Use the following information for questions 1 and 2.

Consider the universal set containing all undergraduate students at UWO.
Let A be the subset containing all students in the Faculty of Arts.
Let R be the subset containing all students who live in residence.
Let V be the subset containing all students who own their own vehicles.

1. Which of the following subsets corresponds to the set of all undergraduate students at UWO who are in Arts and either live in residence or own their own vehicle?

A: $A \cup R \cup V$	B: $(A \cap R) \cup V$	C: $(A \cup R) \cap V$	D: $A \cap (R \cup V)$	E: $A \cup (R \cap V)$

2. Which of the following describes the subset $A^c \cup (R \cap V)^c$?

A: The subset containing all non-Arts sutdents who either don't live in residence or don't own a vehicle.
B: The subset containing all non-Arts sutdents as well as all students who neither live in residence nor own a vehicle.
C: The subset containing all non-Arts students who neither live in residence nor own a vehicle.
D: The subset containing all students who either are not in Arts or else don't live in residence and don't own a vehicle.
E: The subset containing all UWO undergraduate students except for Arts students who live in residence and own a vehicle.

3. There are 70 students registered in a certain online course this summer. Of these, only 31 have never taken the course before. If 25 students failed the midterm exam, and 23 of the students taking the course for the first time passed the midterm, how many of the students who are repeating the course failed the midterm? (Assume all registered students wrote the midterm.)

A: 45	B: 39	C: 22	D: 17	E: cannot be determined

4. There are 27 houses on Short Street. Of these, there are 13 houses which have a garage and do not have a covered porch. In total, there are 21 houses which either do not have a garage or do not have a covered porch. How many of the houses on Short Street have garages?

A: 20	B: 19	C: 14	D: 8	E: 6

5. A certain car model comes in both 2-door and 4-door styles. Both styles are available in any of 5 different colours. Either style can be ordered with an optional hatch-back design. The 2-door car (only) is also available as a convertible, but not with the hatchback design. Taking into account the colour and style as well as whether or not the car has a hatchback or is a convertible, how many different ways are there in which to order a car of this model?

A: 40	B: 25	C: 20	D: 10	E: 9

6. The dessert table at a buffet has 3 kinds of pie, 4 different cakes, 3 fruit dishes and 5 flavours of ice cream. A customer at this buffet can sample as many of these different desserts as they wish. In how many ways can a customer decide which items to have for dessert?

A: 2^{15}	B: $2^{15}-2$	C: 15^2	D: 15^2-1	E: $3\times4\times3\times5$

7. Refer to question 6. John is a customer at the buffet and has decided to have dessert. Before going up to the dessert table, he decides to have 1 piece of pie, 1 sliver of cake, a scoop of the 'tropical fruit salad' and scoops of 2 different flavours of ice cream. He thinks that, having made this decision, selecting his dessert will be easy. However, when he goes up to the dessert table he realizes that he still has many different dessert possibilities, even though he will definitely stick with his pre-determined plan. In how many different ways can John select his dessert (assuming that he does stick with his plan)?

A: 360	B: 240	C: 120	D: 18	E: 17

8. There are 15 books to be placed on a bookshelf. In how many different ways could these books be arranged on the shelf?

A: 2^{15}	B: $15!$	C: $14!$	D: 15	E: $\binom{15}{15}$

9. There are 15 books to be placed on a bookshelf. Nine are hardcover books, while 6 are paperback. In how many ways can the books be arranged on the shelf so that books of the same type (i.e. hardcover or paperback) are together on the shelf?

A: $\binom{15}{9}\binom{15}{6}$	B: $9!+6!$	C: $9!6!$	D: $9!6!2!$	E: $\binom{15}{9\ 6}$

10. There are 15 books to be placed on a bookshelf. The collection of books includes 3 books in the "An Idiots Guide to ..." series. In how many ways can the books be arranged on the shelf if the 3 "Idiots" books must be together?

A: $12!3!2!$	B: $12!3!$	C: $13!3!$	D: $\binom{15}{3}$	E: $13!+3!$

Use the following information for questions 11 and 12.

There are 4 married couples (all heterosexual) at a dinner party. These 8 people are to be arranged around a table for dinner.

11. How many different seating arrangements are possible if the only restriction is that Mrs. Smith cannot be seated next to Mrs. Jones?

A: 28,800	B: 30,240	C: 4,320	D: 1,800	E: 3,600

12. How many different seating arrangements are possible if men and women must alternate around the table?

A: 144	B: 576	C: 36	D: 5040	E: 30

13. La Belle Boutique needs to stock up on bathing suits. Because it is relatively late in the season, it has been decided that only 5 of the 12 designs they usually carry should be restocked. In how many different ways can the manager decide which 5 designs to reorder and which 7 designs not to restock?

A: 5^{12}	B: 2^7	C: $\binom{12}{5}$	D: $\binom{12}{5}\binom{12}{7}$	E: $5!7!$

14. A certain board of directors consists of 15 people. Three subcommittees are to be formed: a Finance subcommittee of 5 people, a Programs subcommittee of 4 people and a Fundraising subcommittee of 6 people. Each board member must sit on exactly 1 subcommittee, and the Treasurer (Mr. Bucks) must be on the Finance subcommittee. In how many ways can the subcommittees be chosen?

A: $\binom{15}{5\ \ 4\ \ 6}$	B: $\binom{14}{4\ \ 4\ \ 6}$	C: $\binom{14}{4\ \ 4\ \ 6} \div 2!$	D: $\binom{15}{5}\binom{15}{4}\binom{15}{6}$	E: $\binom{14}{4}\binom{15}{4}\binom{15}{6}$

15. How many distinct arrangements of the letters in the word ASSININE are there?

A: $8!$	B: $7!$	C: $8! - 2^3$	D: $2^3 \times 1^2$	E: $\binom{8}{8}$

16. A Grandmother has 8 different commemorative display plates. Each is a souvenir of a different royal family event (Elizabeth's coronation, Charles' birth, the Queen Mother's 100th birthday, Elizabeth's Golden Jubilee, etc.). She also, as it happens, has 8 grandchildren. The woman has decided that (all of) these plates will be inherited by her grandchildren. However, she has not yet decided how the plates will be distributed. Perhaps she'll leave all 8 to one grandchild, or one each to all 8 grandchildren, or some to each of several and none to the rest, etc. In how many different ways could the distribution of the 8 plates among the grandchildren be specified in the woman's will?

A: 8^8	B: 2^8	C: $8!$	D: $\binom{15}{8}$	E: $\binom{8}{8}$

17. See question 16. The same woman also has a set of 8 identical coffee mugs commemorating the death of Princess Diana. She has decided that her grandchildren will inherit these, as well. As before, she has not yet decided how these mugs should be distributed. If there are no restrictions on how the set may or may not be broken up, or on how many of the grandchildren should be chosen to receive mugs, in how many different ways could the woman decide to leave these 8 mugs to her grandchildren?

A: 2^8	B: 8^2	C: $8!$	D: $\binom{15}{8}$	E: $\binom{8}{8}$

18. Consider the experiment: Draw 2 cards (without replacement) from a standard deck. Consider also the following sets:
$S_1 = \{$2 red cards drawn, 2 black cards drawn, 1 red card and 1 black card drawn$\}$
$S_2 = \{$no hearts drawn, exactly 1 heart drawn, 2 hearts drawn$\}$
$S_3 = \{$at least 1 heart drawn, at least 1 black card drawn$\}$.
Which of these sets are possible sample spaces for the experiment?

A: S_1 only	B: S_2 only	C: S_3 only	D: S_1 and S_2 but not S_3	E: all of S_1, S_2 and S_3

19. Consider the experiment 'toss a coin 3 times'. Let H represent heads being tossed and T represent tails being tails being tossed. Consider the set

$$S = \{\text{at least one } H, \text{ more that one } T\}.$$

Which of the following statements is true?

A: The set S is a possible sample space for this experiment.
B: The set S is complete, but the descriptions are not mutually exclusive.
C: The set S contains mutually exclusive elements, but is not complete.
D: The set S is not complete and also the elements are not mutually exclusive.

20. Consider the experiment 'choose 1 student from the Math 028b Summer Evening class'. Let S be the set whose sample points are the names of the students in the class. Consider the following events defined on this sample space:
K is the event that the student is registered at King's College,
P is the event that the student is in Psychology,
M is the event that the student is male.
Let E be the event that the chosen student is not a male King's student who is not in Psychology. Which of the following is a correct statement of the event E?

A: $E = (M \cup K \cup P^c)^c$	B: $E = M^c \cap K^c \cap P$	C: $E = (M \cap K)^c \cap P^c$
D: $E = M^c \cup K^c \cup P^c$	E: $E = (M \cap K \cap P^c)^c$	