20 MX 1 **12 c** To complete a course, a student must choose and pass exactly three topics. **2**

There are eight topics from which to choose.

Last year 400 students completed the course.

Explain, using the pigeonhole principle, why at least eight students passed exactly the same three topics.

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400 students passed the course.

There are $\binom{8}{3}$ = 56 ways of choosing 3 from 8 topics. ✔

State Mean: **1.04/2**

As 400 ÷ 56 = 7.14 (2 dec. pl.), there are at least 8 students who passed the same three topics. ✔

HSC Marking Feedback

Students should:

- evaluate the correct expression for ${}^nC_r$
- identify and quantify the pigeons and pigeonholes
- be prepared to answer questions on the Year 11 content in the HSC.

In better responses, students were able to:

- work out that a minimum of 393 students are needed to ensure that at least eight students pass exactly the same three topics
- establish that 392 pigeons are needed to equally fill each pigeonhole with 7 pigeons and the 8 remaining pigeons could be added to any one or more of the pigeonholes.

Areas for students to improve include:

- clearly explaining the pigeonhole principle
- understanding the ceiling function (or why we round up) when using the pigeonhole principle
- solving the problem using logic and sound reasoning, instead of simply using a formula with the hope of getting the correct answer
- practicing interpreting worded problems
- thoroughly revising Year 11 content.