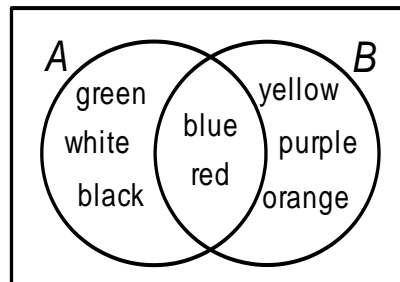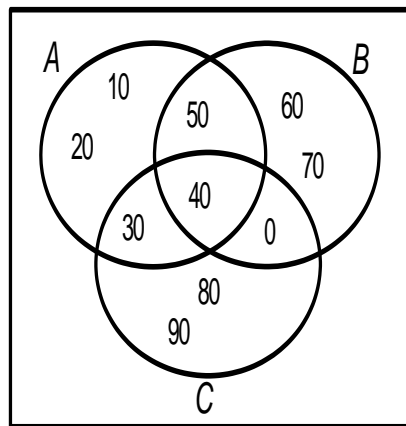**Answer all items. Shade the letter of the correct answer on the computer scorable answer sheet.**

1. Given the Venn diagram below, what is the number of elements in both A and B, $n(A \cap B)$?

   (A) 2
   (B) 3
   (C) 6
   (D) 8

2. Given the Venn diagram below, which element(s) is (are) in sets A, B or C, $A \cup B \cup C$?

   (A) {0, 30, 40, 50}
   (B) {10, 20, 60, 70, 80, 90}
   (C) {40}
   (D) {0, 10, 20, 30, 40, 50, 60, 70, 80, 90}

3.   There are 26 students in a classroom. 11 students have blonde hair (H), 16 have brown eyes (E), 6 do not have blonde hair or brown eyes, and 13 have blonde hair or brown eyes, but not both. How many of these students have both blonde hair and brown eyes, $H \cap E$?

(A)   1
(B)   7
(C)   13
(D)   20

4. A is the set of positive even integers less than 12. B is the set of multiples of 3 between 4 and 20. Which element(s) is (are) not in the intersection of A and B, $(A \cap B)'$?

(A)   {2, 4, 8, 9, 10, 15, 18}
(B)   {2, 4, 8, 9, 10, 12, 15, 18}
(C)   {6}
(D)   {6,12}

5.   A student incorrectly wrote 4! = 12. To produce a correct solution for 4!, what operation should be applied to 12.

(A)   add 2
(B)   divide by 2
(C)   multiply by 2
(D)   subtract 2

6.   Consider the word CAR. In how many different ways can the letters be arranged?

(A)   1
(B)   3
(C)   4
(D)   6

7. A student must select a protective case for her new cell phone. She must choose a colour and a style for her case. Given the selections below, how many protective case choices does she have?

Case Colour	Case Style
Red	
Blue	hard
Green	
Black	
White	soft
Silver	

(A)   8
(B)   12
(C)   15
(D)   30

8. Simplify: $\dfrac{(n-2)!}{n!}$

(A) $\dfrac{1}{n^2-n}$

(B) $\dfrac{1}{n^2-3n+2}$

(C) n^2-n

(D) n^2-3n+2

9. 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 three moves East followed by two moves South (EEESS). Under these rules, which represents the total number of possible routes that can be taken to get from *A* to *B*?

A

N
W ←→ E
S

Example: *A* E E E

S
S

B

Route:
→ EEESS

B
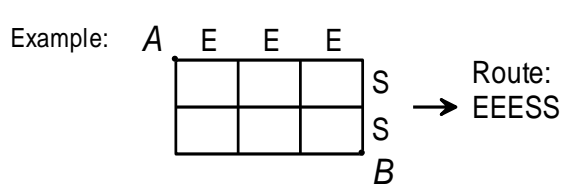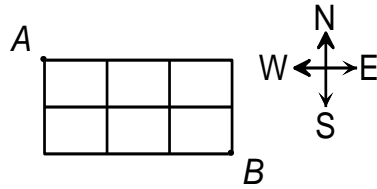
(A) $\dfrac{5!}{3!2!}$

(B) $\dfrac{6!}{3!2!}$

(C) 5!

(D) 6!

10. There are 7 marbles in a bowl: 2 white, 3 green and 2 blue. If taken out one at a time, in how many different ways can all 7 marbles be taken out of the bowl?

(A) 105
(B) 210
(C) 420
(D) 5040

11. A soccer player has 17 attempts on net and 6 goals scored. What are the odds in favour of her scoring a goal on her next attempt?

(A) 6 : 11
(B) 6 : 17
(C) 11 : 6
(D) 17 : 6

12. A committee of three people will be randomly chosen from a group of nine people; 5 females and 4 males. Which represents the probability of selecting a committee that has at least one male and at least one female member?

(A) $\dfrac{\left(_4C_1 \times _5C_2\right)+\left(_4C_2 \times _5C_1\right)}{_9C_3}$

(B) $\dfrac{\left(_4C_0 \times _5C_3\right)+\left(_4C_3 \times _5C_0\right)}{_9C_3}$

(C) $\dfrac{\left(_9C_1 \times _5C_2\right)+\left(_9C_2 \times _5C_1\right)}{\left(_4C_3 \times _5C_3\right)}$

(D) $\dfrac{\left(_9C_1 \times _4C_2\right)+\left(_9C_2 \times _4C_1\right)}{\left(_4C_3 \times _5C_3\right)}$

13. *A* and *B* are mutually exclusive events. The probability that either *A* or *B* will occur, $P(A \cup B)$, is 56%. If the probability of *A* occurring, $P(A)$, is 17%, what is the probability of *B* not occurring, $P(B')$?

(A) 27%
(B) 39%
(C) 61%
(D) 73%

14. You have a six-sided die with each side numbered one through six. You also have a coin with heads on one side and tails on the other. What is the probability of rolling a number greater than 4 with the die and tossing heads with the coin?

(A) $\frac{1}{12}$

(B) $\frac{1}{6}$

(C) $\frac{1}{4}$

(D) $\frac{1}{3}$

15. A deck of 40 cards consists of 4 different coloured sets: red, blue, green and yellow. Each set is numbered from 0 to 9 as shown below. If two cards are randomly picked from the deck, what is the probability that the first card is blue or green and the second card is also blue or green?

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
yellow	0 1 2 3 4 5 6 7 8 9

(A) $\frac{1}{20}$

(B) $\frac{19}{80}$

(C) $\frac{19}{78}$

(D) $\frac{1}{4}$

16. What are the non-permissible values for the rational expression $\dfrac{3x}{5(4-x)(2x+1)}$?

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

(B) $\left\{-4, \frac{1}{2}, 5\right\}$

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

(D) $\left\{-\frac{1}{2}, 4, 5\right\}$

17. What is the simplified form of $\dfrac{x^2}{x^2-5x}$, $x \neq 0,5$?

(A) $-5x$

(B) $-\dfrac{1}{5x}$

(C) $\dfrac{x}{x-5}$

(D) $\dfrac{1}{1-5x}$

18. What expression is equivalent to $\dfrac{x+5}{x-4}$, $x \neq 4$?

(A) $\dfrac{x^2+5x}{x^2-4x}$

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

(C) $\dfrac{3x+5}{3x-4}$

(D) $\dfrac{5x+25}{5x-20}$

19. Simplify: $\dfrac{12-4x}{2x^2-18}$

(A) $\dfrac{-2}{x-3}$, $x \neq -3,3$

(B) $\dfrac{-2}{x+3}$, $x \neq -3,3$

(C) $\dfrac{2}{x-3}$, $x \neq -3,3$

(D) $\dfrac{2}{x+3}$, $x \neq -3,3$

20. Simplify: $\dfrac{6x}{9} \div \dfrac{4x^3}{3}$

    (A) $\dfrac{1}{2x^2}$, $x \neq 0$

    (B) $2x^2$, $x \neq 0$

    (C) $\dfrac{9}{8x^4}$, $x \neq 0$

    (D) $\dfrac{8x^4}{9}$, $x \neq 0$

21. Simplify: $\dfrac{2x}{x+3} - \dfrac{5x}{2x+6}$

    (A) $\dfrac{-3x}{-x-9}$, $x \neq -3$

    (B) $\dfrac{-3x}{-x-3}$, $x \neq -3$

    (C) $\dfrac{-x}{2(x+3)}$, $x \neq -3$

    (D) $\dfrac{x}{2(x+3)}$, $x \neq -3$

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

Value

3   51.   200 students wrote exams in Math, Biology and English. The Venn Diagram below represents the percentage of those who wrote the exams. Algebraically determine the percentage of students who wrote all three exams, and determine the number of students that this represents.

Biology | Math

$(2 - x)\%$ 1%   4%

$(6)x\%$

1%

$(x + 27)\%$

2%

English
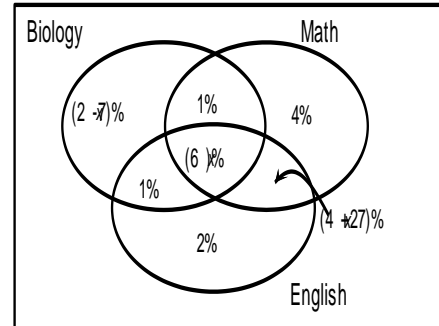
2   52.(a) In how many ways can a teacher seat four girls and two boys in a row of six seats if the two boys must be seated next to each other?

3   52.(b) Algebraically solve for *n*: $_nP_2 = 12$

2   52.(c) Four students are to be chosen from a group of 12 to fill the positions of president, vice-president, treasurer and secretary. In how many ways can this be accomplished?

3   53.(a) If a 5-digit number is generated at random from the digits 2, 3, 4, 5 and 8 (with no repetition), what is the probability that it will be an odd number?

3   53.(b) A person will be randomly selected from a group to draw a marble from a bag. The odds of selecting a female from the group is 7:8 and the odds of drawing a red marble from the bag are 1:3. What is the probability of a non-red marble being drawn from the bag by a male from the group?

4   54.(a) Simplify and state restrictions: $\dfrac{1-x^2}{8-8x} \div \dfrac{3x+3}{2(3x-1)}$

54.(b) Pat and Chris can paint the house in 5 hours if they work together. Pat is a professional painter and can paint twice as fast as Chris. How long would it take Pat to paint the house by himself?