THE NORMAL DISTRIBUTION

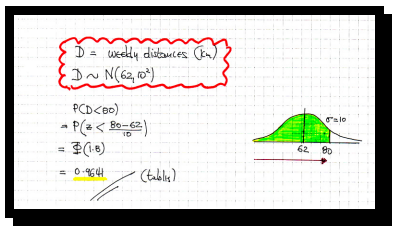
CALCULATING PROBABILITIES

Question 1

The weekly distances, D km, a leopard walks in search of food are thought to be Normally distributed with a mean of 62 and a standard deviation of 10.

Find the probability that on a given week a leopard will walk less than 80 km.

$\boxed{0.9641}$

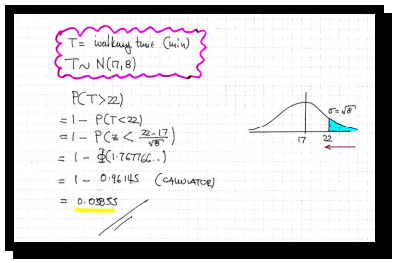


Question 2

The time, T minutes, Jason takes to cycle to school is Normally distributed with a mean of 17 and a variance of 8.

Find the probability that on a given day Jason will take over 22 minutes to cycle to school.

$\boxed{0.03855}$

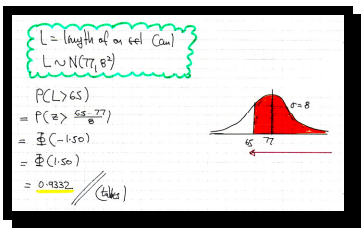


Question 3

The length of a certain type of eel, L cm, is assumed to be a Normal variable with a mean of 77 and a standard deviation of 8.

Find the probability that the length of a randomly picked eel will be at least 65 cm.

$\boxed{0.9332}$

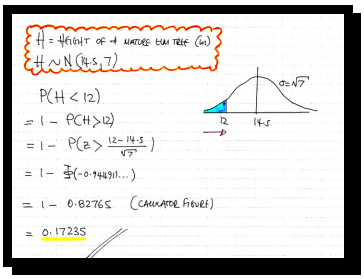


Question 4

The heights of mature elm trees, H metres, are Normally distributed with a mean of 14.5 and a variance of 7.

Determine the probability that the height of a randomly chosen elm tree will be less than 12 metres.

$\boxed{0.17235}$

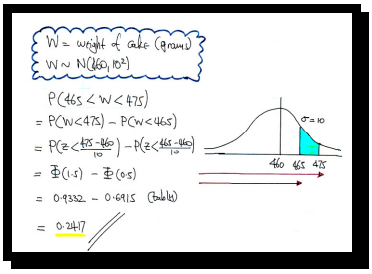


Question 5

The weights of walnut cakes, W grams, are Normally distributed with a mean of 460 and a standard deviation of 10.

Find the probability the weight of such cake will be between 465 and 475 grams.

$$\boxed{0.2417}$$

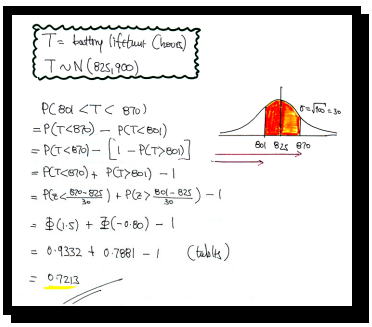


Question 6

The lifetimes, T hours, of a certain brand of battery are assumed to be Normally distributed with a mean of 825 and a variance of 900.

Find the probability that one such battery will last between 801 and 870 hours.

$$\boxed{0.7213}$$

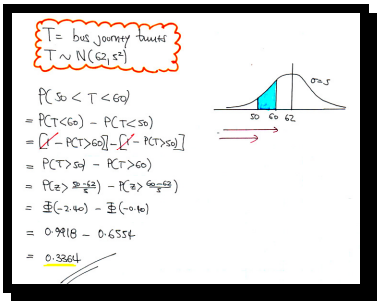


Question 7

The journey times of a bus service, T minutes, are thought to be Normally distributed with a mean of 62 and a standard deviation of 5.

Determine the probability that the time of a random journey from this bus service will be between 50 and 60 minutes.

$\boxed{0.3364}$

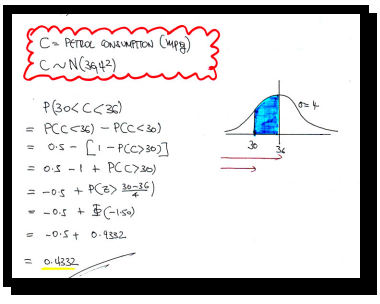


Question 8

The petrol consumption C, measured in mpg, of a certain make of car is Normally distributed with a mean of 36 and a standard deviation of 4.

Find the probability that the petrol consumption of one of the cars of this make will be measured between 30 mpg and 36 mpg.

$\boxed{0.4332}$

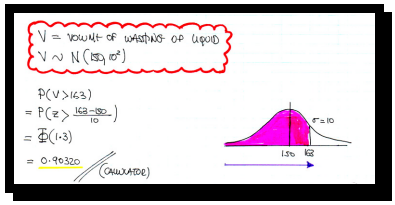


Question 9

The volume of washing up liquid, V ml, in a bottle is Normally distributed with a mean of 150 and a standard deviation of 10.

Find the probability a bottle selected at random will contain less than 163 ml.

0.90320

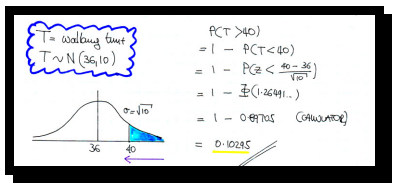


Question 10

Antonia's walking times to school, T minutes, are Normally distributed with a mean of 36 and a variance of 10.

Find the probability that her next walking time to school will be over 40 minutes.

0.10295

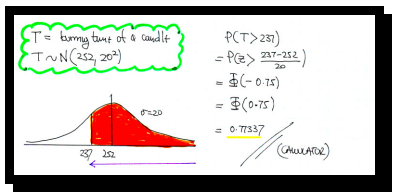


Question 11

The burning times of scented candles, T minutes, are Normally distributed with a mean of 252 and a standard deviation of 20.

Find the probability that one such candle will burn for more than 237 minutes.

$$\boxed{0.77337}$$

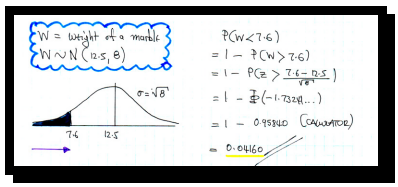


Question 12

The weights of decorating marbles, W grams, are Normally distributed with a mean of 12.5 and a variance of 8.

Find the probability that one such marble will weigh less than 7.6 grams.

$$\boxed{0.04160}$$

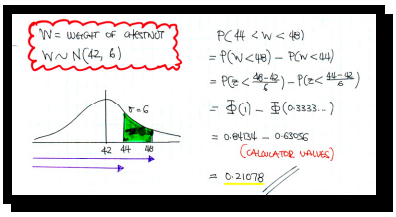


Question 13

The weights of raw chestnuts, W grams, are Normally distributed with a mean of 42 and a standard deviation of 6.

Find the probability that the weight of a chestnut picked at random will be between 44 and 48 grams.

$$\boxed{0.21078}$$

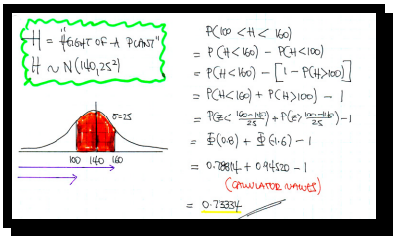


Question 14

The heights of sunflower plants, H cm, are Normally distributed with a mean of 140 and a standard deviation of 25.

Determine the probability the height of a random sunflower plant will have a height between 100 and 160 cm.

$$\boxed{0.73334}$$

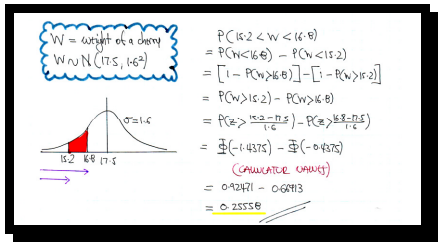


Question 15

The weights of cherries, W grams, are Normally distributed with a mean of 17.5 and a standard deviation of 1.6.

Find the probability the weight of a cherry will be between 15.2 and 16.8 grams.

0.25558

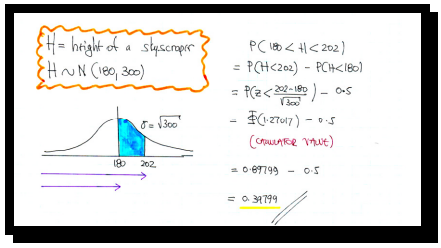


Question 16

The heights of skyscrapers in a very populous city, H metres, are Normally distributed with a mean height of 180 and variance of 300.

Find the probability the height of a skyscraper will be between 180 and 202 metres.

0.398



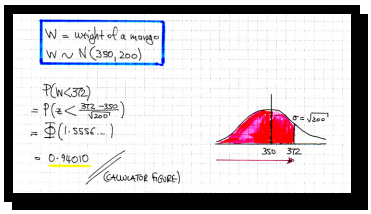
Question 17

A mango that weighs over 372 grams is considered as "large" in size.

The weights of mangos, W grams, are Normally distributed with a mean of 350 and a variance of 200.

Find the probability that a mango picked at random will not be large.

$\boxed{0.9401}$

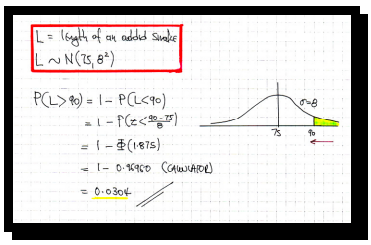


Question 18

The lengths of adder snakes, L cm, are Normally distributed with a mean of 75 and a standard deviation of 8.

Find the probability the length of such a snake will be over 90 cm.

$\boxed{0.0304}$

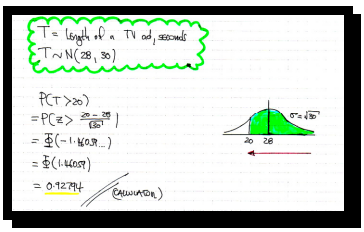


Question 19

The lengths of TV advertisements, in seconds, are Normally distributed with a mean of 28 and a variance of 30.

Find the probability that next TV advertisement will exceed 20 seconds.

$\boxed{0.92794}$

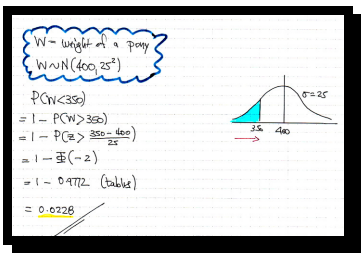


Question 20

The weights of ponies, W kg, are Normally distributed with a mean of 400 and a standard deviation of 25.

Determine the probability that the weight of a randomly chosen pony will be less than 350 kg.

$\boxed{0.0228}$

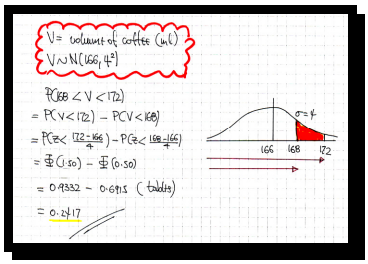


Question 21

The volume of cups of coffee, V ml, dispensed by a machine are assumed to be Normally distributed with a mean of 166 and a standard deviation of 4.

Find the probability a cup filled at random by the above mentioned machine will contain between 168 and 172 ml.

0.2417

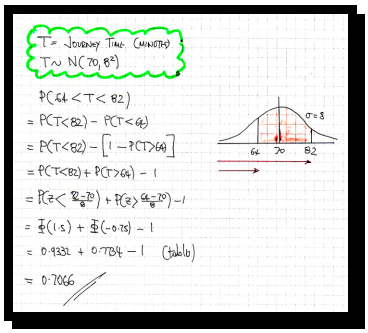


Question 22

The journey times of a certain train service, T minutes, are Normally distributed with a mean of 70 and a standard deviation of 8.

Calculate the probability the time of a random journey, of this train service, will be between 64 and 82 minutes.

0.7066

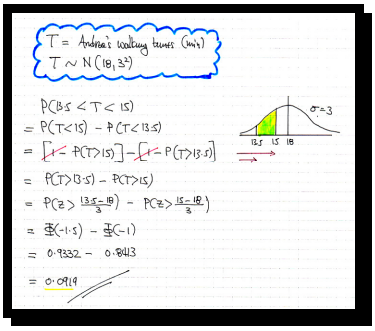


Question 23

The time, T minutes, Andrea takes to walk to school are Normally distributed with a mean of 18 and a standard deviation of 3.

Determine the probability that on a given day Andrea will take between 13.5 and 15 minutes to walk to school.

$\boxed{0.0919}$

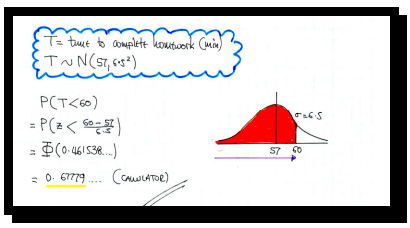


Question 24

The times taken by a large group of students to complete a piece of homework, T minutes, are Normally distributed with a mean of 57 minutes and standard deviation of 6.5.

Find the probability that the time taken by a random student from the group to complete this homework will be less than 60 minutes.

$\boxed{0.67779...}$

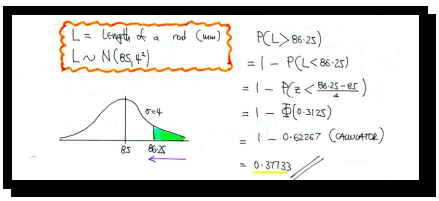


Question 25

The lengths of rods cut by a machine, L mm, are Normally distributed with a mean of 85 and standard deviation of 4.

Find the probability that a rod picked at random will exceed 86.25 mm.

$\boxed{0.37733}$

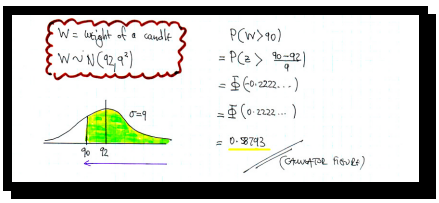


Question 26

The weights of candles, W grams, are Normally distributed with a mean of 92 and standard deviation of 9.

Find the probability that a candle picked at random will exceed 90 grams.

$\boxed{0.58793}$

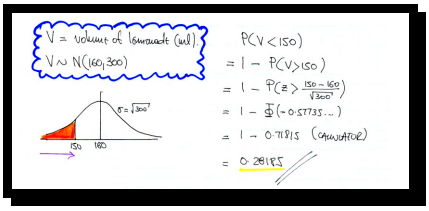


Question 27

The volume of glasses of lemonade, V ml, are Normally distributed with a mean of 160 and variance of 300.

Find the probability that a glass picked at random will contain less than 150 ml.

$\boxed{0.28185}$

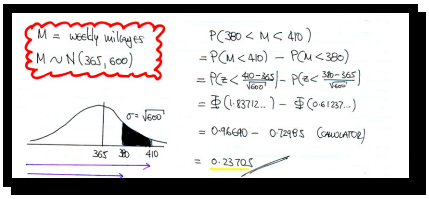


Question 28

The weekly mileages covered by a sales rep, M miles, are Normally distributed with a mean of 365 and variance of 600.

Find the probability that in a random week the rep will cover a mileage between 380 and 410.

$\boxed{0.23705}$

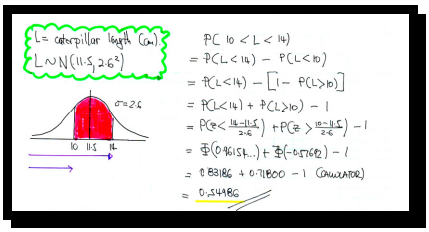


Question 29

The lengths of caterpillars, L cm, are Normally distributed with a mean of 11.5 and standard deviation of 2.6.

Find the probability that the length of a caterpillar picked at random will be between 10 cm and 14 cm.

0.54986

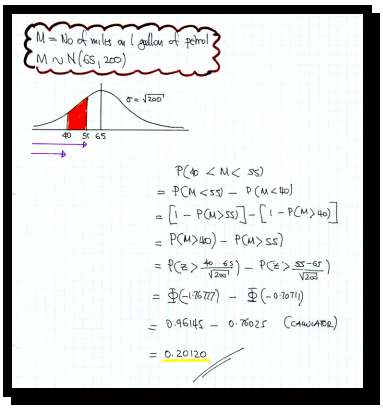


Question 30

The mileages covered by a certain make of car, M miles, on a single gallon of petrol are Normally distributed with a mean of 65 and a variance of 200.

Find the probability that the distance covered on one gallon of petrol by this make of car will be between 40 and 55 miles.

0.20120

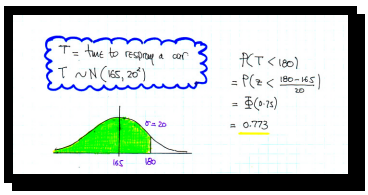


Question 31

Nathan works as a car sprayer in a garage and the time, T minutes, he spends re-spraying a typical car can be modelled by a Normal distribution with a mean of 165 and standard deviation of 20.

Find the probability that the time Nathan will spend re-spraying the next car will be less than 180 minutes.

$\boxed{0.773}$

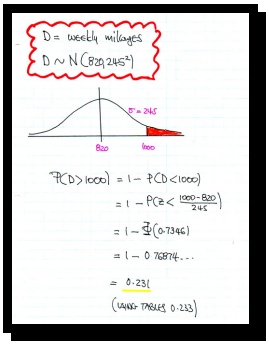


Question 32

The weekly distances covered by a taxi driver, D miles, are Normally distributed with a mean of 820 and standard deviation of 245.

Find the probability that the distance this taxi driver will cover next week will exceed 1000 miles.

$\boxed{0.233}$

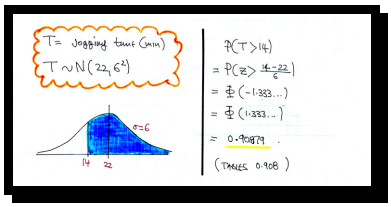


Question 33

Maria goes for a jog every morning and the time T minutes spent jogging can be modelled by a Normal distribution with a mean of 22 and standard deviation of 6.

Find the probability that Maria will jog for at least 14 minutes next morning.

$\boxed{0.908}$

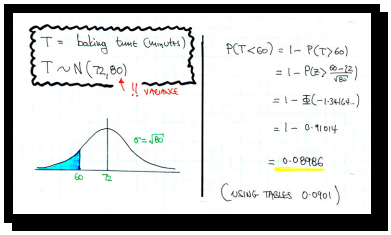


Question 34

The average baking time for a loaf of bread is 72 minutes and this time is assumed to be Normally distributed with a variance of 80.

Find the probability that the next loaf of bread would be baked in under 1 hour.

$\boxed{0.090}$

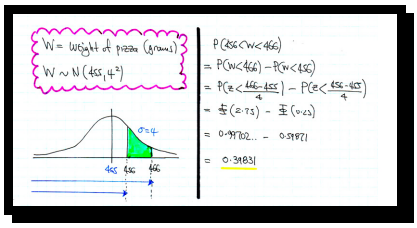


Question 35

The weight of a certain supermarket pizza brand, W grams, is thought to be Normally distributed with a mean of 455 and standard deviation of 4.

Find the probability that one such pizza picked at random from this supermarket, will weigh between 456 and 466 grams.

$\boxed{0.398}$

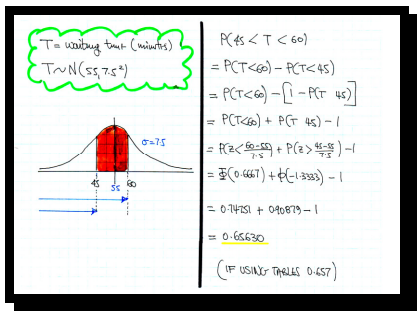


Question 36

The waiting time to change tyres in a garage, T minutes, can be modelled by a Normal distribution with a mean of 55 and standard deviation of 7.5.

Find the probability that the next customer arriving for a tyre change will have to wait between 45 and 60 minutes.

$\boxed{0.657}$

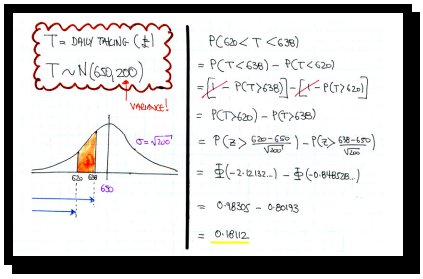


Question 37

The daily takings of a small shop, £T, are Normally distributed with a mean of £650 and a variance of 200.

Find the probability that the takings of a random day will be between £620 and £638.

$\boxed{0.181}$

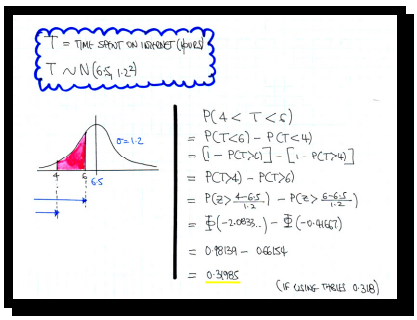


Question 38

The time Helena spends on the Internet every week, T hours, can be modelled by a Normal distribution with a mean of 6.5 and standard deviation of 1.2.

Find the probability that in the next week Helena will spent on the Internet between 4 and 6 hours.

$\boxed{0.318}$



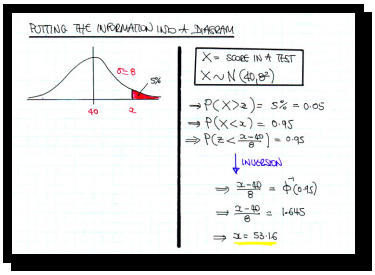
CALCULATING FROM GIVEN PROBABILITIES

Question 1

The scores in a test are Normally distributed with a mean of 40 and a standard deviation of 8.

Find the score exceeded in 5% of the tests.

$\boxed{53.2}$

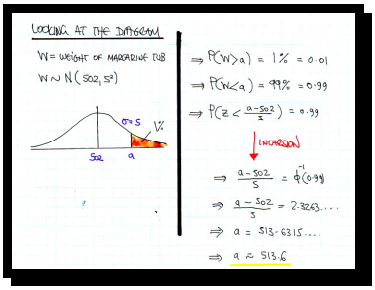


Question 2

The weights of tubs of margarine are Normally distributed with a mean of 502 grams and a standard deviation of 5.

Find the weight exceeded by 1% of the tubs.

$\boxed{513.6}$

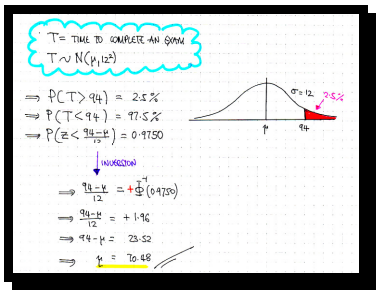


Question 3

The times, in minutes, taken by a group of students to complete a mock Biology Exam are thought to be Normally distributed with a standard deviation of 12.

Find the mean time if 2.5% of the students took over 94 minutes to complete this mock Biology Exam.

$$\boxed{\mu \approx 70.48}$$

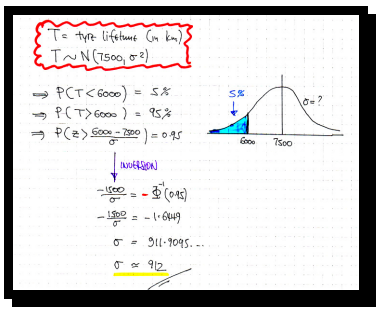


Question 4

The lifetimes of a certain brand of car tyres, in km, are Normally distributed with a mean of 7500.

Find the standard deviation, if 5% of these tyres last less than 6000 km.

$$\boxed{\sigma \approx 912}$$

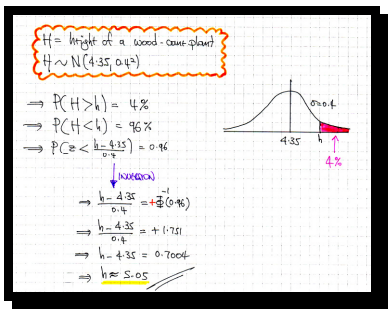


Question 5

The heights of mature wood cane plants, in metres, are Normally distributed with a mean of 4.35 and a standard deviation of 0.4.

Find the height exceeded by 4% of these plants.

≈ 5.05

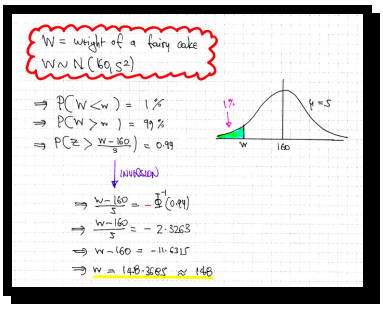


Question 6

The weights of fairy cakes, in grams, produced by a local baker are assumed to be Normally distributed with mean of 160 and standard deviation of 5.

Find the weight **not** exceeded by 1% of these fairy cakes.

≈ 148

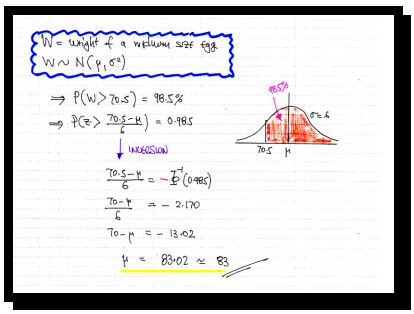


Question 7

The weights of eggs, in grams, classed as medium in size are thought to be Normally distributed with a standard deviation of 6.

Determine the mean weight of a medium size egg if 98.5% of the medium size eggs weigh more than 70.5 grams.

$$\boxed{\mu \approx 83}$$

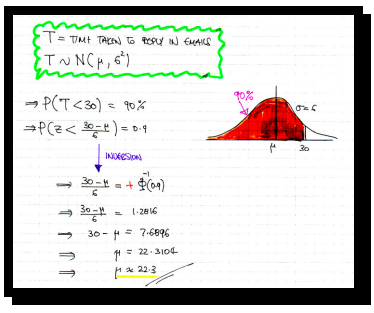


Question 8

The time, in minutes, Jonathan spends every day replying to e-mails is thought to be Normally distributed with a standard deviation of 6.

Find the average time Jonathan spends replying to his e-mails every day, if typically in 9 out of 10 days he spends less than 30 minutes on this task.

$$\boxed{\mu \approx 22.3}$$

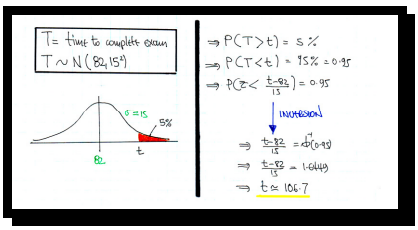


Question 9

The times taken by students to complete a practice Maths test are Normally distributed with a mean of 82 minutes and a standard deviation of 15.

Find the time exceeded by 5% of the students.

106.7

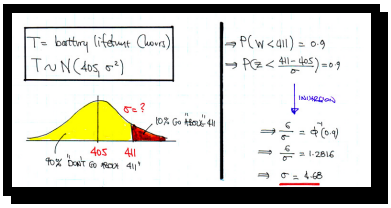


Question 10

The lifetimes of a certain brand of battery are assumed to be Normally distributed with a mean of 405 hours.

Find the standard deviation of these battery lifetimes, if 90% of these batteries **do not** achieve a lifetime of 411 hours.

4.7

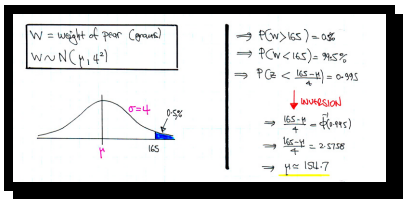


Question 11

The weights of pears classed as "grade A" are Normally distributed with a standard deviation of 4 grams.

Find the mean weight of a "grade A" pear if 0.5% of the weights of these pears exceed 165 grams.

$$\mu \approx 155$$

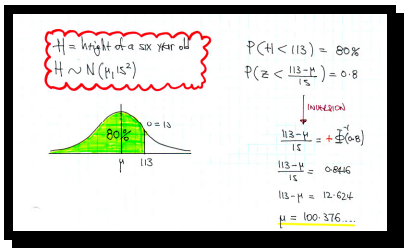


Question 12

The heights of six year old girls, in cm, are Normally distributed with a standard deviation of 15.

Calculate the mean height of six year olds, if 80% of the six year old girls are shorter than 113 cm.

$$\mu = 100.376...$$

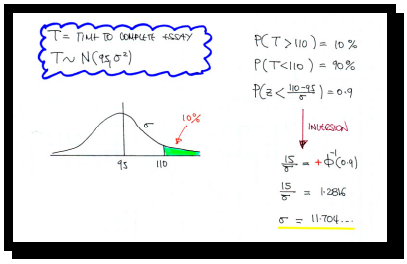


Question 13

The times taken by students to complete a Psychology essay are Normally distributed with a mean of 95 minutes and unknown standard deviation.

Find the standard deviation, if 10% of the students took more than 110 minutes to complete this essay.

$$\boxed{\sigma = 11.704...}$$



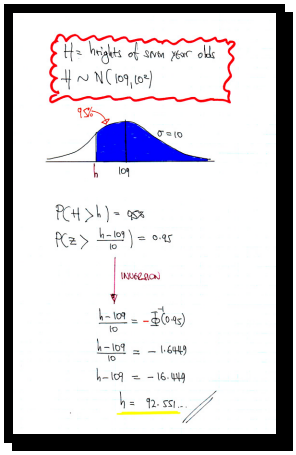
Question 14

The heights of seven year old boys, in cm, are Normally distributed with a mean of 109 and a standard deviation of 10.

95% of these seven year old boys are taller than a certain height h.

Find the value of h.

$$\boxed{h = 92.551...}$$

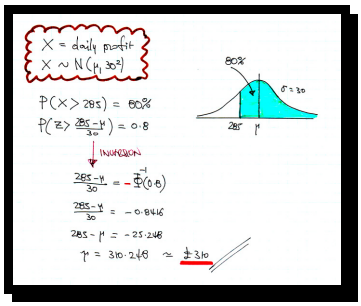


Question 15

The daily profit, in £, of a clothes shop can be modelled by a Normal distribution with a standard deviation of 30.

Find, to the nearest £, the average daily profit of the shop, if in 4 out of 5 days the daily profit exceeds £285.

£310



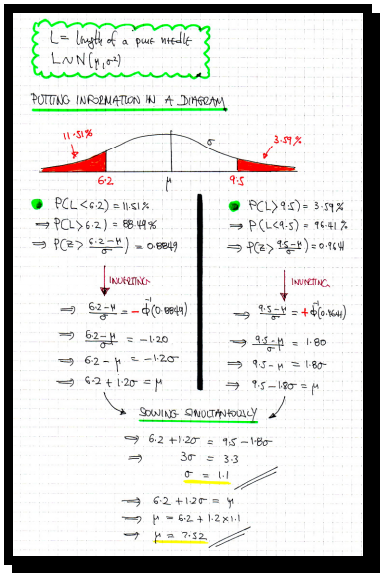
Question 16

The lengths of pine needles, in cm, are Normally distributed.

It is further given that 11.51% of these pine needles are shorter than 6.2 cm and 3.59% are longer than 9.5 cm.

Find the mean and the standard deviation of the length of these pine needles.

$\boxed{\mu = 7.52}$, $\boxed{\sigma = 1.1}$



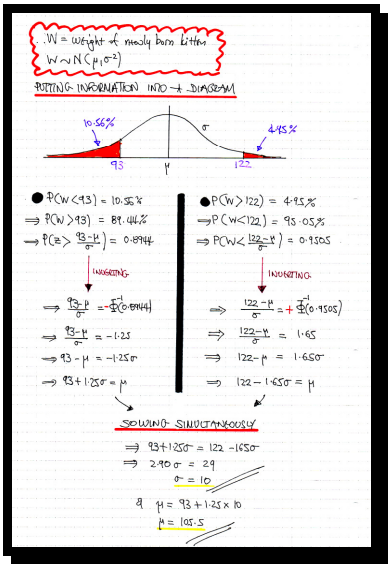
Question 17

The weights of newly born kittens are Normally distributed.

4.95% of newly born kittens are heavier than 122 grams and 10.56% are lighter than 93 grams.

Find the mean and the standard deviation of the weights of newly born kittens.

$$\boxed{\mu = 105.5}\ ,\ \boxed{\sigma = 10}$$



VARIOUS QUESTIONS

Question 1 (+)**

An airline operates between Manchester and Madrid.

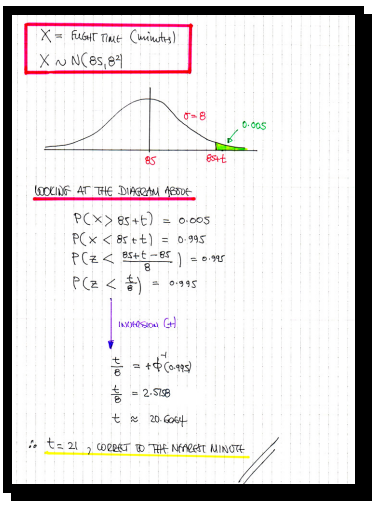
The flight time may be modelled by a Normal distribution with mean of 85 minutes and standard deviation 8.

In order to boost sales for the service, the airline decides to refund the fares if a flight time exceeds the mean flight time by t minutes.

The airline does not want to refund more than 0.005 of the fares.

Find the value of t, correct to the nearest minute.

$\boxed{}$, $\boxed{t=21}$



Question 2 (***)

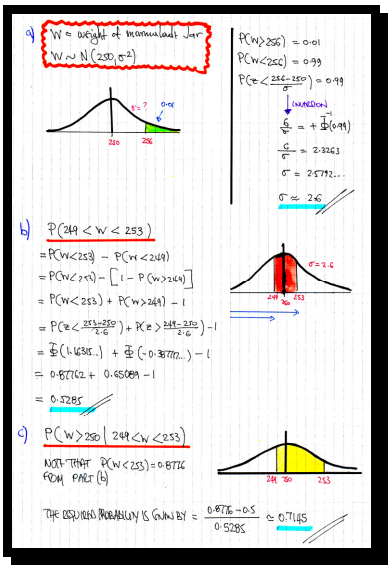
The weights of marmalade jars are Normally distributed with a mean of 250 grams.

a) Calculate, correct to 1 decimal place, the standard deviation of these jars if 1% of the jars are heavier than 256 grams.

b) Using the answer of part **(a)**, determine the probability that the weight of one such marmalade jar is between 249 and 253 grams.

c) Given that the weight of a randomly picked marmalade jar is between 249 and 253 grams, find the probability that the jar weighs more than 250 grams.

$\boxed{}$, $\boxed{\sigma \approx 2.6}$, $\boxed{0.5285}$, $\boxed{0.7145}$



Question 3 (***)

A continuous random variable X is Normally distributed with mean μ and standard deviation σ.

It is further given that $\mathrm{P}\left(X>\mu+a\right)=0.20$, where a is a positive constant.

Determine ...

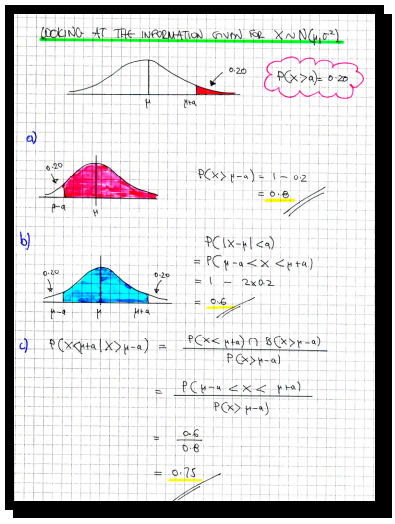
a) ... $\mathrm{P}\left(X>\mu-a\right)$.

b) ... $\mathrm{P}\left(\left|X-\mu\right|<a\right)$.

c) ... $\mathrm{P}\left(X<\mu+a\left|X>\mu-a\right.\right)$.

$\boxed{}$, $\boxed{\mathrm{P}\left(X>\mu-a\right)=0.8}$, $\boxed{\mathrm{P}\left(\left|X-\mu\right|<a\right)=0.6}$,

$\boxed{\mathrm{P}\left(X<\mu+a\left|X>\mu-a\right.\right)=0.75}$



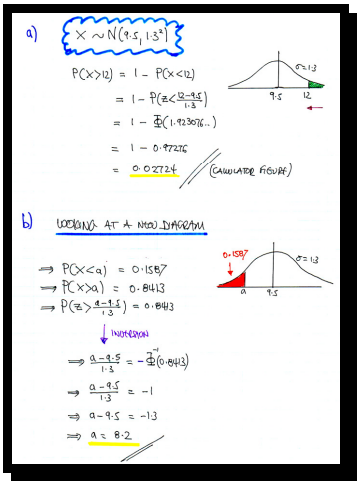
Question 4 (***)

The continuous random variable X is Normally distributed with a mean of 9.5 and a standard deviation of 1.3.

a) Find $\mathrm{P}(X>12)$.

b) Determine the value of a such that $\mathrm{P}(X<a)=0.1587$

$\boxed{}$, $\boxed{0.02724}$, $\boxed{a=8.2}$



Question 5 (*+)**

The volume of shower gel bottles, V ml, is Normally distributed with a mean of 250 and a variance of 10.

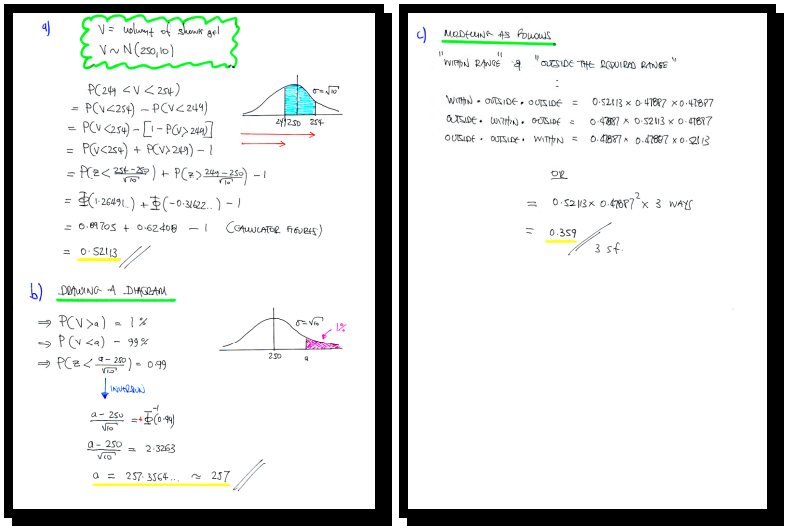
a) Find the probability that the volume of one of these shower gel bottles picked at random will be between 249 ml and 254 ml.

b) Determine the value of V exceeded by 1% of the shower gel bottles.

Three shower gel bottles are picked at random.

c) Find the probability that the volume of only one of these three bottles will be between 249 ml and 254 ml.

$\square$, $\boxed{0.52113}$, $\boxed{\approx 257}$, $\boxed{0.359}$



Question 6 (*+)**

The volume of still water in Ebian bottles is Normally distributed with a mean of 502 ml and standard deviation 2.5 ml.

A bottle of Ebian still water is selected at random.

a) Determine the probability that the bottle will contain ...

i. ... less than 506 ml.

ii. ... less than 495 ml.

iii. ... between 495 ml and 506 ml.

iv. ... exactly 500 ml.

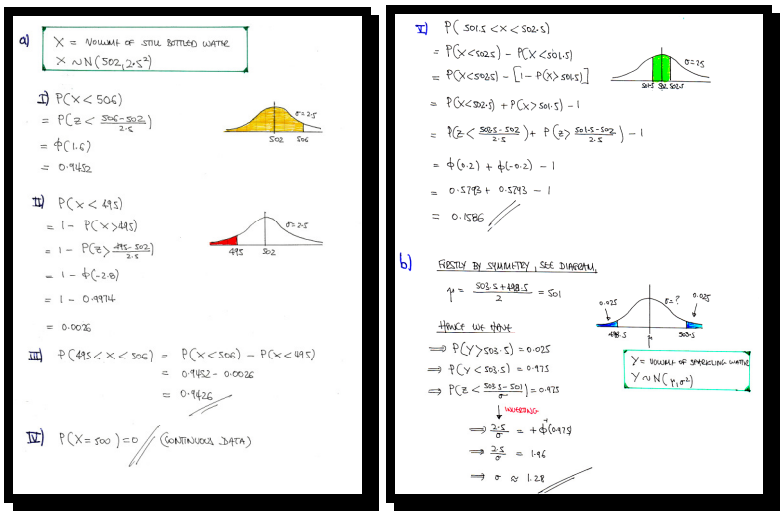
v. ... 502 ml, correct to nearest ml.

The volume of sparkling water in Ebian bottles is Normally distributed with mean μ ml and standard deviation σ ml.

It is known that 2.5% of these bottles contain more than 503.5 ml and 2.5% of these bottles contain less than 498.5 ml.

b) Determine the value of σ.

$\boxed{}$, $\boxed{0.9452}$, $\boxed{0.0026}$, $\boxed{0.9426}$, $\boxed{0}$, $\boxed{0.1586}$, $\boxed{\sigma \approx 1.28}$



Question 7 **(***+)**

The lifetimes, in hours, of a certain make of light bulbs are assumed to be Normally distributed with a mean of 5500 hours and a standard deviation of 120.

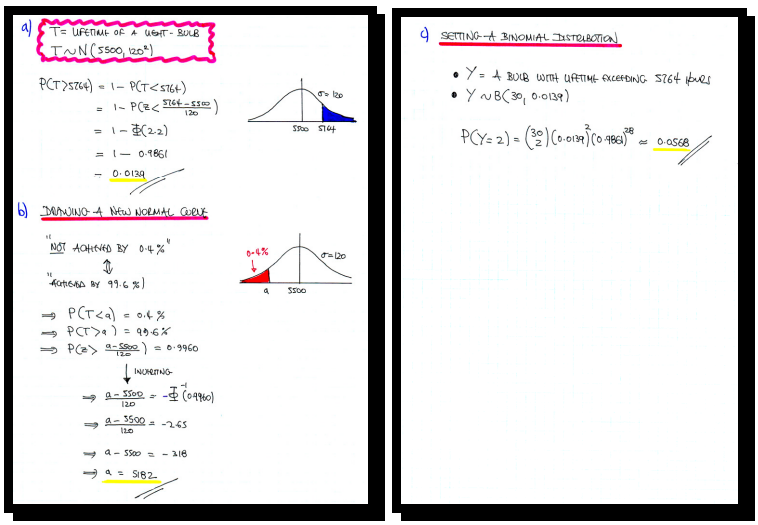
a) Find the probability that the lifetime of a light bulb picked at random will exceed 5764 hours.

b) Determine the lifetime **not** achieved by 0.4% of these light bulbs.

Thirty of these light bulbs are selected.

c) Find the probability that two out of these thirty light bulbs will have a lifetime exceeding 5764 hours.

$\boxed{}$, $\boxed{0.0139}$, $\boxed{5182}$, $\boxed{0.0568}$

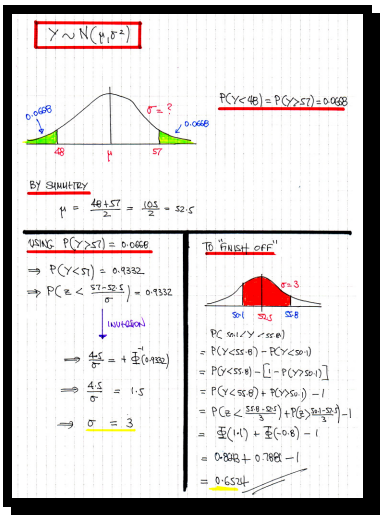


Question 8 **(***+)**

The random variable Y is Normally distributed with mean μ and variance σ^2.

Given that $\mathrm{P}(Y<48)=\mathrm{P}(Y>57)=0.0668$, find the value of $\mathrm{P}(50.1<Y<55.8)$.

$\boxed{}$, $\boxed{0.6524}$



Question 9 **(***+)**

An airline operates between London and New York.

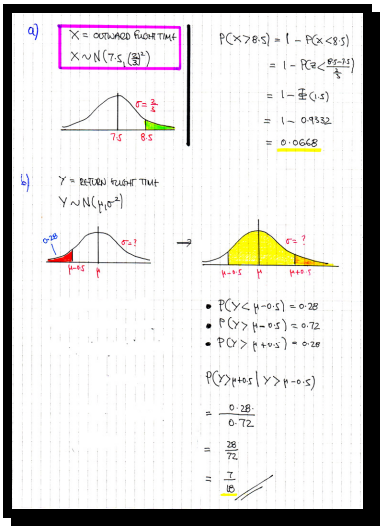
The outward flight time, X hours, may be modelled by a Normal distribution with mean of $7\frac{1}{2}$ hours and a standard deviation of $\frac{2}{3}$.

a) Find the probability that one such flight will take more than $8\frac{1}{2}$ hours.

The return flight time, Y hours, may also be modelled by a Normal distribution with mean μ hours and unknown standard deviation.

b) Given that $P(Y < \mu - 0.5) = 0.28$, determine $P(Y > \mu + 0.5 | Y > \mu - 0.5)$.

$\boxed{}$, $\boxed{0.067}$, $\boxed{\frac{7}{18}}$



Question 10 (*+)**

The weights of baking apples are thought to be Normally distributed.

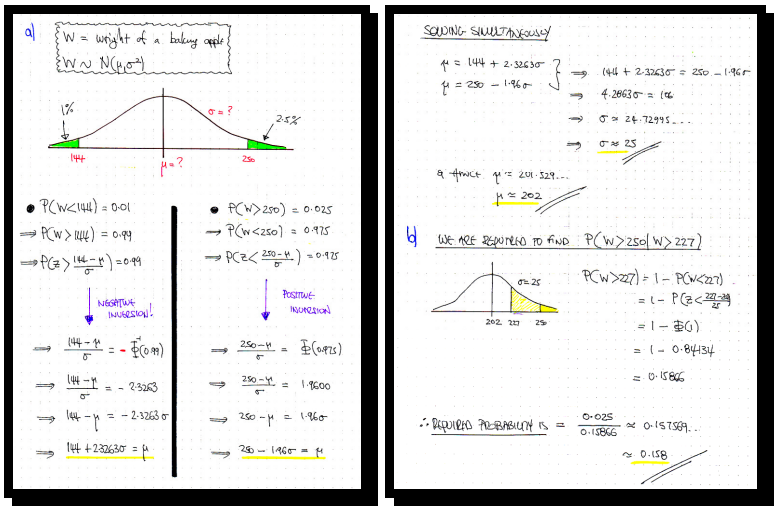
2.5% of these apples are heavier than 250 grams and 1% are lighter than 144 grams.

a) Find the mean and the standard deviation of the weights of baking apples, according to this model, giving the answers correct to the nearest integer.

You may use the mean and standard deviation found in part **(a)** to answer part **(b)**.

b) Given a baking apple weighs more than 227 grams, determine the probability it weighs more than 250 grams.

$\boxed{}$, $\boxed{\mu = 201 \text{ to } 202, \ \ \sigma \approx 25}$, $\boxed{\approx 0.158}$



Question 11 (*+)**

The contents of bottles of olive oil, in ml, produced by a small factory are Normally distributed with mean μ and standard deviation 5.

a) Find the value of μ if 97.5% of these bottles contain more than 994 ml.

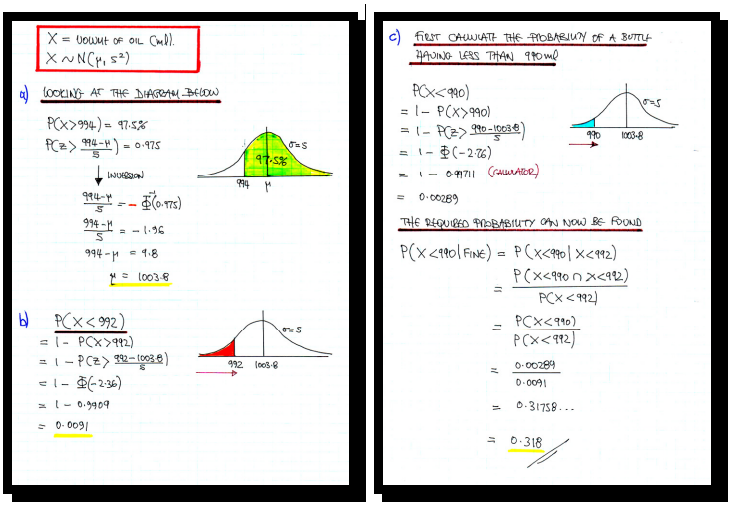
b) Using the value of μ found in part **(a)**, determine the probability that a bottle picked at random will contain less than 992 ml.

An inspector visits the factory and selects a bottle at random.

If the bottle contains less than 992 ml, the factory will get fined.

c) Given that the factory got fined, determine the probability that the bottle that the inspector examined contained less than 990 ml.

$\boxed{}$, $\boxed{1003.8}$, $\boxed{0.0091}$, $\boxed{0.318}$



Question 12 (*+)**

Paul's training session times, in minutes, are modelled as a Normal variable, distributed with a standard deviation of 18.

In 3 sessions out of 4, Paul takes more than 80 minutes to complete his training.

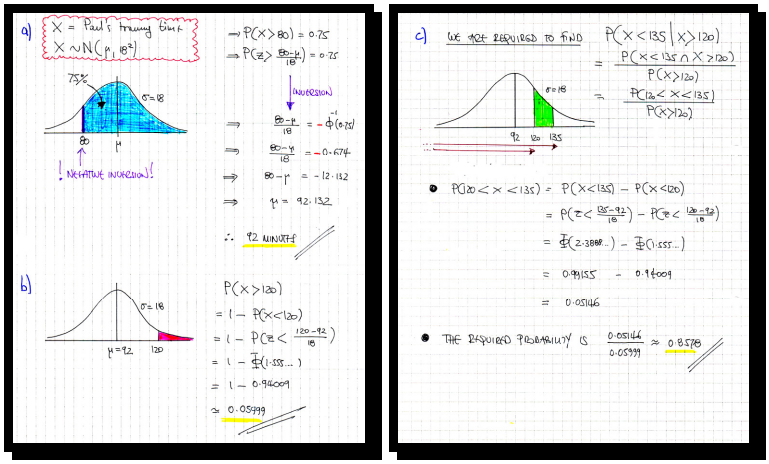
a) Determine, to the nearest minute, Paul's mean training time.

b) Find the probability that one of Paul's sessions will last more than 2 hours.

One of Paul's training sessions lasted more than 2 hours.

c) Find the probability that this particular session did not exceed $2\frac{1}{4}$ hours.

$\boxed{}$, $\boxed{\mu \approx 92}$, $\boxed{\mu \approx 92}$, $\boxed{\mu \approx 92}$



Question 13 (*+)**

In a doctor's surgery 1 in 40 patients wait more than 45 minutes to be seen, while 9 in 10 patients wait more than 20 minutes.

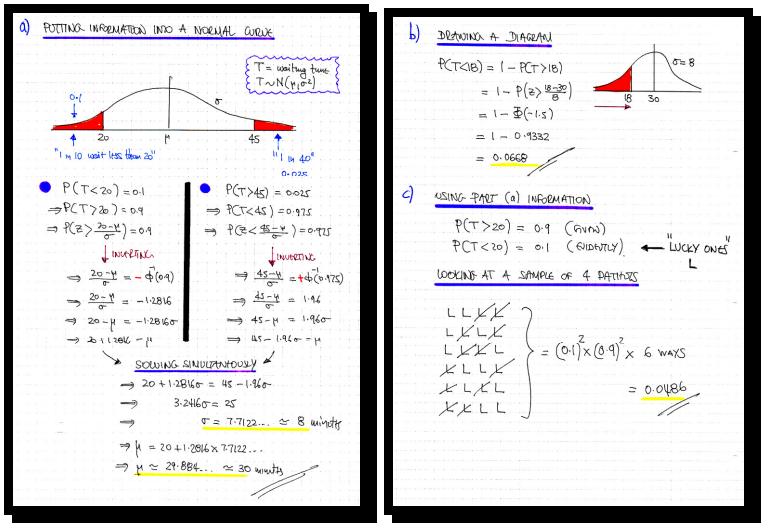
a) Assuming that these waiting times can be modelled by a Normal distribution, find the mean and standard deviation of the distribution, giving both answers correct to the nearest minute.

b) Using the answers of part **(a)** determine the probability that a randomly chosen patient waits less than 18 minutes.

4 patients, from those waiting in the surgery, are selected at random.

c) Find the probability that only 2 of these 4 patients will have to wait for more than 20 minutes.

$\boxed{}$, $\boxed{\mu \approx 30}$, $\boxed{\sigma \approx 8}$, $\boxed{0.0668}$, $\boxed{0.0486}$



Question 14 **(***+)**

The weights of rock samples collected and send to an institute A, are Normally distributed with a mean of 250 grams and a standard deviation of 40 grams.

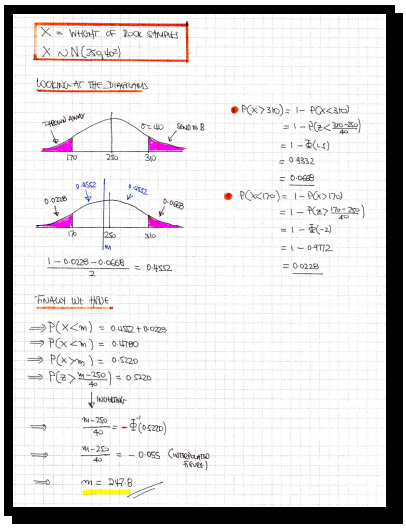
Rock samples, which weigh less than 170 grams are discarded as non-suitable.

Rock samples which weigh more than 310 grams are send away to another institute B, as their weights exceed the maximum weight that institute's A machinery can analyse.

The rest of the samples are analysed at institute A.

Determine the median weight of the samples analysed at institute A.

$\square$, $\boxed{\approx 247.8}$



Question 15 (*+)**

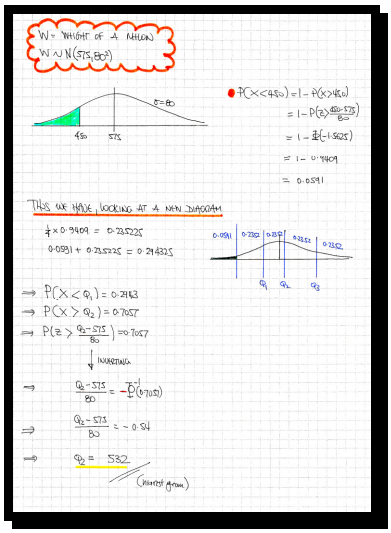
A farmer sells the melons he produces to a large supermarket chain.

The supermarket chain only accepts melons which weigh at least 450 grams.

It is assumed that the weights of this farmer's melons are Normally distributed with a mean of 575 grams and a standard deviation of 80 grams.

Calculate the lower quartile of the weights of the melons that the farmer **sells to this supermarket** chain.

$\square$, ≈ 532



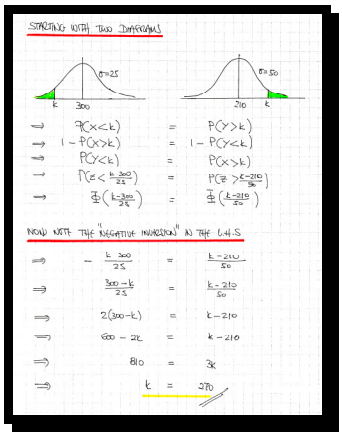
Question 16 **(****)**

The continuous random variables X and Y are independent of one another and have Normal distributions

$$X \sim \mathrm{N}\left(300, 25^2\right) \quad \text{and} \quad Y \sim \mathrm{N}\left(210, 50^2\right).$$

Given further that $P(X < k) = P(Y > k)$, determine the value of k.

$\boxed{}$, $\boxed{k = 270}$



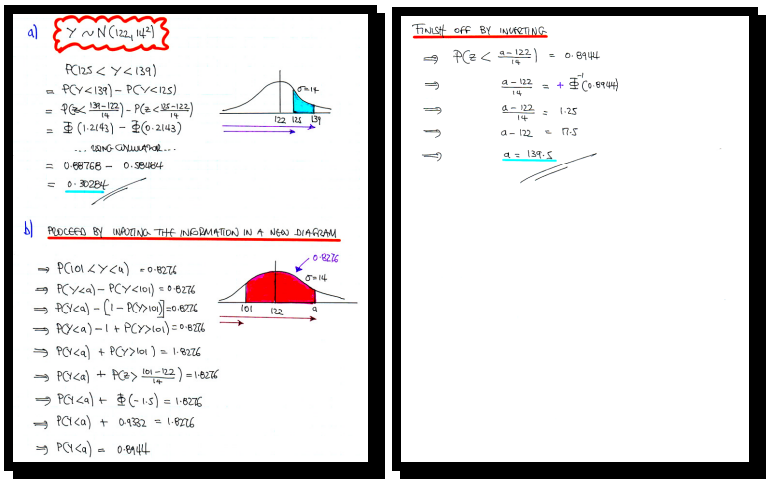
Question 17 **(****)**

The continuous random variable Y is Normally distributed with a mean of 122 and a standard deviation of 14.

a) Find $\mathrm{P}(125 < Y < 139)$.

b) Determine the value of a such that $\mathrm{P}(101 < Y < a) = 0.8276$

$\boxed{}$, $\boxed{0.30284}$, $\boxed{a = 139.5}$



Question 18 **(****)**

An airline service operates between Manchester and Madrid.

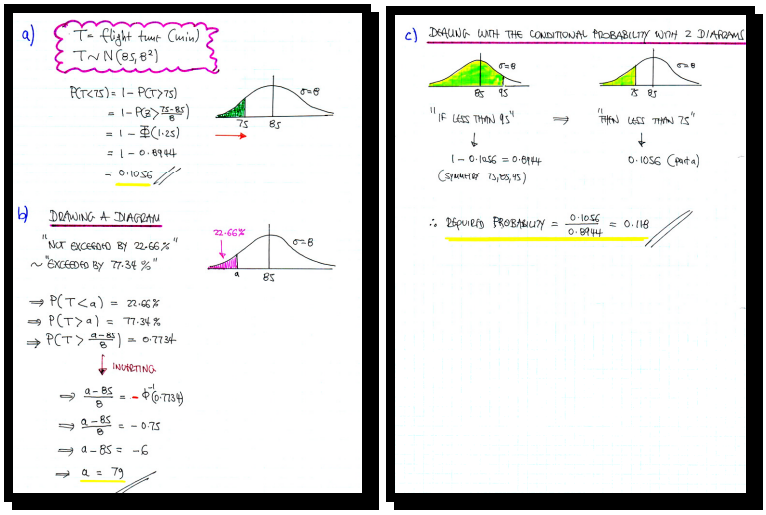
The flight times of this service, in minutes, may be modelled by a Normal distribution with mean of 85 and a standard deviation of 8.

a) Determine the probability that the next flight time of this service will take less than 75 minutes.

b) Find the time **not** exceeded by 22.66% of the flights.

c) If a flight from this service took less than 95 minutes, what is the probability that the actual flight time was in fact less than 75 minutes.

$\boxed{}$, $\boxed{0.1056}$, $\boxed{79}$, $\boxed{0.118}$



Question 19 **(****)**

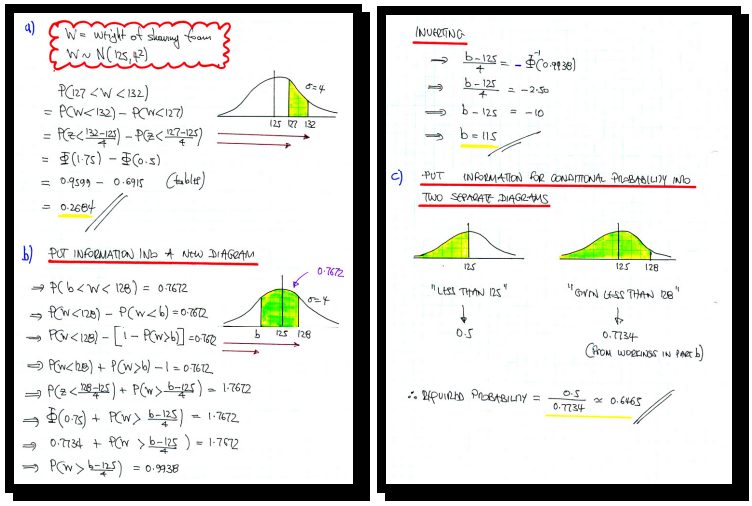
The weights, W grams, of shaving foam canisters are Normally distributed with a mean of 125 and a standard deviation of 4.

a) Determine the probability the weight of one such canister will be between 127 and 132 grams.

b) Find the value of b, so that $\mathrm{P}(b < W < 128) = 0.7672$.

c) Determine $\mathrm{P}(W < 125 \,|\, W < 128)$

$\square$, $\boxed{0.2684}$, $\boxed{b = 115}$, $\boxed{0.6465}$



Question 20 (****)

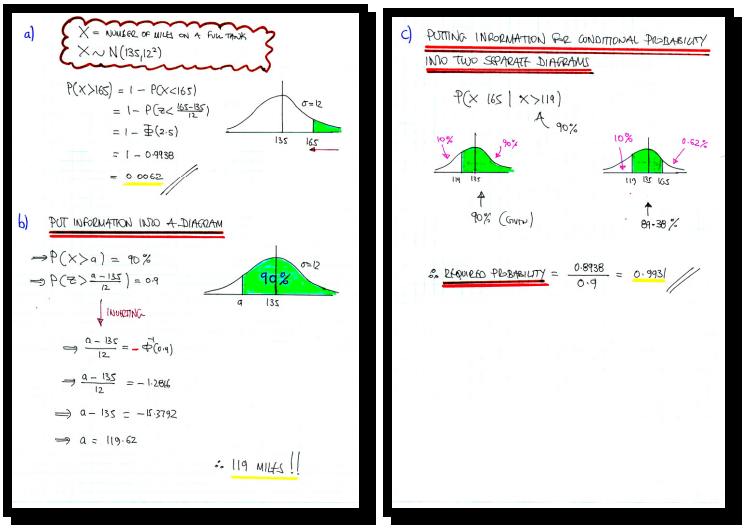
The number of miles Mark's motorbike can travel on a full tank of petrol, can be modelled by a Normal distribution with a mean of 135 and a standard deviation of 12.

a) Determine the probability that Mark can travel at least 165 miles on a full tank of petrol.

b) Find, to the nearest mile, the longest journey that Mark can make, if he is to have at least a 90% chance of completing it on a single full tank of petrol.

c) Given that Mark has a 90% chance of completing a journey on a single full tank of petrol find the probability that this journey will **not** exceed 165 miles.

$\boxed{}$, $\boxed{0.0062}$, $\boxed{119}$, $\boxed{0.9931}$



Question 21 (****)

A certain type of drug takes on average 8 minutes to act.

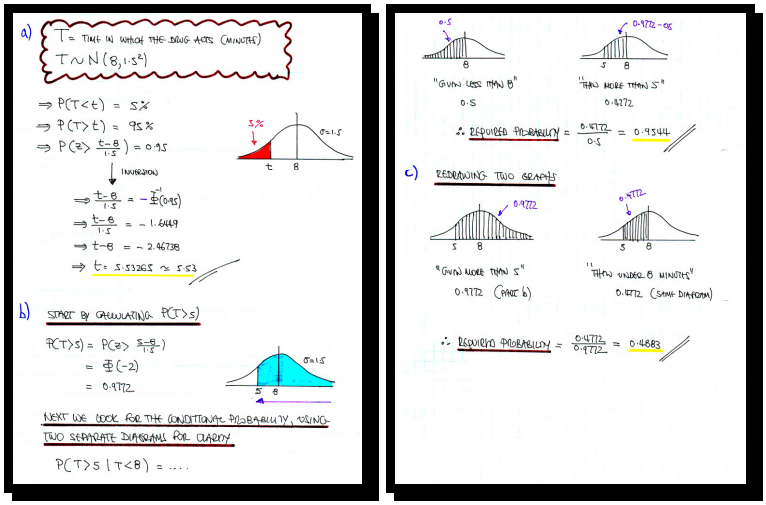
a) Assuming this time is Normally distributed with a standard deviation of 1.5, find the time under which the drug begins to act in 5% of the patients.

A patient is given this drug.

b) Given that the drug took less than 8 minutes to act, determine the probability that it actually took more than 5 minutes to act.

c) Given instead that the drug took more than 5 minutes to act, determine the probability that it actually took less than 8 minutes to act.

$\boxed{}$, $\boxed{5.53}$, $\boxed{0.9544}$, $\boxed{0.4883}$



Question 22 (****)

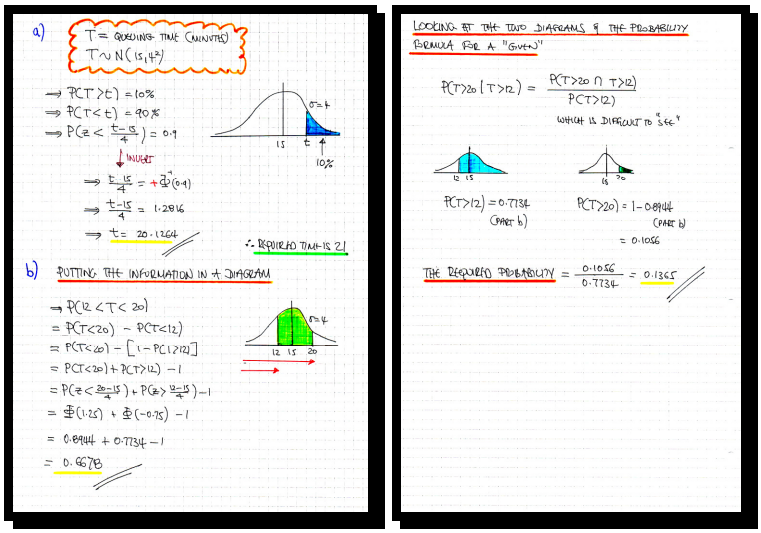
The Monday morning queuing times, in minutes, in a High Street Bank is modelled by a Normal distribution with mean 15 and standard deviation 4.

a) Find the minimum time, correct to the nearest minute, for which at most 10% of the customers have to queue.

b) Determine the probability that a randomly chosen customer will have to queue between 12 and 20 minutes.

c) Given a customer has to queue for more than 12 minutes, find the probability he has to queue for more than 20 minutes.

$\boxed{}$, $\boxed{t=21}$, $\boxed{0.6678}$, $\boxed{0.1365}$



Question 23 (****)

The time, in minutes, Tasha spends talking on her mobile phone every day has a Normal distribution with a mean of 18.

a) Calculate, correct to the nearest minute, the standard deviation of her daily talk time, if in 70% of the days she spends less than 22 minutes on her mobile phone.

Using the value of the standard deviation obtained in part **(a)**, ...

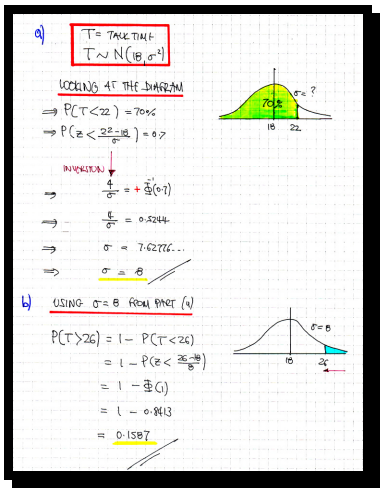
b) ... find the probability that on a randomly chosen day Tasha talks on her mobile phone for more than 26 minutes.

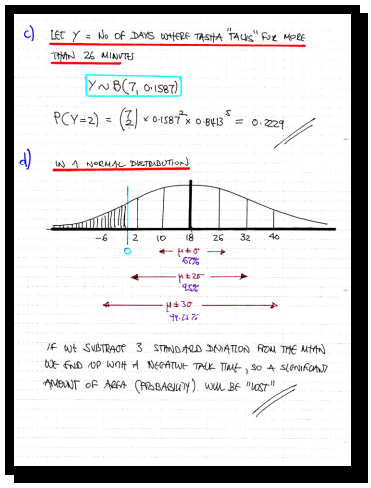
c) ... find the probability that on a randomly chosen week, Tasha talks on her mobile phone for more than 26 minutes, on exactly 2 days.

A statistician, after looking at the mean and standard deviation, claims that the time Tasha spends on her mobile phone cannot possibly be Normally distributed.

d) Explain, with justification, the statistician's reasoning.

$\boxed{}$, $\boxed{\sigma \approx 8}$, $\boxed{0.1587}$, $\boxed{0.2229}$





Question 24 (****)

The weights of packs of cheese, in grams, are thought to be Normally distributed with a standard deviation of 4.

a) Find the mean weight of a pack of cheese, if 95.5% of these packs are heavier than 248 grams.

Give the answer correct to the nearest gram.

Using the value of the mean obtained in part **(a)**, ...

b) ... determine the probability that a randomly chosen pack of cheese weighs between 250 and 256 grams.

c) ... determine the probability that given a randomly chosen pack of cheese weighs more than 248 grams then its actual weight is less than 256 grams.

Ten packs of cheese are selected at random.

d) Calculate, correct to 3 significant figures, the probability that exactly 6 of these packs weigh over 248 grams.

$\boxed{}$, $\boxed{\mu \approx 255}$, $\boxed{0.4931}$, $\boxed{0.5798}$, $\boxed{0.000653}$

