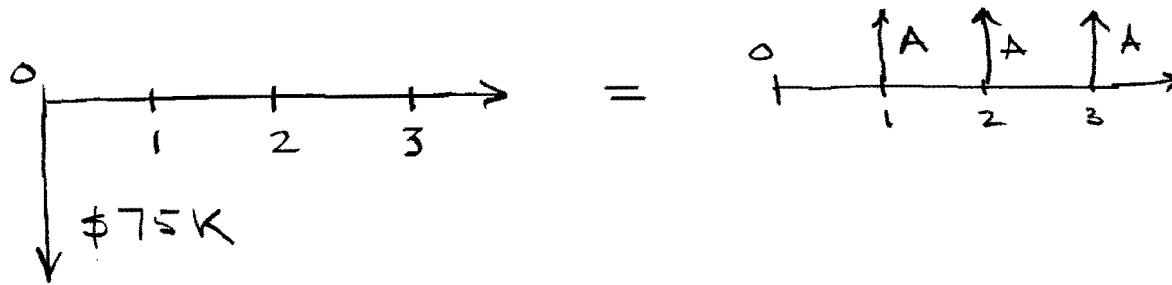


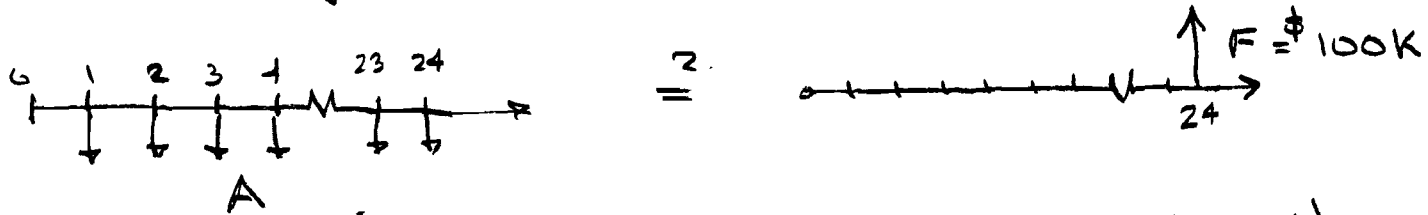
A new rapid prototyping machine currently costs \$75K and has an anticipated service life of 3 years. How much money would you need to make each year (after all operation, maintenance and service costs) by using this machine to fab prototypes in order to justify this investment? Assume a 6% annual interest rate.



$$\begin{aligned} A &= P(A/P, i, n) = \$75K (A/P, 6\%, 3) \\ &= \$75K(0.3741) \\ &= \$28,058. \end{aligned}$$

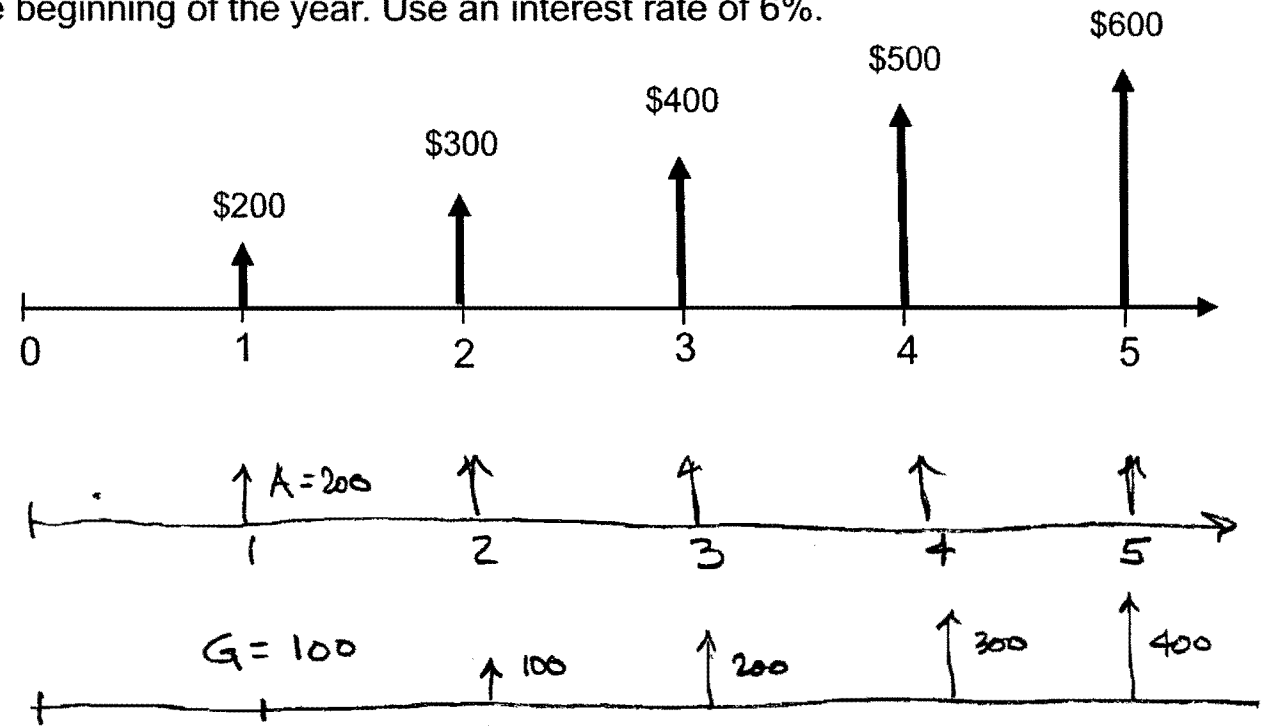
You anticipate that you will need to replace a major piece of equipment in 2 years. You have a commitment from the vendor that the equipment will cost \$100K. In preparation for the expenditure, you want to invest a fixed amount each month for the next two years in order to make the purchase in cash. How much money will you need to invest each month (at 6% nominal annual interest rate) in order to purchase this equipment?

$$6\% / \text{yr} \Rightarrow i(\text{1 month}) = 6\% / 12 = 0.5\% / \text{mo}$$



$$\begin{aligned}
 A &= F(A/F, i, n) = F(A/F, 0.5\%, 24) \\
 &= \$100\text{K} (0.0393) \\
 &= \$3930 / \text{month}
 \end{aligned}$$

How much would you be willing to pay at the time of purchase for a one-time payment maintenance agreement for a new automated drilling machine that you plan on using for the next six years in lieu of signing a contract for a uniformly increasing maintenance agreement illustrated by the following cash flow diagram? When you purchase the machine the first year's maintenance is free, in all subsequent years you pay for the maintenance at the beginning of the year. Use an interest rate of 6%.



$$\begin{aligned}
 P &= A (P/A, 6\%, 5) + G (P/G, 6\%, 5) \\
 &= \$200 (4.2124) + \$100 (7.9345) \\
 &= \$1636.
 \end{aligned}$$

You need to purchase a new machine tool and have three purchase options for the same machine:

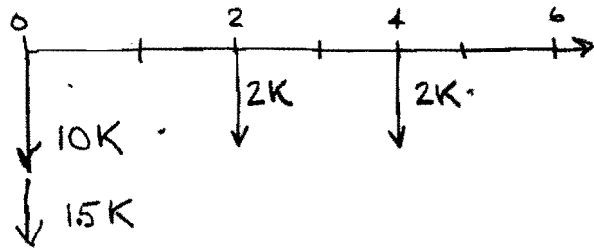
Option A: Purchase the machine for \$10,000 and at the same time purchase an up-front "maintenance" contract for \$1500 that will cover all repairs for 2 years and it will be renewable in two year increments for \$2,000 for as long as you own the machine.

Option B: Purchase the machine for \$11,000 with a one year initial guarantee and then purchase an annual maintenance agreement for \$1000 per year, paid at the beginning of the covered year.

Option C: Purchase the machine for \$14,750 and get a lifetime guarantee that covers all maintenance.

You plan using the machine for 6 years and your current MARR (interest rate) is 8%

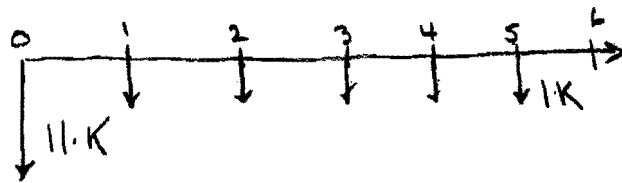
A



$$P = -10K - 1.5K - 2K(P/F, 8\%, 2) - 2K(P/F, 8\%, 4)$$

$$= -11.5K - 2K(0.8573) - 2K(0.7350) = -14,685 K$$

B



$$P = -11K - 1K(P/A, 8\%, 5)$$

$$= -11K - 1K(3.9927) = -14,993.70$$

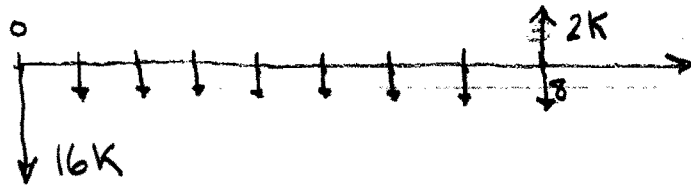
C

$$P = \$14,750.$$

	Unit A	Unit B
Initial Cost (\$)	16,000	30,000
Expected Lifetime (yrs)	8	15
Salvage Value (\$)	2,000	5,000
Annual Operating Cost (\$)	2,000	1,000

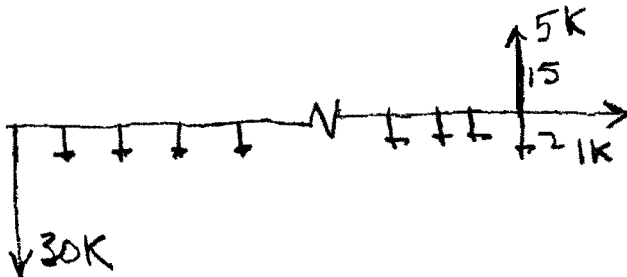
You want to decide which machine tool to purchase for a new product line. Two options are available. Your organization is using a minimum attractive rate of return (MARR) of 12%.

A



$$\begin{aligned}
 A &= -16K (A/P, 12\%, 8) - 2K + 2K (A/F, 12\%, 8) \\
 &= -16K(0.2013) - 2K + 2K(0.0813) \\
 &= -3.221K - 2K + 0.163K = -\$5,058. /yr
 \end{aligned}$$

B



$$\begin{aligned}
 A &= -30K (A/P, 12\%, 15) - 1K + 5K (A/F, 12\%, 15) \\
 &= -30K(0.1468) - 1K + 5K(0.0268) \\
 &= -4404 - 1000 + 134 \\
 &= -\$5270 /yr
 \end{aligned}$$