Use the following information to answer the next two questions.

Let the universal set $U = \{\text{whole } \#'s \text{ less than 15}\}$ \[0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14\]
The following are subsets of the universal set $U$

$$A = \{\text{factors of 12}\}, 2, 3, 4, 6, 12$$
$$B = \{x \in W | 2 < x < 7 \}$$

1. The intersection of sets $A$ and $B$ is
   A. $\{6, 12\}$
   B. $\{4, 6, 12\}$
   C. $\{2, 4, 6, 12\}$
   D. $\{1, 2, 3, 4, 6, 8, 10, 12\}$

Numerical Response

1. The value of $n(A')$ is $9$
Use the following information to answer the next 2 questions

The students from Jefferson High School were surveyed on instruments they play. 27 students play Trumpet, 40 students play Flute, 31 play Drums, 11 play Trumpet and Flute, 13 play Flute and Drums, 8 play Trumpet and Drums, 5 play all 3 instruments and 11 play none.

2. The value of \(D' \cap F\) is
   
   A. 21  
   B. 27  
   C. 34  
   D. 40

3. The number of students who play only trumpet is
   
   A. 3  
   B. 5  
   C. 6  
   D. 13
Use the following information to answer the next two questions

The pattern below represents Pascal's triangle with the corresponding row # on the left.

\[
\begin{array}{cccccccc}
0 & & & & & & & 1 \\
1 & & & & & & 1 & 1 \\
2 & & & & 1 & 2 & 1 & 4 \\
3 & & & 1 & 3 & 3 & 1 & 8 \\
4 & & 1 & 4 & 6 & 4 & 1 & 16 \\
5 & 1 & 5 & 10 & 10 & 5 & 1 & 32 \\
6 & 1 & 6 & 15 & 20 & 15 & 6 & 1 & 64 \\
7 & 1 & 7 & 21 & 35 & 35 & 21 & 7 & 1 & 128 \\
8 & 1 & 8 & 28 & 56 & 70 & 56 & 28 & 8 & 1 & 256 \\
\end{array}
\]

4. The 4th term in the 5th row of the triangle is

A. 28  
B. 35  
C. 56  
D. 70

5. In the triangle above, there is a relationship between the row # and the sum of the numbers in each row. If \( k = \text{row number and } S = \text{sum of numbers in each row}, \) the pattern is

A. \( S = 2k \)  \( 16 = 2^4 \times \)  
B. \( S = 2^k \)  \( 16 = 2^4 \) \( \checkmark \)  
C. \( S = 2^{k-1} \)  \( 16 = 2^{4-1} \times \)  
D. \( S = 2^{k+1} \)  \( 16 = 2^{4+1} \times \)
2. Assuming the letter arrangement \text{OREO} corresponds to the number 4214, the arrangement \text{EROO} corresponds to a new number. That number divided by 2 would be 622.

6. What is the number of distinguishable 5-letter arrangements that are possible using the letters in the word \text{VERTICAL} if each arrangement must begin with a vowel?

A. 360
B. 840
C. 2520
D. 6720

7. There are 10 teams entered in a hockey tournament in which each team must play every other team exactly once. How many games will there be altogether in the tournament?

A. 10!
B. 2(10!)
C. \(10P_2\)
D. \(10C_2\)
Use the following information to answer the next question

Numerical Response

3. The number of different paths from A to B without backtracking is 36

8. A school committee consists of 1 vice-principal, 2 teachers and 3 students. The number of different combinations that can be selected from 2 vice-principals, 5 teachers and 9 students is

\[ \binom{2}{1} \cdot \binom{5}{2} \cdot \binom{9}{3} \]

A. 20,160
B. 8,008
C. 1,680
D. 90
Use the following information to answer the next question

The following instructions were given on a survey.

Place an X beside the activities that interest you when you are on vacation. You may place an X beside as many activities as you like, or you may leave all boxes blank.

- Sightseeing
- Theatre
- Hiking
- Skiing
- Museums
- Golfing
- Shopping

Before the results of all the completed surveys can be tabulated, the number of different possible combinations that can be selected must be determined.

9. What is the number of different possible combinations?

A. 28
B. 128
C. 5040
D. 13700

10. Fred and Josephine are the first and second students in a line of 7 students waiting to buy tickets for a concert. The number of different orders in which the remainder of the students can line up behind them is

F J 5 4 3 2 1

A. 5!
B. 7!
C. 5!×2!
D. \( \frac{7!}{2!} \)
11. The expression \( 2 \times \binom{n}{2} \) when simplified algebraically is equivalent to

- \( n^2 - n \)
- \( 2n^2 - 2n \)
- \( n^2 + n \)
- \( 2n^2 + 2n \)

Use the following information to answer the next question

A box contains 6 blue balls and 4 red balls. Two balls are drawn from the box, one after the other, without replacement.

12. The actions described above will result in events that are

- \( \text{dependent} \)
- \( \text{independent} \)
- \( \text{complementary} \)
- \( \text{mutually exclusive} \)

13. The odds of rain tomorrow is 3:1 against. The probability of rain tomorrow is

- A. 3
- B. \( \frac{3}{4} \)
- C. \( \frac{1}{3} \)
- D. \( \frac{1}{4} \)
Use the following information to answer the next 2 questions

The diagram shows the sample space S of 10 equally likely outcomes.

14. The value of $P(T|R)$ is equivalent to

$$P(A \cap B) = P(A) \cdot P(B|A)$$

$$P(R \cap T) = P(R) \cdot P(B|A)$$

A. $\frac{2}{5}$

B. $\frac{3}{10}$

C. $\frac{1}{5}$

D. $\frac{1}{4}$

Numerical Response

4. The probability of the compliment of R to the nearest hundredth is 0.50

$$\frac{5}{10}$$
15. A card is randomly selected from a standard deck of cards. The probability that the card is either a six or not a diamond is

\[
\frac{4}{52} + \frac{39}{52} = \frac{43}{52} - \frac{3}{52}
\]

A. \( \frac{43}{52} \)

B. \( \frac{40}{52} \)

C. \( \frac{17}{52} \)

D. \( \frac{3}{52} \)

**Numerical Response**

5. The word **COMPUTER** has been spelled using scrabble tiles. Two tiles are randomly chosen one at a time and placed in the order in which they were chosen. The probability that the tiles chosen are OU (in that order) to the nearest thousandth is 0.018

\[
\frac{1}{8} \cdot \frac{1}{7} = \frac{1}{56} = 0.018
\]

Use the following information to answer the next question

The half-life of Phosphorus-32 can be represented with the formula:

\[
A(t) = A_o \left( \frac{1}{2} \right)^{\frac{t}{14.3}}, \text{ where}
\]

- \( A(t) = \text{the mass in grams present at time } t \)
- \( A_o = \text{the initial mass in grams} \)
- \( t = \text{time in days} \)

16. The length of time it will take for 96.2 g of phosphorus-32 to decay to 12.5 g, to the nearest day is

A. 8 days

B. 26 days

C. 42 days

D. 52 days
Use the following graphs to answer the next 2 questions

17. The graph that best represents $y = a \log_b x$, where $a > 0$ and $0 < b < 1$, is

A. Graph A  
B. Graph B  
C. Graph C  
D. Graph D

18. The range of the inverse of graph A is

A. $y > 0$  
B. $y < 0$  
C. $y \in \mathbb{R}$  
D. range is undefined
**Numerical Response**

6. A car that is currently worth $28,500 is depreciating in value at a rate of 8% per year. The value of the car, after $t$ years, can be modeled by the function $P(t) = 28500(b)^t$. The value of $b$ to the nearest hundredth is __0.92__

7. Use the following information to answer the next question.

The expression:

$$2 \log 8 + 3 \log 4 - 5 \log 2$$

is equivalent to 3 of the 4 options below.

1. $\log 8^2 + \log 4^3 - \log 2^5$
2. $\log (8^2 + 4^3 - 2^5)$
3. $\log \left( \frac{8^2 \cdot 4^3}{2^5} \right)$
4. $\log (2^7)$

**Numerical Response**

7. The 3 equivalent expressions, listed in any order, are __1, 3, 4__

8. Look at log laws on formula sheet

9. If $\log y, 81 = -\frac{4}{3}$, then the value of $y$ could be represented by

   - A. $(\sqrt[3]{81})^3$
   - B. $(\sqrt[4]{81})^4$
   - C. $\frac{1}{(\sqrt[3]{81})^3}$
   - D. $\frac{1}{(\sqrt[4]{81})^4}$
Use the following information to answer question #20

\[ \log_4 p = 3 \]
\[ \log_4 q = x \]

20. The value of \( \log_4 pq - \log_4 256 \) is

A. \( x - 1 \)
B. \( 3x - 4 \)
C. \( -x - 1 \)
D. \( -3x - 4 \)

\[ \log_4 p + \log_4 q - \log_4 256 \]
\[ 3 + x - 4 \]
\[ x - 1 \]

Numerical Response

8. Eggs have a pH of 8 and Milk of Magnesia a pH of 10.5. The number of times Eggs are more acidic than Milk of Magnesia to the nearest whole # is \( 316 \)

\[ \text{pH} = -\log [\text{H}^+] \]

\[ 10^{10.5 - 8} = 10^{2.5} = 316.3 \]
21. The function that represents the graph above is

A. \( f(x) = (x - 3)(x - 1)(x + 2) \)
B. \( f(x) = (x + 3)(x + 1)(x - 2) \)
C. \( f(x) = (x - 3)(x - 1)(x + 2)^2 \)
D. \( f(x) = (x + 3)(x + 1)(x - 2)^2 \)
Math 30 students are learning about Polynomial Functions. The class is currently investigating the number of x-intercepts associated with functions of degree 3. The following 4 conjectures were made:

Sally: These functions will always have 3 x-intercepts
Joe: These functions will always have 1 x-intercept
Brian: These functions can have 1, 2 or 3 x-intercepts
Wendy: These functions can have 0, 1, 2 or 3 x-intercepts

22. The true statement above is from

A. Sally
B. Joe
C. Brian
D. Wendy

Kim kicks a soccer ball into the air. The table below shows the height of the ball at different times during its flight.

<table>
<thead>
<tr>
<th>Time(s)</th>
<th>0</th>
<th>0.2</th>
<th>0.4</th>
<th>0.7</th>
<th>1.0</th>
<th>1.2</th>
<th>1.5</th>
<th>1.9</th>
<th>2.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Height(m)</td>
<td>0</td>
<td>1.80</td>
<td>3.20</td>
<td>4.55</td>
<td>5.0</td>
<td>4.80</td>
<td>3.75</td>
<td>0.95</td>
<td>0</td>
</tr>
</tbody>
</table>

**Numerical Response**

9. If the data models a quadratic function, the time when the height first hits 3.63 meters to the nearest hundredth of a second is **0.48**
23. The range of the function $h(x) = \sin(bx + c) + d$ is equivalent to

A. $\{y | d - a \leq y \leq d + a, y \in \mathbb{R}\}$  
B. $\{y | a - d \leq y \leq a + d, y \in \mathbb{R}\}$  
C. $\{y | b - c \leq y \leq c + b, y \in \mathbb{R}\}$  
D. $\{y | c - b \leq y \leq c + b, y \in \mathbb{R}\}$

A → amplitude  
B → period  
C → horizontal phase shift  
D → vertical phase shift/midline

Use the following graph to answer the next 2 questions

![Graph](image)

24. The function above can be represented by the sinusoidal function $R(t) = \sin(bt + c) + d$. The value of $b$ is equivalent to

A. 10  
B. 5  
C. $\frac{\pi}{10}$  
D. $\frac{\pi}{5}$

$\text{Period} = \frac{2\pi}{b}$  
$b = \frac{2\pi}{10} = \frac{\pi}{5}$

Numerical Response

10. The value of $d$ in the equation is $-1$  

$\frac{2 + (-4)}{2} = -1$
25. The non-permissible values for $x$ in the expression \( \frac{x+2}{(x-3)} \cdot \frac{x}{(x-2)} \) is/are

A. \( x \neq 0 \)
B. \( x \neq 2, 3 \)
C. \( x \neq -2, 2, 3 \)
D. \( x \neq -2, 0, 2, 3 \)

\[ x \neq 3, 2 \]

26. When simplified, the quotient of \( \frac{1}{(x-5)(x+3)} \div \frac{(x+3)(x-5)}{(x-5)^2} \) is

A. \( \frac{x-5}{(x+3)^2} \)
B. \( \frac{1}{(x-5)^3} \)
C. \( \frac{x-5}{x+3} \)
D. \( \frac{x+3}{x-5} \)

\[ \frac{x-5}{(x+3)^2} \]

Numerical Response

11. The value of $x$ satisfying the rational equation \( \frac{1}{x-3} - \frac{6}{x^2-9} = \frac{1}{5} \) is \( 2 \)

\[ \frac{1}{x-3} - \frac{6}{(x-3)(x+3)} = \frac{1}{5} \]
\[ \frac{1}{x+3} = \frac{1}{5} \]
\[ 5 = x + 3 \]
\[ 2 = x \]
Use the following information to answer question #27

The dimensions of a given rectangle are: length $= \frac{1}{x-2}$ and width $= \frac{1}{x}$

27. The perimeter of the rectangle is equivalent to

A. $\frac{4}{x(x-2)}$
B. $\frac{4x}{x(x-2)}$
C. $\frac{4(x-2)}{x(x-2)}$
D. $\frac{4x-4}{x(x-2)}$

28. The rational expression $\frac{2x(3-x)(x+3)}{10(x^2-9)}$ simplified is equal to

A. $5x$
B. $-5x$
C. $\frac{x}{5}$
D. $\frac{x}{5}$
Use the following information to answer Numerical Response #12

Two friends are departing from Lethbridge to visit their families for the Christmas holiday’s. Fred is flying to Vancouver in a private plane, a distance of 950 km. His friend Karl, is flying to Winnipeg in his own private plane, a distance of 1100 km. Both planes will be travelling at the same average velocity but Karl’s trip will take him 1 hour longer.

\[ v = \frac{d}{t} \]
\[ v_F = \frac{950}{t} \]
\[ v_K = \frac{1100}{t+1} \]

**Numerical Response**

12. The time it will take Fred to fly from Lethbridge to Vancouver to the nearest hundredth of an hour is

\[ \frac{1100}{t+1} = \frac{950}{t} \]

\[ 1100t = 950t + 950 \]

\[ 150t = 950 \]

\[ t = 6.33 \]