%\documentclass[10pt]{article}

\documentclass[10pt]{exam}

\usepackage[margin=1in]{geometry}

\usepackage[utf8]{inputenc}

\usepackage{amsmath,amsthm,amssymb, graphicx, multicol, array, physics}

\usepackage{bbm}

\usepackage{float}

\usepackage{mathtools}

\usepackage{fancyvrb}

\usepackage{changepage,enumerate}

\usepackage{ifthen}

\usepackage{natbib}

\usepackage[inline]{enumitem}

\usepackage[dvipsnames]{xcolor}

\newcommand{\Prof}[1]{\textcolor{blue}{Prof: #1}}

\newcommand{\indep}{\perp \!\!\! \perp}

\usepackage[linesnumbered,ruled,vlined]{algorithm2e}

\usepackage{hyperref}

\hypersetup{

colorlinks=true,

linkcolor=blue,

filecolor=magenta,

urlcolor=cyan,

}

\urlstyle{same}

\input{macros}

\newenvironment{problem}[2][Problem]{\begin{trivlist}

\item[\hskip \labelsep {\bfseries #1}\hskip \labelsep {\bfseries #2.}]}{\end{trivlist}}

\begin{document}

% num = 0: problems set without solution

% num = 1: problem set with solution

\newcounter{num}

\setcounter{num}{0}

\title{Problem Set 1}

\author{Artificial Intelligence\\

Fall 2021 CS47100-AI}

\date{}

\maketitle

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Student PUID:~0030665034~~~~~~~~~~~~~~~~~

\\\\Note: You are free to use your intuition to find the steps in the proof. But, make sure you do not use your intuition to justify steps in your proofs.\footnote{

\textit{The contents of this problem set is based on the AI course CS221 taught at Stanford University.}}

\input{Hw1}

Problem 1

\begin{proof}[Solution]

If $\theta$ is the mean value of $\{x\_i\}\_{i}^n$, $f(\theta)$ could be minimized, since $(\theta-x\_i)^2$ would be minimized.

Since $f(\theta)$ is a quadratic function, and $\big\{w\_i\big\}\_i^n$ are all positive. $f(\theta)$ is minimized when $f'(\theta)$ is equal to 0.

f（theta）会变小

\end{proof}

Problem 2

\begin{proof}[Solution]

\end{proof}

Problem 3

\begin{proof}[Solution]

There are four cases:

case 1: $x\_1$: roll a 1 -> P1=$\frac{1}{6}$

case 2: $x\_2$: roll a 2 -> P2=$\frac{1}{6}$

case 3: $x\_3$: roll a 6 -> P3=$\frac{1}{6}$

case 4: $x\_4$: roll 3,4,5 -> P4= $\frac{1}{2}$

Let E be the expected number of points before stopping.

$E = \frac{1}{6} \* 0 + \frac{1}{6} \* (E-a) + \frac{1}{6} \* (E + b) + \frac{1}{2} \* E$

$E = b - a$

\end{proof}

Problem 4

\begin{proof}[Solution]

P(0.6)>P(0.5)

\end{proof}

\end{document}

Problem 5

\begin{proof}[Solution]

We know that $P(A\bigcup B) = 1 = P(A) + P(B) - P(A\bigcap B)$ and $P(A\bigcap B) > 0$.

If we rewrite the above equation, we could get $1 + P(A\bigcap B) = P(A) + P(B) > 1$.

Also, given $\Prob(A|B)=\Prob(B|A)$, we know P(A) = P(B).

Thus, 2P(A) > 1 -> P(A) > 1/2.

\end{proof}