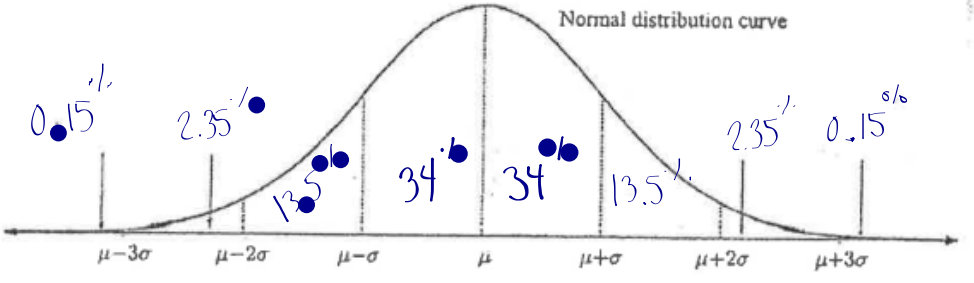
Write on the board to let me know about HW questions

Pick up the Warm Up

You will need to view your Calculator instructions a bit later

① Use the Emperical Rule [68%, 95%, 99.7%] to fill out the probabilities for each of the 8 sections below. Try not to look at yesterday's notes



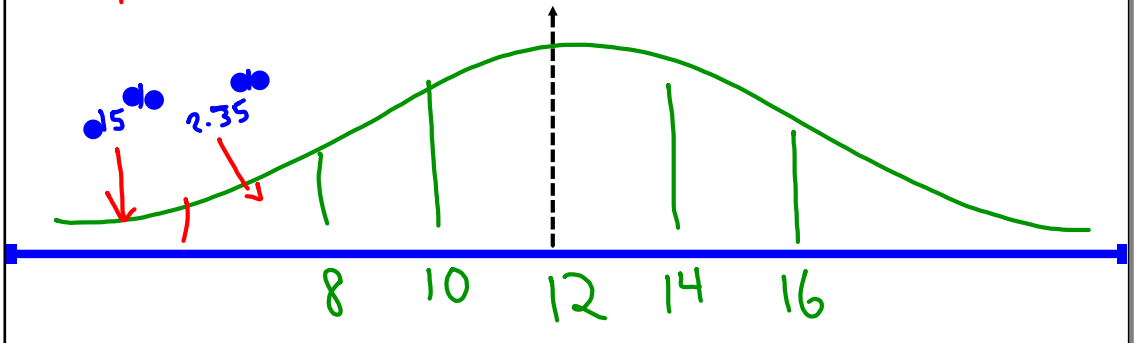
(2) Suppose the time it takes to get to school is normally distributed with a mean of 12 minutes and a std. deviation of 2 minutes. What is the probability that, tomorrow, it will take you less than 8 minutes to get to school? Make a sketch below.

Hint: Use the values in #1 above to help you.

(2) Using these new, slightly less accurate values (compared to yesterday), answer the following question.

Suppose the time it takes to get to school is normally distributed with a mean of 12 minutes and a std. deviation of 2 minutes. What is the probability that, tomorrow, it will take you less than 8 minutes to get to school?

$P(x < 8) = 2.35\% + 0.15\% = 2.50\%$



Read

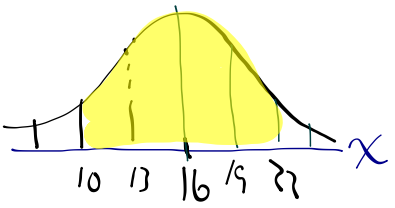
Notation: If a continuous random variable, like time in the example above, is normally distributed with a mean μ and standard deviation σ we write

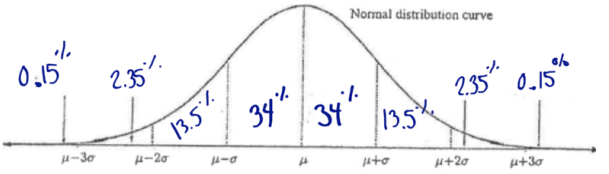
$X \sim N(\mu, \sigma^2)$ ← σ^2 is the square of std deviation which is the variance.

(3) Suppose $X \sim (16, 3^2)$, what is

$P(10 < x < 22)$?

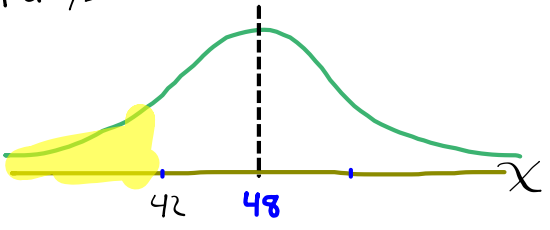
$= .95 = 95\%$





(4) The mean average rainfall of Claudona for August is 48 mm with a standard deviation of 6 mm. Over a 20 year period, how many times would you expect there to be less than 42 mm of rainfall during August in Claudona?

31 days



$P(x < 42) = .16$

or 16%

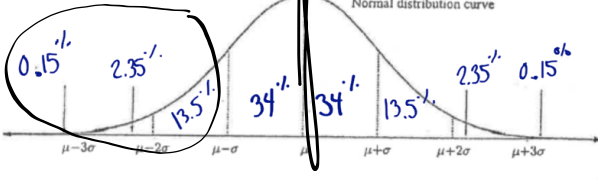
16% of 31 days

$(.16)(31)$

$= 4.96$ days

for 20 years

99.2 ~~years~~ days



Check HW

and record on new sheet

$100\% + 1.9\% = 101.9\%$

1.019

Problem #1 : In 1989, the population of India was 835 million people. The annual growth rate was 1.9%. Use this information to predict the population in 1990, 1991, and 1992.

in 1990: $835{,}000{,}000(1.019)^1 = 850{,}865{,}000$ people

in 1991: $867{,}031{,}435$ people

1992: $883{,}505{,}032$ people

#2 : Write an exponential function to model India's growth. Use it to estimate India's population in 2001

2001 in 12 years

$y = (835{,}000{,}000)(1.019)^x$

if $x = 12$, $y = 1{,}046{,}590{,}248$ people

CONTINUE ON BACK

Problem #3 : A typical car depreciates about 20% a year once purchased. Hopefully my Subaru's is only 10%!

Suppose a $19,000 car loses 1/5 of its value every year. What is its value after 5 years?

1/5 is 0.20

100 − 20% = 80%

Try to write an exponential function to help you answer this question.

$f(x) = 19000(0.8)^t$ $= 19000(0.8)^5$

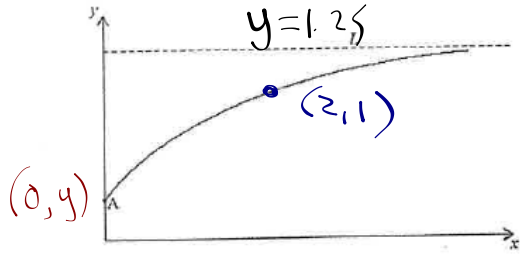
$= \$6,275.92$

$y = -\frac{1}{2^x} + 1.25$ $f(x) = -a^{-x} + 1.25$ $y = -\frac{1}{a^x} + 1.25$

$f(0) = -\frac{1}{a^0} + 1.25$

$= .25$

(14) Consider the function $f(x) =$, where a is a positive constant and $x \geq 0$. The diagram shows a sketch of the graph of f. The graph intersects the y-axis at point A and line L is its horizontal asymptote.



$1 = -\frac{1}{a^2} + 1.25$

$-\frac{0.25}{1} = -\frac{1}{a^2}$

$a^2 = -\frac{1}{-0.25}$

$a = 2$

(a) Find the y-coordinate of A. $y = .25$ (2)

The point (2, 1) lies on the graph of $y = f(x)$

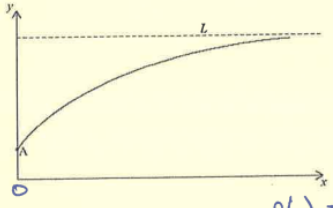
(b) Calculate the value of a. (2)

(c) Write down the equation of L. (2)

$f(x) = -a^{-x} + 1.25$

4

Consider the function $f(x) =$, where a is a positive constant and $x \geq 0$. The diagram shows a sketch of the graph of f. The graph intersects the y-axis at point A and line L is its horizontal asymptote.



(a) Find the y-coordinate of A. $f(0) = -a^{-0} + 1.25 = 1.25$ (2)

The point (2, 1) lies on the graph of $y = f(x)$ (x, y)

(b) Calculate the value of a. 2 (2)

(c) Write down the equation of L. (2)

$f(x) = -2^{-x} + 1.25$

$y = 1.25$

asymptote

$1 = -a^{-2} + 1.25$

$\frac{1}{-1.25} = -\frac{1}{a^2} + 1.25 - 1.25$

$-.25 = -\frac{1}{a^2}$

$\frac{-.25}{1} = -\frac{1}{a^2}$

cross multiply and solve

$a^2 = \frac{1}{.25}$

5

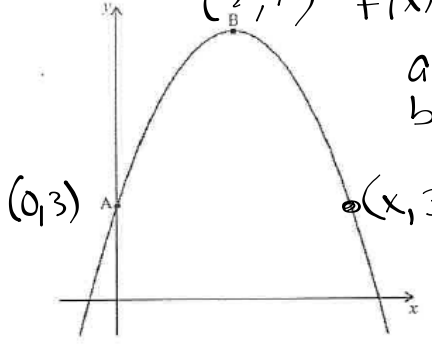
The graph of the quadratic function $f(x) = 3 + 4x - x^2$ intersects the y-axis at point A and has its vertex at point B.

(2, 7) $f(x) = -x^2 + 4x + 3$

$a = -1$

$b = 4$

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



(0, 3) (x, 3)

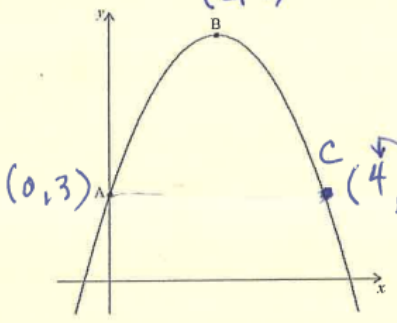
(a) Find the coordinates of B. (3)

Another point, C, which lies on the graph of $y = f(x)$ has the same y-coordinate as A.

(b) (i) Plot and label C on the graph above.

(ii) Find the x-coordinate of C. (3)

5 The graph of the quadratic function $f(x) = 3 + 4x - x^2$ intersects the y-axis at point A and has its vertex at point B. (2,7)



$3 = 3 + 4x - x^2$

$0 = 4x - x^2$

$0 = x(4 - x)$

$x = 0$ $4 - x = 0$, $x = 4$

$-x^2 + 4x + 3$

$a = -1$
$b = 4$
$c = 3$

C (4, 3)

(0, 3)

(a) Find the coordinates of B. (3)

CAN USE GDC or USE $x = -\frac{b}{2a} = -\frac{(4)}{2(-1)} = 2$ (2, 7)

(2, 7) with GDC

Another point, C, which lies on the graph of $y = f(x)$ has the same y-coordinate as A.

(b) (i) Plot and label C on the graph above. C also has a y-value of 3 since the y-intercept at point A is 3

(ii) Find the x-coordinate of C. (4, 3) (3)

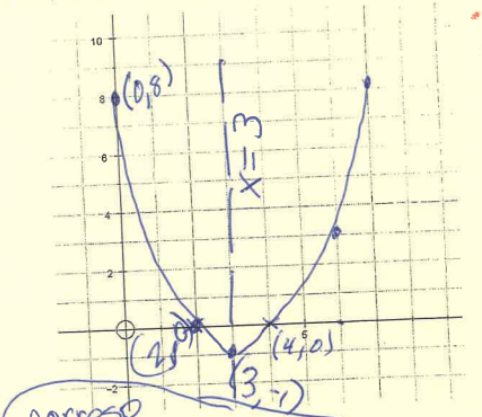
Topic 6—Mathematical models

6.3	Equation of the axis of symmetry for the graph of the quadratic function $y = ax^2 + bx + c$	$x = -\frac{b}{2a}$

6

Factorise the following Quadratic, $f(x) = x^2 - 6x + 8$ $= (x-4)(x-2)$

Plot it on the axes below for the domain $0 \le x \le 6$ label with the coordinates, the zeros, the y-intercepts and the vertex. Mark on the axis of symmetry and label it with the equation of the line. State the corresponding range of the function.



corresp. range $-1 \le y \le 8$

Where is the vertex of the function $f(x) = (x-5)^2 + 6$?

(5, 6)

(Total 6 marks)

7

a. Given $f(x) = k \times 2^x$ and $f(2) = 24$, what is the value of k?

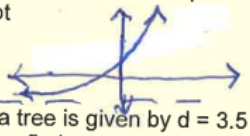
when $x=2, y=24$

$24 = k \cdot 2^2$

$24 = 4k$

$k = 6$

b. Given $g(x) = 2^{(x+1)} - 1$, what is the equation of the asymptote and the coordinates of the y – intercept



$y = -1$

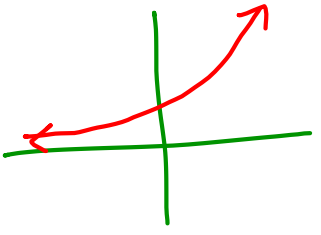
y-intercept $(0,1)$

c. If the diameter of a tree is given by $d = 3.5 \times 2.4^{0.1t}$, where t is the number of years after planting, find

a) The diameter of the tree when it was planted

when $t = 0$ $3.5(2.4)^{0.1(0)} = 3.5$

$y = a \cdot b^x$



b) The number of years it takes for the diameter to triple

10.5 solve exponential equation

$5(2.4)^{0.1t} = 10.5$

divide

$(2.4)^{0.1t} = 3$

$\log(2.4)^{0.1t} = \log 3$

$(0.1t)(\log 2.4) = \log 3$

$t = \frac{1}{0.1}\left(\frac{\log 3}{\log 2.4}\right)$

≈ 12.54 years

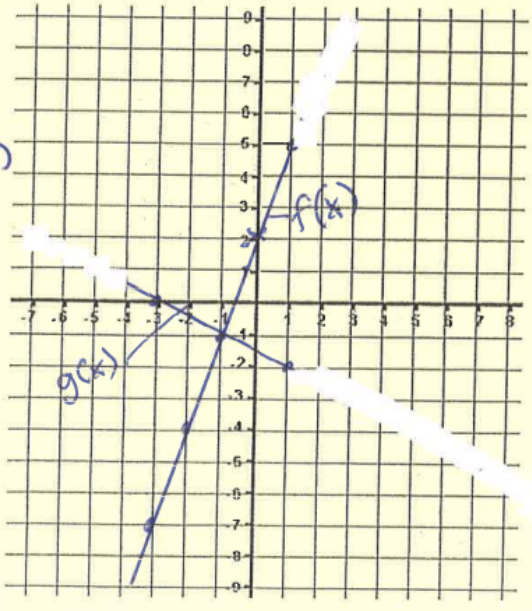
(8)

f(x) is a linear function with gradient 3 and y – intercept 2, g(x) = -0.5x -1.5
Plot these two lines on the grid below for the domain $-4 \le x \le 1$ and state the coordinates of the intersection of the two lines and the range of the functions.

gradient = "slope"

f(x) $y = 3x + 2$

$g(x) = -\frac{1}{2}x - 1.5$ (use GDC to quickly get points)



Intersection $(-1, -1)$

Range of f(x) in given domain:

$-7 \le y \le 5$

Range of g(x) in given domain

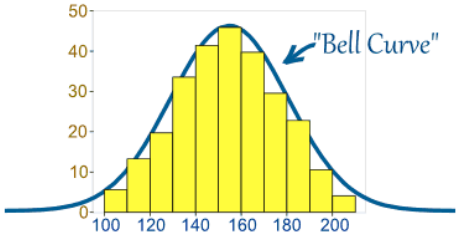
$-2 \le y \le 0.5$

Reminders

- Be sure you have read about Data Collection (Packet P2)
-
- See your test on Unit 2

From last class:

Be able to construct diagrams of Normal Distributions



Pulse rates example

It is possible to utilize Normal Distribution in your IB Math Studies project if you like, BUT you would have to have data that is at least somewhat likely to be accepted as normally distributed.

Notes

So, now the challenge

Suppose the weights of a bag of organic potatoes is 40 lb with a std. deviation of 5 lb. (Assume a normal distribution).

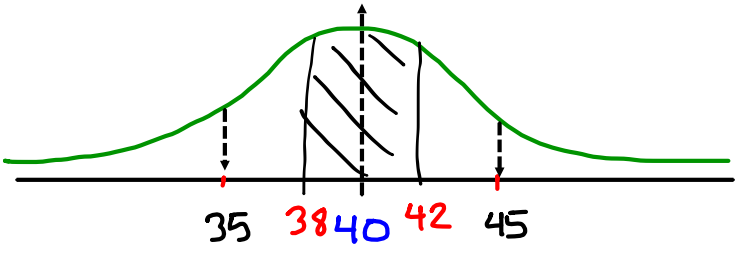
What is the probability of the next bag you pick up is between 38 and 42 lbs ?

So, now the challenge

Suppose the weights of a bag of organic potatoes is 40 lb with a std. deviation of 5 lb. (Assume a normal distribution).

What is the probability of the next bag you pick up is between 38 and 42 lbs?

$P(38 < x < 42)$



Goal Today:

Calculate Probabilities and Expected Values of Normal Distributions

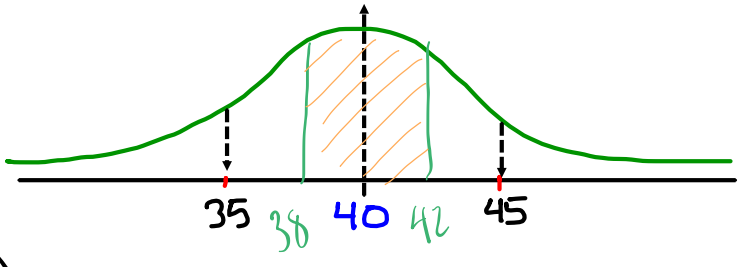
[for any std. deviation position]

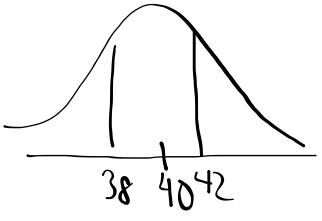
using the GDC

TNFGS

Take Notes For Gosh Sakes

$P(38 < x < 42)$ $\mu = 40$ $\sigma = 5$





normalcdf(38, 42, 40, 5)

Lower boundary

Upper boundary

μ

σ

= .311 or 31.1%

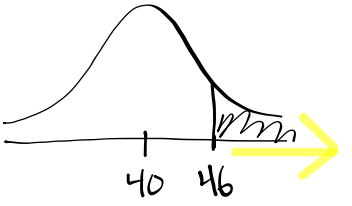
If there were 1000 bags of potatos, how many would we expect to be between 38 and 42 pounds.

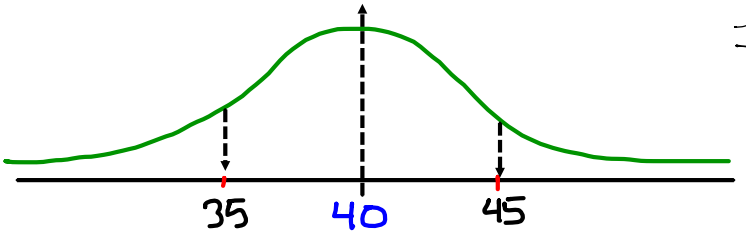
So .... 31.1% of 1000

(.311)(1000)

= 311 ~~pounds~~ bags.

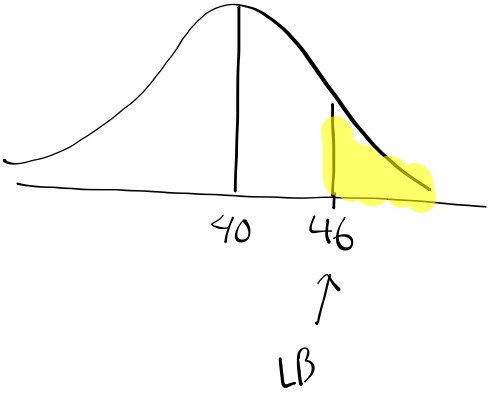
$P(x > 46 \text{ lb})$



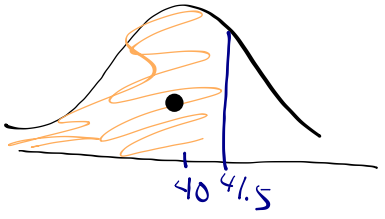


$= \text{normalcdf}(46, 1000, 40, 5)$

$P(x > 46 \text{ lb}) = .115$



What is the probability of being less than 41.5



$P(x < 41.5) =$ 68.8%

normalcdf(−1000, 41.5, 40, 5)

BB

There are many small isolated topics that are in the IB Math Curriculum. Those will be handled during warm ups or, as in this case, a Warm Down.

IB MATH Warm Up

NUMBER & ALGEBRA

0, 1, 2, 3, ...

I. LOOK AT THE "NOTATION LIST" FOR A REFERENCE

Put the appropriate symbol next to the column headings and then put a tick or cross in each box of the table

R Q N Z

	Real	Rational	Natural	Integers
4.6				
$\sqrt{3}$				
-6				
7				
$\frac{6}{7}$				
π				

IB MATH **Warm UP**

NUMBER & ALGEBRA

I. LOOK AT THE "NOTATION LIST" FOR A REFERENCE

Put the appropriate symbol next to the column headings and then put a tick or cross in each box of the table

	Real (R)	Rational (Q)	Natural (N)	Integers (Z)
4.6	✓	✓		
$\sqrt{3}$	✓			
-6	✓	✓		✓
7	✓	✓	✓	✓
$\frac{6}{7}$	✓	✓		
π	✓			

II. SI - UNITS

$ms^{-1} = \frac{m}{s^1} = \frac{m}{s}$

Which of the following units could be used to measure speed? Circle your answers

ms-1 cm²/s l/s km²/kms

$\frac{km^2}{km \cdot s} = \frac{km}{s}$

Convert the following density to g/cm³

$5kg/m^3 = .005\ g/cm^3$

$\frac{5kg}{m^3} \times \frac{1000g}{1kg} \cdot \frac{1m}{100cm} \times \frac{1m}{100cm} \times \frac{km}{100^3 cm}$

V. Factor the quadratic $x^2 + 2x - 15$

$(x+5)(x-3)$

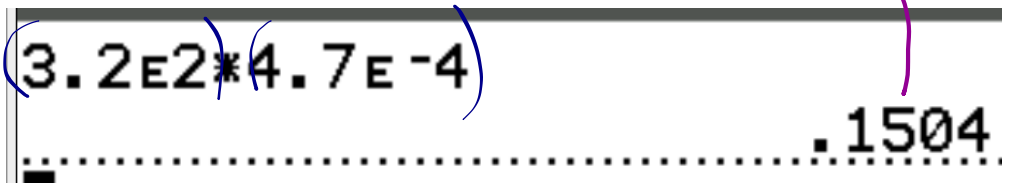
III. STANDARD INDEX FORM (Scientific Notation)

If $a = 3.2 \times 10^{2}$ and $b = 4.7 \times 10^{-4}$ then please calculate, giving your answers in standard form

ab = 1.50×10^{-1}

b/a = 1.47×10^{-6}

a + b = 3.20×10^{2}



Warm Down

See your Test

- ✓ Each groups gets a copy of solutions
- ✓ Learn from your mistakes!!
- ✓ I will collect all when finished.
- ✓ Feel free to come in and go over everything.

Assignment

must use good notation as in today's notes.

HH - Ch. 10 Packet.....

a) Study pp.300-301

b) do problems on p.303.... 5, 6, 9
and p. 307.... 1, 4, 7