Challenge 1

November 2025

Information and guidance

- You are permitted access to any calculator for this challenge.
- Write your answers in the spaces provided on this paper.
- Read each question carefully before answering it.
- Check your answers at the end of each question.
- The difficulty of each task is indicated by stars.
- Each correct answer awards 1 point.
- The maximum score for this challenge is **13 points**.

BEGINNING OF CHALLENGE

1. A square has an area of $81cm^2$.
A rectangle has the same perimeter as the square.
The length and width of the rectangle are in the ratio 2:1.

Find out the area of the rectangle. ★☆☆☆☆

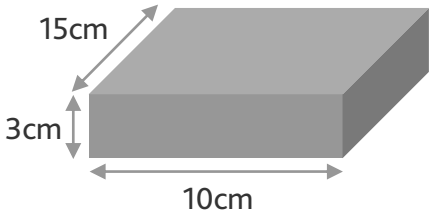
Answer:

2. Charles and Alice have $9 combined.
Alice has $3 more than Charles.
Charles spends one third of his money.

Find out how much money Charles is left with. ★☆☆☆☆

Answer:

3. A block of pastry is modelled as a cuboid shown below.



Freddie is making pies for his birthday party.
For each pie, he cuts out a cylinder of pastry with diameter 3cm and thickness 1cm.

a. Find out the greatest number of pies he can cut from one block of pastry. ★☆☆☆☆

Answer:

Freddie throws away the remaining pastry.
Each block of pastry costs $10.99.

b. Find out the cost of the pastry that was thrown away. ★☆☆☆☆

Answer:

4. John needs 250 pieces of 11cm string.
String is sold in rolls of 5m each.

a. Find out the minimum number of rolls John needs to buy. ★☆☆☆☆

Answer:

John collects all the wasted string and joins them together to make more pieces of 11cm string.

b. Find out how many more pieces of string he makes. ★☆☆☆☆

Answer:

5. 1 in every 250 people are infected with a disease.
A test for the disease is 99.5% accurate.
Oliver is randomly selected to be tested for the disease, and tests positive.

Find out the probability Oliver has the disease. ★★☆☆☆

Answer:

6. David and Michael have some money.
David gives $6 to Michael, making Michael have 3 times as much as David.
After a week, Michael gives $9 to David, making David have 2 times as much as Michael.

Find out how much money they have combined. ★★☆☆☆

Answer:

7. A student studies English and Mathematics for an equal amount of time each day.
They sleep at 22:15 for 8 hours and have meals at 08:00, 13:00, and 19:30.
Each meal lasts 30 minutes, during which they do not study.
They study at all other times.

Find out the time when the student switches studying subjects. ★★☆☆☆

Answer:

8. After work, Alice and Bob both walk 2km from their office to a bus stop.
A bus departs every 10 minutes at the bus stop.
Alice walks at $1ms^{-1}$.

Find out the minimum constant speed Bob needs to walk at to catch an earlier bus than Alice. ★★☆☆☆

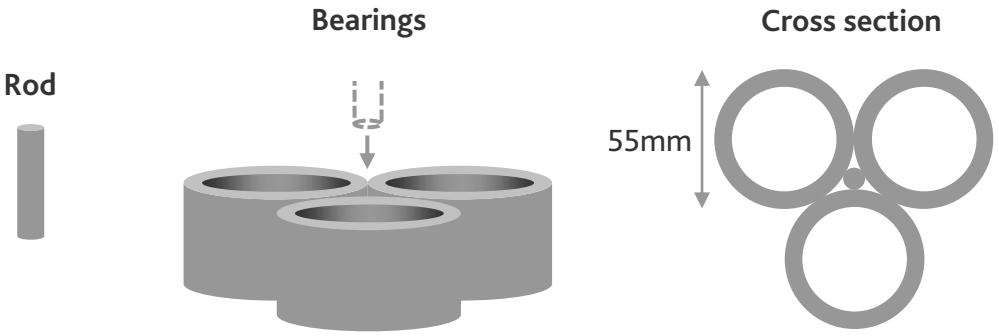
Answer:

9. A plane travels from Dubai to London.
The total distance it flies is 7,000km.
The total flight time is 8 hours.
It makes a stop in Paris along the way.
The average speed of the plane on the first leg is 50kmh^{-1} slower than on the second leg.
The first leg takes 2 hours longer than the second leg.

Find out the average speed of the plane on the first leg. ★★★☆☆

Answer:

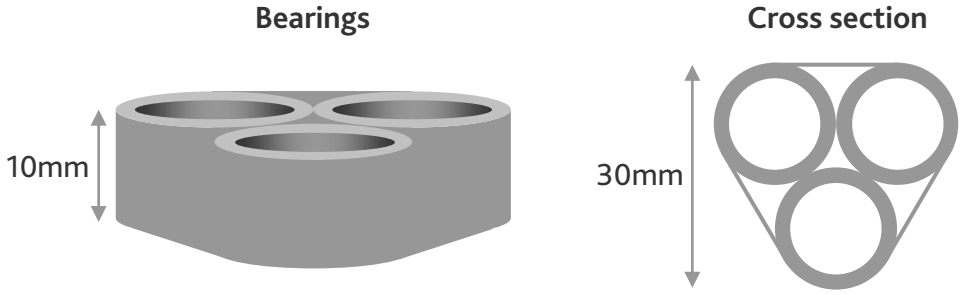
10. Three identical bearings are placed so that they are mutually tangent.
An engineer fits a circular rod between them.
Each bearing has an outer diameter of 55mm.
The rod has a radius of 3mm.



a. Find out the percentage of space remaining between the three bearings with the rod fully fitted. ★★★★☆

Answer:

The engineer collects a smaller set of bearings and assembles them in the same position.
They wrap an elastic band of equal height around the bearings.



b. Find out the outer surface area of the elastic band. ★★★★☆

Answer:

END OF CHALLENGE