Question 1

You have nine cards, numbered as shown:

5	7	4	5	4	3	5	4	1

You pick two of the cards at random and multiply their numbers.

What is the probability that this product is an **even** number?

Question 2

Find the exact coordinates of the two points of intersection of the line $y = -2x$ and the circle $x^2 + y^2 = 250$.

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You pick two of the cards at random and multiply their numbers.

What is the probability that this product is an **even** number?

The only way to get an odd product is to pick two odd cards.
Therfore the probability of getting an odd product is

$$\frac{6}{9} \times \frac{5}{8} = \frac{30}{72} = \frac{5}{12}$$

So the probability of an even product is $1 - \frac{5}{12} = \frac{7}{12}$

Question 2

Find the exact coordinates of the two points of intersection of the line $y = -2x$ and the circle $x^2 + y^2 = 250$.

Substituting $y = -2x$ into $x^2 + y^2 = 250$, we get:

$x^2 + (-2x)^2 = 250$

$\implies 5x^2 = 250$

$\implies x^2 = 50$

$\implies x = \pm\sqrt{50}$

Therefore, $x = 5\sqrt{2}, x = -5\sqrt{2}$

Since $y = -2x$, the points of intersection are

$(5\sqrt{2}, -10\sqrt{2})$ and $(-5\sqrt{2}, 10\sqrt{2})$