

Worksheet N°2: Probability Distributions

Exercise 1 (Reading the Normal Distribution table)

a) Let X be a r.v. with distribution $N(0, 1)$.

1. Calculate:

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| 1) $P(X \leq 2.41)$ | 6) $P(1.34 \leq X \leq 2.41)$ |
| 2) $P(X \geq 1.34)$ | 7) $P(-1.53 \leq X \leq 2.41)$ |
| 3) $P(X \leq -1.72)$ | 8) $P(-2.74 \leq X \leq -1.45)$ |
| 4) $P(X \leq -1.45)$ | 9) $P(X \leq 1.45)$ |
| 5) $P(X \geq -1.53)$ | 10) $P(X \geq 1.96)$ |

2. Determine x such that:

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|--------------------------|--------------------------|
| 1) $P(X \leq x) = 0.95$ | 3) $P(X \leq x) = 0.486$ |
| 2) $P(X \geq x) = 0.239$ | 4) $P(X \geq x) = 0.812$ |

b) Let X be a r.v. with distribution $N(5, 4)$. Calculate:

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|-------------------|-------------------------|
| 1) $P(X \leq 6)$ | 4) $P(X \geq -2)$ |
| 2) $P(X \leq -1)$ | |
| 3) $P(X \geq 7)$ | 5) $P(3 \leq X \leq 7)$ |

c) Let X be a r.v. with distribution $N(\mu, \sigma^2)$ where $\mu = 3$ and $\sigma^2 = 4$. Determine x such that:

- 1) $P(X \leq x) = 0.95$, 2) $P(X \geq x) = 0.015$, 3) $P(X \geq x) = 0.812$.

Exercise 2 (Reading statistical tables)

1. Let T be a r.v. following a Student's distribution with n degrees of freedom ($T \rightsquigarrow t_n$). Determine the value of t if:

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|--------------------------------------|---------------------------------------|
| 1) $n = 18$ and $P(T \leq t) = 0.95$ | 4) $n = 25$ and $P(T \geq t) = 0.25$ |
| 2) $n = 10$ and $P(T \leq t) = 0.80$ | |
| 3) $n = 40$ and $P(T \leq t) = 0.95$ | 5) $n = 25$ and $P(T \geq t) = 0.975$ |

2. Let Y be a r.v. following a Chi-Squared distribution with m degrees of freedom ($Y \rightsquigarrow \chi_m^2$). Determine the value of y if:

$$1) \ m = 15 \text{ and } P(Y \geq y) = 0.900$$

$$3) \ m = 20 \text{ and } P(Y \leq y) = 0.975$$

$$2) \ m = 15 \text{ and } P(Y \geq y) = 0.975$$

$$4) \ m = 50 \text{ and } P(Y \geq y) = 0.975$$

3. Let f be a r.v. following a Fisher distribution with n, m degrees of freedom ($f \rightsquigarrow F_{n,m}$). Determine the value of f if:

$$1) \ n = 6, \ m = 2 \text{ and } P(F \leq f) = 0.99$$

$$2) \ n = 20, \ m = 15 \text{ and } P(F \geq f) = 0.05.$$