

1	2	3	4	5	6	7	8	9	10	11	12	Sum

Mathematics

INSTRUCTIONS

- *Maximum marks: 36*
- *Working time: 60 minutes*
- *Number of questions: 12*
- *Number of pages: 8*
- *Don't use a calculator, please!*
- *You are advised to show all working where possible. Where an answer is wrong some marks may be given for correct method provided this is shown by written working. For the solution of can use also clean pages of paper. Please, don't forget to mark the number of the question.*

1. Tickets for the zoo are of two types: *A* for adults, *C* for children and senior citizens. The cost of 7 type *A* and 4 type *C* tickets is 46 €, whereas the cost of 8 type *A* and 6 type *C* tickets is 57 €. Calculate the cost 5 type *A* and 3 type *C* tickets.

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Answer:

2. The following results were obtained from a survey concerning the reading habits of students.

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- 60 % read magazine P
- 50 % read magazine Q
- 50 % read magazine R
- 30 % read magazines P and Q
- 20 % read magazines Q and R
- 30 % read magazines P and R
- 10 % read all three magazines

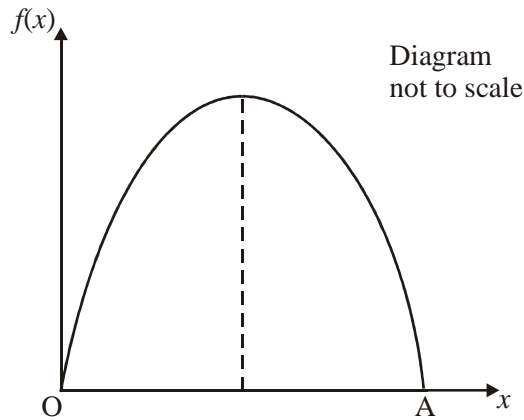
Represent all of this information on a Venn diagram.

- (a) What percentage of students read exactly two magazines?
- (b) What percentage of students read at least two magazines?
- (c) What percentage of students do not read any of the magazines?

Answers:

3. The graph of the function $f : y = 30x - 6x^2$ is given in the diagram below.

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- (a) Factorise fully $30x - 6x^2$.
- (b) Find the coordinates of the point A.
- (c) Write down the equation of the axis of symmetry f .

Answers: _____

4. A fast train leaves Manchester for London, a journey of 330 km, at 12 noon. A slow train, travelling half as fast, leaves London for Manchester at the same time. They pass each other at 2. p. m. Find the speed of each train.

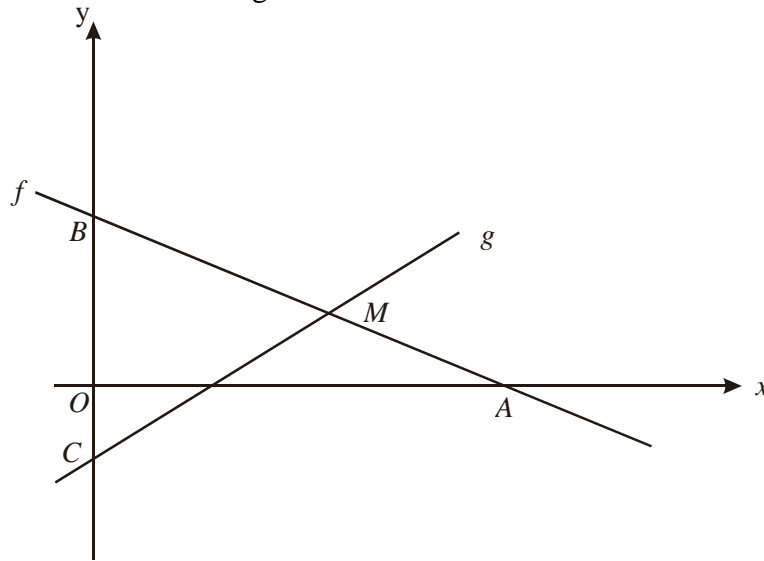
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Answer:

5. The linear function f , shown on the set of axes below has equation $f(x) = -\frac{1}{4}x + 4$ cuts the x -axis at A and cuts the y -axis at B .

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Diagram not drawn to scale



- Write down the coordinates of A and B .
- The linear function g passes through the point M (M is the midpoint of AB) and the point $C(0, -1)$. Write down the equation of g .
- Find the length of MC .

Answers:

6. A family of functions is given by $f(x) = x^2 + 3x + k$, where $k \in \{1, 2, 3, 4, 5, 6, 7\}$. One of these functions is chosen at random. Calculate the probability that the curve of this function crosses the x -axis.

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Answer: _____

7. A magician asks a volunteer to think of two different positive integers without telling her what they are. She then asks him to calculate x , the sum of the larger number with the square of the smaller, and y , the difference between the numbers. The volunteer tells her that $x = 9$ and $y = 3$. Find the original numbers.

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Answer:

8. The function f is given by $f(x) = x^2 - 6x + 13$, for $x \geq 3$.

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- (a) Write $f(x)$ in the form $f(x) = (x - a)^2 + b$.
- (b) Find the inverse function f^{-1} .
- (c) State the domain of f^{-1} .

Answers: _____

9. Find the number of ways in which 5 book can be distributed between tree people A, B and C, if the book are

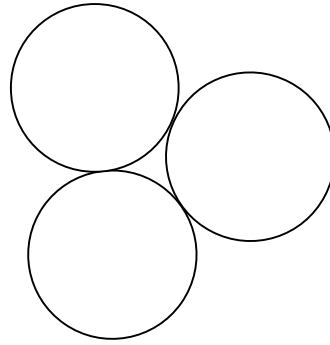
- (a) indistinguishable.
- (b) all different.

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Answers:

10. Three coins of radius 1 cm are placed on a table so that each touches the other two. Find the area of the space between the coins.

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Answer:

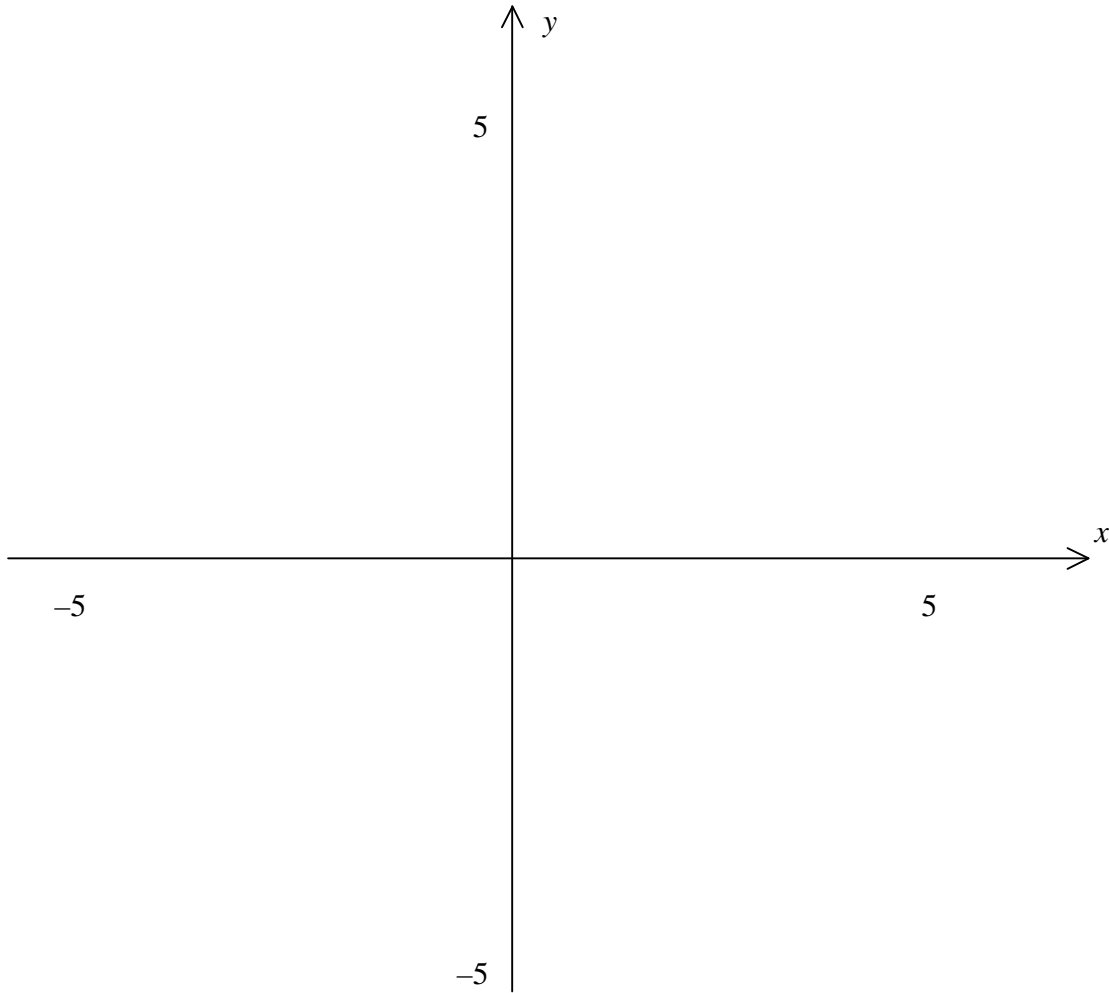
11. Prove that this equation $xy + x + y = 36$ has no positive integer solutions.

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12. On the same graph sketch the curves $y = |x|$ and $y = 3 - \frac{1}{x}$ for values of x from -5 to 5 and values of y from -5 to 5 . Find coordinates (exactly) the points of intersection of these two curves.

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Answers:
