

1. Probability

December 2010 (No Calculator)

1. Of all the natural numbers less than 50, what is the probability of randomly selecting a number that contains only one "2"?

Ans. _____

2. There are 3 green socks, 4 brown socks and 2 white socks in a drawer. What is the probability of selecting socks of three different colors, if you take three socks out of the drawer at once?

Ans. _____

3. Two people, A and B, are selected at random. Find the probability the first letter in A's first name is a letter that appears in the alphabet before the first letter in B's first name. Assume an equal number of names begin with each of the 26 letters in the alphabet.

Ans. _____

1. Probability

December 2011 (No Calculator)

1. The probability 3 straight HEADS would be flipped with a particular unfair coin is $\frac{125}{512}$. Find the probability two straight TAILS would be flipped with this same coin.

Ans. _____

2. In the past 5 years Bill has tagged 3 deer during hunting season. Using this as a basis, we can assume his chances of tagging a deer each year is $\frac{3}{5}$. What is the probability that he tags at least 3 deer in the next 5 seasons?

Ans. _____

3. The four entrees at MAML High School on a certain day were pizza, chicken nuggets, macaroni and cheese, and fish chowder. If Allen, Brian, and Carl each randomly choose an entrée, what is the probability that at least two of them choose the same entrée?

Ans. _____

2. Exponents and Radicals

December 2010 (No Calculators)

1. Simplify: $\sqrt[3]{3672}$

Ans. _____

2. Find all values of x such that $\frac{\sqrt{x+12}}{x+4} = \frac{\sqrt{33-x}}{\sqrt{x+7}}$

Ans. _____

3. If $4^x - 4^{x-1} = 24$, find the exact value of $(2x)^x$.

Ans. _____

2. Exponents and Radicals

December 2011 (No Calculators)

1. If $a^p b^q = \frac{a^5 b^{-3}}{b^{12} a^{-10}} \cdot \frac{a^{-3} b^8}{b^{-2} a^6}$, find the value of p + q.

Ans. _____

2. Find the positive number x, such that $x^6 = \frac{12^3 \cdot 15^3 \cdot 20^6}{125}$

Ans. _____

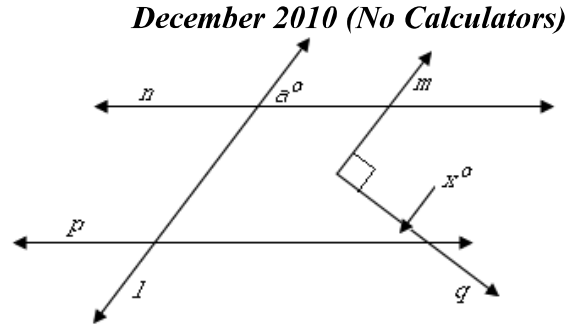
3. Solve for x among the real numbers: $4^{4x} - 4^{2x} - 2 = 0$

Ans. _____

3. Lines, Angles, and Polygons

1. In the figure at right, line l is parallel to ray m , line n is parallel to line p , and ray m is perpendicular to ray q . Find x in terms of a .

Ans. _____

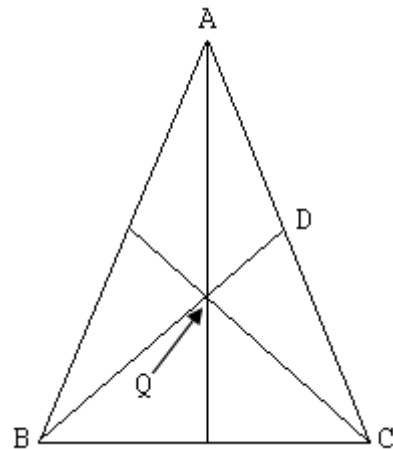


2. A polygon has 135 diagonals. Find the sum of its interior angles.

Ans. _____

3. Triangle ABC is isosceles. Q is the centroid of the triangle. $AC = AB = 2BC$. $BC = 8$. Find the unit length of \overline{BD} in simplest form.

Ans. _____



3. Lines, Angles, and Polygons

December 2011 (No Calculators)

1. If all the diagonals are drawn inside a regular hexagon, at how many distinct points do the diagonals intersect inside, but not on the boundary, of the polygon?

Ans. _____

2. In a plane, a triangle is constructed as follows: Line segment AB is drawn and its midpoint, X, marked. 30° of arc is drawn from point A with center at X. The end of the arc is marked as C. Then line segments AC and BC are drawn, completing the triangle. Find the measure of angle ACB.

Ans. _____

3. Each side of a regular octagon is 4 units long. How long is its longest diagonal?

Ans. _____

4. Complex Numbers

December 2010 (No Calculators)

1. If $x = 3 - 2i$, and $y = 4 - i$, find the product of x and y .

Ans. _____

2. Find the solutions for $x^2 + 2x = -6$.

Ans. _____

3. If $\sqrt{-16 - 30i} = a + bi$, where a and b are real numbers, find the value of $(a + b)^2$.

Ans. _____

4. Complex Numbers

December 2011 (No Calculators)

1. Find the product: $(2 + 3i)(1 - 3i)(2 - 3i)$.

Ans. _____

2. The equation $x^2 + 4ix - 9 = 0$ has two roots, one in quadrant 3 of the complex plane and the other in quadrant 4. Find the root in quadrant 4.

Ans. _____

3. A cubic equation has the form $ax^3 + bx^2 + cx + d = 0$, where a , b , c , and d are integers with a greatest common factor of 1. If two of the roots of the equation are 2 and $3 - 2i$, find the product of $abcd$.

Ans. _____

5. *Arithmetic w/Percent*

December 2010 (You may use a Calculator)

1. The Oldies Club has 27 men. 62.5% of the group is female. How many folks belong to the club altogether?

Ans. _____

2. How many natural numbers divide the number 3000 evenly?

Ans. _____

3. A merchant has an item originally priced at p . Wanting to make more profit, he raised the price by 25%. Later the store had a store-wide reduction sale of 25%. The item sold well, so he decided to make more profit on the item and raised the price 25% again. Later the store had another store-wide reduction sale of 25%. After all four price adjustments, the price of the item is \$56.25. Find p .

Ans. _____

5. *Arithmetic w/Percent*

December 2011 (You may use a Calculator)

1. The number 58 is 29% of what number?

Ans. _____

2. *Percent* is defined as the number of one-hundredths ($\frac{1}{100}$). Only 9 unit fractions (meaning the numerator is 1) can be expressed as a whole-number percent:

$\frac{1}{1}$, $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{5}$, $\frac{1}{10}$, $\frac{1}{20}$, $\frac{1}{25}$, $\frac{1}{50}$, and $\frac{1}{100}$. How many unit fractions could be expressed

as a whole number percentage if *percent* were defined as a number of one-hundred-twentieths ($\frac{1}{120}$)?

Ans. _____

3. Barbara brought a bag of spirit tokens to school one day. She gave 50% to the spirit committee, then 20 to her best friend, then 50% of what she had left to the field hockey captains, then 18 to her worst friend, and then 20% of what was left to Libby. This left her with 12 tokens. How many tokens did Barbara have when she first arrived at school?

Ans. _____