CPA Preparatory Courses

Calculator Guide

2020-11-05

Table of Contents

CPA PREPARATORY COURSES CALCULATOR GUIDE

INTRODUCTION

The approved calculator for use in the CPA preparatory courses is the Texas Instruments BA II Plus. Knowing how to efficiently use this calculator is essential for success in the CPA preparatory courses.

This guide explains how to properly set up your calculator and perform essential calculations, and includes some examples so you can practise. It is recommended that you work through these and compare your answers to the solutions provided in order to ensure you are ready for the CPA preparatory courses.

SETTING UP YOUR CALCULATOR

Your calculator should be set up to show four decimal places to ensure the appropriate level of rounding, as follows:

1. Press “2nd” and then “.” (“Format”). It should display “DEC =” and a preset value, usually 2.00.
2. Type in “4” and “ENTER”.
3. Clear your calculator (“CE/C”). You will now see four decimal places.

Next, ensure that your calculator is set for one payment per period:

1. Press “2nd” and then “I/Y” (“P/Y”).
2. If the screen says “P/Y = 1.0000”, it is set up correctly. If not, press “1” and “ENTER”.
3. Clear your calculator (“CE/C”).

TIME VALUE OF MONEY CALCULATIONS

The premise of the time value of money (TVM) is that a dollar that you have today is worth more than the value of a dollar in the future. Money that you hold today is worth more because you can invest it and earn interest. Given that many financial liabilities are measured at the present value of the future cash flow stream, it is important to have a working knowledge of TVM.

Interest is the money paid by a borrower to a lender for the use of the lender’s money over a certain period of time. The sum of money borrowed or loaned is called the principal. The rate of interest is the amount charged for the use of the principal over that given period of time. Interest rates are normally quoted as a nominal (ignoring compounding effects) annual rate. Compounding is when interest is calculated on the

outstanding principal plus accumulated unpaid interest rather than just on the principal balance.

A common calculation is to determine the present value (now) of, for example, $3,500 to be paid in three years' time. Expressed differently, what amount would you have to pay today that would make you indifferent between paying that amount today or paying $3,500 three years from now?

This process of calculating the present value of amounts to be paid (or received) at future dates is known as discounting and the rate of interest is known as the discount rate. The discount rate is based on market discount rates, the opportunity cost rate (the interest rate that would be earned under another use for the funds) or the entity's internal rate of return.

Calculating TVM

Calculating TVM involves five buttons in the third row from the top of the calculator:

- "N" (number of periods)
- "I/Y" (interest per period)
- "PV" (present value)
- "PMT" (payment)
- "FV" (future value)

To enter one of these values, type in the number followed by the related button listed above.

Note: Each time a calculation is performed, the calculator stores the numbers entered and keeps them until they are cleared out in one of two ways: 1) clear all TVM data by pressing "2nd" and then "FV" ("CLR TVM"), or 2) enter either a new number or a zero for each variable (that is, enter "0" for any variables not used in the calculation).

Example

What is the present value of $10,000 to be received in five years including 4% interest?

Solution

1. Type "5" and then "N".
2. Type "4" and then "I/Y".
3. Type "10000" and then "FV".

4. Type “0” and then “PMT”. (You may omit this step if no amount is stored as PMT from a previous calculation. To recall or check for a previously stored amount, press “RCL” and then the variable, “PMT”.)
5. Press “CPT” and then “PV”. The display should read “PV = –8,219.2711.”

The present value is negative because in order to receive $10,000 in the future, you would need to pay out $8,219 now.

The TVM buttons can be used to determine any of the five variables. When inputting both a present value and a future value, ensure the correct value is negative. For example, if you are receiving money in the future, the future value is positive and the present value is negative. If you will be paying money out in the future, then the present value is positive and the future value is negative.

Example

John has a $15,000, 0% loan due in five years’ time. The market rate of interest for this type of obligation is 8%. What is the present value of John’s obligation?

Solution

N = 5; FV = $15,000; I/Y = 8; CPT PV = –$10,209 (rounded)

Calculating annuities

An annuity is a series of payments of the same amount paid at regular intervals. A regular annuity is one in which the payments are received at the end of each period. An annuity due is one in which payments are received at the beginning of the period. Unless explicitly stated otherwise, payments are assumed to be paid at the end of the period.

In order to perform calculations relating to the present value of an annuity or an annuity due, you must change the mode of the calculator to account for the change in payment timing, as follows:

1. Press “2nd” and then “PMT” (“BGN”).
2. Press “2nd” and then “ENTER” (“SET”). “BGN” should appear at the top-right corner of the screen.

Ensure that this mode is **only** used for calculations related to an annuity due. To switch your calculator back to the regular mode with payments at the end of each year:

1. Press “2nd” and then “PMT” (“BGN”).
2. Press “2nd” and then “ENTER” (“SET”). “BGN” should no longer appear in the top-right corner of the screen.

All other steps are the same for TVM calculations in BGN mode.

Example (regular annuity)

Tony is required to make payments of $3,333 per year on a loan for the next four years. The market rate of interest for this type of obligation is 5%. What is the present value of the obligation?

Solution

N = 4; PMT = $3,333; I/Y = 5; CPT PV = –$11,819 (rounded)

Example (annuity due)

You are buying a new vehicle and are trying to determine whether to lease the vehicle over five years or pay cash today. The salesperson has offered a cash price of $23,000 or a five-year lease with payments of $300 per month, with the first payment due at the signing of the lease and a buyout of $9,500 at the end of five years. Because the first payment is made at the start of the lease, the lease will require 59 additional equal payments at the beginning of each month to cover the 60-month (five-year) lease period. The buyout will occur at the end of the lease, after the 60-month lease period is concluded. Which is the better offer, assuming the rate on loans for new vehicles is 6% per year compounded monthly?

Solution

Because the payments are made monthly, you need to calculate a monthly interest rate to coincide with these payments.

Monthly rate = 6% / 12 months = 0.5% per month

There are also two different types of payments: the monthly annuity and the lump-sum buyout in five years.

BGN; N = 60; I/Y = 0.5; FV = $9,500; PMT = $300; CPT PV = –$22,638 (rounded)

Therefore, the lease is a better deal because the PV of the lease is less than the cash price.

Calculating payment on a loan

The financial calculator can be used to determine the required payment for a given loan amount, term and interest rate.

Example

Davinder has borrowed $10,000 repayable annually over five years, including interest at 12% per annum. What is the required annual payment?

Solution

N = 5; I/Y = 12; PV = –$10,000; CPT PMT = $2,774 (rounded)

Calculating cash flow

Some questions may involve varying payments each year and therefore require separate TVM calculations where conditions are the same for the TVM variables. In this situation, you may use the calculator's cash flow function.

Example

ABC Corp. sells goods for $25,000 on January 1. This balance is not payable until the end of the sixth year, and the company will receive interest of 1% in Years 1 and 2 and 3.5% in Years 3 through 6. What is the net present value of this sale if the imputed rate of interest is 7.5%?

Solution

ABC Corp. has the following cash flows:

Year 1: $250 ($25,000 × 1%)

Year 2: $250 ($25,000 × 1%)

Year 3: $875 ($25,000 × 3.5%)

Year 4: $875 ($25,000 × 3.5%)

Year 5: $875 ($25,000 × 3.5%)

Year 6: $25,875 [($25,000 × 3.5%) + $25,000]

You can determine the present value using a series of TVM calculations, as follows:

Calculation 1: Find the PV of the Year 1 and 2 cash flows.

N = 2; I/Y = 7.5%; PMT = –$250; FV = 0; CPT PV = $448.8913

Calculation 2: Find the value at Year 3 of the Year 3 through 6 interest payments.

N = 4; I/Y = 7.5%; PMT = –$875; FV = 0; CPT PV = $2,930.6605

Then bring this payment back to Year 1 to make it comparable to Calculation 1:

Calculation 3: Find the PV of the Year 3 through 6 interest payments.

N = 2; I/Y = 7.5%; PMT = 0; FV = –2,930.6605; CPT PV = $2,535.9961

Calculation 4: Find the PV of the $25,000 received in Year 6.

N = 6; I/Y = 7.5%; PMT = 0; FV = –25,000; CPT PV = $16,199.0380

The total present value is Calculation 1 + Calculation 3 + Calculation 4:

$448.8913 + $2,535.9961 + $16,199.0380 = $19,183.9254

The alternative way of calculating this is using the calculator's cash flow function, but first be sure to clear out any cash flow calculation numbers so that you don't have any old information affecting your current calculations:

Press "CF", and then press "2nd" and then "CE/C" ("CLR WORK").

To use the cash flow function:

1. Press "CF".
2. The screen will display "CFo =", asking for the cash flow at Time 0. In this case, there is no cash flow at the beginning of the contract, so leave this as zero. Press "↓".
3. For C01, type "250" and then "ENTER". (This is the first regular cash flow.) Press "↓".
4. For F01, type "2" and then "ENTER". (This is the frequency with which this cash flow is received.) Press "↓".
5. For C02, type "875" and then "ENTER". Press "↓".
6. For F02, type "3" and then "ENTER". Press "↓".
7. For C03, type "25875" and then "ENTER". Press "↓".
8. For F03, type "1" and then "ENTER".
9. Press "CPT" and "NPV". The screen should display "I = 0.0000".
10. Type "7.5" and then "ENTER". Press "↓".
11. Press "CPT". The screen should display 19,183.9253.

Calculating perpetuities

A perpetuity is a special case of an annuity where the contract runs forever (that is, there is no end to the payments). This may seem like a strange concept, but there are some government securities that are undated and it is unlikely that the principal on these securities will be repaid. Also, the dividends on preferred shares are often thought of as a perpetuity because there is no maturity date on the shares. The formula to determine the value of a perpetuity (P) with an annual payment (C) at an interest rate (r%) is P = C / r%.

Example

Your company sells a bond that pays $1,000 interest per annum in perpetuity. The market rate of interest for this type of obligation is 9%. What amount will you be able to sell the bond to an investor for?

Solution

P = C / r% = $1,000 / 0.09 = $11,111 (rounded)

Bond valuation

When bonds are issued, there is a contract attached to them that details the important aspects of the bonds, such as the par value (face or maturity value), coupon rate, payment dates, maturity date and principal payment. This contract is called the bond indenture. Often, bonds also have a security attached to them that may be seized in the event of default. If bonds are issued with no security attached, they are called debentures. Note that the coupon rate is the actual rate of interest paid on the bond.

The price of a bond can be determined by discounting the future cash flows associated with the bond using the appropriate discount rate (market rate). There are two cash flows associated with a bond — the periodic payments of interest (the coupons) and the lump sum at maturity (the face value) — so the price of the bond is the sum of the present value of the interest payments (an annuity) and the present value of the maturity amount (a lump sum). Your calculator allows you to calculate the sum of these values simultaneously.

Example

Determine the price of a $1,000, 5% (coupon rate) bond that pays interest semi-annually and matures in five years, assuming a market rate of 6%.

Solution

N = 10 (5 × 2); I/Y = 3 (6 / 2); FV = $1,000; PMT = $25 (1,000 × 5% / 2); CPT PV = –$957 (rounded)

In this example, because the market was demanding a higher interest rate than that offered on the bond, the price of the bond fell below its par value and the bonds sold at a discount. If the market rate had been lower than the coupon rate, the price of the bonds would have been higher than the par value and the bonds would have sold at a premium. It follows that if interest rates increase, then the price of bonds will decrease and vice versa.

Interest rate conventions

In Canada, by established convention, the method used to calculate interest expense depends to some degree on the nature of the financial instrument. For example, interest expense on bonds payable and finance leases is usually calculated based on the number of months outstanding, without regard to the number of days in each month.

The method used to calculate interest expense on notes payable also depends on their nature. If the term note includes a set payment amount that includes principal and interest (as bonds and leases do), interest expense is usually calculated based on the number of months outstanding. However, if the note is repayable on a principal-plus-interest basis or does not include an established repayment schedule, interest expense is calculated on a daily basis.

Calculating interest based on number of days

When interest is calculated on a daily basis, include the day that the money was borrowed but not the day that it was paid off. Note, however, that when you are accruing interest, you include the last day of the month because the loan is still outstanding. An easy way to remember this is to think of whether the money was owed at midnight. If yes, include that day; if no, exclude that day.

Notes issued at a discount

To calculate a note issued at a discount:

- Interest expense for the period = amortized cost[1] × market rate of interest × # of days / 365. Debit this amount to interest expense and credit it to notes payable.
- At maturity, the discount will have been amortized and the amortized cost will equal the face value (maturity value) of the note. Debit this amount to notes payable and credit it to cash.

Example

On June 15, 20X5, Fencing Superstore Inc. (FSI) issued a $100,000 interest-free note to a supplier in exchange for inventory. The note is repayable in full on June 15, 20X6. The fair market value of the inventory approximates the fair value of the note. The market rate of interest for similar transactions is 5%. FSI's year end is December 31. FSI only accrues interest at year end.

a) Prepare the journal entry to record the issuance of the note.

b) Prepare the journal entry to accrue interest expense on the note at year end.

c) Prepare the journal entry to accrue interest expense and derecognize the note at maturity.

Solution

a) **June 15, 20X5**

DR Inventory	95,238	
CR Notes payable		95,238

FV = $100,000; N = 1; I/Y = 5; CPT PV = –$95,238 (rounded)

[1] You need to remain aware of the compounding frequency specified in the note. Amortized cost is only updated for determining interest expense when the interest is compounded in accordance with the terms of the note, rather than simply accrued for bookkeeping purposes.

b) **December 31, 20X5**

DR Interest expense	2,609	
CR Notes payable		2,609

June (16 days — include the day borrowed) + July (31 days) + August (31 days) + September (30 days) + October (31 days) + November (30 days) + December (31 days) = 200 days

$95,238 × 0.05 × 200/365 = $2,609 (rounded)

c) **June 15, 20X6**

DR Interest expense	2,153	
CR Notes payable		2,153
DR Notes payable	100,000	
CR Cash		100,000

January (31 days) + February (28 days) + March (31 days) + April (30 days) + May (31 days) + June (14 days — exclude the day paid off) = 165 days

$95,238 × 0.05 × 165/365 = $2,153 (rounded); amortized cost is not updated because interest was simply accrued for bookkeeping purposes.