Write on the board to let me know about HW Questions

Pick up the Warm Up

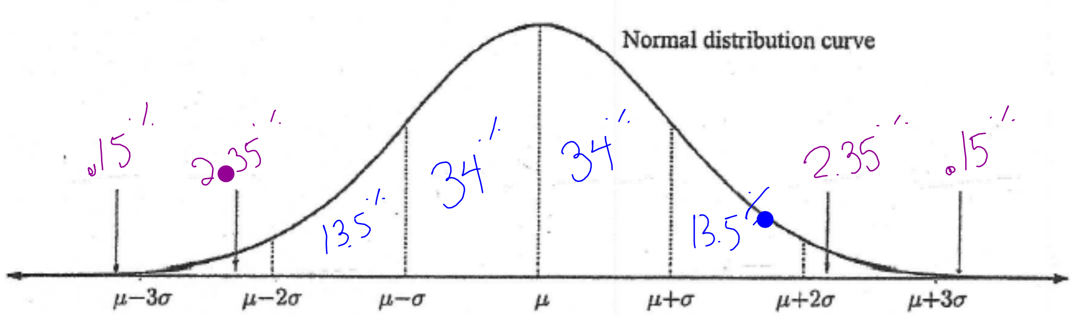
You'll need a magnifying glass :)

①

- Don't open any books or notes
- Suppose you are told that the Emperical Rule is 68/95/99.7%

In other words 68% of values lie within one std. dev. from the mean. and 95% lie within 2 std. deviations, etc.

(notice these are slightly different)



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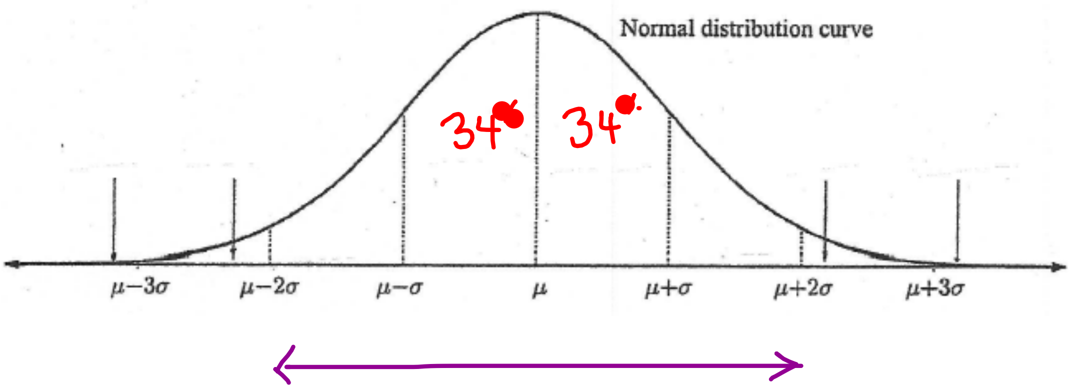

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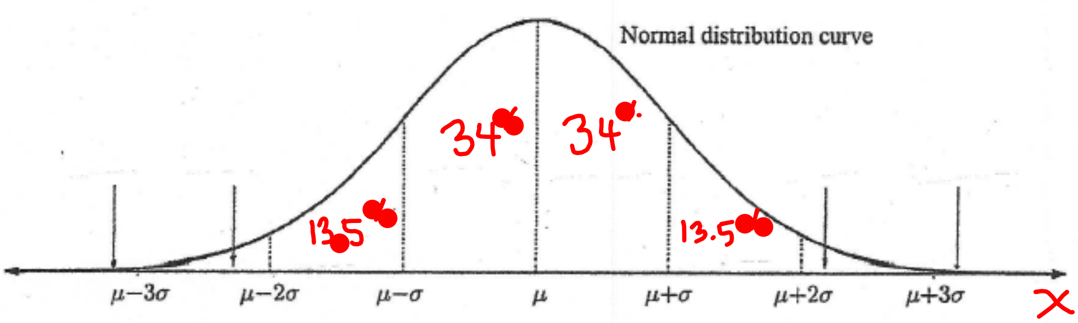

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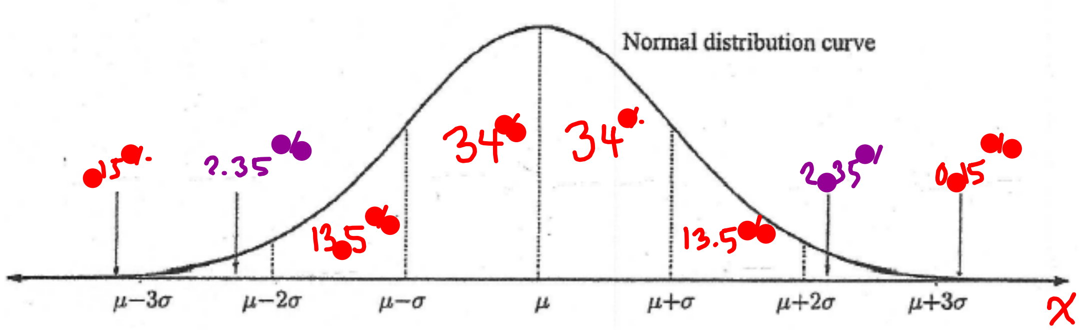
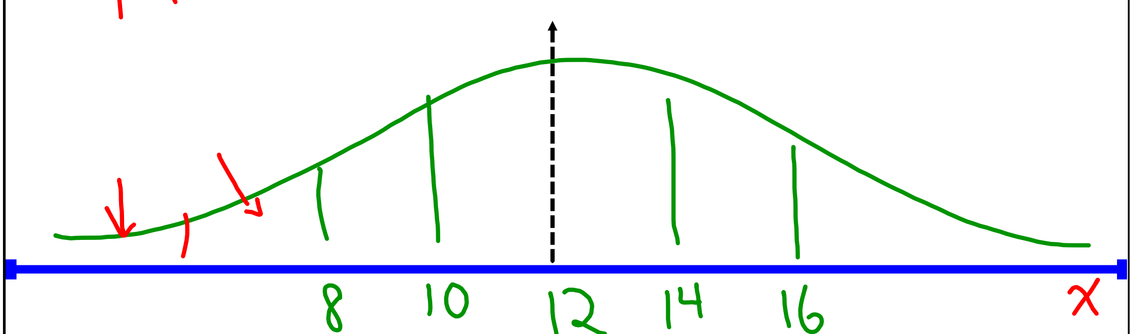


② Using these new, slightly less accurate values (compared to yesterday), answer the following question.

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, tommorow, it will take you less than 8 minutes to get to school?

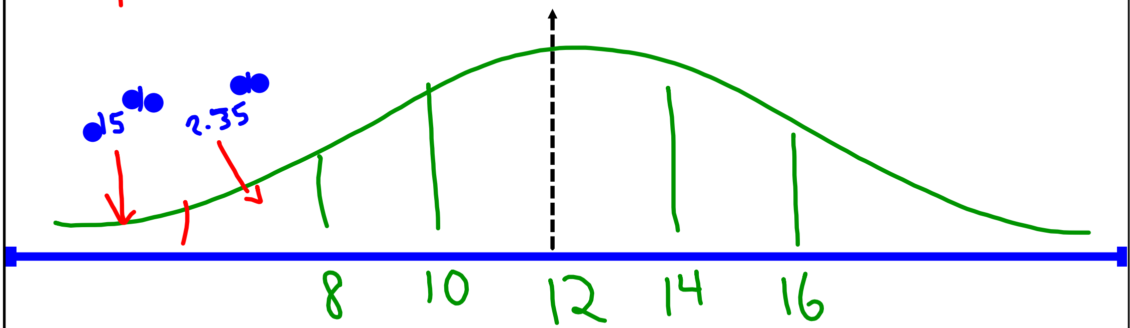
$P(x < 8) = 2.5\%$



(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, tommorow, it will take you less than 8 minutes to get to school?

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



(3) 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.

(16, 9)

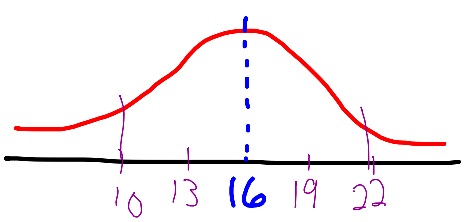
(4) Suppose $x \sim (16, 3^2)$, what is

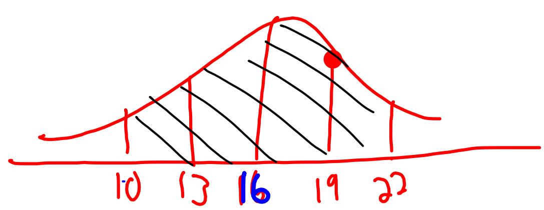
$P(10 < x < 22)$?

$= 95\%$

$\mu = 16$

$\sigma = 3$





$x \sim (\text{mean}, \text{variance})$

σ^2

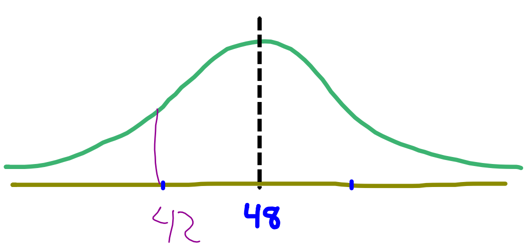
page 303 #4

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?

$P(x < 42) = 16\%$

16% of 20 years

$(.16)(20) = 3.2$ years



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?

$\frac{1}{5}$ is $.10$ 20

$100\% - 20\% = 80\%$

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

$f(x) = 1900(0.8)^t$ $= 1900(0.8)^5$

$= \$6,225.42$

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

$1 = -a^{-2} + .25$

$.75 = -a^{-2}$

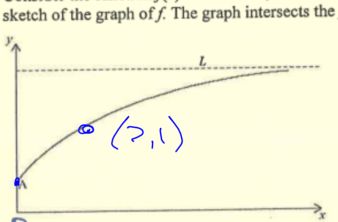
(4) Consider the function $f(x) =$, where a is a positive constant and $x \geq 0$. The diagram shows a sketch of the graph of f. The graph intersects the y-axis at point A and line L is its horizontal asymptote.

$-.75 = a^{-2}$

$\frac{-.75}{1} = \frac{1}{a^2}$

$a^2 = \frac{1}{-.75}$

(0,)



(a) Find the y-coordinate of A. **(2)**

$.25$

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

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

x y

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

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

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

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

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

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

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

cross multiply and solve

$y = 1.25$

asymptote

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

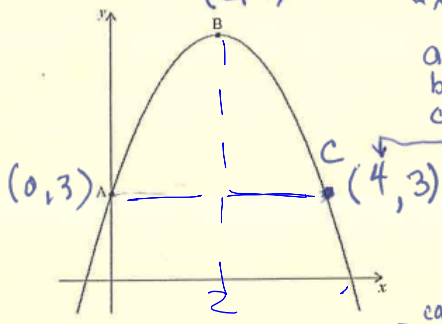
5

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)

$-x^2 + 4x + 3$

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

$3 = 3 + 4x - x^2$
$0 = 4x - x^2$
$0 = x(4 - x)$
$x = 0$ $\quad 4 - x = 0$
$x = 4$



can use GDC or use $\boxed{x = -\frac{b}{2a}}$ $= -\frac{(4)}{2(-1)}$ $= 2$

(a) Find the coordinates of B. (2,7) with GDC **(3)** (2,7)

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

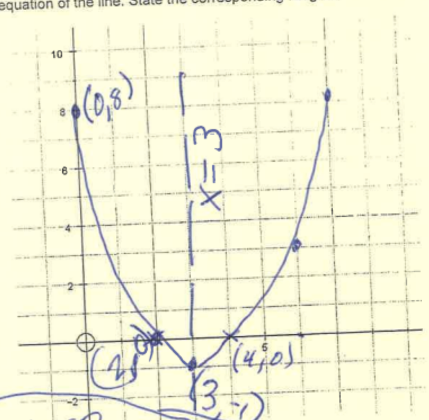
(b) (i) Plot and label C on the graph above. C also has a y-value of 3 since the y-intercept at point A is 3

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

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 x 2^x and f(2) = 24, what is the value of k?

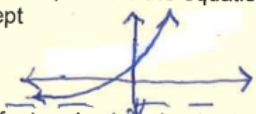
when $x=2$, $y=24$

$24 = k \cdot 2^2$

$24 = 4k$

$k = 6$

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



$y = -1$

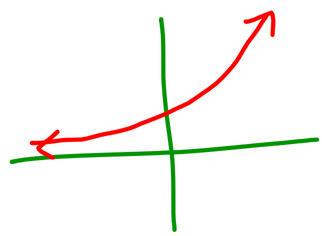
y-intercept $(0,1)$

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

$3.5(2.4)^{.1t} = 10.5$

divide

$(2.4)^{.1t} = 3$

$\log(2.4)^{.1t} = \log 3$

$(.1t)(\log 2.4) = \log 3$

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

≈ 12.54 years

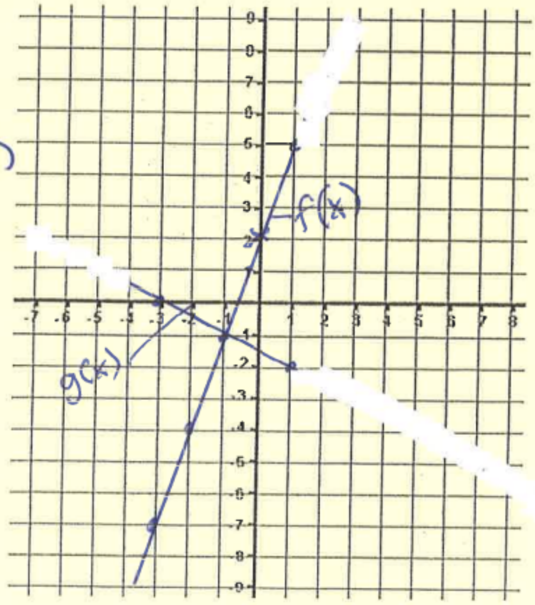
8

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

$-2 \le y \le 0.5$

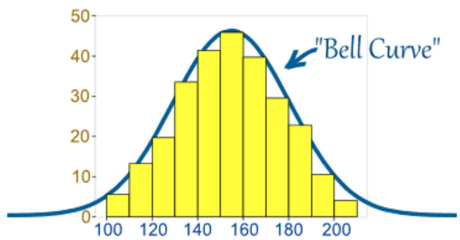
Today:

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

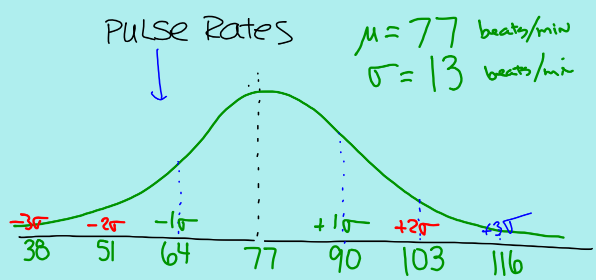
From last class:

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.

research...

So, now the challenge

Suppose the weights of a bag of organic potatos 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 ?

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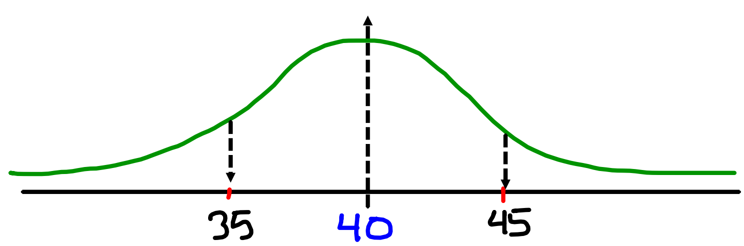
$$P(38 < x < 42)$$



38 42

B.B.

Goal Today:

Calculate Probabilities and Expected Values of Normal Distributions

[for any std. deviation position]

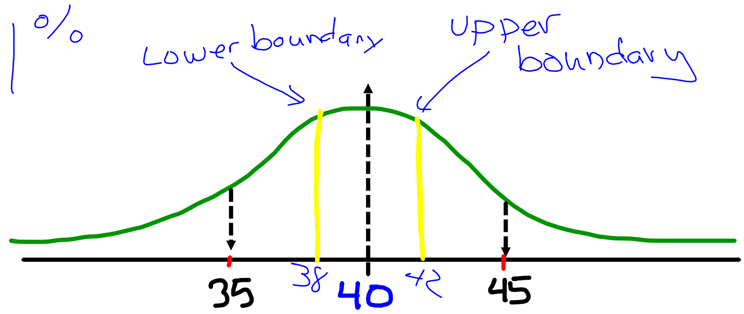
using the GDC

TNFGS

Take Notes For Gosh Sakes

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

$\doteq 31.1\%$



$\approx$

normalcdf(38, 42, 40, 5)

Lower boundary

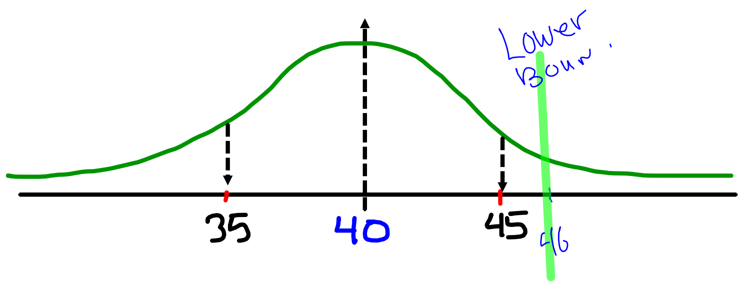
upper boundary

μ mean

σ

= .311 or 31.1%

$P(x > 46 \text{ lb}) = 11.4\%$



Upper Bound (at least 5 std. deviations from σ)

= normalcdf(46, , 40, 5)

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

What is the probability of being less than 41.5

$p(x < 41.5) \doteq 61.8\%$

.618

Assignment

HH - Ch. 10 Packet.....

a) Study pp.300-301

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

use good notation

pdf

Correlation Coefficient, r :

The quantity ***r***, called the linear correlation coefficient, measures the strength and the direction of a linear relationship between two variables. The linear correlation coefficient is sometimes referred to as the ***Pearson product moment correlation coefficient*** in honor of its developer Karl Pearson.The mathematical formula for computing r is:

$$r = \frac{n\sum xy - \left(\sum x\right)\left(\sum y\right)}{\sqrt{n\left(\sum x^2\right) - \left(\sum x\right)^2}\sqrt{n\left(\sum y^2\right) - \left(\sum y\right)^2}}$$

(Aren't you glad you have a graphing calculator that computes this formula?)

The value of ***r*** is such that $-1 < r < +1$. The + and – signs are used for positive linear correlations and negative linear correlations, respectively.

r = -1 indicates a **perfectly strong** *negative l*inear relationship.

r = -0.8 indicates a **relatively strong** *negative* linear relationship

r = -0.5 indicates a **moderate** *negative* linear relationship

r = -0.2 indicates a **weak** *negative* linear relationship

r = 0 indicates **no** *linear* relationship

r = 0.5 indicates a **moderate** *positive* linear relationship

r = 0.8 indicates a **relatively strong** *positive* linear relationship

r = 1 indicates a **perfectly strong** *positive* linear relationship.

Interpreting Correlation:

a) **strength / direction.**

If strong, do (b)

b) **Make a statement such as**

as the heights increase the calories decrease

Based on both, describe the correlation between group size and time to finish the task.

✓✓

1 → There is a strong (or very strong) correlation between group size and time to complete the task

2 → Therefore we can say that: as the group size gets larger the time it takes to do the job goes down

	Age				
Result	**18–30**	**31–42**	**43–61**	**62 and older**	
Willing to buy a hybrid	72 67.83	66 68.60	73 72.60	69 70.99	280
Not willing to buy a hybrid	14 18.20	21 18.40	19 19.40	21 19.00	75
	86				355

1. **State the Null Hypothesis** using good notation. (contingency table is already given)

H_0 : Age and willingness to buy a hybrid are independent.

n projects → (H_1 : Age and willingness to buy a hybrid are NOT independent or are associated.)

2. Use your calculator to calculate the **expected** values. Show them next to the observed values in the table to 2 decimal places. You don't need to show totals.

Show one sample calculation (for one of these): example $\frac{86 \times 280}{355} = 67.83$

3. State if the test results will be valid and why.

The test will be valid because there are no expected values less than 5.