

Before we begin, are there any questions from last day's work?

Worksheet 1.2.4

Today's Learning Goal(s):

By the end of the class, I will be able to:

- a) solve problems involving exponential equations graphically, including problems arising from real-world context.
- b) find the point of intersection of two exponential functions.
- c) explain the solution in terms of real-life context.

1.3.1: MATCH IT

Date: _____

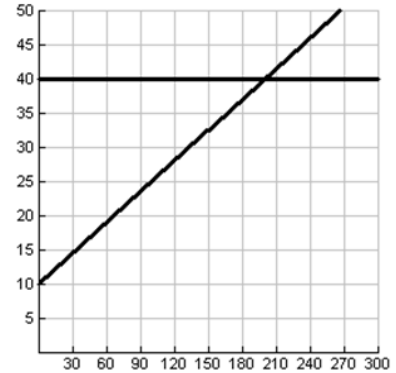
Teacher Instructions: Photocopy the charts. Cut up the charts into its cells. Give each student a piece of the chart. Tell them to find the students who are holding the matching application, system of equations, solution to the system, and graph.

Liam bought a cell phone plan charging \$40 per month for unlimited minutes. Isaac bought a plan charging \$10 per month plus \$0.15 per minute. How many minutes would they use if they paid the same amount on their monthly bill?

$$C = 40$$

$$C = 0.15t + 10$$

(200, 40)

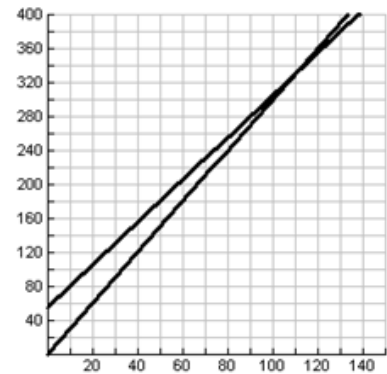


Ella ordered wedding invitations at her neighbourhood printing shop for \$55 plus \$2.50 per invitation. Lyndi ordered wedding invitations from her Uncle Shawn for \$3 per invitation. How many invitations would have to be ordered so that the cost would be the same for both women?

$$C = 55 + 2.5x$$

$$C = 3x$$

(110, 330)

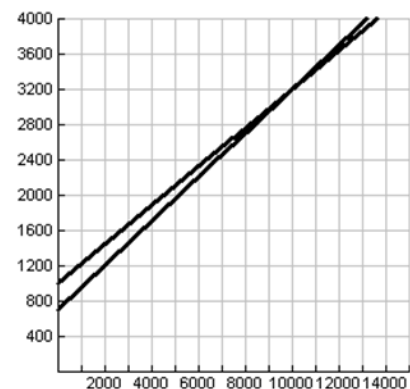


Sara states that the cost of driving her car for a year is \$1000 plus \$0.22 per kilometre. Gord states that the cost of driving his car is \$700 plus \$0.25 per kilometre. However, they both argue that the annual cost of driving their car is the least. How many kilometres driven would make their costs equal?

$$C = 1000 + 0.22x$$

$$C = 700 + 0.25x$$

(10000, 3200)

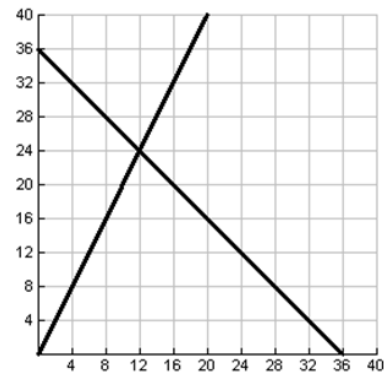


The length of a rectangle is twice its width and its perimeter is 72 cm. Find the length and width.

$$y = 2x$$

$$2x + 2y = 72$$

(12, 24)

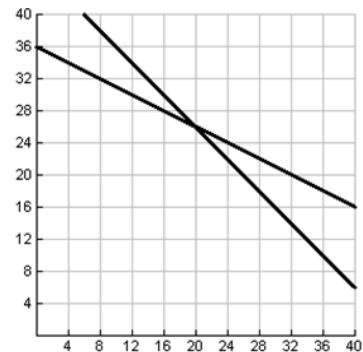


The club sold tickets and then counted their money. They had 46 coins, all loonies and toonies. The value of the money was \$72 in total. How many of each kind of coin was there?

$$x + y = 46$$

$$x + 2y = 72$$

(20, 26)

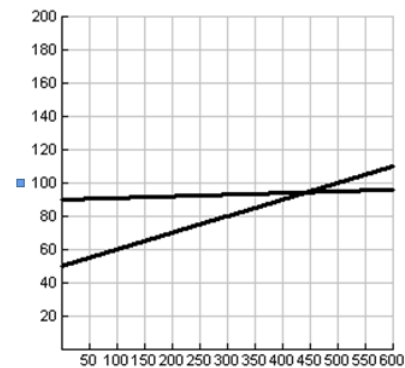


One store pays their workers \$50 per week plus 10% of all their sales. A different store pays their employees \$90 per week and 1% of all their sales. How much must an employee sell in order to be paid the same at both stores?(nearest \$)

$$y = 0.1x + 50$$

$$y = 90 + 0.01x$$

(444, 94)



1.3.2: Comparing Growths

Date: Feb. 9/18

Investigation

Audrey invested \$1000 at 9% per annum compounded annually. Her daughter invested \$2000 at 2.5% per annum compounded annually at the same time. How long did it take for the investments to be of equal value?

Materials:

Graphing calculator, Formula for Amount of an Investment $A = P(1 + i)^n$

Method: Number Questions

- The equation for the amount of Audrey's investment is $A = 1000(1 + 0.09)^n$
- The equation for the amount of Audrey's daughter's investment is $D = 2000(1 + 0.025)^n$
- What type of function is each of the above? each is an exponential function
- Describe the expected shape of the graph of each.
Each graph will be an *increasing* exponential curve.

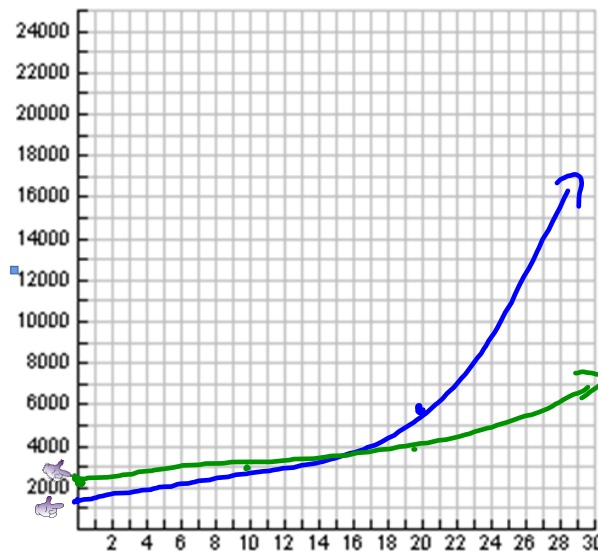
5. In the $Y=$ window, enter the two equations above.

Set the window as follows:

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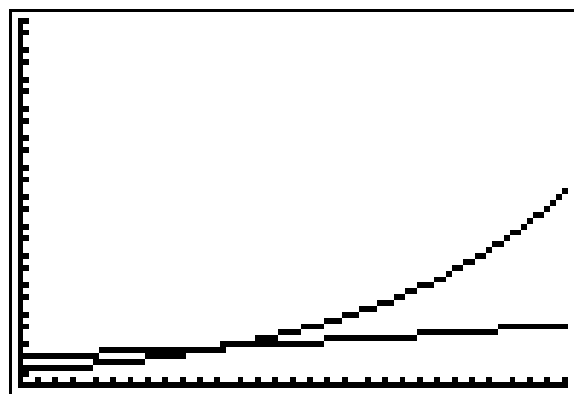
WINDOW
Xmin=0
Xmax=30
Xscl=1
Ymin=0
Ymax=25000
Yscl=1000
Xres=1
    
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Sketch the graph from the graphing calculator on the grid at the right.
(Possible alternate grid)
(see below right)



To find the point of intersection, press 2nd , TRACE, 5:Intersect, then press ENTER three times.

- The point of intersection is $(11.27, 2641.95)$.
- Explain the significance of the point of intersection in relation to the question.
It took 11.27 years for both investments to be equal in value.



Double check student's understanding:

What if you invested \$3000 at 12%/a compounded semi-annually for 4 years?
Determine the values of A, P, i, and n.

$$A = ?$$

$$P = 3000$$

$$i = \frac{0.12}{2}$$

$$n = 4 \times 2 \\ = 8$$

$$A = 3000 \left(1 + \frac{0.12}{2}\right)^8$$

No Time Frame

$$A = 3000 \left(1 + \frac{0.12}{2}\right)^{2n}$$

Review the learning goals. Were we successful today?

Homework: Worksheet 1.3.3

Answer any remaining homework questions

Students ask for "at desk" clarification.

1.3.3: Crossing Curves

Date: _____

Use the method of graphing on the graphing calculator to answer the following questions. Adjust the window settings as appropriate for each question. [Consider using 'Zoom Fit' to help with this.]

1. Determine the point of intersection of each pair of functions graphically.

a) $y = 2^{x+4}$ and $y = 2^7$

Window (0, 5, 1, 0, 500, 50, 1)

d) $f(x) = 6^{-x}$ and $f(x) = 8^{x+3}$

Window (-5, 5, 1, -5, 50, 5, 1)

b) $y = 9^6$ and $y = 27^x$

Window (0, 5, 1, 0, 700 000, 10 000, 1)

e) $y = 3^{x+15}$ and $y = 27^{2x}$

Window (-2,5,1, -70 000 000, 600 000 000, 50 000 000,1)

c) $f(x) = 6^{-x}$ and $y = 36^5$

Window (-12, 12, 1, 0, 70 000 000, 100 000, 1)

f) $y = -x + 1$ and $y = 6^{-x}$

Window (-0.5, 1.5, 0.1, -0.5, 1.5, 0.1, 1)

2a) Consider question 1(a) and the solution you determined.

How is the solution related to the expressions given for the exponents?


b) Suggest a rule for solving exponential equations without graphing.


 **Use the exponents laws, get equal bases, then equate the exponents.**

ex) $9^6 = 27^x$

c) Can you solve questions (b) through (e) in the same way? Why or why not?

3. Al has saved \$5000. He checked the website of a prominent bank. The rate for a savings account is 0.05% per annum, while the rate for a GIC is 3.85% per annum, both compounded annually. Al doesn't believe he wants to invest all \$5000 for 5 years. He compared saving \$5000 in the savings account to saving \$4500 in the GIC. How long will it take for the investments to be equal in value?

 $A = 5000(1 + 0.0005)^n$

 $G = 4500(1 + 0.0385)^n$

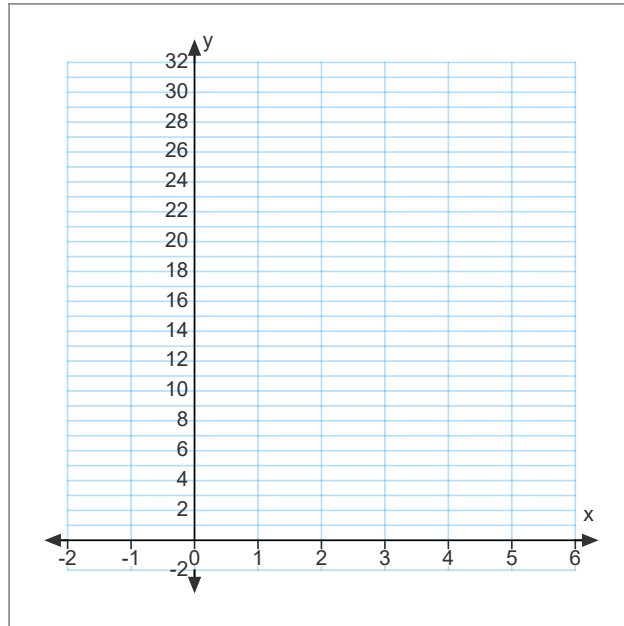
4. The SarJen marketing company has determined that the effect on customers of a particular advertising campaign is modelled according to the following function $A = 100(1.7^{-0.08x})$ where x is the time in weeks since the end of the advertising campaign and A is the value on their advertising rating scale. Calculate the number of weeks until the effect of the advertising will fall to half (or a rating of 50) [represent the 50 with $y = 50$ as function #1 on the graphing calculator].

5. For the following system of equations find the point of intersection.

i) $y = 2x$

ii) $y = x^2$

iii) $y = 2^x$



Check that the point of intersection found is actually a point on all three functions.
Describe the rate of increase for each of the three functions.

Answers

1a) (3, 128) b) (4, 531 441) c) (-10, 60 466 176) d) (-1.61, 17.95) e) (3, 387 420 489)

f) (0, 1) and (0.729, 0.2707) 2) [a,b,c,e: Yes], [d,f: Not Possible]

3) 2.826 years

4) 16.32 weeks

5) (2, 4)