

Name: \_\_\_\_\_

Teacher: \_\_\_\_\_

**DO NOT OPEN THE EXAMINATION PAPER UNTIL  
YOU ARE TOLD BY THE SUPERVISOR TO BEGIN**



# Mathematics 3201

*MIDYEAR EXAMINATION  
January 2014*

**Value: 70 Marks  
Duration: 2 Hours**

## General Instructions

This examination consists of two parts. Both parts are contained in this booklet and further general instructions are provided on appropriate pages.

### **Part I – Selected Response (35 marks)**

Select the letter of the correct response from those provided. EITHER shade the letter on your computer scorable card OR place the letter in the blank provided on your Multiple Choice Answer Sheet, whichever format is being used by your school for this exam. **Do ALL questions in this section.**

### **Part II - Constructed Response (35 marks)**

Answer ALL questions fully in the space provided, showing all work.

## Student Checklist

***The items below are your responsibility. Please ensure that they are completed.***

- Write your name and teacher's name on the top of this page.
- Write your name, teacher's name, course name and number on the Part I answer sheet.
- Check the exam to see that there are no missing pages.

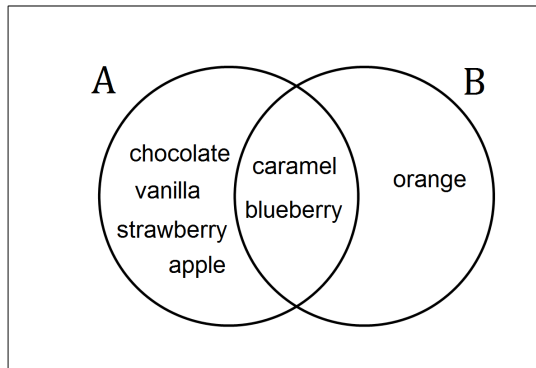
**ALL MATERIALS MUST BE PASSED IN WITH THIS EXAM.** Use your time wisely. Good luck!

**PART I**  
**Total Value: 35 marks**

Answer all items. Shade the letter of the correct answer on the computer scorable answer sheet or place the letter in the blank provided on your Multiple Choice Answer Sheet.

1. Given the Venn diagram below, how many elements are in the complement of A,  $n(A')$  ?

- (A) 1
- (B) 2
- (C) 3
- (D) 4



2. Which statement is true for sets A, B, and C ?

$$A = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$$

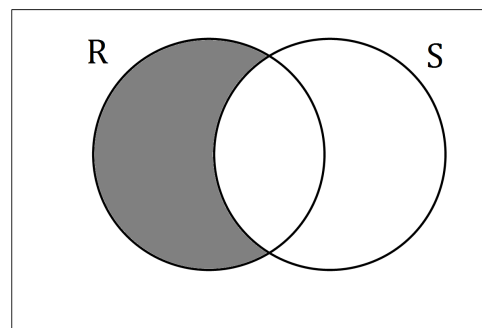
$$B = \{5, 10\}$$

$$C = \{3, 6, 9, 12\}$$

- (A) A is a subset of B,  $A \subset B$
  - (B) A is a subset of C,  $A \subset C$
  - (C) B is a subset of A,  $B \subset A$
  - (D) C is a subset of A,  $C \subset A$
3. There are 25 people in line for a movie. 12 people have popcorn ( $P$ ), 10 people have a drink ( $D$ ), 9 people have neither popcorn nor a drink. How many people have both popcorn and a drink, ( $P \cap D$ )?
- (A) 3
  - (B) 6
  - (C) 16
  - (D) 22

4. In the Venn diagram below, what does the shaded portion represent?

- (A)  $R \cup S$  (R or S)
- (B)  $R \setminus S$  (R minus S)
- (C)  $S \setminus R$  (S minus R)
- (D)  $S \cap R$  (S and R)



5. Vince asked 50 people if they liked apples or oranges:

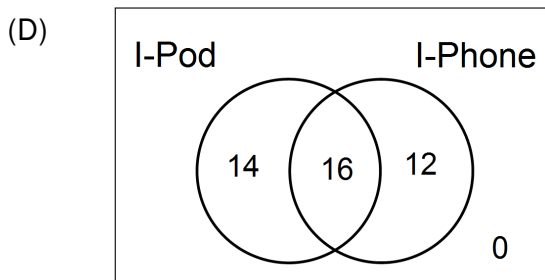
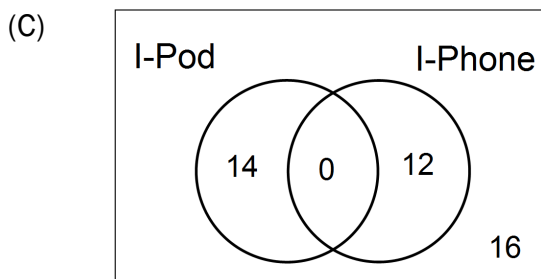
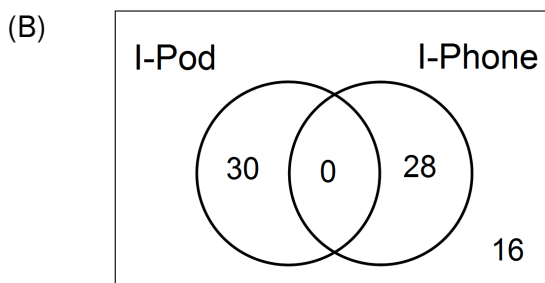
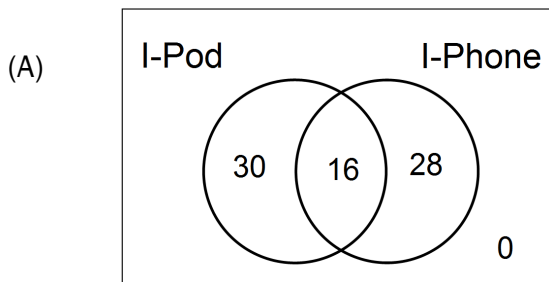
- 5 people didn't like apples or oranges
- 11 people liked **both** apples and oranges
- 13 people liked **only** apples

How many people liked **only** oranges?

- (A) 21
- (B) 32
- (C) 37
- (D) 45

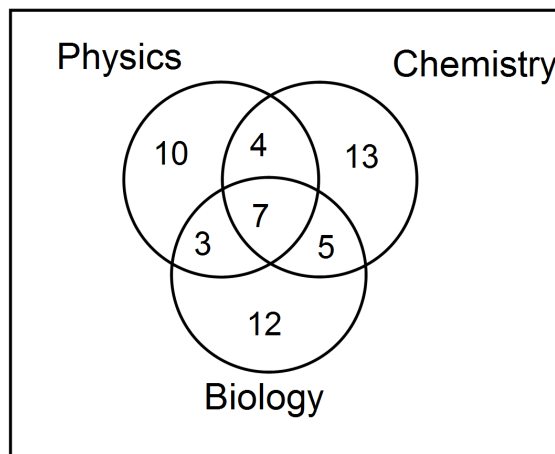
6. The table below shows the results of 42 people who own Apple products. Which Venn diagram best represents the information in the table?

Apple Product	# of People
I-Pod	30
I-Phone	28



7. Given the Venn diagram below, how many students are in Physics **AND** Chemistry but **NOT** Biology?

- (A) 4  
 (B) 7  
 (C) 11  
 (D) 27



8. Bob is selecting a new vehicle. He can either get a car or a truck. Each vehicle comes in 4 different colours. Given the selections below, how many choices does he have?

Vehicle	Colour
Car	Red
	Blue
Truck	Grey
	Black

- (A) 6  
 (B) 8  
 (C) 24  
 (D) 48
9. How many ways can the letters in the word **SAMPLE** be arranged if you must **start** with a consonant (S, M, P, L) and **end** with a vowel (A, E)?

- (A) 16  
 (B) 192  
 (C) 720  
 (D) 1152
10. Simplify:  $\frac{(n+3)!}{(n+1)!}$

- (A)  $\frac{1}{n^2+6}$   
 (B)  $\frac{1}{n^2+5n+6}$   
 (C)  $n^2 + 6$   
 (D)  $n^2 + 5n+6$

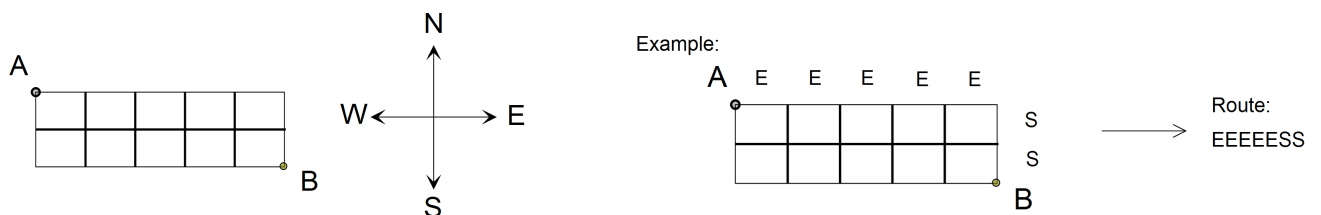
11. Evaluate:  $\frac{100!}{98!}$

- (A) 2
- (B) 199
- (C) 9900
- (D) 970200

12. A teacher has 5 different math books. How many ways can any 3 of them be arranged on a shelf?

- (A) 6
- (B) 10
- (C) 12
- (D) 60

13. In the grid below, a person must travel from  $A$  to  $B$  by only heading East ( $E$ ) or South ( $S$ ). One example of a route is shown representing 5 moves East followed by 2 moves South ( $EEEESS$ ). Under these rules, which represents the total number of possible routes that can be taken to get from  $A$  to  $B$ ?



- (A)  $\frac{2!5!}{7!}$
- (B)  $\frac{7!}{2!5!}$
- (C)  $2! \times 5!$
- (D)  $7!$

14. John, Sam, Alice and Brianna are to be arranged in a line from left to right. In how many ways can they be arranged?

- (A) 1
- (B) 4
- (C) 12
- (D) 24

15. Which expression is equivalent to  $\binom{7}{3}$ ?

- (A)  $\frac{3!}{7!}$   
(B)  $\frac{3!4!}{7!}$   
(C)  $\frac{7!}{3!}$   
(D)  $\frac{7!}{3!4!}$

16. A Math teacher must choose 3 girls and 2 boys to attend a math competition. In how many ways can this be done if there are 10 girls and 8 boys who are interested in attending?

- (A) 3360  
(B) 8568  
(C) 40 320  
(D) 1 028 160

17. A chess club in high school must consist of 7 members.

- There must be exactly 4 Level III students.
- There must be exactly 2 Level II students.
- There must be exactly 1 Level I student.

If 10 Level III's, 12 Level II's, and 8 Level I's wish to participate, how many different chess clubs are possible?

- (A)  ${}_{30}C_7$   
(B)  ${}_{30}P_7$   
(C)  ${}_{10}C_4 \times {}_{12}C_2 \times {}_8C_1$   
(D)  ${}_{10}P_4 \times {}_{12}P_2 \times {}_8P_1$

18. The odds of randomly selecting an apple from a bag of fruit are 2:7. What is the probability of selecting an apple?

- (A)  $\frac{2}{9}$   
(B)  $\frac{2}{7}$   
(C)  $\frac{5}{9}$   
(D)  $\frac{5}{7}$

19. Twelve adults were surveyed and asked how many children they had. The results are below:

1, 3, 0, 2, 2, 0, 1, 1, 3, 2, 0, 0

If one adult is chosen from this group, what is the probability that they will have at least one child?

- (A) 1.25%
- (B) 1.88%
- (C) 33.33%
- (D) 66.67%
20. A hockey player has taken 21 shots and scored 6 goals. What are the odds **against** the player scoring a goal on their next shot?
- (A) 2:5
- (B) 2:7
- (C) 5:2
- (D) 7:2
21. Which experiment involves mutually exclusive events?
- (A) driving while texting and having an accident
- (B) rolling a die and flipping a coin
- (C) rolling a die and getting an even number
- (D) studying math and passing the test
22. A standard six sided die is rolled twice. What is the probability of rolling a 3 and then rolling a 5?
- (A)  $\frac{1}{6} \times \frac{1}{6}$
- (B)  $\frac{1}{3} \times \frac{1}{5}$
- (C)  $\frac{1}{6} + \frac{1}{6}$
- (D)  $\frac{1}{3} + \frac{1}{5}$

23. The student council has 7 members (3 males and 4 females). Four members are going to be chosen at random to attend a conference. Which expression represents the probability of at least 2 males being selected?

(A) 
$$\frac{\binom{3}{1} \times \binom{4}{3} + \binom{3}{2} \times \binom{4}{2}}{{}^7C_4}$$

(B) 
$$\frac{\binom{3}{2} \times \binom{4}{2} + \binom{3}{3} \times \binom{4}{1}}{{}^7C_4}$$

(C) 
$$\frac{({}_3P_1 \times {}_4P_3) + ({}_3P_2 \times {}_4P_2)}{{}_7P_4}$$

(D) 
$$\frac{({}_3P_2 \times {}_4P_2) + ({}_3P_3 \times {}_4P_1)}{{}_7P_4}$$

24. The probability of Sean going to the hockey game on Friday night is 0.4. The probability he will go to the dance on Friday night is 0.5. The probability he will go to either the game or the dance is 0.8. What is the probability he will go to the dance and the hockey game?

- (A) 0.10  
 (B) 0.16  
 (C) 0.20  
 (D) 0.90

25. Bob randomly selects 2 cards, **without replacement**, from the deck of 30 cards shown below. What is the probability of him selecting 1 red and then 1 blue?

Card Colour	Cards
red	0 1 2 3 4 5 6 7 8 9
blue	0 1 2 3 4 5 6 7 8 9
green	0 1 2 3 4 5 6 7 8 9

- (A)  $\frac{1}{100}$   
 (B)  $\frac{1}{9}$   
 (C)  $\frac{10}{87}$   
 (D)  $\frac{5}{19}$



26. What are the non-permissible values for the rational expression  $\frac{7x}{3(2-x)(4x+1)}$  ?

(A)  $\left\{-2, 0, \frac{1}{4}\right\}$

(B)  $\left\{-2, \frac{1}{4}\right\}$

(C)  $\left\{-\frac{1}{4}, 0, 2\right\}$

(D)  $\left\{-\frac{1}{4}, 2\right\}$

27. Which expression is equivalent to  $\frac{x+10}{x+4}$ ,  $x \neq -4$ ?

(A)  $\frac{x+5}{x+2}$

(B)  $\frac{3x+10}{3x+4}$

(C)  $\frac{5x+50}{5x+20}$

(D)  $\frac{x^2+10x}{x^2+4x}$

28. Which rational expression has non-permissible values of 0 and 5?

(A)  $\frac{x(x-5)}{4}$

(B)  $\frac{(x-5)}{4x}$

(C)  $\frac{4x}{(x-5)}$

(D)  $\frac{4}{x(x-5)}$

29. Simplify:  $\frac{5x+15}{x^2-9}$

(A)  $\frac{5}{x+3}$ ,  $x \neq \pm 3$

(B)  $\frac{5}{x-3}$ ,  $x \neq \pm 3$

(C)  $\frac{5(x+3)}{(x+3)(x-3)}$ ,  $x \neq \pm 3$

(D)  $\frac{5(x+3)}{(x-3)(x-3)}$ ,  $x \neq \pm 3$

30. Simplify:  $\frac{x^2}{x^2-7x}$

(A)  $-7x$ ,  $x \neq 0, 7$

(B)  $-\frac{1}{7x}$ ,  $x \neq 0, 7$

(C)  $\frac{1}{1-7x}$ ,  $x \neq 0, 7$

(D)  $\frac{x}{x-7}$ ,  $x \neq 0, 7$

31. Simplify:  $\frac{x+5}{x+6} \cdot \frac{x+6}{x^2-25}$

(A)  $\frac{1}{x-5}$ ,  $x \neq -6, \pm 5$

(B)  $\frac{1}{x+5}$ ,  $x \neq -6, \pm 5$

(C)  $x-5$ ,  $x \neq -6, \pm 5$

(D)  $\frac{x+5}{x^2-25}$ ,  $x \neq -6, \pm 5$

32. Simplify:  $\frac{6x}{20} \div \frac{2x^3}{5}$

(A)  $\frac{3}{4x^2}$ ,  $x \neq 0$

(B)  $\frac{3x^2}{4}$ ,  $x \neq 0$

(C)  $\frac{3x^3}{25}$ ,  $x \neq 0$

(D)  $\frac{3x^4}{25}$ ,  $x \neq 0$

33. Simplify:  $\frac{8x-2}{x+1} + \frac{3x+4}{x+1}$ ,  $x \neq -1$

(A)  $\frac{11x-2}{x+1}$

(B)  $\frac{11x+2}{x+1}$

(C)  $\frac{11x-2}{2x+2}$

(D)  $\frac{11x+2}{2x+2}$

34. Simplify:  $\frac{-7x}{x+4} - \frac{3x}{2x+8}$ ,  $x \neq -4$

(A)  $\frac{-4x}{2(x+4)}$

(B)  $\frac{-10x}{2(x+4)}$

(C)  $\frac{-11x}{2(x+4)}$

(D)  $\frac{-17x}{2(x+4)}$

35. A student simplifies  $\frac{3}{x-4} - \frac{2}{x}$ ,  $x \neq 0, 4$ . In which step does she make an error?

Step 1  $\left(\frac{3}{x-4} \cdot \frac{x}{x}\right) - \left(\frac{2}{x} \cdot \frac{x-4}{x-4}\right)$

Step 2  $\frac{3x-(2x-8)}{x(x-4)}$

Step 3  $\frac{3x-2x-8}{x(x-4)}$

Step 4  $\frac{x-8}{x(x-4)}$

- (A) 1  
 (B) 2  
 (C) 3  
 (D) 4

**PART II - Total Value: 35 marks**

Answer **ALL** items in the space provided. Show **ALL** workings.

Value

3 36(a). Brandon surveyed his classmates to see if they liked Action movies or Horror movies.

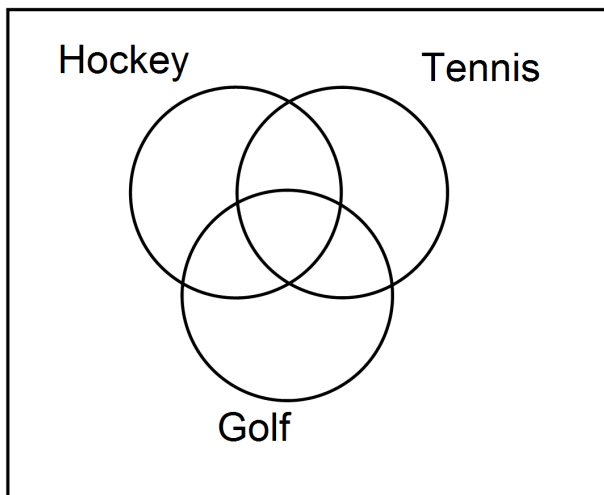
- 9 people liked Horror movies
- 3 people liked both Action movies and Horror movies
- 4 people liked neither type of movie
- 20 people liked Action movies

Draw a Venn diagram to determine how many people he surveyed in total.

3 36(b). 50 members of a sports club were surveyed:

- 3 play all three sports
- 24 play hockey
- 25 play tennis
- 22 play golf
- 13 play tennis and hockey
- 9 play tennis and golf
- 2 members volunteer and don't play any of the sports

Determine the number of people who play hockey **AND** golf but **NOT** tennis.



Value

- 2      37(a). How many different arrangements of the letters in the word **MATHEMATICS** are possible?
- 2      37(b). David rolls a 6-sided die, numbered 1 to 6, and flips a coin with heads and tails. Use a graphic organizer such as a tree diagram or table to illustrate all possible outcomes.
- 3      37(c). How many 6 person committees can be formed from a group of 4 teachers and 30 students if there must be **at least 3** teachers?

Value

3 37(d). Algebraically solve for  $n$ :  ${}_nP_2 = 72$

3 38(a). When considering the total arrangements of the letters in the word FLOAT, what is the probability of the vowels (O, A) being together?

3 38(b). John likes to jog. If the weather is nice he is 80% likely to jog. If it is raining he is only 40% likely to jog. The forecast for tomorrow indicates a 30% chance of rain. What is the probability that he will jog tomorrow?

Value

- 3 38(c). A recent survey indicated that 98% of all high school students in Newfoundland have a cell phone and of these students, 40% have an I-Phone. What is the probability of a student owning a cell phone that is **NOT** an I-Phone?

- 3 39(a). Algebraically solve for x:  $\frac{2}{3x} + \frac{5}{6} = 2$ ,  $x \neq 0$

- 4 39(b). Simplify and state the non-permissible values:

$$\frac{6x+30}{6+3x} \div \frac{3(x+5)}{x^2-4}$$

Value

39(c). It takes Jason and Sean 6 minutes to shovel their driveway when they work together. If Jason works by himself it will take him 5 minutes longer than Sean if Sean shovels the driveway by himself.

1 (i) Set up a rational equation to model the situation.

2 (ii) Use your equation from (i) to algebraically determine how long it would take Sean to shovel the driveway when he works alone.