1. 甲、乙兩人投籃，其投中的機率分別為 0.6 及 0.7，今各投籃三次，求(1)兩人投中次數相等之機率.(2)甲比乙投中次數多的機率.　　(10%)

2. 設隨機變數X與Y相互獨立，且均服從標準常態分配，若$W = \sqrt{X^2 + Y^2}$，求W的機率密度函數.　　(10%)

3. 若隨機變數X和Y的累積分配函數如下所示，求$P(-4 < X \leq 3 , 1 < Y \leq 5)$及$P(X + 2Y > 4)$之值.　　(15%)
$$F_{X,Y}(x,y) = \begin{cases} 1 - e^{-x} - e^{-y} + e^{-x-y} & ,x \geq 0 ,y \geq 0 \\ \quad\quad 0 & , \quad\quad 其他 \end{cases}$$

4. 若隨機變數X的機率質量函數為$f(x) = \dfrac{\theta^x}{x \, ! \, (e^\theta - 1)}, x = 1,2,3\cdots$,求X的期望值及變異數.　　(15%)

5. Let X and Y be independent Uniform(0,1) random variables.　Find the pdf of $Z = X + Y$.　(10%)

6. 90%患某病的病患能被某藥治癒。(a)試求 5 個患某病的病患中，至少有 2 人能被某藥治癒的機率 (b)試求 10 個患某病的病患中，至多有 3 人能被某藥治癒的機率(用 Poisson 分配求近似值) (c)試求 50 個患某病的病患中，至少有 45 人能被某藥治癒的機率(用常態分配求近似值)　(10%)

7. (18%)
   Let the joint pmf of X and Y is defined by
   $$p(x,y) = \begin{cases} c\,|\,x + y\,| & x = -2,0,2, \ y = -1,0,1 \\ 0 & \text{otherwise} \end{cases}$$
   (a) Find the value c.
   (b) $P(X > Y)$
   (c) Let $W = X + 2Y$, find the pmf of W, $p_W(w)$
   (d) Find $E(W)$ and $Var(W)$.
   (e) Find $P(W > 0)$
   (f) Find $Var(X)$ and $Var(Y)$

8. (12%)
   A system consisting of one original unit plus a spare can function for a random amount of time X.　If the density of X is given (in units of months) by
   $$f(x) = \begin{cases} cxe^{-\frac{x}{2}} & 0 < x < \infty \\ 0 & \text{otherwise} \end{cases}$$
   (a) What is the value c?
   (b) What is the probability that the system functions for at least 5 months?
   (c) Find $E(X)$
   (d) Find $M(t) = E(e^{tX})$, $t < \frac{1}{2}$

TABLE 5.1: AREA $\Phi(x)$ UNDER THE STANDARD NORMAL CURVE TO THE LEFT OF x

x	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
.0	.5000	.5040	.5080	.5120	.5160	.5199	.5239	.5279	.5319	.5359
.1	.5398	.5438	.5478	.5517	.5557	.5596	.5636	.5675	.5714	.5753
.2	.5793	.5832	.5871	.5910	.5948	.5987	.6026	.6064	.6103	.6141
.3	.6179	.6217	.6255	.6293	.6331	.6368	.6406	.6443	.6480	.6517
.4	.6554	.6591	.6628	.6664	.6700	.6736	.6772	.6808	.6844	.6879
.5	.6915	.6950	.6985	.7019	.7054	.7088	.7123	.7157	.7190	.7224
.6	.7257	.7291	.7324	.7357	.7389	.7422	.7454	.7486	.7517	.7549
.7	.7580	.7611	.7642	.7673	.7704	.7734	.7764	.7794	.7823	.7852
.8	.7881	.7910	.7939	.7967	.7995	.8023	.8051	.8078	.8106	.8133
.9	.8159	.8186	.8212	.8238	.8264	.8289	.8315	.8340	.8365	.8389
1.0	.8413	.8438	.8461	.8485	.8508	.8531	.8554	.8577	.8599	.8621
1.1	.8643	.8665	.8686	.8708	.8729	.8749	.8770	.8790	.8810	.8830
1.2	.8849	.8869	.8888	.8907	.8925	.8944	.8962	.8980	.8997	.9015
1.3	.9032	.9049	.9066	.9082	.9099	.9115	.9131	.9147	.9162	.9177
1.4	.9192	.9207	.9222	.9236	.9251	.9265	.9279	.9292	.9306	.9319
1.5	.9332	.9345	.9357	.9370	.9382	.9394	.9406	.9418	.9429	.9441
1.6	.9452	.9463	.9474	.9484	.9495	.9505	.9515	.9525	.9535	.9545
1.7	.9554	.9564	.9573	.9582	.9591	.9599	.9608	.9616	.9625	.9633
1.8	.9641	.9649	.9656	.9664	.9671	.9678	.9686	.9693	.9699	.9706
1.9	.9713	.9719	.9726	.9732	.9738	.9744	.9750	.9756	.9761	.9767
2.0	.9772	.9778	.9783	.9788	.9793	.9798	.9803	.9808	.9812	.9817
2.1	.9821	.9826	.9830	.9834	.9838	.9842	.9846	.9850	.9854	.9857
2.2	.9861	.9864	.9868	.9871	.9875	.9878	.9881	.9884	.9887	.9890
2.3	.9893	.9896	.9898	.9901	.9904	.9906	.9909	.9911	.9913	.9916
2.4	.9918	.9920	.9922	.9925	.9927	.9929	.9931	.9932	.9934	.9936
2.5	.9938	.9940	.9941	.9943	.9945	.9946	.9948	.9949	.9951	.9952
2.6	.9953	.9955	.9956	.9957	.9959	.9960	.9961	.9962	.9963	.9964
2.7	.9965	.9966	.9967	.9968	.9969	.9970	.9971	.9972	.9973	.9974
2.8	.9974	.9975	.9976	.9977	.9977	.9978	.9979	.9979	.9980	.9981
2.9	.9981	.9982	.9982	.9983	.9984	.9984	.9985	.9985	.9986	.9986
3.0	.9987	.9987	.9987	.9988	.9988	.9989	.9989	.9989	.9990	.9990
3.1	.9990	.9991	.9991	.9991	.9992	.9992	.9992	.9992	.9993	.9993
3.2	.9993	.9993	.9994	.9994	.9994	.9994	.9994	.9995	.9995	.9995
3.3	.9995	.9995	.9995	.9996	.9996	.9996	.9996	.9996	.9996	.9997
3.4	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9998