MTH 225: Discrete Structures 1

Module 1, Day 1: Representing integers in different bases

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GVSU

August 7, 2020

Agenda for today

- Review of Daily Prep assignment and Q+A

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- Polling activity: Properties of different number bases

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- Polling activity: Properties of different number bases
- Activity: Converting integers to different bases

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- Activity: Working with the algorithm

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- Polling activity: Properties of different number bases
- Activity: Converting integers to different bases
- Minilecture: The division/remainder algorithm
- Activity: Working with the algorithm
- Next actions

Polling for today

Go to `Mentimeter.com` and enter the code

`XX YY ZZ`

Activity: Converting number bases

Google Jamboard: An online collaborative whiteboard. Can write on it, or write on paper, snap a photo and upload the photo.

Go to `https://bit.ly/3fWLpkz`

An algorithm for making this simpler

Decimal to base b conversion

- Let n be a (positive) decimal integer and b is the base we're converting to
- Let m be the result, initially empty.
- Repeat the following until $n = 0$:
  - Divide n by b, let d be the quotient and r the remainder
  - Write r as the left-most digit of m
  - Let d be the new value of n

Example: Convert 3000 to octal (Base 8)

Start: $n = 3000$, $b = 8$, $m =$ (empty).

1. $3000/8 = 375$ remainder 0. So $d = 375$, $r = 0$. $m = 0$, new n is 375

Example: Convert 3000 to octal (Base 8)

Start: $n = 3000$, $b = 8$, $m =$ (empty).

1. $3000/8 = 375$ remainder 0. So $d = 375$, $r = 0$. $m = 0$, new n is 375
2. $375/8 = 46$ remainder 7. So $d = 46$, $r = 7$. $m = 70$, new n is 46

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Start: $n = 3000$, $b = 8$, $m =$ (empty).

1. $3000/8 = 375$ remainder 0. So $d = 375$, $r = 0$. $m = 0$, new n is 375
2. $375/8 = 46$ remainder 7. So $d = 46$, $r = 7$. $m = 70$, new n is 46
3. $46/8 = 5$ remainder 6. So $d = 5$, $r = 6$. $m = 670$, new n is 5

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1. $3000/8 = 375$ remainder 0. So $d = 375$, $r = 0$. $m = 0$, new n is 375
2. $375/8 = 46$ remainder 7. So $d = 46$, $r = 7$. $m = 70$, new n is 46
3. $46/8 = 5$ remainder 6. So $d = 5$, $r = 6$. $m = 670$, new n is 5
4. $5/8 = 0$ remainder 5. So $d = 0$, $r = 5$. $m = 5670$, new n is 0

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Start: $n = 3000$, $b = 8$, $m =$ (empty).

1. $3000/8 = 375$ remainder 0. So $d = 375$, $r = 0$. $m = 0$, new n is 375
2. $375/8 = 46$ remainder 7. So $d = 46$, $r = 7$. $m = 70$, new n is 46
3. $46/8 = 5$ remainder 6. So $d = 5$, $r = 6$. $m = 670$, new n is 5
4. $5/8 = 0$ remainder 5. So $d = 0$, $r = 5$. $m = 5670$, new n is 0
5. STOP because n is now 0. Result: $3000_{10} = 5670_8$.

Activity: Working with the algorithm

Go to `https://bit.ly/3fWLpkz`

NEXT TIME...

- Complete followup activities – see discussion board and announcements for details
- Go ahead and start Daily Prep for Wednesday (Due Tuesday 11:59pm ET)
- Weekly Practice 1:

Take 5 minutes to fill this form out: https://bit.ly/3a4fexD