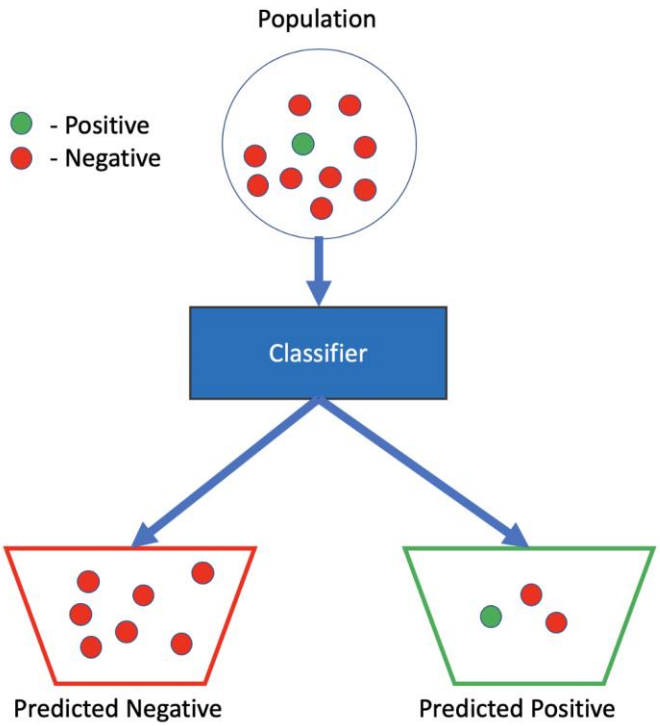
PRECISION RECALL



		Real	
		Positive	Negative
Predicted	Positive	1	2
	Negative	0	7

$$\textbf{precision} = \frac{tp}{tp + fp} = \frac{1}{3} = 33\%$$

$$\textbf{recall} = \frac{tp}{tp + fn} = \frac{1}{1} = 100\%$$

$$\textbf{specificity} = \frac{tn}{tn + fp} = \frac{7}{9} = 78\%$$

$$\textbf{sensitivity} = recall = 100\%$$

		Real	
		Positive	Negative
Predicted	Positive	True Positive (tp)	False Positive (fp)
	Negative	False Negative (fn)	True Negative (tn)

$$\boldsymbol{precision} = \frac{tp}{tp + fp}$$

Precision — Out of all the examples that predicted as positive, how many are really positive?

$$\boldsymbol{recall} = \frac{tp}{tp + fn}$$

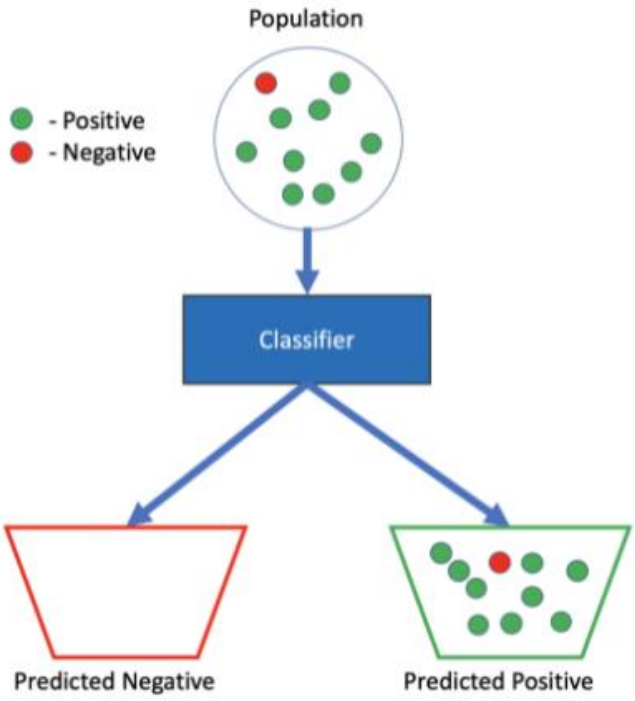
Recall — Out of all the positive examples, how many are predicted as positive?

$$\boldsymbol{specificity} = \frac{tn}{tn + fp}$$

Specificity — Out of all the people that do not have the disease, how many got negative results?

$$\boldsymbol{sensitivity} = \frac{tp}{tp + fn}$$

Sensitivity — Out of all the people that have the disease, how many got positive test results?



		Real	
		Positive	Negative
Predicted	Positive	9	1
	Negative	0	0

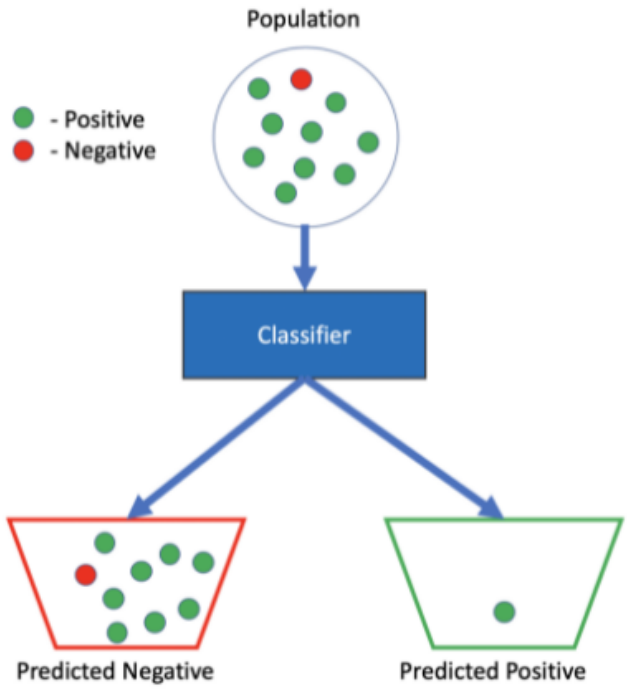
$$\boldsymbol{precision} = \frac{tp}{tp + fp} = \frac{9}{10} = \mathbf{90\%}$$

$$\boldsymbol{recall} = \frac{tp}{tp + fn} = \frac{9}{9} = \mathbf{100\%}$$

$$\boldsymbol{specificity} = \frac{tn}{tn + fp} = \frac{0}{1} = \mathbf{0\%}$$

$$\boldsymbol{sensitivity} = recall = \mathbf{100\%}$$

Example 3 — High Precision, Low Recall, and High Specificity



		Real	
		Positive	Negative
Predicted	Positive	1	0
	Negative	8	1

$$precision = \frac{tp}{tp + fp} = \frac{1}{1} = 100\%$$
$$recall = \frac{tp}{tp + fn} = \frac{1}{9} = 11\%$$
$$specificity = \frac{tn}{tn + fp} = \frac{1}{1} = 100\%$$
$$sensitivity = recall = 11\%$$

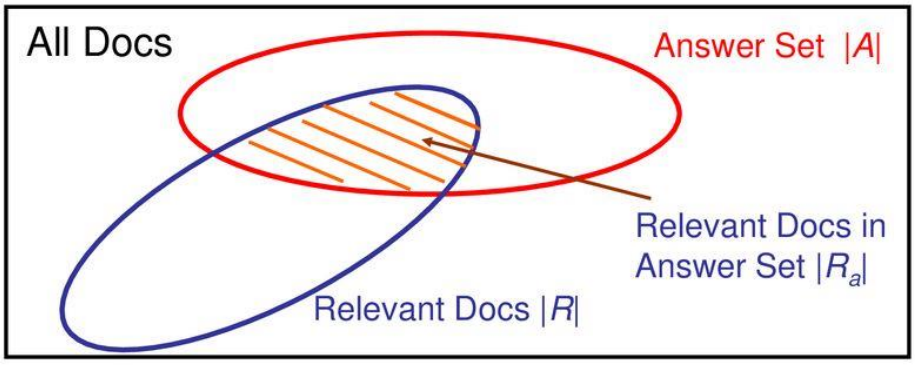
Precision (also called positive predictive value) is the fraction of relevant instances among the retrieved instances, while **recall** (also known as sensitivity) is the fraction of relevant instances that were retrieved. Both precision and recall are therefore based on relevance.

PRECISION: FRACTION OF RELAVANT AMONG RETRIEVED

RECALL: FRACTION OF RETRIEVED WERE RELEVANT

Recall and Precision

- Recall ($\frac{|R_a|}{|R|}$)
  - The fraction of the relevant documents which has been retrieved
- Precision ($\frac{|R_a|}{|A|}$)
  - The fraction of the retrieved documents which is relevant



Unranked retrieval evaluation: Precision and Recall

- **Precision**: fraction of retrieved docs that are relevant = P(relevant|retrieved)
- **Recall**: fraction of relevant docs that are retrieved = P(retrieved|relevant)

	Relevant	Nonrelevant
Retrieved	tp	fp
Not Retrieved	fn	tn

- Precision P = tp/(tp + fp)
- Recall R = tp/(tp + fn)

		True state of patient's health	
		Disease	No disease
Test result	Alert	5	3
	No alert	4	8