Check Your Understanding
## Probability – Basic, And, Or, and Conditional Probability

The table below identifies some key concepts from this unit. Complete each question, check your answers, and get help as needed.

Key Concepts	Basic Questions	Intermediate Questions	Advanced Questions
Venn Diagrams	1	3	5
Contingency Tables	2	4	
Conditional Probabilities		1, 2, 4	6

1) Many people were asked to respond to a survey asking about their preferences of season (summer, winter, fall, or spring) and their favorite color.

The results are presented in the Venn diagram below.
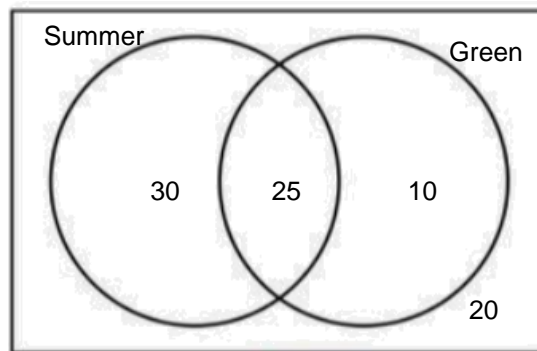
Use the Venn diagram to determine:

a) $P(summer)$

b) $P(green)$

c) $P(summer \cap green)$

d) $P(summer \cup green)$

e) $P(summer|green)$

f) $P(green|summer)$

2) Students were playing a game where they had to pick an animal from a bag of several different animals and pick a card from a standard deck of 52 cards and the color of the card is recorded.

The contingency table below shows the results of this experiment.

	Horse	Duck	Cow	Pig	Total
Red Card	3	2	5	4	14
Black Card	1	4	7	4	16
Total	4	6	12	8	30

Using the contingency table, determine the following probabilities:

a) $P(duck)$

b) $P(red\ card)$

c) $P(cow \cap black\ card)$

d) $P(pig \cup red\ card)$

e) $P(black\ card|cow)$

f) $P(duck|red\ card)$

3) 25 people were asked if they liked dogs, cats, both, or neither.
- 4 people like both dogs and cats
- 12 people like dogs
- 16 people like cats

a) Construct Venn diagram representing these results.

b) If a person was chosen at random from this group, what is the probability
   I. the person would like dogs?

   II. the person would like dogs or cats?

4) A school is hosting a trip for grade 10 and grade 11 students. The possible destinations are: Banff, Vancouver, and Halifax. The teachers collected the following information:

	Banff	Vancouver	Halifax	TOTAL
Grade 10				250
Grade 11				
TOTAL	300	225		750

Additionally, the teachers know the following:

- Given a student is in Grade 10, the probability they choose Banff is $\frac{9}{25}$

- The probability a student is in Grade 11 given they chose Vancouver is $\frac{5}{9}$

a) What is the probability that a student, chosen at random is in grade 11?

b) What is the probability that a student, chosen at random, is in grade 11 and choose Halifax?

c) Given that a student chose the Banff trip, what is the probability that they are in Grade 10?

5) 25 students went on an outdoor winter trip. The students could choose from the following activities: ski, snowshoe, dogsled.
   - 10 students went skiing
   - 7 students went snowshoeing
   - 14 students went dogsledding or snowshoeing
   - 1 student did all three activities
   - 4 students went snowshoeing and dogsledding
   - 2 students went skiing and snowshoeing
   - 18 students went skiing or dogsledding
   - 5 students did not do any of the activities

   a) Construct a Venn diagram to represent these choices.

   b) Determine
      I. $P(dogsledding)$

      II. $P(skiing \cup snowshowing)$

      III. $P(skiing \cap dogsledding)$

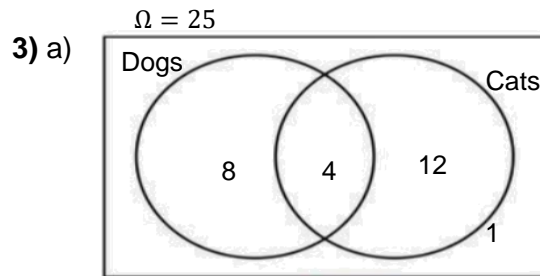6) Given dependent events A and B, where $P(A) = \frac{2}{7}$ $P(B) = \frac{1}{11}$ and $P(A \cap B) = \frac{1}{14}$

   a) Determine $P(A|B)$

   b) Determine $P(B|A)$

Answer Key

1) a) $P(summer) = \frac{55}{85}$

b) $P(green) = \frac{35}{85}$

c) $P(summer \cap green) = \frac{25}{85}$

d) $P(summer \cup green) = \frac{65}{85}$
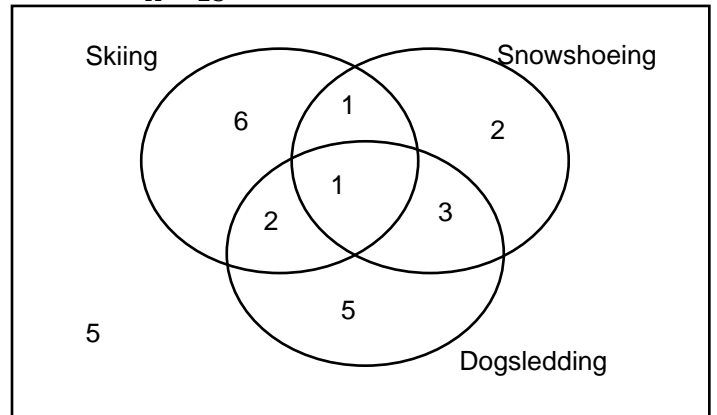
e) $P(summer|green) = \frac{25}{35}$

f) $P(green|summer) = \frac{25}{55}$

2) a) $P(duck) = \frac{6}{30}$

b) $P(red\ card) = \frac{14}{30}$

c) $P(cow \cap black\ card) = \frac{7}{30}$

d) $P(pig \cup red\ card) = \frac{18}{30}$

e) $P(black\ card|cow) = \frac{7}{12}$

f) $P(duck|red\ card) = \frac{2}{14}$

3) a)

$\Omega = 25$

b i) $P(dogs) = \frac{12}{25}$

b ii) $P(dogs \cup cats) = \frac{24}{25}$

4) a) $P(Gr\ 11) = \frac{500}{750}$

b) $P(11 \cap Halifax) = \frac{165}{750}$

c) $P(Gr\ 10|Banff) = 90/300$

5) a)

$\Omega = 25$

b)

I. $P(dogsledding) = \frac{11}{25}$

II. $P(skiing \cup snowshowing) = \frac{15}{25}$

III. $P(skiing \cap dogsledding) = \frac{3}{25}$

6)

a) $P(A|B) = 11/14$

b) $P(B|A) = \frac{1}{4}$