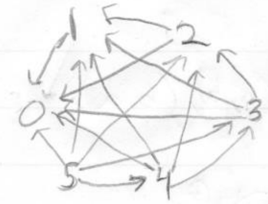
11.1 1-9 odd

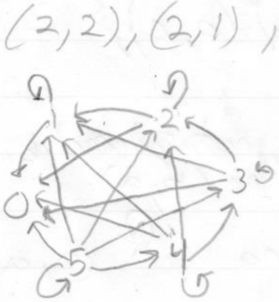
1) $A = \{0, 1, 2, 3, 4, 5\}$

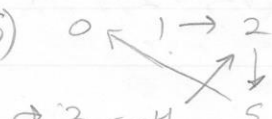
$> \ R = \{(5,4), (5,3), (5,2), (5,1), (5,0), (4,3), (4,2), (4,1), (4,0), (3,2), (3,1), (3,0), (2,1), (2,0), (1,0)\}$



3) $A = \{0, 1, 2, 3, 4, 5\}$

$\geq \ R = \{(5,5), (5,4), (5,3), (5,2), (5,1), (5,0), (4,4), (4,3), (4,2), (4,1), (4,0), (3,3), (3,2), (3,1), (3,0), (2,2), (2,1), (2,0), (1,1), (1,0), (0,0)\}$



5)


$A = \{0, 1, 2, 3, 4, 5\}$

$R = \{(5,0), (4,3), (4,2), (3,3), (2,5), (1,2)\}$

7) $<$ $A = \mathbb{Z} \subseteq \mathbb{R}$ of $\mathbb{Z} \times \mathbb{Z}$

$R = \{(x,y) \in \mathbb{Z} \times \mathbb{Z}, y - x \in \mathbb{N}\}$

9) $A=\{1,2,3,4,5,6\}$ How many different relations?

a relation $(x,y) \in A \times A$

$A \times A = 36$ $\quad 2^{36} = 68{,}719{,}476{,}736$

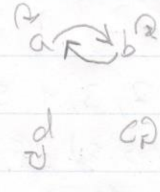
11.2 1-5

1) $R=\{(a,a),(b,b),(c,c),(d,d),(a,b),(b,a)\}$

$A=\{a,b,c,d\}$

it is Reflexive,

Symmetric and Transitive



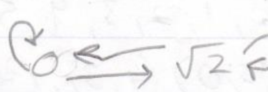
3) $R=\{(a,b),(a,c),(c,b),(b,c)\}$

not reflexive, not symmetric, not transi

no (b,a) no (c,c)

not reflexive because no a (a,a) etc..

5) $R=\{(0,0),(\sqrt{2},0),(0,\sqrt{2}),(\sqrt{2},\sqrt{2})\}$ in $\mathbb{R}$



not reflexive no $(1,1)$

is symmetric and transitive,

11.3

1) $A = \{1, 2, 3, 4, 5, 6\}$

$R = \{(1,1), (2,2), (3,3), (4,4), (5,5), (6,6)$
$, (2,3), (3,2), (4,5), (5,4), (4,6), (6,4), (5,6), (6,5)\}$

$[1] = 1$ $[2] = [3] = (2,3)$ $[4] = [5] = [6] = (4,5,6)$

3) $A = \{a, b, c, d, e\}$ aRd, bRc, eRd

R is an equivalene relation on A

R has two equivelene classes

$R = \{(a,a), (b,b), (c,c), (d,d), (e,e), (a,d), (d,a)$
$, (b,c), (c,b)\}$

5) two different equivelnce relations

$A = \{a, b\}$

$R = \{(a,a), (b,b)\}$; $R = \{(a,a), (b,b), (a,b), (b,a)\}$

11.4

1) all partitions $A = \{a, b\}$

$\{\{a\}, \{b\}\}$ $\{\{a, b\}\}$

3) partition of $\mathbb{Z}$ from $\equiv (\text{mod } 4)$

$\{[0], [1], [2], [3]\} = \{\{\ldots, -4, 0, 4, 8, 12, \ldots\}, \{-3, 1, 5, 9, 13, \ldots\} \ldots$
$\}$

5) $P = \{\{\ldots, -4, -2, 0, 2, 4, \ldots\}, \{\ldots, -5, -3, -1, 1, 3, 5, \ldots\}\}$ of $\mathbb{Z}$

Congruene mod 2

11.5

1) Z_2

+	[0]	[1]
[0]	[0]	[1]
[1]	[1]	[0]

×	[0]	[1]
[0]	[0]	[0]
[1]	[0]	[1]

3) Z_4

+	[0]	[1]	[2]	[3]
[0]	[0]	[1]	[2]	[3]
[1]	[1]	[2]	[3]	[0]
[2]	[2]	[3]	[0]	[1]
[3]	[3]	[0]	[1]	[2]

×	[0]	[1]	[2]	[3]
[0]	[0]	[0]	[0]	[0]
[1]	[0]	[1]	[2]	[3]
[2]	[0]	[2]	[0]	[2]
[3]	[0]	[3]	[2]	[1]

5) $[a], [b] \in Z_5$ $\quad [a] \cdot [b] = [0]$

$[a] = [0]$ or $[b] = [0]$

True $\quad Z_2$ multiplacation table