1. Identify the five components $e$, $\pi$, $i$, 1, and 0 that appear in the famous formula: $e^{\pi i} + 1 = 0$.

   (a) The additive identity: _______
   (b) The square root of $-1$: _______
   (c) The multiplicative identity: _______
   (d) The base of the natural logarithm: _______
   (e) The ratio of a circle’s circumference to its diameter: _______

2. Order the following five numbers in an increasing order: $e$, $\sqrt{2}$, 1, $\pi$, 0

   ____ < ____ < ____ < ____ < ____

3. Let $A$ be the set of all the prime numbers greater than 2 and smaller than 24. Let $B$ be the set of all integers greater than 2 and smaller than 24 that are of the form $4k + 1$ for some integer $k$. Find the following sets:

   (a) $A =$ __________________________
   (b) $B =$ __________________________
   (c) $A \cup B =$ __________________________
   (d) $A \cap B =$ __________________________

4. (a) Expand $(x + y)^2 =$ __________________________
   (b) Expand $(x - y)^2 =$ __________________________
   (c) Factor $x^2 - y^2 =$ __________________________

5. (a) Simplify $x^n \times x^m =$ __________________________
   (b) Simplify $x^n \times y^n =$ __________________________
   (c) If $\log_a(y) = x$, then $a^x =$ __________________________
   (d) If $\log_a(x) + \log_a(y) = \log_a(z)$, then $z =$ __________________________

6. (a) $4! =$ __________________________
   (b) Simplify $\frac{(n+1)!}{n!} =$ __________________________
7. (a) Solve the following two linear equations. Find the values of $x$ and $y$.

\[
\begin{align*}
  x + y &= 20 \\
  2x - 3y &= 5
\end{align*}
\]

$x = \phantom{0}$  
$y = \phantom{0}$

(b) What are the two roots of the quadratic equation $x^2 - 2x - 15 = 0$?

$x_1 = \phantom{0}$  
$x_2 = \phantom{0}$

8. When a fair coin is flipped, then both the probabilities of Head (H) and Tail (T) are $1/2$. Three fair coins are flipped. What is the probability that

(a) all the coins are the same (either all show T or all show H):

(b) exactly one coin shows H while the other two coins show T:

9. (a) Let $T$ be a right-angled triangle with sides $a$, $b$, and $c$ where $c$ is the hypotenuse (the side opposite the right angle). Write $c$ as a function of $a$ and $b$.

(b) What is the sum of the degrees of all the inner angles of the following geometric shapes?

   i. Triangle: 

   ii. Square: 

(c) Let $C$ be a circle whose radius is $r$.

   i. What is the circumference of $C$ as a function of $r$?

   ii. What is the area of $C$ as a function of $r$?

10. What is the value of $c$ when each procedure terminates?

(a) $f(n)$ (* $n > 0$ is an integer number *)

\[
\begin{align*}
  c &= 0 \\
  \text{for } i &= 1 \text{ to } n \text{ do} \\
  \text{for } j &= 1 \text{ to } n \text{ do} \\
  c &= c + 1
\end{align*}
\]

(c) $f(n)$ (* $n > 0$ is an integer number *)

\[
\begin{align*}
  c &= 1 \\
  \text{for } i &= 1 \text{ to } n \text{ do} \\
  c &= c \times 2
\end{align*}
\]

11. Express the sum of the following sequences as a function of $n$:

(a) $1 + 2 + 3 + \cdots + n = \phantom{0}$

(b) $1 + 2 + 4 + 8 + \cdots + 2^n = \phantom{0}$

12. Order the following functions by their growth from the slowest to the fastest when $n$ tends to infinity:

\[ n^2 ; \log(n) ; n ; 2^n \]

___ < ___ < ___ < ___