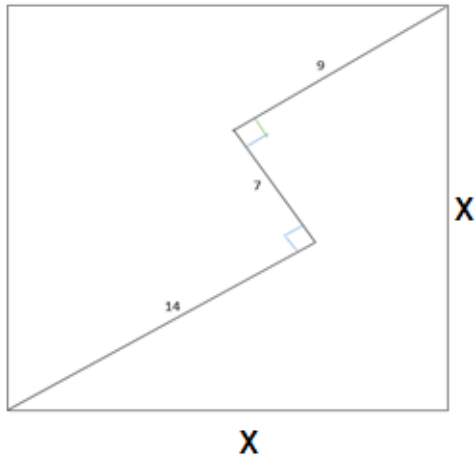
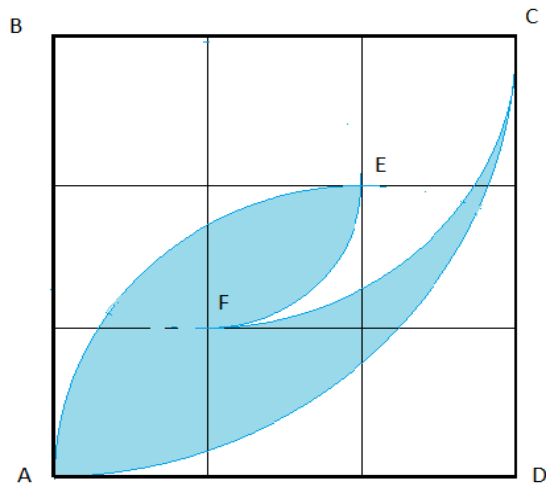


A collection of some challenging questions, Level III
Recommended for all placement or high level tests
Solutions are available

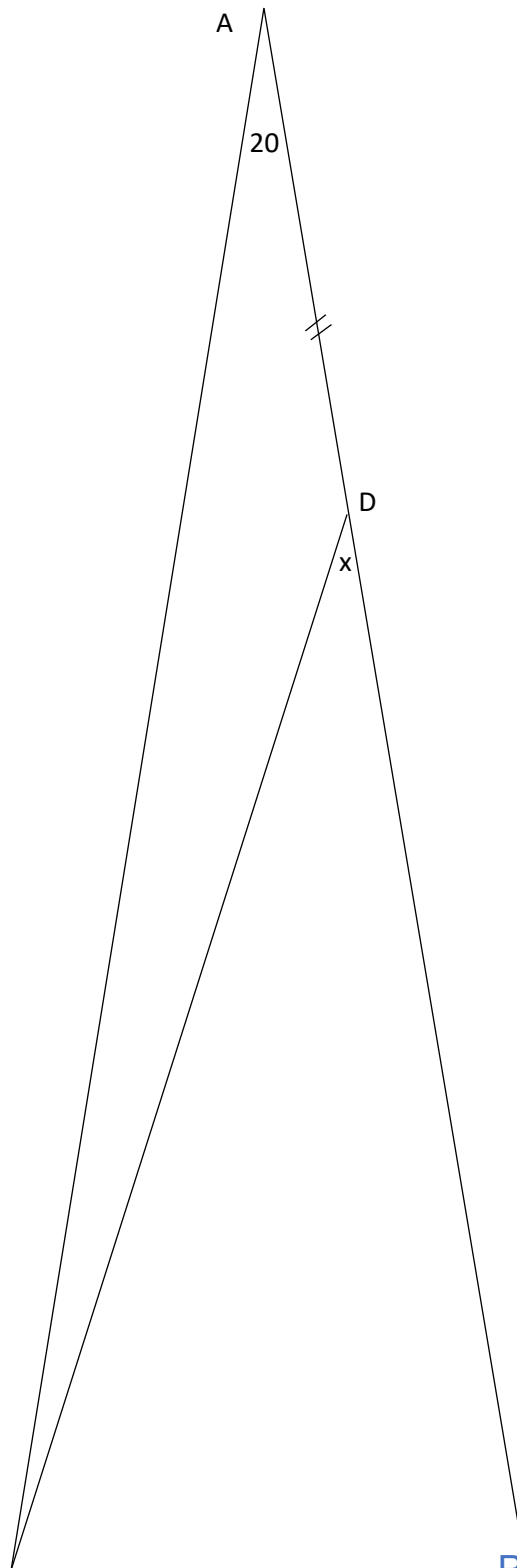
1. Find the side length "X" of the square in the following case:



2. Calculate the shaded area in the 3x3 diagram bellow.



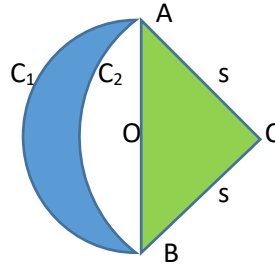
3. In the triangle ABC, if $A = 20^\circ$, $C = 80^\circ$, and $AD = BC$. Then find the angle x ?



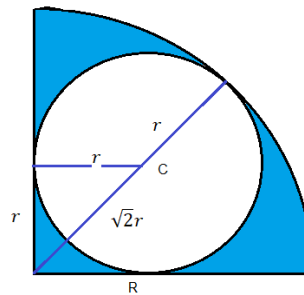
B //

4. In the following diagram, ABC is right, isosceles triangle with sides s . C_1 is a semi-circle with diameter AB and C_2 is a quarter of circle with radius s and centre C.

Prove the area of the triangle is equal to the area enclosed by two arcs.



5. In the following diagram, a circle with radius r is inscribed in a quarter of a circle with radius R . Find the ratio of the area shaded in blue to the inner circle.



6. Find the smallest positive three-digit integer N , which has a remainder of 2 when divided by 6, a remainder of 5 when divided by 9 and a remainder of 7 when divided by 11.

7. a, b, c are 3 consecutive terms of an arithmetic sequence, Prove:
- $(a + b)$, $(a + c)$ and $(b + c)$ are also consecutive terms of an arithmetic sequence.
 - $\frac{1}{\sqrt{b} + \sqrt{c}}$, $\frac{1}{\sqrt{a} + \sqrt{c}}$ and $\frac{1}{\sqrt{a} + \sqrt{b}}$ are also consecutive terms of an arithmetic sequence.
8. Three men—A, B, and C—crossed paths walking through woods on a cold night. They decided to light a fire to rest by, and set out to gather some firewood. A came back with 5 logs of wood, B brought 3 logs, but C came back empty-handed. C requested that they let him rest by the fire and promised to pay them some money in the morning. In the morning C paid them \$8. How should A and B split the money fairly?
- A \$7; B \$1
 - A \$6; B \$2
 - A \$5; B \$3
 - A \$4; B \$4
 - None of these

9. Multiple identities in one question:

If A, B and C are the 3 angles of a triangle, prove: $\sin 2A + \sin 2B + \sin 2C = 4 \sin A \cdot \sin B \cdot \sin C$ (1)

10. in the following sequence: $\left(1 - \frac{1}{2}\right), \left(2 - \frac{2}{3}\right), \left(3 - \frac{3}{4}\right), \dots, \left(15 - \frac{15}{16}\right)$

- write the general term in simplest form
- find the product of all terms