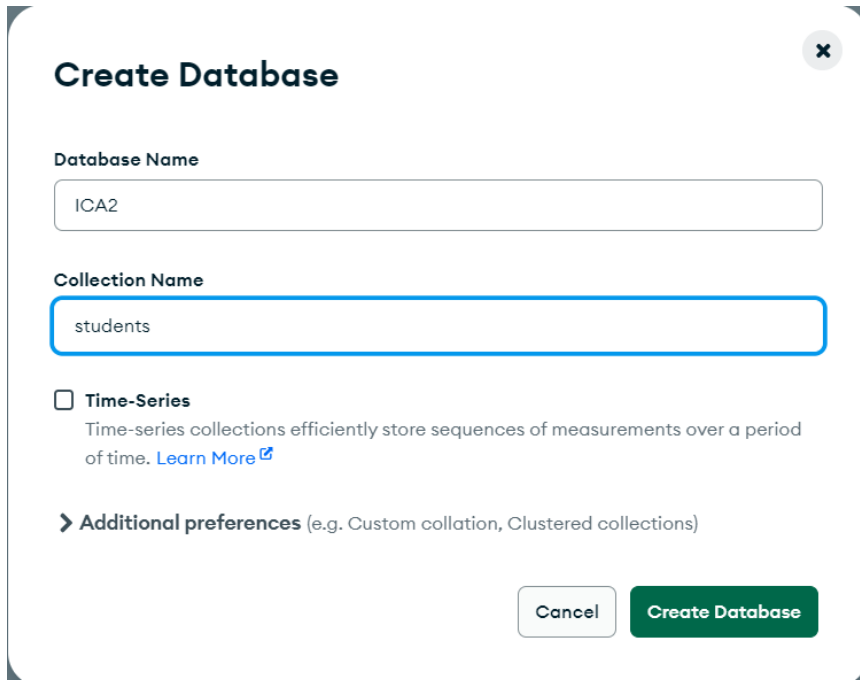


IT2234: Web Service and Server Technologies – Practical

ICAE 02

1. Create the students and grades collections and insert the sample documents into both collections.



Create Database

Database Name

ICA2

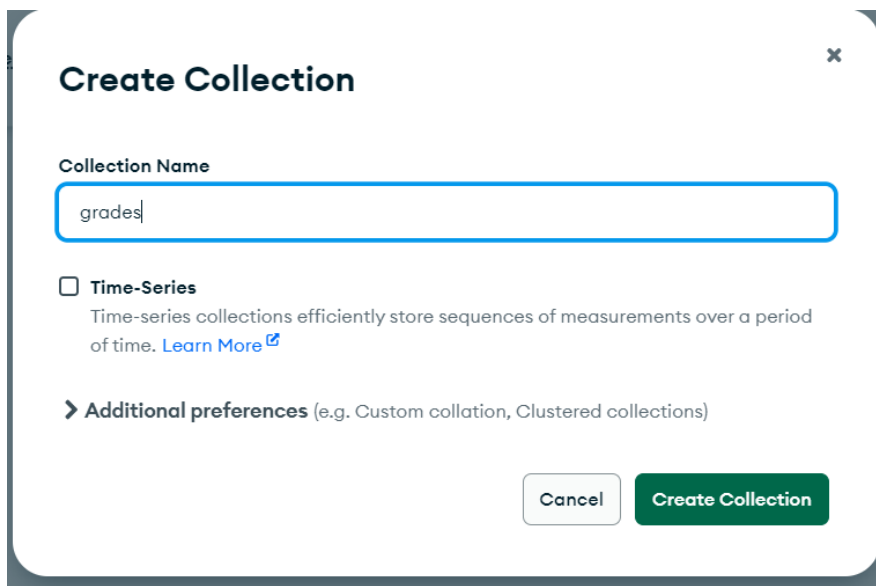
Collection Name

students

☐ **Time-Series**
Time-series collections efficiently store sequences of measurements over a period of time. [Learn More](#)

➤ **Additional preferences** (e.g. Custom collation, Clustered collections)

Cancel Create Database



Create Collection

Collection Name

grades

☐ **Time-Series**
Time-series collections efficiently store sequences of measurements over a period of time. [Learn More](#)

➤ **Additional preferences** (e.g. Custom collation, Clustered collections)

Cancel Create Collection

```
//Insert sample documents into students collection
```

```
db.students.insertMany([
```

```
{
```

```
  _id: ObjectId("64b1fcd1f4a13a001e3d41a1"),
```

```
  name: "Alice Johnson",
```

```
  enrollmentYear: 2021,
```

```
  major: "Computer Science",
```

```
  email: "alice.johnson@example.com",
```

```
  gender: "Female",
```

```
  age: 20
```

```
},
```

```
{
```

```
  _id: ObjectId("64b1fcd1f4a13a001e3d41a2"),
```

```
  name: "Bob Smith",
```

```
  enrollmentYear: 2020,
```

```
  major: "Mathematics",
```

```
  email: "bob.smith@example.com",
```

```
  gender: "Male",
```

```
  age: 22
```

```
},
```

```
{
```

```
  _id: ObjectId("64b1fcd1f4a13a001e3d41a3"),
```

```
  name: "Clara Lee",
```

```
  enrollmentYear: 2022,
```

```
  major: "Physics",
```

```
  email: "clara.lee@example.com",
```

```
gender: "Female",
age: 19
},
{
  _id: ObjectId("64b1fcd1f4a13a001e3d41a4"),
  name: "Daniel Kim",
  enrollmentYear: 2021,
  major: "Engineering",
  email: "daniel.kim@example.com",
  gender: "Male",
  age: 21
},
{
  _id: ObjectId("64b1fcd1f4a13a001e3d41a5"),
  name: "Eva Chen",
  enrollmentYear: 2020,
  major: "Biology",
  email: "eva.chen@example.com",
  gender: "Female",
  age: 23
},
{
  _id: ObjectId("64b1fcd1f4a13a001e3d41a6"),
  name: "Frank Wright",
  enrollmentYear: 2019,
  major: "Chemistry",
```

```
email: "frank.wright@example.com",
gender: "Male",
age: 24
},
{
  _id: ObjectId("64b1fcd1f4a13a001e3d41a7"),
  name: "Grace Liu",
  enrollmentYear: 2022,
  major: "Economics",
  email: "grace.liu@example.com",
  gender: "Female",
  age: 20
},
{
  _id: ObjectId("64b1fcd1f4a13a001e3d41a8"),
  name: "Henry Davis",
  enrollmentYear: 2021,
  major: "Philosophy",
  email: "henry.davis@example.com",
  gender: "Male",
  age: 22
},
{
  _id: ObjectId("64b1fcd1f4a13a001e3d41a9"),
  name: "Ivy Zhang",
  enrollmentYear: 2020,
```

```

    major: "Statistics",
    email: "ivy.zhang@example.com",
    gender: "Female",
    age: 21
  },
  {
    _id: ObjectId("64b1fcd1f4a13a001e3d41aa"),
    name: "Jack Lee",
    enrollmentYear: 2023,
    major: "Business",
    email: "jack.lee@example.com",
    gender: "Male",
    age: 18
  }
]);

```

```

< {
  acknowledged: true,
  insertedIds: {
    '0': ObjectId('64b1fcd1f4a13a001e3d41a1'),
    '1': ObjectId('64b1fcd1f4a13a001e3d41a2'),
    '2': ObjectId('64b1fcd1f4a13a001e3d41a3'),
    '3': ObjectId('64b1fcd1f4a13a001e3d41a4'),
    '4': ObjectId('64b1fcd1f4a13a001e3d41a5'),
    '5': ObjectId('64b1fcd1f4a13a001e3d41a6'),
    '6': ObjectId('64b1fcd1f4a13a001e3d41a7'),
    '7': ObjectId('64b1fcd1f4a13a001e3d41a8'),
    '8': ObjectId('64b1fcd1f4a13a001e3d41a9'),
    '9': ObjectId('64b1fcd1f4a13a001e3d41aa')
  }
}
ICA2 >

```

Documents 0 Aggregations Schema Indexes 1 Validation

Type a query: { field: 'value' } or [Generate query](#) ⚡

Explain Reset Find ↩ Options ▶

➕ ADD DATA ▾ 📄 EXPORT DATA ▾ ✎ UPDATE 🗑 DELETE

25 ▾ 1 – 10 of 10 ↺ < > ▾ ⌵ {} | E

```
_id: ObjectId('64b1fcd1f4a13a001e3d41a1')
name: "Alice Johnson"
enrollmentYear: 2021
major: "Computer Science"
email: "alice.johnson@example.com"
gender: "Female"
age: 20
```

```
_id: ObjectId('64b1fcd1f4a13a001e3d41a2')
name: "Bob Smith"
enrollmentYear: 2020
major: "Mathematics"
email: "bob.smith@example.com"
gender: "Male"
age: 22
```

```
_id: ObjectId('64b1fcd1f4a13a001e3d41a3')
name: "Clara Lee"
enrollmentYear: 2022
major: "Physics"
email: "clara.lee@example.com"
gender: "Female"
age: 19
```

// Insert sample documents into grades collection

```
db.grades.insertMany([

  { subject: "Mathematics", score: 85, term: "Fall 2022", studentId:
    ObjectId("64b1fcd1f4a13a001e3d41a1") },

  { subject: "English", score: 90, term: "Fall 2022", studentId:
    ObjectId("64b1fcd1f4a13a001e3d41a1") },

  { subject: "Mathematics", score: 75, term: "Spring 2022", studentId:
    ObjectId("64b1fcd1f4a13a001e3d41a2") },

  { subject: "Statistics", score: 80, term: "Fall 2022", studentId:
    ObjectId("64b1fcd1f4a13a001e3d41a2") },

  { subject: "Physics", score: 92, term: "Fall 2022", studentId:
    ObjectId("64b1fcd1f4a13a001e3d41a3") },
```

{ subject: "Mathematics", score: 86, term: "Spring 2023", studentId: ObjectId("64b1fcd1f4a13a001e3d41a3") },

{ subject: "Engineering", score: 89, term: "Fall 2021", studentId: ObjectId("64b1fcd1f4a13a001e3d41a4") },

{ subject: "Mathematics", score: 84, term: "Spring 2022", studentId: ObjectId("64b1fcd1f4a13a001e3d41a4") },

{ subject: "Biology", score: 78, term: "Spring 2021", studentId: ObjectId("64b1fcd1f4a13a001e3d41a5") },

{ subject: "Chemistry", score: 82, term: "Fall 2021", studentId: ObjectId("64b1fcd1f4a13a001e3d41a5") },

{ subject: "Chemistry", score: 88, term: "Fall 2021", studentId: ObjectId("64b1fcd1f4a13a001e3d41a6") },

{ subject: "Physics", score: 79, term: "Spring 2022", studentId: ObjectId("64b1fcd1f4a13a001e3d41a6") },

{ subject: "Economics", score: 83, term: "Spring 2023", studentId: ObjectId("64b1fcd1f4a13a001e3d41a7") },

{ subject: "English", score: 89, term: "Fall 2022", studentId: ObjectId("64b1fcd1f4a13a001e3d41a7") },

{ subject: "Philosophy", score: 91, term: "Fall 2022", studentId: ObjectId("64b1fcd1f4a13a001e3d41a8") },

{ subject: "History", score: 77, term: "Spring 2023", studentId: ObjectId("64b1fcd1f4a13a001e3d41a8") },

{ subject: "Statistics", score: 79, term: "Spring 2022", studentId: ObjectId("64b1fcd1f4a13a001e3d41a9") },

```
{ subject: "Finance", score: 82, term: "Spring 2024", studentId:
ObjectId("64b1fcd1f4a13a001e3d41aa") }
```

1);

```

2-MONGOSH
{
  subject: "Finance", score: 82, term: "Spring 2024", studentId: ObjectId("64b1fcd1f4a13a001e3d41aa")
};
< {
  acknowledged: true,
  insertedIds: {
    '0': ObjectId('682760962d45e5a3987a2d99'),
    '1': ObjectId('682760962d45e5a3987a2d9a'),
    '2': ObjectId('682760962d45e5a3987a2d9b'),
    '3': ObjectId('682760962d45e5a3987a2d9c'),
    '4': ObjectId('682760962d45e5a3987a2d9d'),
    '5': ObjectId('682760962d45e5a3987a2d9e'),
    '6': ObjectId('682760962d45e5a3987a2d9f'),
    '7': ObjectId('682760962d45e5a3987a2da0'),
    '8': ObjectId('682760962d45e5a3987a2da1'),
    '9': ObjectId('682760962d45e5a3987a2da2'),
    '10': ObjectId('682760962d45e5a3987a2da3'),
    '11': ObjectId('682760962d45e5a3987a2da4'),
    '12': ObjectId('682760962d45e5a3987a2da5'),
    '13': ObjectId('682760962d45e5a3987a2da6'),
    '14': ObjectId('682760962d45e5a3987a2da7'),
    '15': ObjectId('682760962d45e5a3987a2da8'),
    '16': ObjectId('682760962d45e5a3987a2da9'),
    '17': ObjectId('682760962d45e5a3987a2daa'),
    '18': ObjectId('682760962d45e5a3987a2dab'),
    '19': ObjectId('682760962d45e5a3987a2dac')
  }
}

```

Documents 0
Aggregations
Schema
Indexes 1
Validation

Type a query: { field: 'value' } or [Generate query](#)

Explain

Reset

Find

Options

ADD DATA
EXPORT DATA
UPDATE
DELETE

25 v
1 - 20 of 20
< >

```

_id: ObjectId('682760962d45e5a3987a2d99')
subject: "Mathematics"
score: 85
term: "Fall 2022"
studentId: ObjectId('64b1fcd1f4a13a001e3d41a1')

```

```

_id: ObjectId('682760962d45e5a3987a2d9a')
subject: "English"
score: 80
term: "Fall 2022"
studentId: ObjectId('64b1fcd1f4a13a001e3d41a1')

```

```

_id: ObjectId('682760962d45e5a3987a2d9b')
subject: "Mathematics"
score: 75
term: "Spring 2022"
studentId: ObjectId('64b1fcd1f4a13a001e3d41a2')

```

```

_id: ObjectId('682760962d45e5a3987a2d9c')
subject: "Statistics"
score: 80
term: "Fall 2022"
studentId: ObjectId('64b1fcd1f4a13a001e3d41a2')

```


2. Show both collections in table view

Documents0AggregationsSchemaIndexes1Validation

Type a query: { field: 'value' } or [Generate query](#)

ExplainResetFindOptions

ADD DATAEXPORT DATAUPDATEDELETE

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students

	_id ObjectId	name String	enrollmentYear Int32	major String	email String	
1	ObjectId('64b1fcd1f4a13a0...	"Alice Johnson"	2021	"Computer Science"	"alice.johnson@examp...	
2	ObjectId('64b1fcd1f4a13a0...	"Bob Smith"	2020	"Mathematics"	"bob.smith@example.co...	
3	ObjectId('64b1fcd1f4a13a0...	"Clara Lee"	2022	"Physics"	"clara.lee@example.co...	
4	ObjectId('64b1fcd1f4a13a0...	"Daniel Kim"	2021	"Engineering"	"daniel.kim@example.co...	
5	ObjectId('64b1fcd1f4a13a0...	"Eva Chen"	2020	"Biology"	"eva.chen@example.co...	
6	ObjectId('64b1fcd1f4a13a0...	"Frank Wright"	2019	"Chemistry"	"frank.wright@examp...	
7	ObjectId('64b1fcd1f4a13a0...	"Grace Liu"	2022	"Economics"	"grace.liu@example.co...	
8	ObjectId('64b1fcd1f4a13a0...	"Henry Davis"	2021	"Philosophy"	"henry.davis@example...	
9	ObjectId('64b1fcd1f4a13a0...	"Ivy Zhang"	2020	"Statistics"	"ivy.zhang@example.co...	
10	ObjectId('64b1fcd1f4a13a0...	"Jack Lee"	2023	"Business"	"jack.lee@example.co...	

Documents0AggregationsSchemaIndexes1Validation

Type a query: { field: 'value' } or [Generate query](#)

ExplainResetFindOptions

ADD DATAEXPORT DATAUPDATEDELETE

251 - 20 of 20

grades

	_id ObjectId	subject String	score Int32	term String	studentId ObjectId	
1	ObjectId('682760962d45e5a...	"Mathematics"	85	"Fall 2022"	ObjectId('64b1fcd1f...	
2	ObjectId('682760962d45e5a...	"English"	90	"Fall 2022"	ObjectId('64b1fcd1f...	
3	ObjectId('682760962d45e5a...	"Mathematics"	75	"Spring 2022"	ObjectId('64b1fcd1f...	
4	ObjectId('682760962d45e5a...	"Statistics"	80	"Fall 2022"	ObjectId('64b1fcd1f...	
5	ObjectId('682760962d45e5a...	"Physics"	92	"Fall 2022"	ObjectId('64b1fcd1f...	
6	ObjectId('682760962d45e5a...	"Mathematics"	86	"Spring 2023"	ObjectId('64b1fcd1f...	
7	ObjectId('682760962d45e5a...	"Engineering"	89	"Fall 2021"	ObjectId('64b1fcd1f...	
8	ObjectId('682760962d45e5a...	"Mathematics"	84	"Spring 2022"	ObjectId('64b1fcd1f...	
9	ObjectId('682760962d45e5a...	"Biology"	78	"Spring 2021"	ObjectId('64b1fcd1f...	
10	ObjectId('682760962d45e5a...	"Chemistry"	82	"Fall 2021"	ObjectId('64b1fcd1f...	
11	ObjectId('682760962d45e5a...	"Chemistry"	88	"Fall 2021"	ObjectId('64b1fcd1f...	
12	ObjectId('682760962d45e5a...	"Physics"	79	"Spring 2022"	ObjectId('64b1fcd1f...	
13	ObjectId('682760962d45e5a...	"Economics"	83	"Spring 2023"	ObjectId('64b1fcd1f...	
14	ObjectId('682760962d45e5a...	"English"	89	"Fall 2022"	ObjectId('64b1fcd1f...	
15	ObjectId('682760962d45e5a...	"Philosophy"	91	"Fall 2022"	ObjectId('64b1fcd1f...	
16	ObjectId('682760962d45e5a...	"Biology"	77	"Spring 2023"	ObjectId('64b1fcd1f...	

3. Find the female students and only display their name, age and gender

```
db.students.find(  
  { gender: "Female" },  
  { _id: 0, name: 1, age: 1, gender: 1 }  
);
```

```
>_MONGOSH  
  
> db.students.find(  
  { gender: "Female" },  
  { _id: 0, name: 1, age: 1, gender: 1 }  
);  
< [  
  {  
    name: 'Alice Johnson',  
    gender: 'Female',  
    age: 20  
  },  
  {  
    name: 'Clara Lee',  
    gender: 'Female',  
    age: 19  
  },  
  {  
    name: 'Eva Chen',  
    gender: 'Female',  
    age: 23  
  },  
  {  
    name: 'Grace Liu',  
    gender: 'Female',  
    age: 20  
  },  
  {  
    name: 'Ivy Zhang',  
    gender: 'Female',  
    age: 21  
  }  
]
```

4. Find the students who are younger than 22 and enrolled after 2020

```
db.students.find(
```

```
  { age: { $lt: 22 }, enrollmentYear: { $gt: 2020 } }
```

```
);
```

```
>_MONGOSH
> db.students.find(
  { age: { $lt: 22 }, enrollmentYear: { $gt: 2020 } }
);
< {
  _id: ObjectId('64b1fcd1f4a13a001e3d41a1'),
  name: 'Alice Johnson',
  enrollmentYear: 2021,
  major: 'Computer Science',
  email: 'alice.johnson@example.com',
  gender: 'Female',
  age: 20
}
{
  _id: ObjectId('64b1fcd1f4a13a001e3d41a3'),
  name: 'Clara Lee',
  enrollmentYear: 2022,
  major: 'Physics',
  email: 'clara.lee@example.com',
  gender: 'Female',
  age: 19
}
{
  _id: ObjectId('64b1fcd1f4a13a001e3d41a4'),
  name: 'Daniel Kim',
  enrollmentYear: 2021,
  major: 'Engineering',
  email: 'daniel.kim@example.com',
  gender: 'Male',
```

```
>_MONGOSH
{
  _id: ObjectId('64b1fcd1f4a13a001e3d41a4'),
  name: 'Daniel Kim',
  enrollmentYear: 2021,
  major: 'Engineering',
  email: 'daniel.kim@example.com',
  gender: 'Male',
  age: 21
}
{
  _id: ObjectId('64b1fcd1f4a13a001e3d41a7'),
  name: 'Grace Liu',
  enrollmentYear: 2022,
  major: 'Economics',
  email: 'grace.liu@example.com',
  gender: 'Female',
  age: 20
}
{
  _id: ObjectId('64b1fcd1f4a13a001e3d41aa'),
  name: 'Jack Lee',
  enrollmentYear: 2023,
  major: 'Business',
  email: 'jack.lee@example.com',
  gender: 'Male',
  age: 18
}
ICA2>
```

5. Find all grades for "Alice Johnson"

```
const student = db.students.findOne({ name: "Alice Johnson" });
```

```
db.grades.find({ studentId: student._id });
```

```
> const student = db.students.findOne({ name: "Alice Johnson" });
db.grades.find({ studentId: student._id });
< {
  _id: ObjectId('682760962d45e5a3987a2d99'),
  subject: 'Mathematics',
  score: 85,
  term: 'Fall 2022',
  studentId: ObjectId('64b1fcd1f4a13a001e3d41a1')
}
{
  _id: ObjectId('682760962d45e5a3987a2d9a'),
  subject: 'English',
  score: 90,
  term: 'Fall 2022',
  studentId: ObjectId('64b1fcd1f4a13a001e3d41a1')
}
ICA2> |
```

6. Find how many students followed the subject "Mathematics"

```
db.grades.distinct("studentId", { subject: "Mathematics" }).length;
```

```
> db.grades.distinct("studentId", { subject: "Mathematics" }).length;
< 4
ICA2> |
```

7. Find all students with grades in the term "Fall 2022"

```
db.students.aggregate([
```

```
{
  $lookup: {
    from: "grades",
    localField: "_id",
```

```
    foreignField: "studentId",
    as: "grades"
  }
},
{
  $project: {
    name: 1,
    email: 1,
    age: 1,
    gender: 1,
    grades: {
      $filter: {
        input: "$grades",
        as: "grade",
        cond: { $eq: ["$$grade.term", "Fall 2022"] }
      }
    }
  }
},
{
  $match: {
    "grades.0": { $exists: true }
  }
}
]);
```

>_MONGOSH

```
> db.students.aggregate([
  {
    $lookup: {
      from: "grades",
      localField: "_id",
      foreignField: "studentId",
      as: "grades"
    }
  },
  {
    $project: {
      name: 1,
      email: 1,
      age: 1,
      gender: 1,
      grades: {
        $filter: {
          input: "$grades",
          as: "grade",
          cond: { $eq: [ "$$grade.term", "Fall 2022" ] }
        }
      }
    }
  },
  {
    $match: {
      "grades.0": { $exists: true }
    }
  }
])
```

>_MONGOSH

```
< {
  _id: ObjectId('64b1fcd1f4a13a001e3d41a1'),
  name: 'Alice Johnson',
  email: 'alice.johnson@example.com',
  gender: 'Female',
  age: 20,
  grades: [
    {
      _id: ObjectId('682760962d45e5a3987a2d99'),
      subject: 'Mathematics',
      score: 85,
      term: 'Fall 2022',
      studentId: ObjectId('64b1fcd1f4a13a001e3d41a1')
    },
    {
      _id: ObjectId('682760962d45e5a3987a2d9a'),
      subject: 'English',
      score: 90,
      term: 'Fall 2022',
      studentId: ObjectId('64b1fcd1f4a13a001e3d41a1')
    }
  ]
}
{
  _id: ObjectId('64b1fcd1f4a13a001e3d41a2'),
  name: 'Bob Smith',
  email: 'bob.smith@example.com',
  gender: 'Male',
  age: 25,
  grades: [
    {
      _id: ObjectId('682760962d45e5a3987a2d9b'),
      subject: 'Mathematics',
      score: 78,
      term: 'Fall 2022',
      studentId: ObjectId('64b1fcd1f4a13a001e3d41a2')
    }
  ]
}
```

>_MONGOSH

```
{
  _id: ObjectId('64b1fcd1f4a13a001e3d41a2'),
  name: 'Bob Smith',
  email: 'bob.smith@example.com',
  gender: 'Male',
  age: 22,
  grades: [
    {
      _id: ObjectId('682760962d45e5a3987a2d9c'),
      subject: 'Statistics',
      score: 80,
      term: 'Fall 2022',
      studentId: ObjectId('64b1fcd1f4a13a001e3d41a2')
    }
  ]
}
{
  _id: ObjectId('64b1fcd1f4a13a001e3d41a3'),
  name: 'Clara Lee',
  email: 'clara.lee@example.com',
  gender: 'Female',
  age: 19,
  grades: [
    {
      _id: ObjectId('682760962d45e5a3987a2d9d'),
      subject: 'Physics',
      score: 92,
      term: 'Fall 2022',
```

>_MONGOSH

```
  _id: ObjectId('64b1fcd1f4a13a001e3d41a7'),
  name: 'Grace Liu',
  email: 'grace.liu@example.com',
  gender: 'Female',
  age: 20,
  grades: [
    {
      _id: ObjectId('682760962d45e5a3987a2da6'),
      subject: 'English',
      score: 89,
      term: 'Fall 2022',
      studentId: ObjectId('64b1fcd1f4a13a001e3d41a7')
    }
  ]
}
{
  _id: ObjectId('64b1fcd1f4a13a001e3d41a8'),
  name: 'Henry Davis',
  email: 'henry.davis@example.com',
  gender: 'Male',
  age: 22,
  grades: [
    {
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      subject: 'Philosophy',
      score: 91,
      term: 'Fall 2022',
      studentId: ObjectId('64b1fcd1f4a13a001e3d41a8')
```

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  age: 22,  
  grades: [  
    {  
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      subject: 'Philosophy',  
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      term: 'Fall 2022',  
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  ]  
}  
{  
  _id: ObjectId('64b1fcd1f4a13a001e3d41a9'),  
  name: 'Ivy Zhang',  
  email: 'ivy.zhang@example.com',  
  gender: 'Female',  
  age: 21,  
  grades: [  
    {  
      _id: ObjectId('682760962d45e5a3987a2daa'),  
      subject: 'Data Science',  
      score: 88,  
      term: 'Fall 2022',  
      studentId: ObjectId('64b1fcd1f4a13a001e3d41a9')  
    }  
  ]  
}  
ICA2> |
```