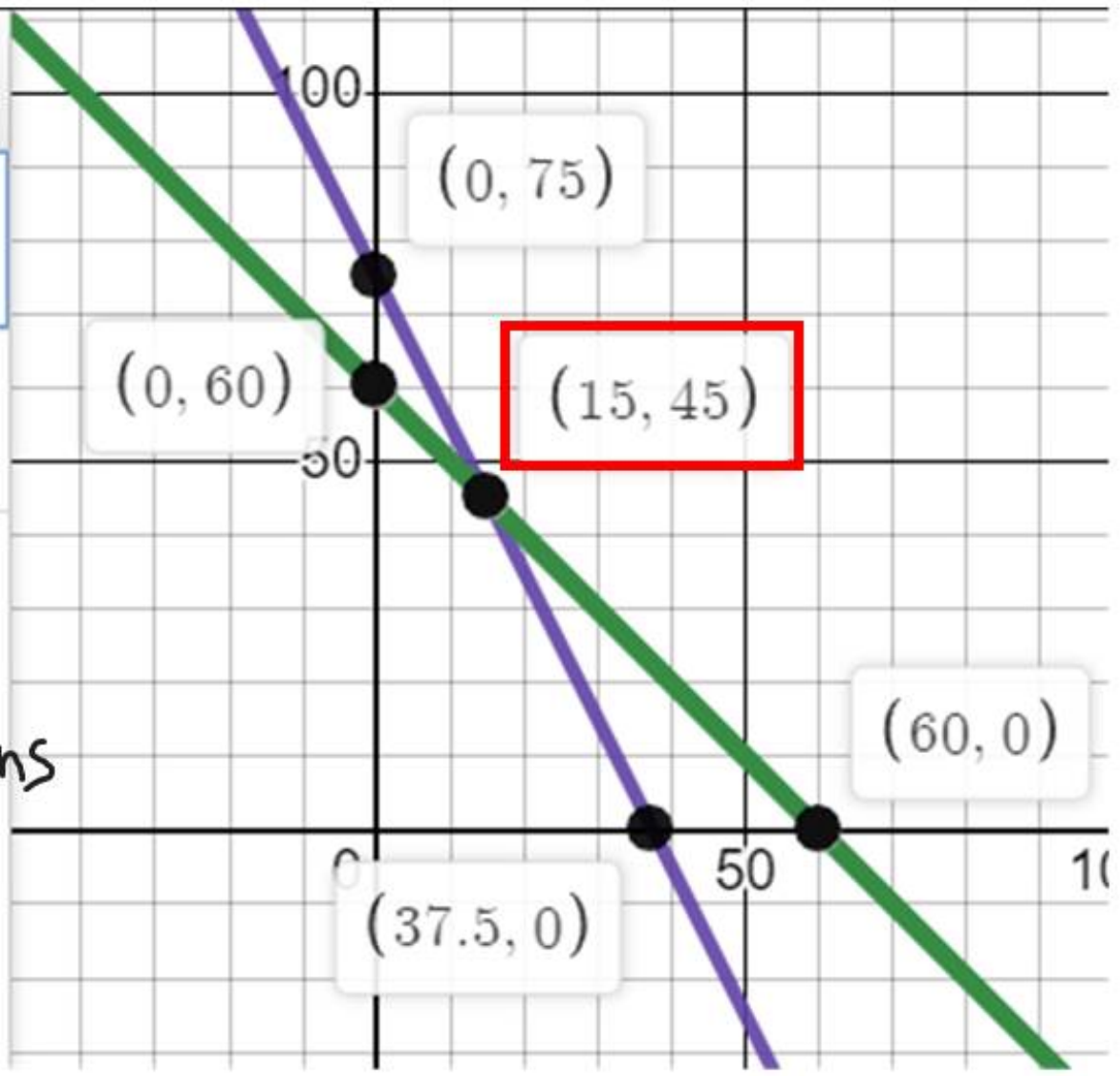
+ ↶ ↷ ⚙ ⏪

$x + y = 60$

$4x + 2y = 150$

$x = \# \text{ of pigs}$
 $y = \# \text{ of chickens}$

Graph in Applied Math



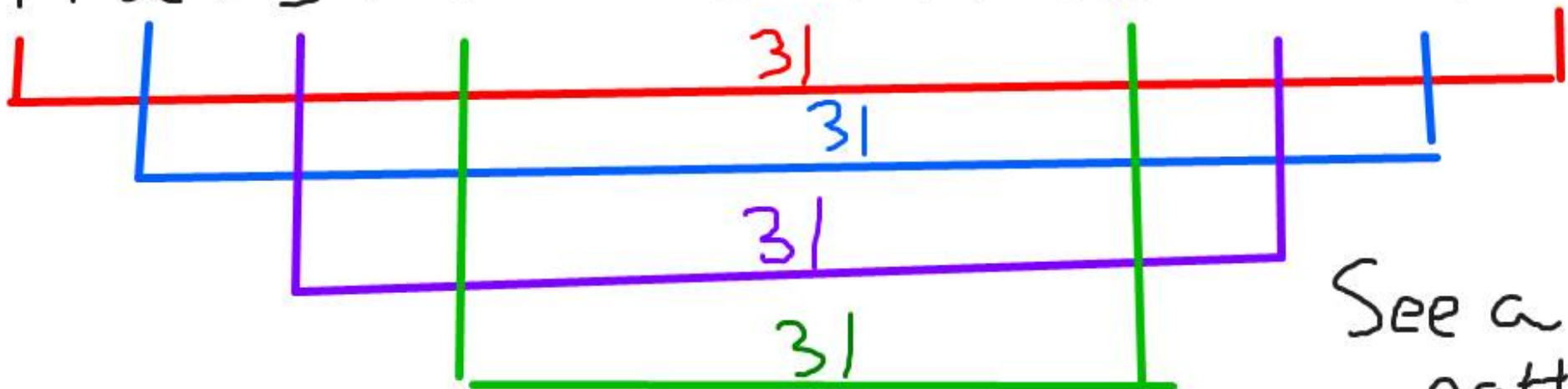
BONUSES (one mark each if you need them)

1. **Convert:** Determine the number of minutes in eight weeks.

$$\cancel{8 \text{ wk}} \cdot \frac{\cancel{7 \text{ days}}}{\cancel{1 \text{ wk}}} \cdot \frac{\cancel{24 \text{ hr}}}{\cancel{1 \text{ day}}} \cdot \frac{60 \text{ min}}{\cancel{1 \text{ hr}}}$$
$$8 \cdot 7 \cdot 24 \cdot 60 = 80,640 \text{ min}$$

2. **Problem Solve.** Determine the sum of the counting numbers from 1 to 30. (ie: add them all up)

$$1 + 2 + 3 + 4 + \dots + \text{etc} + \dots + 27 + 28 + 29 + 30 = ?$$



See a pattern?

How many 31's will there be? (pairing up the 30 numbers)

15 thirty ones!

$$31 \cdot 15 = 465$$

Way smarter!

1+2+3+4+5+6+7+8+
9+10+11+12+13+14
+15+16+17+18+19+
20+21+22+23+24+2
5+26+27+28+29+30

Really?

465

3. **Solve.** Your truck had an initial value of **\$70,000** when you bought it. It depreciates ('exponential decay') at a rate of 25% per year. When it gets down to a value of **\$10,000** you are going to give it to your favourite nephew, Leland. Determine how many years it will take for the value of your truck to get down to \$10,000 value give or take a couple hundred bucks. [Solve by *guess and check* or by any method you may have learned in other math courses]

Pretty easy to do Guess and check with a calculator

The check part is the important part!

$70000 \cdot 0.75^5$	← yr	×
<input type="text" value="= 16611.328125"/>		
$70000 \cdot 0.75^6$		×
<input type="text" value="= 12458.4960938"/>		
$70000 \cdot 0.75^7$		×
<input type="text" value="= 9343.87207031"/>		
$70000 \cdot 0.75^{6.5}$		×
<input type="text" value="= 10789.3741101"/>		
$70000 \cdot 0.75^{6.7}$		×
<input type="text" value="= 10186.1133521"/>		

Ah! Guess and check will work! At least get you as close as you want!