

ORMC Beginners 2

Winter 2024

Please print your name, first and last, followed by your school grade in the space below.

First Name

Last Name

Grade

In computational problems, answers not supported by computations yield no credit!

Test

Pr #	1	2	3	4	5	6
Score	$\frac{10}{10}$	$\frac{8}{8}$	$\frac{10}{10}$	$\frac{12}{12}$	$\frac{10}{10}$	$\frac{10}{10}$

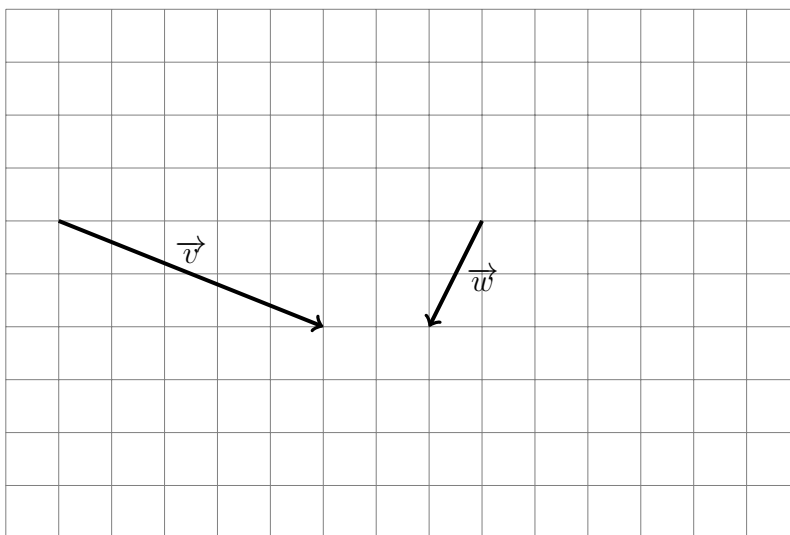
7	8	9	10	11	12	Total
$\frac{10}{10}$	$\frac{10}{10}$	$\frac{10}{10}$	$\frac{10}{10}$	$\frac{10}{10}$	$\frac{10}{10}$	$\frac{100}{100}$

Problem 1**10 pts**

Peter broke his piggy bank and found out that it had less than 100 coins. The boy divided the coins into piles of 2 coins each and was left with one extra coin. The same happened when Peter divided the coins into piles of 3, 4, and 5 coins. How many coins were there in the piggy bank?

Problem 2**8 pts**

For the given vectors \vec{v} and \vec{w} , construct the vector $2\vec{v} - 3\vec{w}$ on the graph paper below.



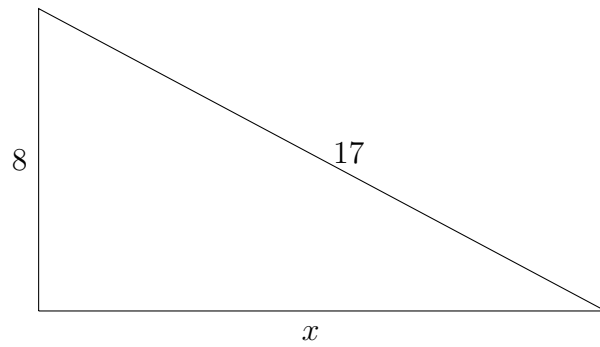
Problem 3

10 pts

Use the Pythagoras' theorem to find x for the following right triangles.

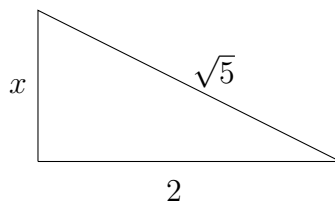
a. $x =$

5 pts



b. $x =$

5 pts



Problem 4**12 pts**

Are the following numbers rational or irrational? Circle correct answers.

a. 3.1416 *rational* *irrational* **2 pts**

b. $\frac{2}{3}$ *rational* *irrational* **2 pts**

c. $\frac{6}{9}$ *rational* *irrational* **2 pts**

d. $\sqrt{2}$ *rational* *irrational* **2 pts**

e. $\sqrt{3}$ *rational* *irrational* **2 pts**

f. $\sqrt{4}$ *rational* *irrational* **2 pts**

Problem 5**10 pts**

Find the following numbers.

a. **5 pts**

$$\lceil \sqrt[3]{25} \rceil =$$

b. **5 pts**

$$\lceil \sqrt[3]{25} \rceil =$$

Problem 6

10 pts

There are no forces acting on the object A below. The current velocity of the body, in metres per second, is represented by the vector \vec{v} . Draw the position of the object four seconds later.



4 pts

The sides of the grid squares on the picture above are $\sqrt{10}$ metres long. Find the speed of the motion.

3 pts

$v =$

What distance would the object cover in four seconds?

3 pts

$d =$

Problem 7

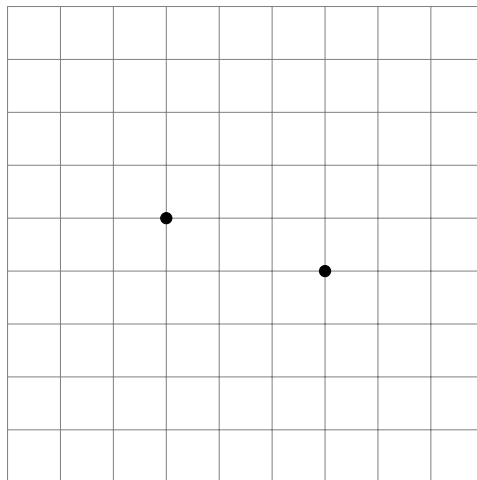
10 pts

How many numbers from 0 to 1000 contain the digit 7?

Problem 8

10 pts

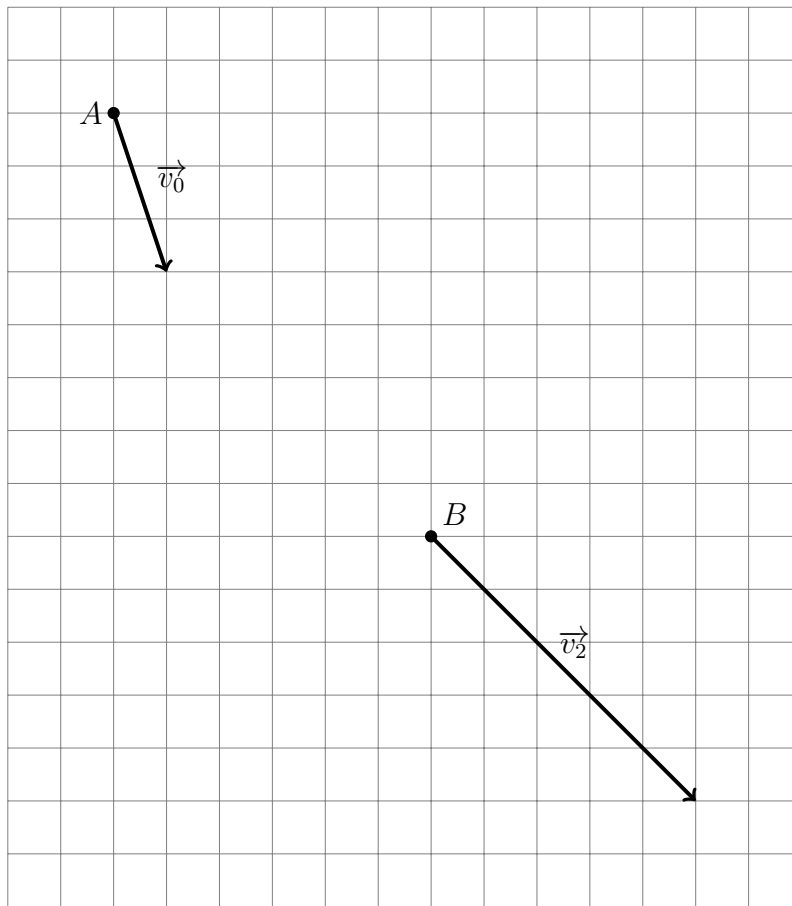
Two points are marked on the grid paper below. Mark two more points so that the four points are the vertices of a square. Find all the solutions!



Problem 9

10 pts

Moving with a constant acceleration, a body changes its position from point A to point B in two seconds. The velocities of the motion, in metres per second, are represented by the vectors \vec{v}_0 and \vec{v}_2 . Find the acceleration vector. **6 pts**

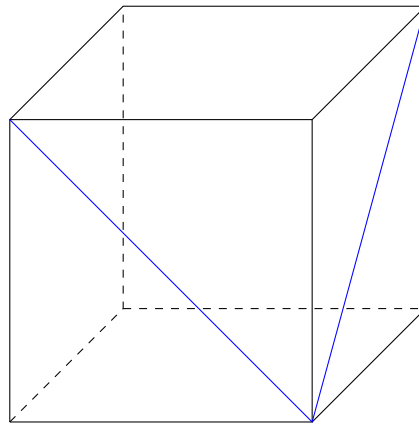


The side length of the above square is $2\sqrt{5}$ metres. The force acting on the body is 300 newtons. What is the mass of the body? **4 pts**

Problem 10

10 pts

What is the angle, in degrees, between the two diagonals of the neighbouring faces of the cube on the picture below?

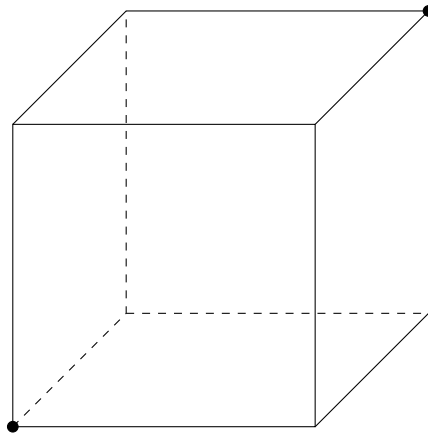


Extra credit problems

Problem 11

10 pts

An ant starts out from a floor corner of a cubical room. It wants to move to the opposite corner using the shortest route. The ant doesn't fly, so the insect can only move along the floor, ceiling, and walls of the room. What path should it take?



Problem 12**10 pts**

The numbers 2^{2014} and 5^{2014} are expanded and all their digits are written down consecutively on one page. How many digits would there be on the page?