North Lanarkshire Council

HERIOT WATT UNIVERSITY

ACADÉMIE DE STRASBOURG

2015

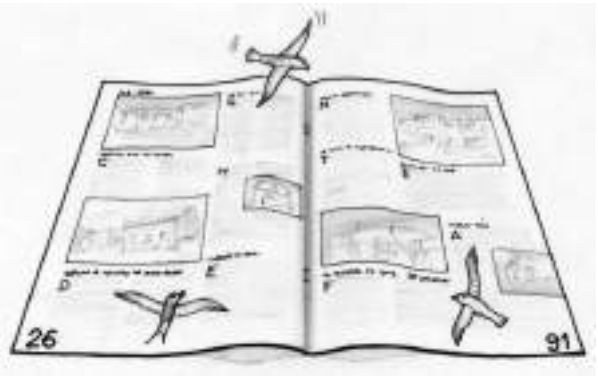
Training test
December 2015

Even partial solutions and attempts can gain marks.
Neat and careful work is important.
Hand in only one team answer sheet for each question.

Question 1 Feuilles volantes

7 MARKS

Les feuilles d'un magazine mal agrafé se sont détachées.
Voici une feuille de ce magazine au bas de laquelle on reconnaît les numéros de pages 26 et 91.
Sur chaque feuille, il y a 4 pages.
La page de couverture et la dernière page au dos du magazine sont comptées comme la première et la dernière page.



Combien de feuilles étaient placées entre les pages 26 et 91 ?
Déterminer le nombre de pages de ce magazine. Expliquer en un minimum de 30 mots.

Die Blätter einer schlecht gebundenen Zeitschrift haben sich herausgelöst.
Hier ein Blatt der Zeitschrift, auf dem unten die Seitenzahlen 26 und 91 zu erkennen sind.
Auf jedem Blatt gibt es 4 Seiten.
Die Titelseite und die Rückseite der Zeitschrift werden als erste und letzte Seite gezählt.

Wie viele Blätter waren zwischen den Seiten 26 und 91?
Bestimmt die Anzahl der Seiten dieser Zeitschrift. Begründet eure Antwort mit mindestens 30 Wörtern

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Las hojas de una revista mal grapada se han soltado.
Aquí tenemos una hoja de esa revista en cuyo pie podemos ver los números de las páginas 26 y 91.
En cada hoja, hay 4 páginas.
La página de la portada y la última página en el dorso de la revista se cuentan como la primera y la última página.

¿Cuántas hojas había entre las páginas 26 y 91?
Determina el número de páginas de esta revista. Explícalo con un mínimo de 30 palabras.

Question 1 Feuilles volantes

7 MARKS

I fogli di una rivista rilegata male si sono staccati.
Ecco un foglio della rivista sui cui bordi si riconoscono i numeri delle pagine 26 e 91.
Su ogni foglio ci sono 4 pagine.
La pagina di copertina e l'ultima sul retro della rivista sono numerate come prima e ultima pagina.

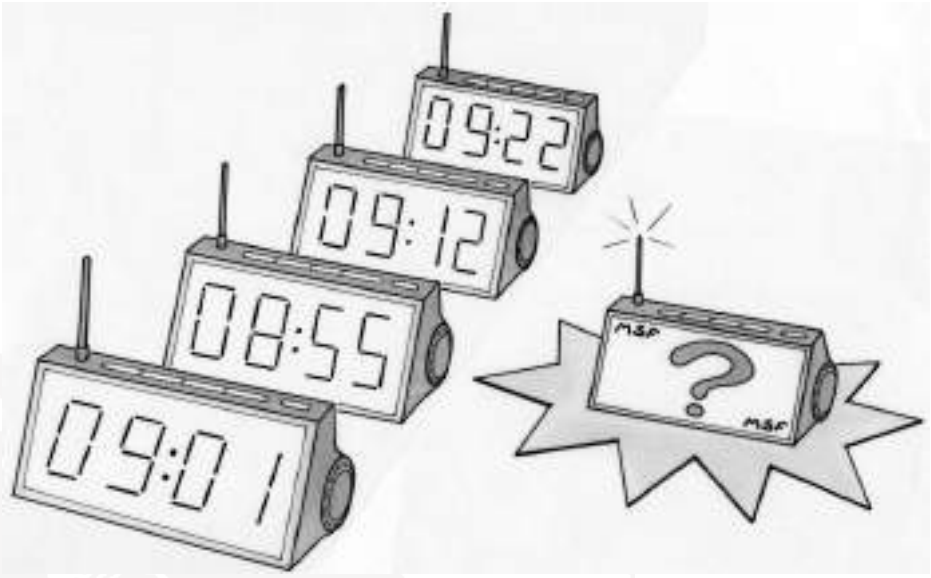
Quanti fogli erano posti tra le pagine 26 e 91 ?
Determinate il numero di pagine della rivista e spiegate la vostra risposta con un minimo di 30 parole.

Question 2 Lucky call

5 MARKS

A game is organized by Radio'Math. To win the jackpot, you have to give the correct answer. But you also need to call in at the lucky moment!
Eloi is the winner.
Ahmed phoned at 9:01; Ben at 8:55; Charlotte at 9:12 and Denis at 9:22.
The five participants all had the right answer. Their calls were separated by 3 minutes, 7 minutes, 14 minutes and 20 minutes from the time of Eloi's lucky phone call.

What time did Eloi phone at to win the jackpot? Justify your answer.

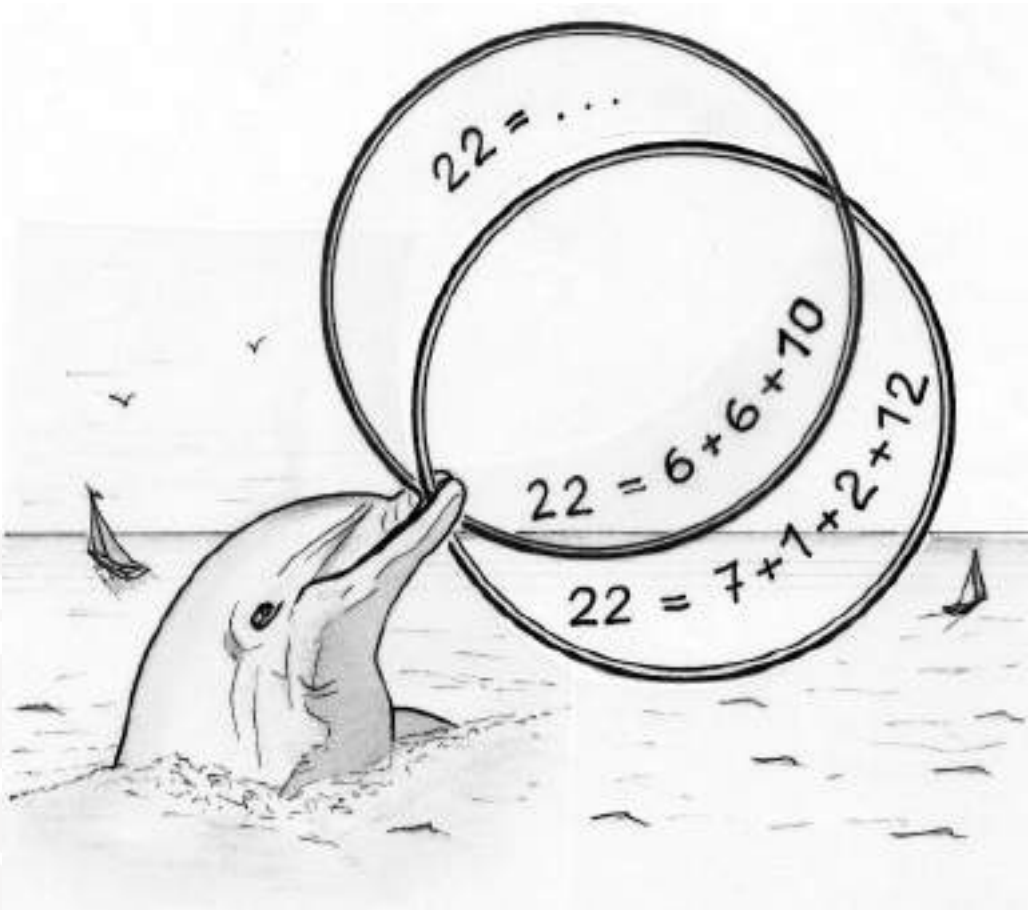


Question 3 Maximum production

7 MARKS

The number 22 can come about in various ways as a sum of natural numbers. And for every sum like that you can also work out the product of those numbers.
Example: the sum 22=7+1+2+12 gives the product 7×1×2×12=168 ;
22=6+6+10 gives 6×6×10=360.

Find the natural numbers that add up to 22 so that the product of the numbers is as large as it can be.



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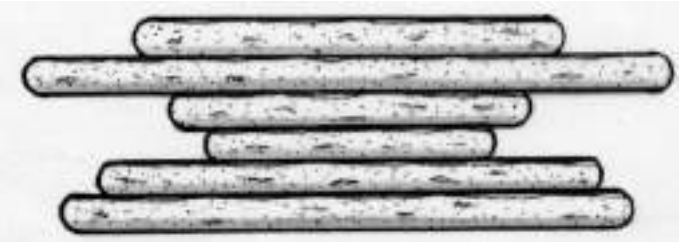
Question 4 Pancake turnover

5 MARKS



William has made six pancakes, all of different diameters. He stacked the different sized pancakes as shown in the diagram.

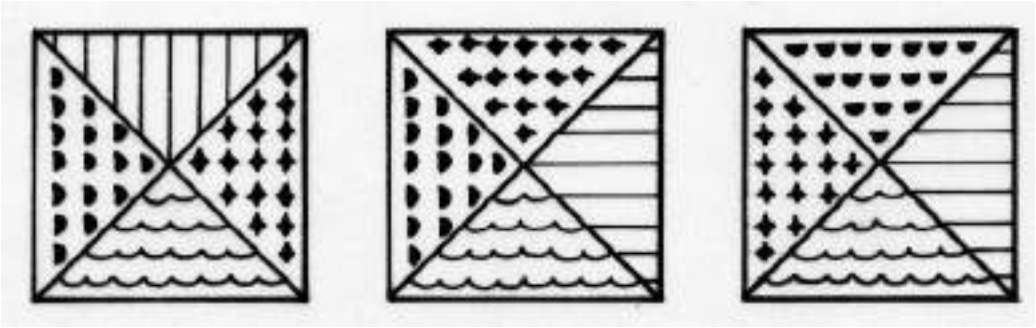
William wants to sort them in order of size, with the largest pancake at the bottom of the pile.
He has a spatula and can only use it in one way (called a turnover). He can slide the spatula under any pancake and then lift all the pancakes on the spatula and turn them over onto the pile.

How can William go about sorting the stack of pancakes in the fewest possible turnovers to get the pile arranged in order of size with the largest one at the bottom?

Question 5 Magic square

7 MARKS

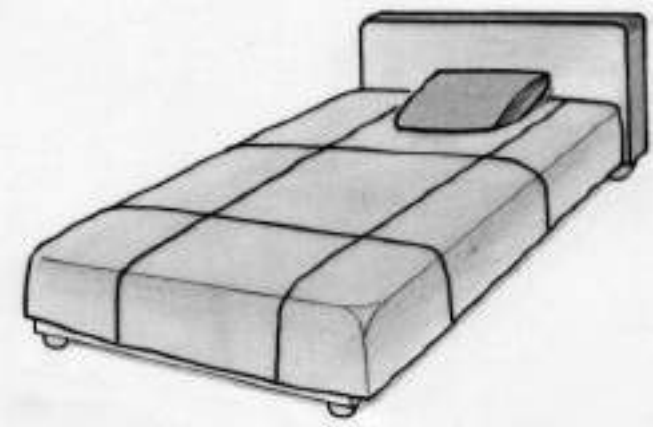
Claude and Dominique are making a patchwork quilt using 9 squares all the same size.
Claude has made the three squares shown here. He made two of each.



Each square is made up of four triangles of different material.
Dominique has made three squares – all different to each other and different to the squares that Claude has made. For each square the four different materials are used.
Draw the squares that Dominique has made.

Claude and Dominique sew their nine squares together to get a square patchwork quilt.
They make sure that any two touching squares in the design are made from the same material.

Draw a possible arrangement of the nine squares.

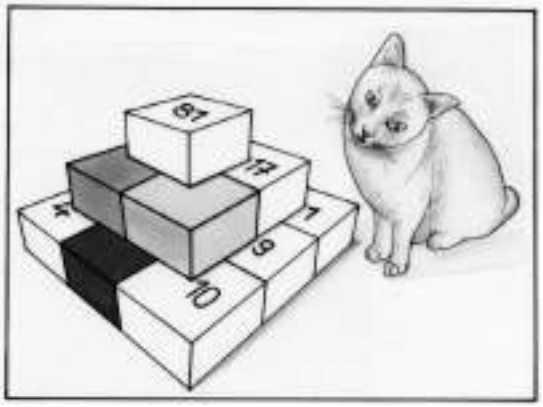


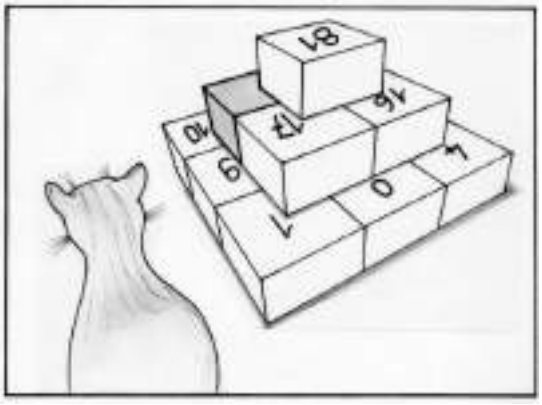
Question 6 Secrets of the pyramid

5 MARKS

Here are two views of the same pyramid. It is made of 14 bricks.
The value shown on each brick is equal to the sum of the values of the four bricks it is standing on.

Calculate the values written on the three shaded bricks.



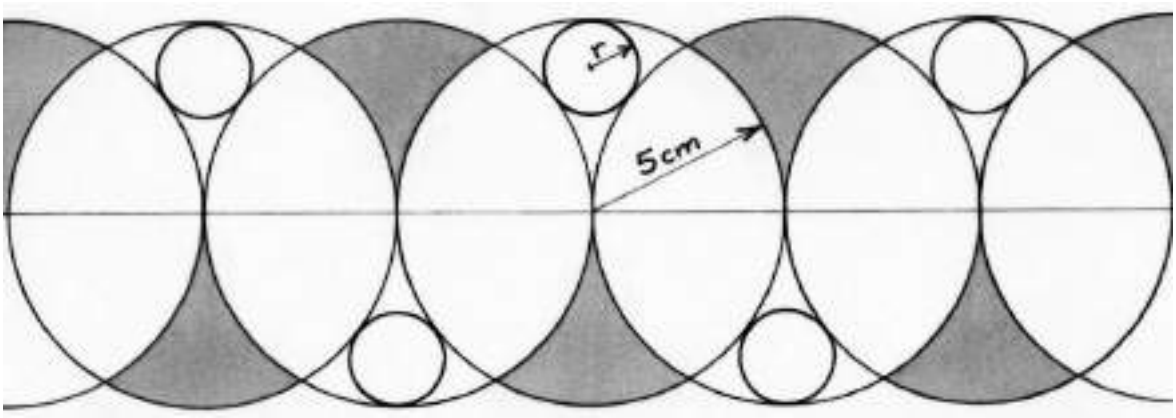


Question 7 oooo that .....

7 MARKS

Toto decorates his jotter with a pattern. On a straight line, he marks points every 5 cm. For each point, he draws a circle of radius 5 cm. To finish the pattern he draws smaller circles so that they touch three large circles.

Calculate the radius of a small circle.
Draw an accurate diagram of the pattern including the small circles.

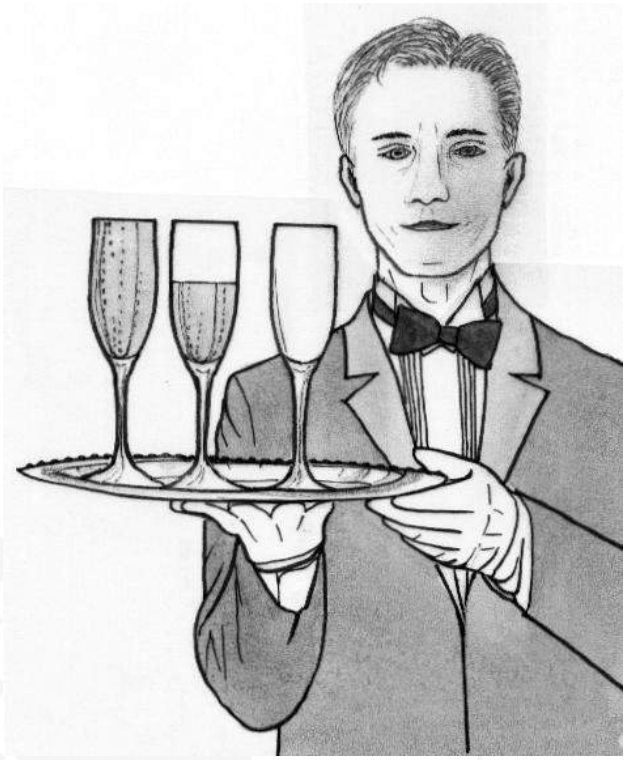


Question 8 Put your glasses on

5 MARKS

24 identical glasses are shared out equally onto 3 trays, so that there are 8 glasses on each tray. 8 of the glasses are full, 8 are half full and 8 glasses are empty.

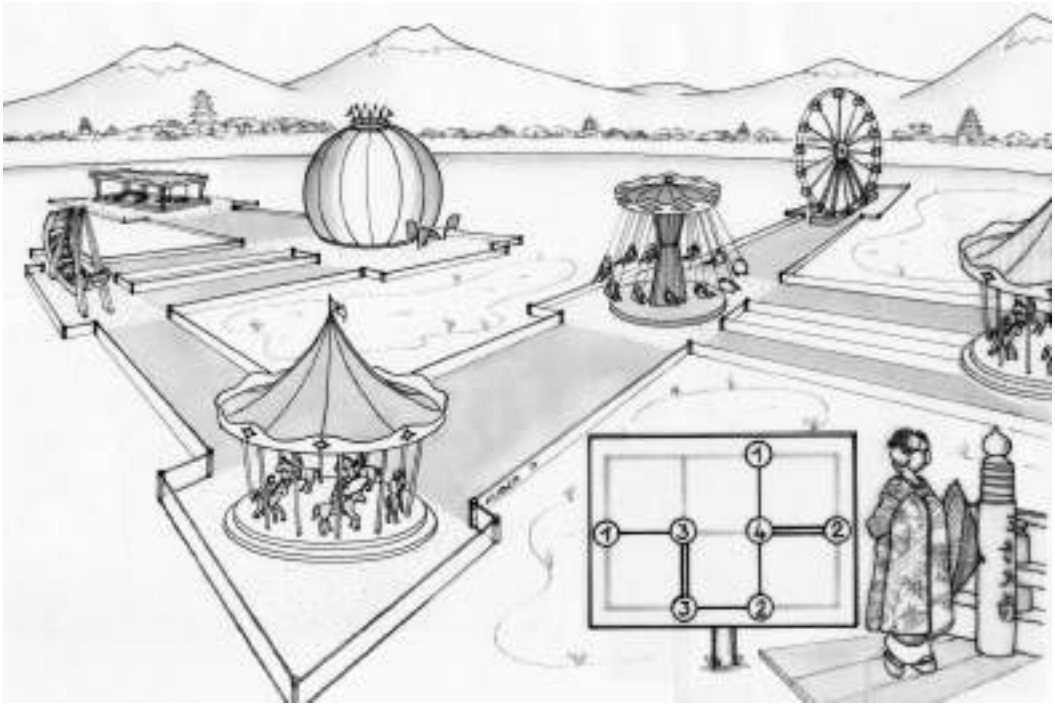
Find all the ways of arranging the 24 glasses so that the weight on each of the 3 trays will also be the same.



Question 9 Hashiwokakero

7 marks

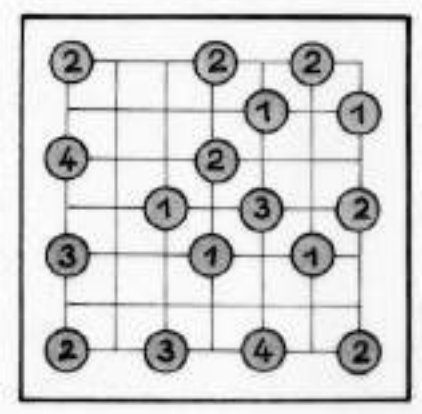
Nicole is in an amusement park. Here is the plan of the park.



The park is sectioned off on a square grid. Here are the rules for paths in the park :

- Every path must link two attractions;
- Every path between two attractions is a straight line along the grid
- The paths cannot cross each other;
- If two attractions are linked it is either by one path or by two paths;
- The number of paths to an attraction is the number written in the circle;
- From an attraction you must be able to get to every other attraction either by one path or by a series of paths.

Here is the layout of another amusement park which keeps to the same rules about paths.

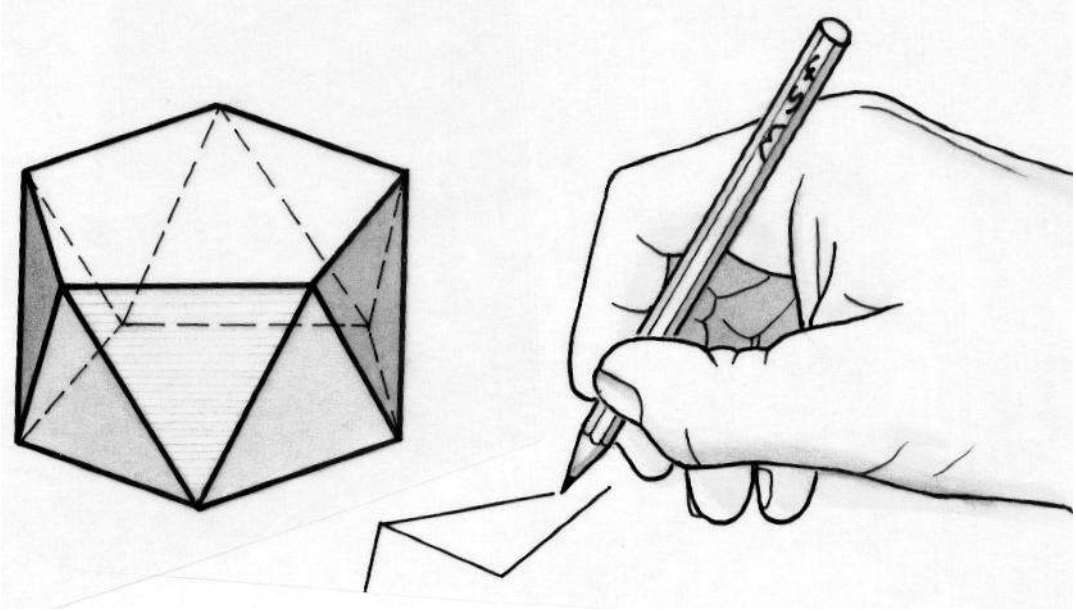


Draw the layout of the park with the paths added.

Question 10 Auntie Prism

10 MARKS

An anti-prism is a solid made up of two identical parallel faces linked by a band of alternating (base down, then base up etc) triangles.
The diagram shows an anti-prism with pentagonal bases.



Draw the net of an anti-prism with triangular bases linked by a band of equilateral triangles of side 4cm.
Construct the anti-prism and show it to your teacher.
Calculate its volume.

Question 11 The root of the problem

5 MARKS

Senior classes only

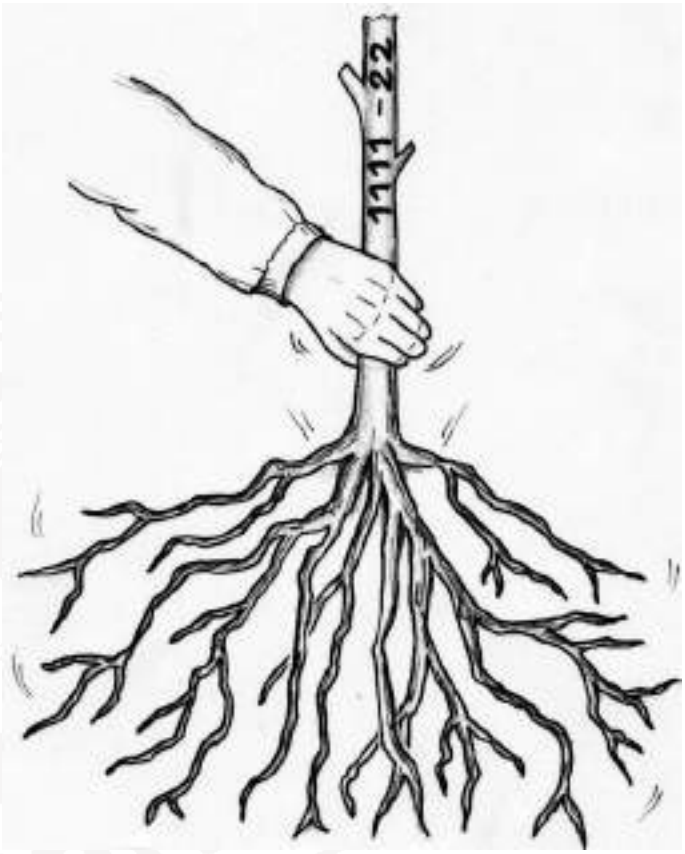
Calculate $\sqrt{1\,111 - 22}$

And then find $\sqrt{111\,111 - 222}$.

Suggest an answer for

$$\sqrt{111\,111\,111\,111\,111\,111\,111\,111 - 222\,222\,222\,222}$$

and then show that your answer is correct.



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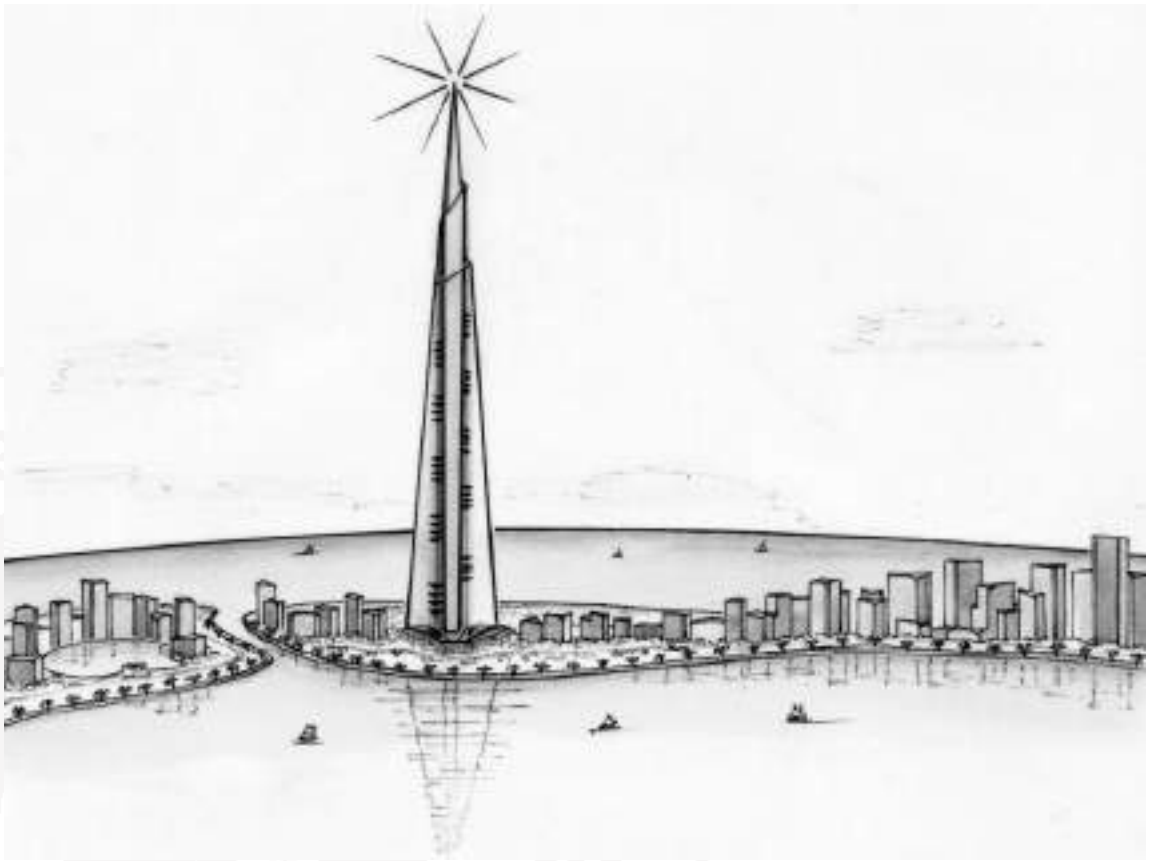
Question 12 Out of sight

7 MARKS

Senior classes only

The Emir Abel's tower is 1000m high.
His yacht is anchored at the foot of the tower.
Under a perfectly clear sky he weighs anchor and sets sail for the north.
Assume that the earth can be represented by a sphere of radius 6370 km.

What distance will he cover before the top of the tower is no longer visible ? Justify your answer.



Question 13 GT Honour among thieves

10 MARKS

Senior classes only

An enquiry is being set up to work out the proportion of shoplifters among the customers of a supermarket.
In order to make sure that people answer the questions truthfully the customers are asked to reply anonymously to this questionnaire:

If you were born in January, February, March or April, answer question A.
If not answer question B.

Question A : You have stolen from a supermarket at least once before : True or False

Question B : You have never stolen from a supermarket : True or False

Your answer : ☐ TRUE ☐ FALSE

We assume that everyone has replied truthfully to the questionnaire and that the proportion of shoplifters is not related to the month they were born.
We assume as well that the dates of birth of the people questioned were equally shared out over the year.
After examining the results it is found that 60% of people questioned answered TRUE.

Calculate the percentage of shoplifters among the people questioned.