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**Problem Set: Single Dollar Problems**

**(Solutions Below)**

1. If you receive $300.00 in 10 years and the discount rate is 15%, what is the present value?
2. If you want to buy a boat in 6 years that costs $1,000.00 and you now have $600.00, what interest rate would you need?
3. If you put $1,000 in a stock portfolio with a return of 8%, how much would you expect to have in 7 years?
4. How long would you need to wait for $500.00 to double if the interest rate is 10%?
5. If you need $10,000 to pay for your first year of graduate school in 3 years and you get an interest rate of 9%, how much must you invest today?
6. If 6 years ago you invested $500.00 and received an annual interest rate of 4%, how much would you now have?
7. You borrowed $100 from a friend, who said you need to pay back $300 in 5 years, what rate are you being charged?
8. How many years would it take you to have $2,500.00 if you invested $500.00 today at 15%?
9. To have $6000 in 7 years what interest rate would you need if you now had $5,500?
10. If you win a lottery worth $1,000,000 payable in 15 years and the interest rate is 8%, what is this worth today?
11. How long does it take for an investment to quadruple in value if the investment yields 6% per year?
12. The average price of a movie ticket at the end of 1988 was $5.50 and the average price of a movie ticket at the end of 1990 was $6.00. At what annual rate did ticket prices grow?
13. If I invest $100 today in an account that earns 10% per year, how much will I have in this account at the end of twenty years if I make no withdrawals?
14. Suppose that I am trying to borrow money from you to finance my business, and I promise to repay you $10,000 in two years. If your opportunity cost of funds is 10%, how much are you willing to lend me?
15. Jim makes a deposit of $12,000 in a bank account. The deposit is to earn interest annually at the rate of 9 percent for seven years. How much will Jim have on deposit at the end of seven years?
16. John is considering the purchase of a lot. He can buy the lot today and expects the price to rise to $15,000 at the end of 10 years. He believes that he should earn an investment yield of 10 percent annually on this investment. The asking price for the lot is $7,000. Should he buy it?
17. An investor can make an investment in a real estate development and receive an expected cash return of $45,000 after six years. Based on a careful study of other investment alternatives, she believes that an 18 percent annual return is a reasonable return to earn on this investment. How much should she pay for it today?
18. Suppose you have the opportunity to make an investment expects to pay investors $75,000 in next eight years. If the cost is $50,000, what return would you receive?
19. Find the values for the following:
	1. An initial $500 compounded for 1 year at 6 percent.
	2. An initial $500 compounded for 2 years at 6 percent.
	3. The present value of $500 due in 1 year at a discount rate of 6 percent.
	4. The present value of $500 due in 2 years at a discount rate of 6 percent.
20. Which grows to a larger future value, $1000 invested for 2 years at: a) 10 percent each year, b) 5 percent the first year and 15 percent the second year or c) 15 percent the first year and 5 percent the second year?
21. Which grows to a larger future value: i) $2000 invested for 20 years at 10% or ii) $1000 invested for 20 years at 20%?
22. Which is worth more at 14 percent interest, compounded annually: a) $1000 in hand today or b) $2,000 due in 6 years?
23. A 1987 advertisement in the New Yorker solicited offers on a 1967 Mercury Cougar XR7 (Motor Trend's 1967 car of the year) that had been stored undriven in a climate controlled environment for 20 years. If the original owner paid $4000 for this car in 1967, what price would he have to receive in 1987 to obtain a 10 percent annual return on his investment?
24. Vincent Van Gogh sold only one painting during his lifetime, for about $30. A sunflower still life he painted in 1888 sold for $39.85 million in 1988,, more than three times the highest price paid previously for any work of art. If this painting had been purchased for $30 in 1888 and sold in 1988 for $39.85 million, what would have been the annual rate of return?
25. In 1940, your grandmother put $1000 into a special trust to be paid to a future grandchild (you) 60 years later, in the year 2000. How much will this trust be worth in the year 2000 if it has been earning a) 8%? b) 12%.
26. You can either receive a bonus of i) $10,000 in one year or ii) $20,000 in five years. Which is better if the discount rate is a) 10%? b) 20%?
27. At an interest rate of 10%, what is present value of $1m to be received in:
	1. 10 years
	2. 50 years
	3. 100 years
	4. 150 years
28. You are a CEO of a firm worth $10 million and you plan to stay until the firm has tripled in value. How long do you expect to be the CEO, if the expected growth rate is 15%?
29. A friend boasts that his investment doubled in 4 years. What was his annual return?
30. Your parents are astonished when they find out that you had to spend $700 on books and supplies, since it would only have cost them $200. If the inflation on these items was 5%, how long ago did your parents go to college?

**Solutions**

1. N = 10; I/Y = 15; PV = **$74.16**; FV = -300
2. N = 6; I/Y = **8.89%**; PV = 600; FV = -1,000
3. N = 7; I/Y = 8; PV = -1,000; FV = **$1,713.82**
4. N = **7.27**; I/Y = 10; PV = 500; FV = -1,000 ⇒ 7.27 = 7 years + 0.27 years, 12 x 0.27 = 3.24 ≈ 3 ⇒ **7 years 3 months**
5. N = 3; I/Y = 9; PV = **$7,721.83**; FV = -10,000
6. N = 6; I/Y = 4; PV = -500; FV = **$632.66**
7. N = 5; I/Y = **24.57%**; PV = 100; FV = -300
8. N = **11.52**; I/Y = 15; PV = 500; FV = -2,500 ⇒ 11.52 = 11 years + 0.52 years, 12 x 0.52 = 6.24 ≈ 6 ⇒ **11 years 6 months**
9. N = 7; I/Y = **1.25%**; PV = 5,500; FV = -6,000
10. N = 15; I/Y = 8; PV = **$315,241.70**; FV = -1,000,000
11. N = **23.79**; I/Y = 6; PV = 1; FV = -4 ⇒ 23.79 = 23 years + 0.79 years, 12 x 0.79= 9.48 ≈ 9 ⇒ **23 years 9 months**
12. N = 2; I/Y = **4.45%**; PV = 5.50; FV = -6.00
13. N = 20; I/Y = 10; PV = -100; FV = **$672.75**
14. N = 2; I/Y = 10; PV = **$8,264.46**; FV = -10,000
15. N = 7; I/Y = 9; PV = -12,000; FV = **$21,936.47**
16. N = 10; I/Y = **7.92%**; PV = 7,000; FV = -15,000 **No, the return is only 7.92%**
17. N = 6; I/Y = 18; PV = **$16,669.42**; FV = -45,000
18. N = 8; I/Y = **5.20%**; PV = 50,000; FV = 75,000
19. 1. N = 1; I/Y = 6; PV = -500; FV = **$530.00**
	2. N = 2; I/Y = 6; PV = -500; FV = **$561.80**
	3. N = 1; I/Y = 6; PV = **$471.70**; FV = -500
	4. N = 2; I/Y = 6; PV = **$445.00**; FV = -500
20. 1. N = 2; I/Y = 10; PV = -1,000; FV = **$1210.00 (best)**
	2. Year 1: N = 1; I/Y = 5; PV = -1,000; FV = **1050.00**

Year 2: N = 1; I/Y = 15; PV = -1050.00; FV = **$1207.50**

* 1. Year 1: N = 1; I/Y = 15; PV = -1,000; FV = **1150.00**

Year 2: N = 1; I/Y = 5; PV = -1,150; FV = **$1207.50**

1. 1. N = 20; I/Y = 10; PV = -2,000; FV = **$13,455.00**
	2. N = 20; I/Y = 20; PV = -1,000; FV = **$38,337.60 (better)**
2. A) **$1,000**, b) N = 6; I/Y = 14; PV = **$911.17**; FV = -2,000 ⇒ **a is better**
3. N = 20; I/Y = 10; PV = -4,000; FV = **$26,910.00**
4. N = 100; I/Y = **15.14%**; PV = -30; FV = 39,850,000
5. 1. N = 60; I/Y = 8; PV = -1,000; FV = **$101,257.06**
	2. N = 60; I/Y = 12; PV = -1,000; FV = **$897,596.93**
6. 1. 10%
		1. N = 1; I/Y = 10; PV = **$9,090.91**; FV = -10,000
		2. N = 5; I/Y = 10; PV = **$12,418.43**; FV = -20,000 **(better)**
	2. 20%
		1. N = 1; I/Y = 20; PV = **$8,333.33**; FV = -10,000 **(better)**
		2. N = 5; I/Y = 20; PV = **$8,037.55**; FV = -20,000
7. 1. N = 10; I/Y = 10; PV = **$385,543.29**; FV = -1,000,000
	2. N = 50; I/Y = 10; PV = **$8,518.55**; FV = -1,000,000
	3. N = 100; I/Y = 10; PV = **$72.57**; FV = -1,000,000
	4. N = 150; I/Y = 10; PV = **$0.62**; FV = -1,000,000
8. N = **7.86**; I/Y = 15; PV = -10,000,000; FV = 30,000,000 ⇒ 7.86 = 7 years + 0.86 years, 12 x 0.86= 10.3 ≈ 10 ⇒ **7 years 10 months**
9. N = 4; I/Y = **18.92%**; PV = 1; FV = -2
10. N = **25.68**; I/Y = 5; PV = 200; FV = -700 ⇒ 25.68 = 25 years + 0.68 years, 12 x 0.68 = 8.1 ≈ 8 ⇒ **25 years 8 months**