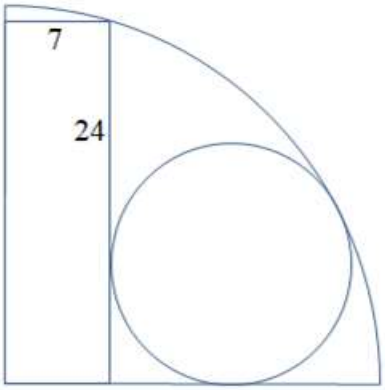
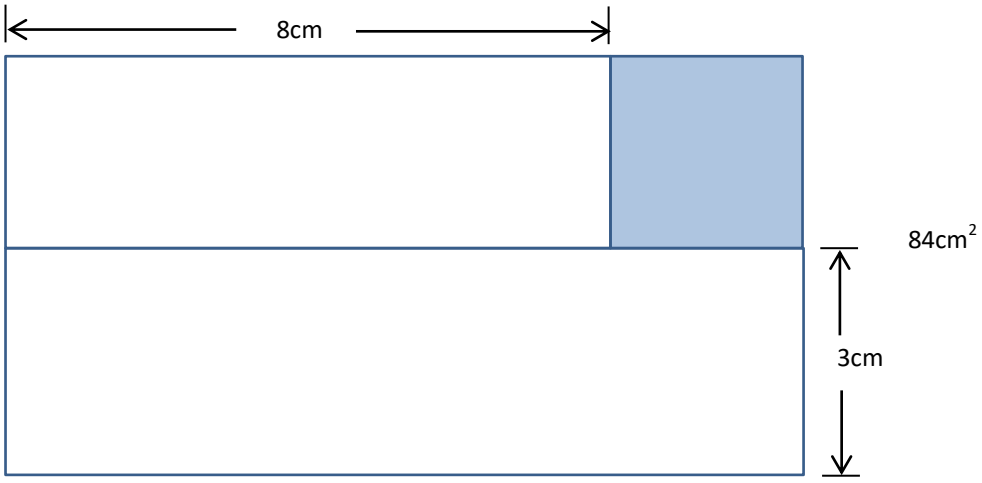
Problem No. 1
Three Thursdays of a month fall on even numbered dates. On what day of the week is the 24th of that month?

Problem No. 2
2024 has 3 different prime factors. Which is the largest of these three numbers?

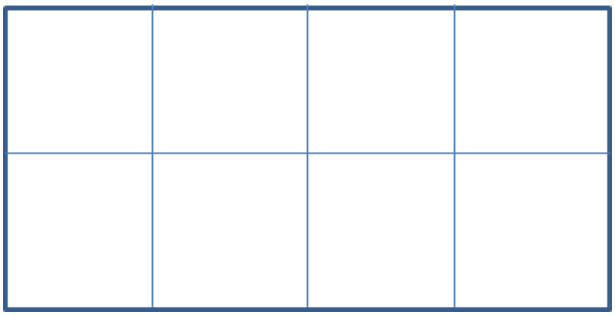
Problem No. 3
a) Find the radius length of the quadrant shown and hence,
b) **Using a scale diagram**, find the integer radius length of the circle within the quadrant (in cm) in the following diagram. Measurements are given in cm. **Show all stages of your work.**
The scale diagram must be set within the Answer Sheet provided (A4 size) and **returned**.



Problem No. 4
Find the area of the shaded square in the following diagram if the total area of the diagram is 84cm^2.



Problem No. 5
The diagram shows 22 matches forming 11 squares. Remove 5 matches to leave only 4 squares. Each remaining stick must be part of a square. In how many different ways can this be done?



Problem No. 6
How many 3-digit numbers are there such that the Tens digit is smaller than both of the other digits?

Problem No. 7
The flight time between Dublin, Ireland, and Vancouver, Canada, is 9 hours and 35 minutes. A plane left Dublin on the 1st of December at 10.45 am local time. At what local time did the plane land in Vancouver?

Problem No. 8
Eight people rented a boat. If there were two more people to share the expense it would have cost each of them €1.50 less. What was each person's share of the rent?

Problem No. 9
What is the median of the six consecutive odd numbers that multiply together to give 6235515?

Problem No. 10
The first two numbers called in a game of Bingo (traditional Irish or British version) are 11 and 1. What is the probability that the next number called has 10 as the sum of its digits.
Write your answer in the form $\frac{A}{B}$ in its simplest form.

Problem No. 11
a, b, c and d are integer numbers such that

$$a + \frac{1}{b + \frac{1}{c + \frac{1}{d}}} = \frac{17}{11}$$

What is a+b+c+d?

Problem No. 12
While practising taking penalties for my football team I drive the ball from the 'spot' to the roof of the net in the centre of the goal.
What is the greatest integer angle at which the ball should travel to ensure I score a goal? (The size of the ball may be ignored).

Problem No. 13
Petrol and oil are to be mixed in a ratio of 40:1 for a hedge-trimmer with a 2-stroke engine. A mixing bottle is provided with a 500ml mark drawn at 123mm above the base to indicate the level for the completed mixture. A second mark is drawn below the 500ml mark to indicate the maximum level of petrol to be used. How far below the 500ml mark should this be?
Give your answer in mm correct to one decimal place.

Problem No. 14
€20240 is bequeathed to 5 members of a family, none of which are twins, such that each sibling gets €200 more than the next youngest. How much does the eldest get?

Problem No. 15
Tommy arranges books on his bookshelves going from the bottom shelf to the top. He puts half of the books on the bottom shelf and two thirds of what remains on the second shelf. He then divides the rest of his books on the other two shelves so that there are 4 more books on the third shelf than on the top shelf.
If there are 3 books on the top shelf how many books are on the bottom shelf?

Problem No. 16

A puzzle starts with 9 numbers in a grid as shown:

7	5	4
11	10	16
22	19	8

On each move you are asked to swop any two numbers. The aim is to arrange for the sum of the numbers in each **row** to be a multiple of 3.
What is the minimum number of moves needed?

Problem No. 17

Some time ago TII (Transport Infrastructure Ireland) installed an Average Speed System on Irish motorways. In this system two cameras are placed at intervals on the motorway. The times taken for vehicles to pass the cameras are noted and their average speeds are calculated to determine if speed limits have been exceeded.
In this problem one such pair of cameras was placed 25 km apart on a motorway and the times taken to pass the cameras were noted for 4 vehicles as follows:
A truck (> 3500kg): 18mins 4secs;
An all-seater bus: 16 mins 32secs;
A car 13 mins 59secs;
A car towing a caravan: 18mins 24secs.
How many vehicles exceeded the appropriate speed limit?
Use rules-of-the-road-.pdf (rsa.ie) to guide your answer.
Copy and paste the following to your browser if the link does not automatically work:
https://www.rsa.ie/docs/default-source/services/s1.8-learner-driver-resources/rules-of-the-road-.pdf

Problem No. 18

Every day, Carol uses a smooth step-less escalator on her way to work. If she stands still, her journey on the escalator takes 60 seconds. One day the escalator is not working and it takes her 90 seconds to walk the length of the escalator.
How long would it take her to travel up the escalator when it is working if she were to walk at the same speed as before? Give your answer in seconds.

Problem No. 19
Using a restricted set of data a mathematician estimated that a person's height was connected to their length of step by the relationship

$$SL = \frac{13}{15}H - 75$$

where SL = Step Length, H = Height and all measurements are in cm.

Two companions went on a walk together. The first person was 150cm tall and walked at a rate of 2 steps per second. Their FitBit recorded that this person had taken 5000 steps when they both stopped. The second person walked at a rate of 1.5 steps per second. How tall was the second person? Show all stages of your work. (Give your explanation on a separate sheet)
Give the answer in cm correct to 1 decimal place.

Problem No. 20
Tickets for a school play cost €15 for adults and €5 for children. Receipts for the show were €6600. The hall has seating for 600 people but not all the tickets were sold. What is the smallest number of adults at the play?

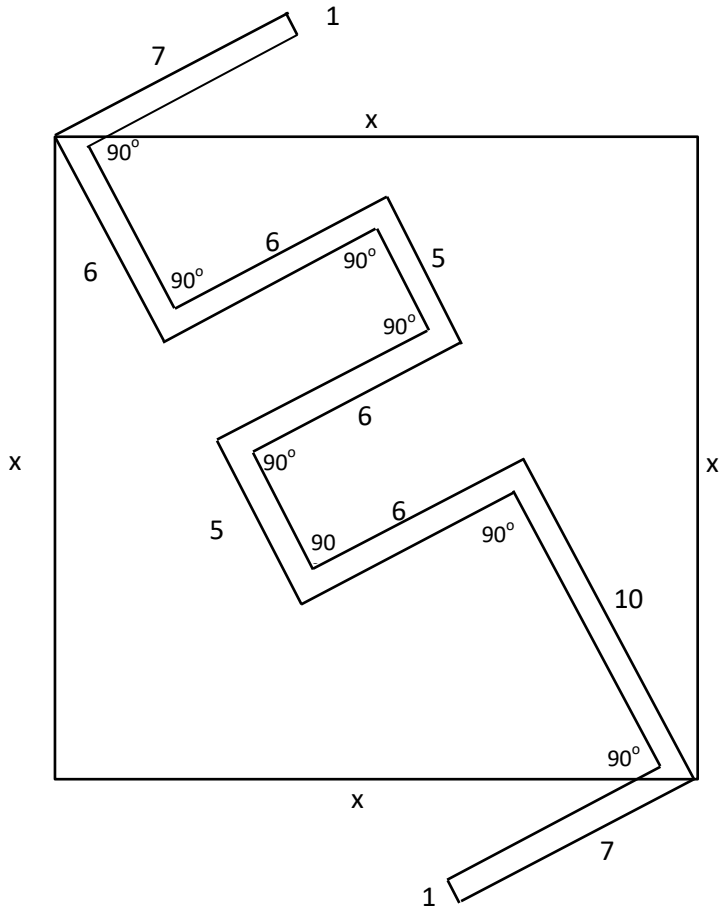
Problem No. 21
The World Athletics Championships 2023 took place in Budapest. The final of the Women's 4x440m Relay was on 27th August. At the beginning of the final 100m of the 4th leg Stacey Ann Williams of Jamaica was 10m ahead of Femke Bol of the Netherlands. However, she was passed by Bol 5m from the end line.
See: 4X400m Relay Women Final World Championships Budapest 2023 - YouTube
(15:36min:sec. video; The full 4x400m race starts after 6:30; the last lap starts after 9:16; finish at 10:20).

Given that Stacey Ann Williams ran this short section of the race (while she was in the lead, as described above) in 13.1 seconds what average speed did Femke Bol have to run in the same section of the race in order to catch up with her?
Give your answer in kilometres per hour (km/hr) correct to one decimal place. (All given measurements have been estimated from the video.)

Problem No. 22
The seven numbers 2, 3, 12, 14, 15, 20 and 21 can be divided into 2 sets such that the product of the numbers in each set is the same.
What is the product?

Problem No. 23

A wrought-iron worker cut out a straight-edged shape of uniform width, 1cm, from a flat plate of metal. She placed it so that it overlaid a square support base as shown. What is the length of the side, x, of the square? (All measurements are in cm.)



Problem No. 24

A shopkeeper buys 10 items for a total of €P. Eight are sold for a profit of 50% and the rest in a sale at a profit of only 10%. What is the total profit in the form € $\frac{a}{b}P$, where *a* and *b* are relatively prime?

Problem No. 25

Use the Engineers Ireland site Schools | Engineers Ireland to find an answer to this question: What is the 3-letter acronym for a programme that STEPS gives as *a hands-on, fun and practical insight into engineering at third level and as a career*?