

## Learning Objective Assessment: R1 (version 3)

MATH2603: Discrete Mathematics

**R1: I can give examples of relations on a set that have combinations of the properties of reflexivity, symmetry, anti-symmetry, and transitivity.**

Let  $A = \{a, b, c, d, e\}$  and let  $R$  be the relation on  $A$  defined by

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

1. Draw a digraph depicting  $R$ .
2. Answer each question: (a) Is  $R$  reflexive? (b) Is  $R$  anti-reflexive? (c) Is  $R$  symmetric? (d) Is  $R$  anti-symmetric? (e) Is  $R$  transitive?
3. Construct the a relation  $S$  on the set  $A = \{a, b, c, d, e, f\}$  such that:
  - $S$  contains at least 9 elements,
  - $S$  is symmetric,
  - $S$  is anti-reflexive,
  - $S$  is transitive.

You can just draw a digraph for  $S$ ; you do not need to write out the subset of  $A \times A$ .

*Place work in this box. Continue on back if needed.*

**Criteria for Satisfactory:** There can be at most one error in your digraph for question 1. Your responses to question 2 will be graded based on your answer to question 1. Four of five responses must be correct. There can be at most one error in your digraph for question 3.