Quiz: Real-life Skills

Section: Probability **Sub-section: Real-life Skills**

Choose the correct answer.

1. In a lottery, there are 15 prizes and 85 blanks. Mason has one ticket for the lottery. What is the probability that Mason will not get a prize?

   (understand, MA 3.1 G.9/2)

   A. 0.15

   B. 0.70

   C. 0.85

   D. 0.90

   Solution 0.85

   There are 15 prizes and 85 blanks.

   So, $N(S) = 15 + 85 = 100$

   Let E be an event that will not get a prize.

   There are 85 blanks.

   So, $N(E) = 85 = 85$

   Thus, $P(E) = \frac{85}{100} = 0.85$

2. In a lottery, there are 12 prizes and 88 blanks. Marcus has one ticket for the lottery. What is the probability that Marcus will not get a prize?
(understand, MA 3.1 G.9/2)

   A. 0.12

   B. 0.76

   C. 0.80

   D. 0.88

   Solution 0.88

   There are 12 prizes and 88 blanks.

   So, $N(S) = 12 + 88 = 100$

   Let E be an event that will not get a prize.

   There are 88 blanks.

   So, $N(E) = 88 = 88$

   Thus, $P(E) = \frac{88}{100} = 0.88$

3. A review was conducted on 600 families and the number of children in each family was recorded. The results are given below:

No. of Children	0	1	2	3	Total
No. of Families	120	356	108	16	600

If a family is chosen at random, find the probability that it will have less than 2 children.

(understand, MA 3.1 G.9/2)

A. $\frac{108}{150}$

B. $\frac{119}{150}$

C. $\frac{135}{150}$

D. $\frac{146}{150}$

Solution $\frac{119}{150}$

There are 600 families.

So, $N(S) = 600$

Let E be an event in which the families will have less than 2 children.

There are 120 and 356 families that have 0 and 1 child, respectively.

So, $N(E) = 120 + 356 = 476$

Thus, $P(E) = \frac{476}{600} = \frac{119}{150}$

4. A review was conducted on 800 families and the number of children in each family was recorded. The results are given below:

No. of Children	0	1	2	3	Total
No. of Families	240	436	106	18	800

If a family is chosen at random, find the probability that it will have less than 2 children.

(understand, MA 3.1 G.9/2)

A. $\frac{169}{200}$

B. $\frac{187}{200}$

C. $\frac{345}{400}$

D. $\frac{391}{400}$

Solution $\frac{169}{200}$

There are 800 families.

So, $N(S) = 800$

Let E be an event in which the families will have less than 2 children.

There are 240 and 436 families that have 0 and 1 child, respectively.

So, $N(E) = 240 + 436 = 676$

Thus, $P(E) = \frac{676}{800} = \frac{169}{200}$

5. A bag contains 8 black marbles, 2 white marbles and 15 blue marbles. A marble is picked up at random. What is the probability of getting a marble which is not black? (understand, MA 3.1 G.9/2)

   A. $\frac{8}{25}$

   B. $\frac{10}{25}$

   C. $\frac{15}{25}$

   D. $\frac{17}{25}$

   Solution $\frac{17}{25}$

   There are 8 black marbles, 2 white marbles and 15 blue marbles.

   So, $N(S) = 8 + 2 + 15 = 25$

   Let E be an event of getting a marble which is not black.

   There are 2 white marbles and 15 blue marbles.

   So, $N(E) = 2 + 15 = 17$

   Thus, $P(E) = \frac{17}{25}$.

6. A bag contains 7 black marbles, 6 white marbles and 12 blue marbles. A marble is picked up at random. What is the probability of getting a marble which is not white? (understand, MA 3.1 G.9/2)

   A. $\frac{7}{25}$

   B. $\frac{13}{25}$

   C. $\frac{19}{25}$

   D. $\frac{21}{25}$

   Solution $\frac{19}{25}$

   There are 7 black marbles, 6 white marbles and 12 blue marbles.

   So, $N(S) = 7 + 6 + 12 = 25$

   Let E be an event of getting a marble which is not white

   There are 7 black marbles and 12 blue marbles.

   So, $N(E) = 7 + 12 = 19$

   Thus, $P(E) = \frac{19}{25}$

7. A company makes electric lamps. Four out of every 100 gadgets are faulty, but the company doesn't know which ones are faulty until a buyer complains. Suppose the

company makes a $4 profit on the sale of any working lamp, but suffers a loss of $60 for every faulty lamp because they have to repair the unit. What is the expected value of the company?

(apply, MA 3.1 G.9/2)

A. 1.20 dollars

B. 1.32 dollars

C. 1.44 dollars

D. 1.96 dollars

Solution 1.44 dollars

Let X_1 be the value of losing the profit when the electric lamp is faulty

and X_2 be the value of getting the profit when the electric lamp is not faulty.

Then, $X_1 = -60 \; and \; X_2 = 4$

The probability of losing the profit is $\frac{4}{100}$. So, $P(X_1) = \frac{4}{100} = \frac{1}{25}$

Then, the probability of getting the profit is $1 - \frac{1}{25} = \frac{24}{25}$. So, $P(X_2) = \frac{24}{25}$

Thus, $E(X) = (\frac{1}{25})(-60) + (\frac{24}{25})(4) = -2.4 + 3.84 = 1.44$

8. A company makes electric lamps. Five out of every 100 gadgets are faulty, but the company doesn't know which ones are faulty until a buyer complains. Suppose the company makes a $5 profit on the sale of any working lamp, but suffers a loss of $70

for every faulty lamp because they have to repair the unit. What is the expected value of the company?

(apply, MA 3.1 G.9/2)

A. 1.20 dollars

B. 1.25 dollars

C. 1.30 dollars

D. 1.35 dollars

Solution 1.25 dollars

Let X_1 be the value of losing the profit when the electric lamp is faulty

and X_2 be the value of getting the profit when the electric lamp is not faulty.

Then, $X_1 = -70 \; and \; X_2 = 5$

The probability of losing the profit is $\frac{5}{100}$. So, $P(X_1) = \frac{5}{100} = \frac{1}{20}$

Then, the probability of getting the profit is $1 - \frac{1}{20} = \frac{19}{20}$. So, $P(X_2) = \frac{19}{20}$

Thus, $E(X) = (\frac{1}{20})(-70) + (\frac{19}{20})(5) = -3.5 + 4.75 = 1.25$

9. Your company plans to invest in a new project. There is a 45% chance that you will lose $20,000, a 30% chance that you will break even, and a 25% chance that you will make $60,000. What is the expected value of the company?

(apply, MA 3.1 G.9/2)

A. 0 dollar

B. $6,000$ dollars

C. $40,000$ dollars

D. $60,000$ dollars

Solution $6,000$ dollars

Let X_1 be the value of losing \$20,000,

X_2 be the value of breaking even,

and X_3 be the value of making \$60,000.

Then, $X_1 = -\ 20,000, X_2 = 0\ and\ X_3 = 60,000$

There is a 45% chance that you will lose \$20,000, a 30% chance that you will break even, and a 25% chance that you will make \$60,000.

Then, $P(X_1) = 0.45,\ P(X_2) = 0.30\ and\ P(X_3) = 0.25$

Thus, $E(X) = (0.45)(-\ 20,000) + (0.30)(0) + (0.25)(60,000) = 6,000$

10. Your company plans to invest in a new project. There is a 55% chance that you will lose \$40,000, a 20% chance that you will break even, and a 25% chance that you will make \$80,000. What is the expected value of the company?
(apply, MA 3.1 G.9/2)

A. $-\ 2,000$ dollars

B. 0 dollar

C. $20,000$ dollars

D. $40,000$ dollars

Solution $-$ $2,000$ dollars

Let X_1 be the value of losing \$40,000,

X_2 be the value of breaking even,

and X_3 be the value of making \$80,000.

Then, $X_1 = -40,000, X_2 = 0 \; and \; X_3 = 80,000$

There is a 55% chance that you will lose \$40,000, a 20% chance that you will break even, and a 25% chance that you will make \$80,000.

Then, $P(X_1) = 0.55, \; P(X_2) = 0.20 \; and \; P(X_3) = 0.25$

Thus, $E(X) = (0.55)(-40,000) + (0.20)(0) + (0.25)(80,000) = -2,000$