

# Guide to Aligning Mathematics Pathways to Programs of Study

Dana Center  
**Mathematics**  
PATHWAYS

**Purpose:** This tool will help your team align your institution's multiple mathematics pathways to its programs of study. Specifically, the outcome of this tool is to develop an inventory of your institution's mathematics courses, which will help your leadership team do the following:

- List all programs of study.
- Identify math course requirements for each program at your institution.
- Compare math course requirements at primary transfer institutions.
- Facilitate discussions with program leads and department chairs across campus.
- Improve alignment of mathematics preparation with needs of the programs over time.
- Provide clear and consistent information for advisors and faculty.

**Users:** Administrators, math department chairs, math faculty, advisors

**Process-at-a-Glance:** This tool is comprised of three parts.

	<b>Part I Current Program Requirements</b>	<b>Part II Review External Recommendations</b>	<b>Part III Action Steps to Maximize Scale</b>
	<b>pp. 2-6</b>	<b>pp. 7-10</b>	<b>pp. 11-13</b>
<b>Purpose</b>	Gather current information about math course requirements and advising practices	Inform changes possibly made to course requirements and advising practices	Identify short- and-long term action steps to scale math pathways implementation
<b>Who Is Involved</b>	Leadership team, with input from partner discipline leads or department chairs	Leadership team	Leadership team
<b>Necessary Resources</b>	<ol style="list-style-type: none"><li>1. <i>Template for Alignment of Mathematics Pathways Inventory</i></li><li>2. <i>Sample Math Pathways List</i></li><li>3. <i>Engaging Partner Disciplines: Multidisciplinary Discussion Tools</i></li></ol>	<ol style="list-style-type: none"><li>1. Institutional Transfer Data</li><li>2. State-Level Math Inventory Guide (if available)</li><li>3. <i>Program of Study Briefs</i> (multiple briefs available)</li></ol>	<ol style="list-style-type: none"><li>1. <i>Alignment of Mathematics Pathways Inventory</i></li></ol>

## Part I: Current Program Requirements

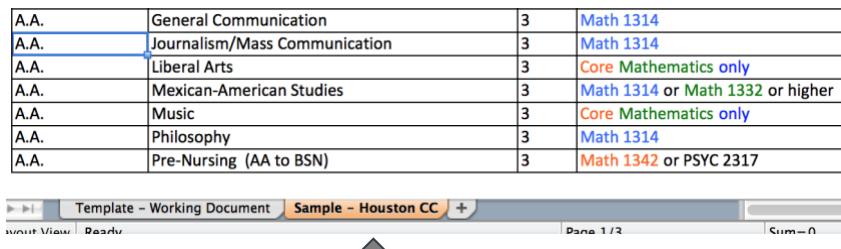
Purpose	Who Is Involved	Necessary Resources
Gather current information about math course requirements and advising practices	Leadership team, with input from partner discipline leads or department chairs	<ol style="list-style-type: none"> <li>1. <a href="#"><i>Template for Alignment of Mathematics Pathways Inventory</i></a></li> <li>2. <a href="#"><i>Sample Math Pathways List</i></a></li> <li>3. <a href="#"><i>Engaging Partner Disciplines: Multidisciplinary Discussion Tools</i></a></li> </ol>

The leadership team will identify the current mathematics course requirements for most, if not all, programs of study at its institution. This data collection task is an important step that requires input from partner discipline leads and/or department chairs. The provided resources, noted above, serve a foundation to initiate this work, yet not required.

To complete Part I, follow each step below. The examples provided in Steps 1-7 are related to pathways in Texas; however, please note that pathways often vary state by state. Ensure that your identification of math courses to programs of study is relevant to your state and institution.

### Step 1: Complete the *Alignment of Mathematics Pathways Inventory*

Before working on your inventory, you may first want to review the *Template for Alignment of Mathematics Pathways Inventory*. Click on the second tab at the bottom of the Excel spreadsheet, labeled “Sample – Houston CC.”



A.A.	General Communication	3	Math 1314
A.A.	Journalism/Mass Communication	3	Math 1314
A.A.	Liberal Arts	3	Core Mathematics only
A.A.	Mexican-American Studies	3	Math 1314 or Math 1332 or higher
A.A.	Music	3	Core Mathematics only
A.A.	Philosophy	3	Math 1314
A.A.	Pre-Nursing (AA to BSN)	3	Math 1342 or PSYC 2317



Next, click on the first tab (“Template – Working Document”) to begin completing the inventory for your institution.

- Complete the top of the inventory with your institution name, core math requirements, and course guide (course numbers and title).
- Use your institution course catalog to ascertain the math course(s) required to complete an associate degree, certificate program, and/or baccalaureate degree in each program of study. List each program of study with its appropriate math requirement(s) under the column entitled “Math Requirements.”
- List any questions or concerns under the column entitled “Notes.”

- If your institution does not offer majors, focus on areas of emphasis within A.A., A.S., B.A., B.S., etc. programs.

## Step 2: Code the Alignment for Mathematics Pathways Inventory

Highlight the math course requirements in the inventory with the following color codes:

- **Math 1342/1442: Statistics** (orange)
- **Math 1332: Quantitative reasoning** (green)
- **Math 1314 and calculus sequence: STEM pathways** (blue)

Note: The color codes, math course numbering, and math course names above are related to Texas pathways. Contextualize the inventory to your state and institution math pathways.

For example, Missouri math pathways may be coded as follows:

- MATH \_\_\_: Contemporary Quantitative Reasoning (green)
- MATH \_\_\_: Elementary Education (red)
- MATH \_\_\_: Precalculus A and Precalculus B (STEM Pathways) (blue)
- MATH \_\_\_: Statistical Reasoning (orange)

## Step 3: Identify High Enrollment Majors at Your Institution

Teams will want to identify the top five most popular programs in which their students declare a major. If this information is not readily available at your institution, refer to your state's database. For example, the information in Texas is available through the Texas Higher Education Coordinating Board (THECB) report, *Declared Majors*, available at: <http://reports.thescb.state.tx.us/approot/dwprodprt/majmenu.htm>.

Some states have split database information for either community colleges or baccalaureate institutions. It may be necessary to conduct external outreach to state-level higher education agencies (e.g., Coordinating Board, Student Success Center) to obtain relevant program data if this information is not available at the institution.

Once the top five programs have been identified, mark these programs in your inventory with an asterisk (\*).

## Step 4: Review the Sample Math Pathways List

The *Sample Math Pathways List* offers suggestions for how to align programs of study with differentiated math pathways. Developed by MDRC and the Dana Center, the tool is based

on a review of the requirements at four-year universities across the state, a sample of two-year colleges that have mapped programs to quantitative reasoning and statistics pathways, and professional recommendations.

As your team members review this resource, ask yourselves:

- What do you notice about the recommended alignment of programs of study to math pathways?

List questions, comments, or suggestions for future modifications to course requirements under the “Notes” column in the *Template for Alignment of Mathematics Pathways Inventory*.

### **Step 5: Engage Your Colleagues and Verify Your Information**

Engage your partner discipline leads or department chairs early in the alignment process and discussions. Set up meetings to share your findings and the implications for math course requirements and advising practices. Use the meetings to answer any of your questions about requirements, concerns about the alignment of the requirement to the needs of the programs, and questions about prerequisites or default advising. Ask your colleagues to review the inventory prior to meeting.

Use the *Engaging Partner Disciplines: Multidisciplinary Discussion Tools* to prepare for and implement cross-disciplinary discussions focused on *identifying a default mathematics course requirement that is most relevant for each program of study*.

To keep this step manageable, consider meeting in small groups. For example, meet with liberal and fine arts leads together, social science and health-related leads together, and STEM-related program leads together.

The meeting should examine:

- Institution’s course catalog to confirm accuracy of math course requirements.
- Student learning outcomes as they align to each program of study.
  - Consider using a survey to help determine the mathematical skills and abilities that students need to learn in entry-level mathematics courses to prepare for upper-division work in each discipline.
- Examples of mathematics content that demonstrates the mathematics skills used in the different programs of study.
- Methods of communication and engagement with partner discipline’s faculty, staff, and students to build awareness of multiple mathematics pathways.

Teams can use the following tables to document their discussions with partner discipline leads or department chairs.

### Assessing Current Context

Example questions to ask:

- Is the information in the course catalog and *Alignment for Mathematics Pathways Inventory* accurate?
- If there are math course options, do students tend to enroll in one option more than others?
- Do you, or do advisors, recommend one option more than others?

Notes:

### Assessing Future Context

Example questions to ask if statistics or quantitative reasoning (contemporary mathematics) is not already an option for liberal arts, fine arts, social science, health, or other “non-STEM” programs:

- How are the learning outcomes in the required math courses tied to the needs of the program?
- What information would you need to determine if a rigorous statistics or quantitative reasoning course could be appropriate preparation for this program?

Example questions to ask if the program allows multiple options:

- Which course has learning outcomes most aligned with the program of study?
- Would you consider designating this course as the preferred or default requirement?

Notes:

### Step 6: Update the *Alignment of Mathematics Pathways Inventory*

Based on your partner discipline meetings and discussions, update the “Math Requirements” and “Notes” section of the Mathematics Pathways inventory.

## Step 7: Review Current Requirements

After completing the Mathematics Pathways inventory, review the results with the leadership team. Consider the following discussion questions regarding math course requirements and advising practices.

### Assessing Current Context

Example questions to ask regarding math course requirements:

- Which programs of study align with statistics or quantitative reasoning math pathways?
- Which programs of study have college algebra as the only math requirement?
- Which programs of study have multiple options for required mathematics?
- How do your program requirements compare to the *Sample Math Pathways List*?

Notes:

### Assessing Future Context

Example questions to ask regarding advising practices:

- Among the programs of study that currently allow or require statistics or quantitative reasoning, do many students enroll in these courses?
- If enrollment is minimal, what could be the reason(s)?
- If enrollment is sizeable, what factors have contributed?

Also, consider the following questions:

- Does the website or catalog information make a strong recommendation for the most appropriate math course among available options?
- Are students consistently and accurately advised to take the most appropriate math pathway?
- Are statistics or quantitative reasoning courses offered at times and locations convenient for targeted programs of study?

Notes:

## Part II: Review External Recommendations

Purpose	Who Is Involved	Necessary Resources
Inform changes possibly made to course requirements and advising practices	Leadership team	<ol style="list-style-type: none"> <li>1. Institutional Transfer Data</li> <li>2. State-Level Math Inventory Guide (if available)</li> <li>3. <i>Program of Study Briefs</i> <ul style="list-style-type: none"> <li>• <a href="#"><u>Nursing</u></a></li> <li>• <a href="#"><u>Criminal Justice</u></a></li> <li>• <a href="#"><u>Communications</u></a></li> <li>• <a href="#"><u>Social Work</u></a></li> <li>• <a href="#"><u>Business</u></a></li> <li>• <a href="#"><u>Pre-Service Elementary (K-5) Teacher Education</u></a></li> </ul> </li> </ol>

As you determine the most appropriate mathematics requirements for programs of study at your institution, you will also want to consider the requirements of your transfer partners and the recommendations of professional associations of client disciplines. This section helps you explore these external factors and to identify implications for your institutional planning and advising practices.

### Step 1: Review Transfer Data for Your Institution

Download the most recent transfer data for your institution from the state database. In Texas, this data can be found at the Texas Higher Education Coordinating Board (THECB) data website: <http://www.txhighereddata.org/reports/performance/ctctransfer/>. Connect with your state's data reporting agency to obtain your institution's transfer data. If this data is not available within your state, work with your office of institutional research to get the necessary data.

With your leadership team, review relevant transfer data. The example data source noted below is from Texas, but its guiding questions are applicable to any institution examining transfer patterns.

#### Data Source: Academic Performance of 2-Year College Transfer Students at Texas Public Universities

- According to the most recent cohort data, how many transfer students did you serve?
- How many transfer students (number and proportion) took developmental education prior to transfer?
- What do you notice about the distribution of universities to which your students transfer?
- Do you send most of your transfer students to a single or small number of universities? Which ones?
- To which universities do you send a small number of transfer students?

Notes:

Next, locate and download the most recent transfer data for your institution's largest transfer partner.

With your leadership team, review relevant transfer data. The example data source noted below is from Texas, but its guiding questions are applicable to any institution examining transfer patterns with its largest transfer partner.

#### Data Source: Academic Performance of 2-Year College Transfer Students from Ranger College to Tarleton State University

- Does this university accept many transfer students? Do students from your college represent a large proportion of the university's transfer population?
- Which other colleges send many transfer students to this university? Do these colleges have multiple math pathways?
- To which universities do you send a small number of transfer students?

Notes:

#### Step 2: Review Math Requirements at Transfer Institutions

What are the math requirements at your primary transfer partner(s)? Focus on the institution(s) where the majority of your students transfer. Institutions in Texas can find this information in the updated *[Mathematics Pathways Transfer Inventory](#)* found on the Dana Center Mathematics Pathways (DCMP) website (<https://dcmathpathways.org/resources/texas-transfer-inventory-guide-2016-17-pdf>).

Use color highlighters to mark the programs, following the same color code that you used in your institution's inventory:

- **Math 1342/1442: Statistics** (orange)
- **Math 1332: Quantitative reasoning** (green)
- **Math 1314 and calculus sequence: STEM pathways** (blue)

Review the results and consider the following discussion questions.

### Assessing Current Context and Future Context

- What do you conclude about the math requirements at your transfer institutions?
- How do these requirements compare to those at your institution?
- If you send significant numbers of students to more than one institution, does one institution have math requirements that better align to multiple math pathways than another?
- What are the implications of this information for determining program requirements and advising practices at your institution?

Notes:

### Step 3: Identify High-Priority Programs

Gather data on where most students transfer and in what programs. If necessary, consult your office of institutional research or ask your department chairs or deans this question when you meet. Use the data to set priorities about revising math course requirements for your institution's top transfer programs.

### Assessing Current Context and Future Context

- What are the implications of information gathered in Steps 1–3 for determining program requirements and for advising at your college?

Notes:

### Step 4: Review the Program of Study Briefs

Review the following *Program of Study Issue Briefs* found on the DCMP site:

- [Nursing](#)
- [Criminal Justice](#)
- [Communications](#)
- [Social Work](#)
- [Business](#)
- [Pre-Service Elementary \(K-5\) Teacher Education](#)

Each brief contains a synthesis of the professional association recommendations for mathematics requirements and a survey of university requirements for these programs.

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### Assessing Current Context and Future Context

- What are the implications of this information for determining program requirements and for advising at your institution?

Notes:

### Step 5: Make Recommendations for Updating the *Alignment for Mathematics Pathways Inventory*

Add notes to the *Mathematics Pathways* inventory to document modifications you may want to make to mathematics requirements for specific programs of study at your institution in the short and/or long term. Also, use the “Notes” section for programs that need additional discussion and action. You will return to these notes during your planning in Part III.

## Part III: Action Steps to Maximize Scale

Purpose	Who Is Involved	Necessary Resources
Identify short- and long-term action steps to scale math pathways implementation	Leadership team	1. <i>Alignment of Mathematics Pathways Inventory</i>

Now that you have gathered information from a variety of sources, it is time to determine the programs of study and/or meta-majors that are well aligned to different mathematics pathways in the short term (i.e., next academic term) and those you may seek to align in the long term (i.e., 1 year +).

### Step 1: Conduct Follow-Up Meetings

Based on your assessment in Part I and Part II, conduct follow-up meetings with department chairs or deans of programs whose math requirements have been identified as misaligned or where a default recommendation about course options is warranted based on your assessment of the math skills most appropriate for careers and transfer in that program of study. Share your notes from Parts I and II.

### Action Planning

Example questions to ask:

- What are the mathematical skills and/or concepts that students completing this program of study need to know?
- What are the essential mathematical skills and/or concepts delineated by the accrediting or professional organization for the program of study?
- Which mathematics course is optimal for students completing an associate degree in this program of study? A baccalaureate degree?
- Should this course be the default recommendation for most students?

Notes:

### Step 2: Take Action Steps to Finalize Pathways for the Next Academic Term

Determine whether there are any course requirement changes or advising changes to be made for the next academic term. Secure consensus for suggested changes.

### Step 3: Finalize the Inventory and Disseminate Information

Finalize the *Alignment for Mathematics Pathways Inventory* for the next academic term, and share with administrators in student services, academic affairs, and with other appropriate personnel. We recommend that you do not disseminate the “Notes” section of the inventory as it may cause confusion in the short term.

Examine the following recommendations for to promote effective communication of this activity:

- Emailing the *Alignment for Mathematics Pathways Inventory* alone is not sufficient.
- Attend meetings with student services and academic affairs administrators to explain the updated inventory. Include the process that was used to develop the inventory, the color codes, how different areas of the institution can use the inventory, how this inventory complements the state-level transfer inventory, and the recommendations and timelines for future update.
- Offer to attend other meetings to explain the inventory to other administrators, faculty, advisors, employees, and students.

### Step 4: Update Advising Information and Support the Creation of Advising Tools

Now that you have made institutional program design decisions, the next step is to support knowledge sharing and tool development among advisors. Collaborate with advisors as they use the *Alignment for Mathematics Pathways Inventory* to develop an advising flow chart, decision tree, or other user-friendly advising tools, which would be provided to advisors, given to students, and posted on the college website. Refer to [Creating Effective Advising Tools](#) for advising tool examples.

Post the math pathways on your website. You may want to develop a visual aid to depict your multiple math pathways, or you may want to embed the math pathways into degree plans and developmental education webpages. The links below show some examples.

- <http://www.hccs.edu/district/students/hcc-new-mathways/>
- <https://www.jccmi.edu/academics/programs-of-study/>
- [http://math.unt.edu/sites/math.unt.edu/files/WhichMathClass\\_Front\\_Mar%202020\\_5%20Ready\\_0.pdf](http://math.unt.edu/sites/math.unt.edu/files/WhichMathClass_Front_Mar%202020_5%20Ready_0.pdf)
- <https://www.ivytech.edu/math-pathways/>

Update all degree plans, including the website, degree audit system, DegreeWorks, and any other degree planner system.

## Step 5: Identify Targets for Future Changes Beyond the Next Academic Term

Review the “Notes” section of the *Mathematics Pathways* inventory. Consult with your leadership team to discuss modifications that you may want to make to course requirements or advising practices over the long term. Set target dates for these changes.

### Action Planning

Example questions to ask:

- Which programs of study do the team members want to have follow-up conversations with stakeholders within your own institution?
- Are there requirements at your primary transfer partner that you believe are not consistent with a multiple math pathways approach?

Notes: