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1-1 (25 %) Given that Co is the cost per order, D is the annual demand, Cc is the annual carrying cost, and Q is the order size, please prove that the optimal order size for minimizing the total annual inventory cost (EOQ) is

$$\sqrt{2CoD/Cc}$$

1-2 (25 %) Suppose that the demand for Christmas trees are normally distributed and can be estimated using the demands of the past five years as 3, 2, 3, 3, and 4. Given that the trees cost NT 100 to obtain, and he sells for NT 120 each, what are the rough expected profits if he stocks with 4 trees this year? (Please use the attached Normal Probability Table)

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2-1 (10%) Please list and describe the major considerations of supply chain design for mass customization.

2-2 (15%) Compare and contrast the Q and P systems of inventory control.

2-3 (15%) X Company has a scheduling problem. Operators work eight-hour shifts and can begin work at midnight, 4 A.M., 8 A.M., noon, 4 P.M., or 8 P.M. Operators are needed to satisfy the following demand pattern. Formulate a linear programming model to cover the demand requirements with the minimum number of operators.

Time Period	Operators Needed
Midnight to 4 A.M.	4
4 A.M. to 8 A.M.	6
8 A.M. to noon	90
Noon to 4 P.M.	85
4 P.M. to 8 P.M.	55
8 P.M. to midnight	20

2-4 (10%) At the AA Bank corporate headquarters, management was discussing the potential of outsourcing the processing of credit card transactions to BB corporate, an international provider of banking operational services. Processing of the transactions at AA Bank corporate has been a costly element of the annual profit and loss statement and the continual investment in equipment to keep up to date has been draining capital reserves. Based on initial study and negotiations, BB corporate will charge $0.02 more per transaction than AA corporate's cost per transaction, and BB corporate will want $12 million per year to cover equipment and overhead costs associated with the contract. AA Bank has yet to develop an estimate for the annual overhead and fixed costs associated with processing the transactions. These costs include supervision, administrative support, maintenance, equipment depreciation, and overhead. If AA Bank must process 20 million transactions per year, how high must those fixed costs be before it would pay to BB corporate?
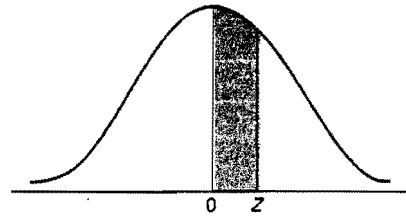
AREAS UNDER THE NORMAL PROBABILITY DISTRIBUTION

Values in the table represent the proportion
of area under the normal curve between
the mean ($\mu = 0$) and a positive value of Z.

Z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
.0	.0000	.0040	.0080	.0120	.0160	.0199	.0239	.0279	.0319	.0359
.1	.0398	.0438	.0478	.0517	.0557	.0596	.0636	.0675	.0714	.0753
.2	.0793	.0832	.0871	.0910	.0948	.0987	.1026	.1064	.1103	.1141
.3	.1179	.1217	.1255	.1293	.1331	.1368	.1406	.1443	.1480	.1517
.4	.1554	.1591	.1628	.1664	.1700	.1736	.1772	.1808	.1844	.1879
.5	.1915	.1950	.1985	.2019	.2054	.2088	.2123	.2157	.2190	.2224
.6	.2257	.2291	.2324	.2357	.2389	.2422	.2454	.2486	.2517	.2549
.7	.2580	.2611	.2642	.2673	.2703	.2734	.2764	.2794	.2823	.2852
.8	.2881	.2910	.2939	.2967	.2995	.3023	.3051	.3078	.3106	.3133
.9	.3159	.3186	.3212	.3238	.3264	.3289	.3315	.3340	.3365	.3389
1.0	.3413	.3438	.3461	.3485	.3508	.3531	.3554	.3577	.3599	.3621
1.1	.3643	.3665	.3686	.3708	.3729	.3749	.3770	.3790	.3810	.3830
1.2	.3849	.3869	.3888	.3907	.3925	.3944	.3962	.3980	.3997	.4015
1.3	.4032	.4049	.4066	.4082	.4099	.4115	.4131	.4147	.4162	.4177
1.4	.4192	.4207	.4222	.4236	.4251	.4265	.4279	.4292	.4306	.4319
1.5	.4332	.4345	.4357	.4370	.4382	.4394	.4406	.4418	.4429	.4441
1.6	.4452	.4463	.4474	.4484	.4495	.4505	.4515	.4525	.4535	.4545
1.7	.4554	.4564	.4573	.4582	.4591	.4599	.4608	.4616	.4625	.4633
1.8	.4641	.4649	.4656	.4664	.4671	.4678	.4686	.4693	.4699	.4706
1.9	.4713	.4719	.4726	.4732	.4738	.4744	.4750	.4756	.4761	.4767
2.0	.4772	.4778	.4783	.4788	.4793	.4798	.4803	.4808	.4812	.4817
2.1	.4821	.4826	.4830	.4834	.4838	.4842	.4846	.4850	.4854	.4857
2.2	.4861	.4864	.4868	.4871	.4875	.4878	.4881	.4884	.4887	.4890
2.3	.4893	.4896	.4898	.4901	.4904	.4906	.4909	.4911	.4913	.4916
2.4	.4918	.4920	.4922	.4925	.4927	.4929	.4931	.4932	.4934	.4936
2.5	.4938	.4940	.4941	.4943	.4945	.4946	.4948	.4949	.4951	.4952
2.6	.4953	.4955	.4956	.4957	.4959	.4960	.4961	.4962	.4963	.4964
2.7	.4965	.4966	.4967	.4968	.4969	.4970	.4971	.4972	.4973	.4974
2.8	.4974	.4975	.4976	.4977	.4977	.4978	.4979	.4979	.4980	.4981
2.9	.4981	.4982	.4982	.4983	.4984	.4984	.4985	.4985	.4986	.4986
3.0	.4987	.4987	.4987	.4988	.4988	.4989	.4989	.4989	.4990	.4990

Source: From Paul G. Hoel, *Elementary Statistics*, 2d ed., John Wiley & Sons, Inc., New York,
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