Competition 8: Evolution Puzzles

① Parent 1 = AB
Parent 2 = AB

	A	B
A	AA	BA
B	AB	BB

25% chance you inherit the disease

②

	A	A
A	AA	AA
B	AB	AB

50% disease
50% carrier
0% none

	B	B
A	BA	BA
B	BB	BB

0% disease
50% carrier
50% none

↑ not possible
└ AA cannot have children

20%, $\frac{1}{5}$ have gene

if both parents are carriers, p(child having disease) = 25%
if one/both parents are BB, p(child having disease) = 0%
if one/both parents are AA, p(child having disease) = 0%

25%

Conditions for child to have disease:
- parents both AB / other parent also is AB
- inherit A from both parents

p(other parent is AB) = 20% = 1/5
p(inherit A from both) = 25% = 1/4

Since must have both $\frac{1}{5} \times \frac{1}{4} = \frac{1}{20}$

③ $\frac{1}{5} \times \frac{1}{5} \times \frac{1}{4} = \frac{1}{100}$

④ 50%

A offspring of AB with either AB or BB has a 50% chance of being a carrier

⑤ p(children are carriers) = 50%
p(grandchildren are carriers) = ~~50%~~ 25%

50% × 50% = 25%
$\frac{1}{2} \times \frac{1}{2} = 1/4$

Answers:

① 25%
② 1/20
③ 1/100
④ 50%
⑤ 25%