## ***Concept and Short Answer Exercises***

*1. As the principal increases, what happens to the interest?*

**1.** The interest increases as the principal increases. Hence, the more you borrow the more interest you will pay.

*2. As the interest rate increases, what happens to the interest?*

**2.** The interest increases as the rate increases. Hence, it will cost more to borrow \$1000 at 10% for 1 year than to borrow \$1000 at 6% for 1 year.

*3. As the term increases, what happens to the interest?*

**3.** The interest increases as the term increases. Hence, it will cost more to borrow \$1000 at 10% for 3 years than for \$1000 at 10% for 2 years.

*4. Why is the basic formula for interest, I = Pit, reasonable?*

**4.** I = Pit expresses that the interest varies directly with the amount borrowed, the rate, and the term.

*5. What is the formula for computing i ? For computing t ?*

**5.** $I = Pit \rightarrow i = I / (Pt)$ and $t = I / (Pi)$

*6. In paying off a loan, each payment must cover at least the ____ (principal or interest), or else the loan will balloon larger and larger.*

**6.** "interest." If you do not pay at least the interest each successive period, you will owe the total principal plus the interest.

## ***Calculation Exercises***

| Abbreviations | d | w | m | q | h | y |
|---|---|---|---|---|---|---|
| Time Unit | day | week | month | quarter | half | year |

*In Exercises 7-16, compute the simple interest/or the given amounts a/money.*

| *Exercise Number* | *Principal* | *Interest Rate* | *Time* |
|---|---|---|---|
| *7* | *\$425* | *6.5%* | *8 months* |
| **7.** $I = Pit$ $= 425 * 0.065 * 8/12 = \$18.42$ | | 0 425 @6.5% → 8m | |
| *8* | *\$1000* | *8.2%* | *1.5 years* |

| | | | |
|---|---|---|---|
| *8. I = P i t = ($1000) × (0.082) × (1.5) = $123.00* | | | |
| *9* | *$1580* | *8%* | *14 months* |
| **9.** $I = Pit$ $= 1580 * 0.08 * {}^{14}/_{12} = \$147.47$ | | 0 — 1580 —@8%→ 14m | |
| *10* | *$300.20* | *18%* | *7 months* |
| *10. I = P i t = ($300.20)× (0.18) × (7/12) = ($300.20)× (0.18) × (0.58333) = $31.52* | | | |
| *11* | *$2950.50'* | *7.75%* | *20 months* |
| **11.** $I = Pit$ $= 2950.50 * 0.0775 * 20/12 = \$381.11$ | | 0 — 2950.50 —@7.75%→ 20m | |
| *12* | *$150,000* | *4.3%* | *14 weeks* |
| *12. I = P i t = ($150000)(0.043) (14/52) = ($150000) (0.043) (0.269231) = $1736.538* | | | |
| *13* | *$255.35* | *12%* | *3 months* |
| **13.** $I = Pit$ $= 255.35 * 0.12 * {}^{3}/_{12} = \$7.66 = \$7.66$ | | 0 — 255.35 —@12%→ 3m | |
| *14* | *$600* | *9%* | *23 months* |
| *14. I = P i t = ($600)(0.09) (23/12) = ($600) (0.09) (1. 91667) = $103.500* | | | |
| *15* | *$640.45* | *6.5%* | *7 months* |
| **15.** $I = Pit$ $= 640.45 * 0.065 * 7/12 = \$24.28$ | | 0 — 640.45 —@6.5%→ 7m | |
| *16* | *$9000* | *2 * %* | *40 weeks* |
| *16. I = P i t = ($9000)(0.02) (40/52) = ($9000) (0.02) (0.769231) = $138.462* | | | |

*17. On 11/2/02 Mark invests $1000 at 5%. Find the interest and the future value of the investment on 4/2/04.*

**17.** $t = 4/2/04 - 11/2/02 = 16/2/03 - 11/2/02 = 5m + 1y = 17m$

$I = Pit = 1000 * 0.05 * 17/12 = \$70.83$

$S = P + I = 1000 + 70.83 = \$1070.83$

11/2/02 — 5000 —@5%→ S — 4/2/04

*18. On 11/2/02 Kristie invests $5000 at 4.5%. Find the interest and the future value of the investment 9 months later.*

*18. I = P i t = ($5000)(0.045) (9/12) = ($5000) (0.045) (0.75) = $168.75*

*S = P + I = $5000 + $168.75 = $5168.75*

*19. On 9/5/03 Penny takes out a loan for $5000 from her parents, who are charging 8%. When Penny graduates on 5/5/07, how much interest does she owe, and what is the amount she will repay her parents ?*

**19.** $t = 5/5/07 - 9/5/03 = 17/5/06 - 9/5/03 = 8\,m + 3\,y = 8\,m + 36\,m = 44\,m$

$I = Pit = 5000 * 0.08 * {}^{44}/_{12} = \$1466.67$

$S = P + I = 5000 + 1466.67 = \$6466.67$

| 9/5/03 | | 5/5/07 |
|---|---|---|
| 5000 | @8% → | S |

*20. On 10/5/03 Edwin purchases a used car by taking out a loan for $10,000 from his parents, who are charging 3%. When Edwin repays the loan on 10/5/04, how much interest does he owe, and what is the amount he will repay his parents?*

*20. I = P i t = ($10000)(0.03) (1) = $*300.00

*S = P + I = $10000 + $*300.00 *= $*10300.00

*21. Ethan requires a loan of $100,000 to start an Internet business. He found a loan agent that charges 12%. He is not willing to pay more than $1000 per month. Why is this an impossible situation?*

**21.** $I = Pit$

$= 100{,}000 * 0.12 * 1/12$

$= \$1000$ which equals her payment. Hence up the payment.

| 0 | | 1m |
|---|---|---|
| 100,000 | @12% → | \| |

*22. Heather requires a quick loan of $4000 and uses a credit card that charges 12%. She can pay at most $40 per month. Why is this an impossible situation?*

*22. I = P i t = ($4000)(0.12) (/1/12) = $*40.00

*Which equals her payment. Hence up the payment.*

*23. A loan shark lets you borrow $100 and pay back $105 in 1 week. Find the annual interest rate.*

**23.** $I = 5 \rightarrow i = {}^{I}/_{Pt} = \dfrac{5}{100 * {}^{1}/_{52}} = 2.6 = 260\%$

| 0 | | 1w |
|---|---|---|
| 100 | @i → | 105 |

*24. A quick check-cashing agent is willing to hold your check of $500 for 2 weeks for only $30. Find the annual interest rate.*

*24. I = $30 ► i = I / Pt = 30 /(500 * 2 / 52) = 30 / 19.23077 = 1.56 * 100% = 156%/y*

*25. On 1/2/03 Joe lends his brother Wes $1000. Wes pays off the loan on 7/2/03 with $1050. Find the annual percentage rate.*

**25.** $I = 50 \rightarrow i = I/Pt = \dfrac{50}{1000 * 6/12} = 0.10 = 10\%$

| 1/2/03 | | 7/2/03 |
|---|---|---|
| 1000 | $\xrightarrow{@i}$ | 1050 |

*26. On February 3 Vicky lends her brother James $10,000. James pays off the loan on October 3 with $11,000. Find the annual percentage rate.*

*26. I =$1000 ► i = I/Pt =1000/(10000 * 8 / 12)= 1000/6666.67 = .15*100% = 15%/y*

*27. To the nearest month how long does it take to increase your investment by 50% if you can get 8% on your investment?*

**27.** $I = 0.50$

$t = I/Pi = \dfrac{0.50}{1 * 0.08} = 6.25\,y$

| 0 | | t y |
|---|---|---|
| 1 | $\xrightarrow{@8\%}$ | 1.50 |

*28. To the nearest month how long does it take to increase your investment by 80% if you can get 9% on your investment?*

*28. I = $0.80 ► t = I / Pi = 0.80 / (1 * 0.09) = 0.80 / 0.09 = 8.889 y * 12 ≈ 107 m*

*29. If you hope to double your money and you have $1000 to invest at 6%, how long will it take you? (Note that the $1000 is unnecessary information. Explain why.)*

**29.** $I = \$1$

$t = I/Pi = \dfrac{1}{1 * 0.6} = 16\dfrac{2}{3}\,y = 16\,y + 8\,m$

| 0 | | t y |
|---|---|---|
| 1 | $\xrightarrow{@6\%}$ | 2 |

It takes the same time for $1 to double as it does for a million dollars.

*30. If you desire to triple your money at 10%, how long will it take you?*

*30. I = $2 ► t = I / Pi = 2 / (1 * 0.10) = 2 / 0.1 = 20 y*

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