Algebra II

SOL Folder Part 2

Functions

Functions

Functions

Notes and Formulas:

Functions: $y = |x|$ Absolute Value   "V"   If positive, goes up. If negative goes down.

$y = \sqrt{x}$ Square Root   "Rocket"   Has a definite starting point.

$y = x^2$ Quadratic   " U " shape   Can go up or down

$y = 2^x$ Exponential   "x in exponent"

$y = \log x$ Logarithmic   Inverse of exponential equation

$y = \dfrac{p(x)}{q(x)}$ Rational Function   Look for Horizontal and Vertical asymptotes

(In calc – p(x) ÷ q(x) – use parentheses)

$y = ax^n + bx^{n-1} + cx^{n-2} + \ldots$ Polynomial Function – decreasing powers

x^2 equation: up/down or down/up   Two movements (Parabola)

x^3 equation: up/down/up or down/up/down Three movements (cubic)

x^4 equation: up/down/up/down or down/up/down/up Four movements (" W ")

Transformations: Remember horizontal shifts are the opposite of the sign

$y = |x - 2|$ Shifts 2 units to the right $y = |x + 2|$ Shifts 2 units to the left
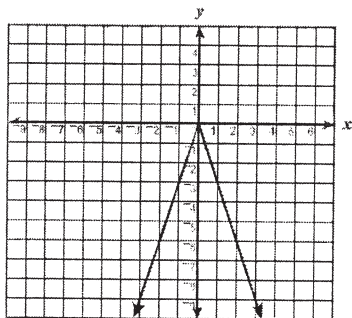
(change within your function)

Vertical shift is at the end of your function and moves the same

$y = |x| + 2$ Shift vertex up 2 $y = |x| - 2$ Shift vertex down 2

Calculator: You can sketch every function in your calculator using y= and zoom 6 or zoom 4

Practice Problems:

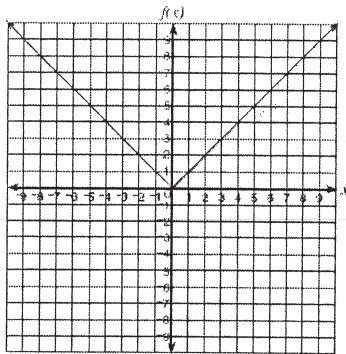**1. The graph below is an example of which type of function?**

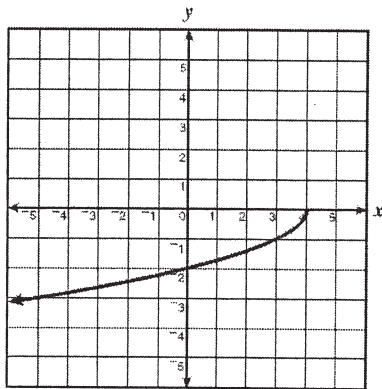**A** Absolute Value

B Exponential

C Linear

D Quadratic

_____2. **Which type of function is shown?**

F Absolute Value

G Exponential

H Linear

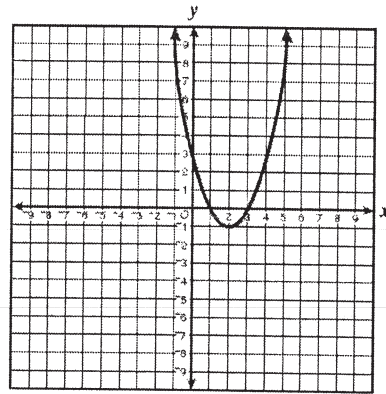**J** Quadratic

_____3.

Which most likely represents the equation

of the graph above?

A $y = \sqrt{4-x}$

B $y = -\sqrt{4-x}$

C $y = -\sqrt{4+x}$
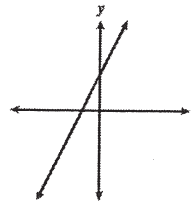
D $y = \sqrt{4+x}$

_____4.

Which of the following is most likely the equation graphed above?
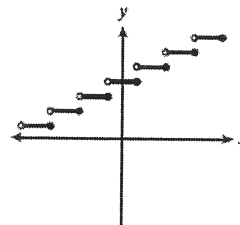
F $y = (x+2)^2 + 1$

G $y = 5(x-1)^2 - 2$

H $y = (x-2)^2 + 2$

J $y = (x-2)^2 - 1$

_____5. **Which of the following sketches could represent the graph of** $y = |x-a|$ **?**

A

B

C

D

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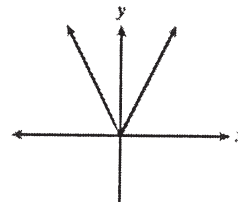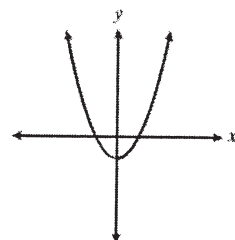
___6. **Which type of function is shown?**
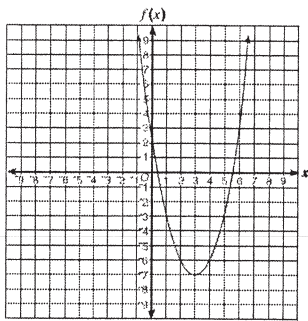
F Absolute Value

G Exponential

H Linear

J Quadratic

___7.
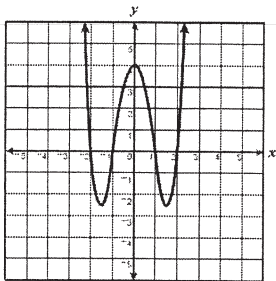
This is a portion of the graph of a polynomial function. If written in order of descending powers, which could be the first term of the polynomial?

A x^2

B x^3

C x^4

D x^5

___8. **Which could be a graph of**

$y = ax^3 + bx^2 + cx + d$ **if a, b, c, and d**

are real numbers and $a < 0$?

F

G

H

J
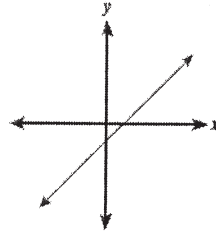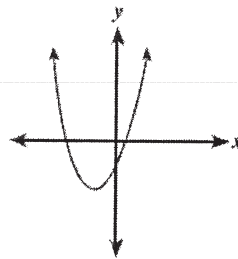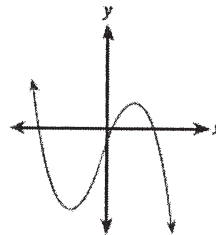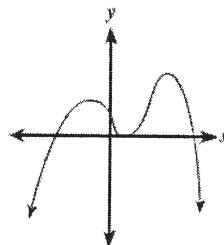
AII.7 The student will investigate and analyze functions algebraically and graphically. Key concepts include
a) domain and range, including limited and discontinuous domains and ranges;
b) zeros;
c) x- and y-intercepts;
d) intervals in which a function is increasing or decreasing;
e) asymptotes;
f) end behavior;
g) inverse of a function; and
h) composition of multiple functions.
Graphing calculators will be used as a tool to assist in the investigation of functions.

Notes and Formulas:
Domain: x values   "alpha order"
Range: y values

To be a function: No two x's are the same or it passes Vertical Line Test

Zero (root, solution, x-intercept) of a function: Where your function has a value of 0 (where your graph crosses the x-axis)

Calculator: Put eqt. in y=
Zoom 6 or 4
2nd Calc #2 – zero   Left Bound/Right Bound/Guess

Work backwards ! Substitute the answers given to see which answer gives you a 0

To find value of a function: Plug the number into your expression for every x

To find composite functions: f(g(x))   Substitute the entire inner function into the outer function in the x position

To find inverse of a function: 3 steps – 1. y =
2. switch x and y
3. Solve for y   Inverse ($f^{-1}(x)$) will be what y =

On a graph: x intercept – where your function crosses the x-axis
y intercept – where your function crosses the y-axis
turning point – point where your function turns the corner and switches direction
interval increasing – region on graph where y values are increasing
interval decreasing – region on the graph where y values are decreasing

Asymptotes: Vertical & Horizontal Asymptotes – Vertical: Look at denominator (what x makes a 0)x = ?
Horizontal: same power – coeff./coeff.   y = ?
higher power below – at y = 0

End Behavior: Look at your graph and your question. Read carefully. It will ask you what y value you are approaching as x approaches a given value. If it is a rational function, you are always approaching your horizontal asymptote. Use your calculator !!

Use your calculator to help you !!!!

Practice Problems:

___1.
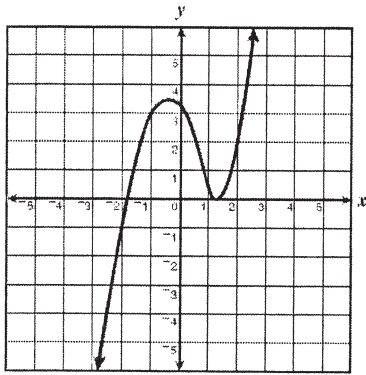
This is a portion of the graph of a

polynomial function. Apparently the

function has a turning point at -

A (-2,0)

B (0,3)

C (-.5,3.5)

D It does not have one

___2.
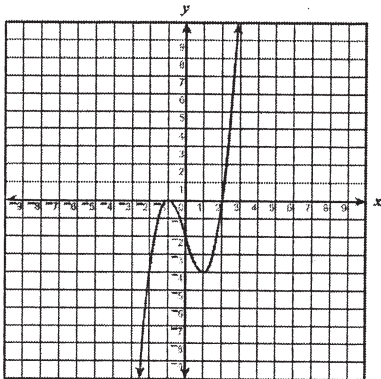
This is a portion of the graph of a

polynomial function. Apparently the

function has a domain of –

F all real numbers

G x > 0

H y > 0

J -9 < x < 10

3. TEQ
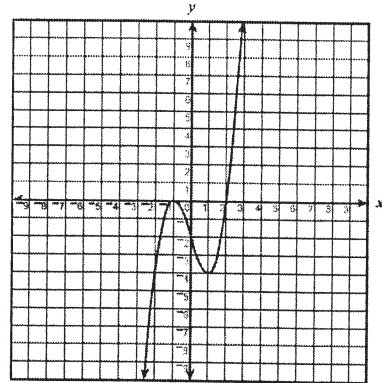
The graph of a polynomial function is
graphed above. Click and Hi-light each
expression that represents an increasing
interval.

(You just check every one)

$-\infty < x < \infty$

$-\infty < x < -1$

$1 < x < \infty$

$-3 < x < \infty$

$-\infty < x < 0$

___4. **Which describes the End Behavior of**
the function f(x) = x^3 – 4x^2 + 4x as x
approaches infinity ?

F   y approaches infinity

G   y approaches 0

H   y approaches negative infinity

J   y approaches 2

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___5.
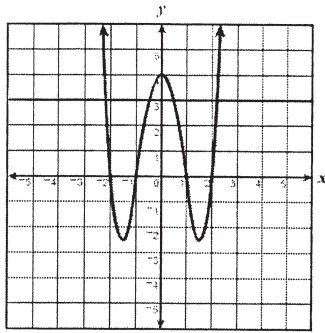
This is a portion of the graph of a polynomial function. This function apparently has the following types of roots -

A   5 different real roots

B   4 different real roots

C   2 real roots and 2 imaginary roots

D   no real roots

___6.   Which value is *not* a zero of

$$P(x) = x^3 + 3x^2 - x - 3 ?$$

F   1

G   -1

H   3

J   -3

___7.
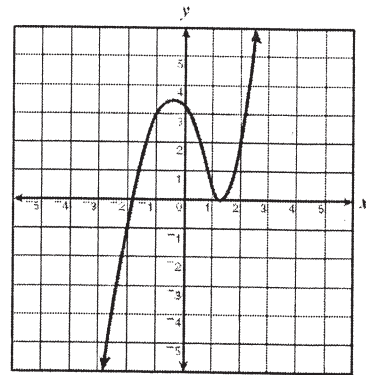
This is a portion of the graph of a polynomial function. Apparently the function has a double zero —

A   between -2 and –1

B   between -2 and 1

C   between 1 and 2

D   between 3 and 4

___8.   The polynomial function

$$y = x^3 - 3x^2 + x + 1$$

has a zero between —

F   -4 and –3

G   -2 and –1

H   -1 and 0

J   3 and 4

___9. If the domain of $f(x) = 2x^2 - 3$

is limited to { -3, -1, 1, -3}, what is the range?

A   {-21, -5, -1, 15}

B   {-21, 15}

C   {-1, 15}

D   {1, 5, 15, 21}

_10. $f(x) = x^2 - 2x$

$g(x) = x - 3$

Which of the following expressions

represents $g(f(x))$?

F $x^3 - 5x^2 + 6x$

G $x^2 - 2x - 3$

H $x^2 - 3x - 3$

J $x^2 - 8x + 9$

_11. **If** $f(x) = 5x^2 - 7$, **what is** $f(-3)$?

A -52   **B** -22

C 38   **D** 45

_12. **Which function represents the inverse of the function f(x) = x + 2?**

F $f^{-1}(x) = x - 2$

G $f^{-1}(x) = -x - 2$

H $f^{-1}(x) = -x + 2$

J $f^{-1}(x) = -(x + 2)$

13. **TEQ: Click and drag the horizontal and**

vertical asymptotes for the function

$$g(x) = \frac{x-1}{x-4}.$$

You just select and put the answer

in each box.

Vertical	Horizontal

x = 1

y = 1

x = 4

y = 4

x = -4

AII.8	The student will investigate and describe the relationships among solutions of an equation, zeros of a function, *x*-intercepts of a graph, and factors of a polynomial expression.

Notes and Formulas:

Solutions of equation, zeros of a function, and x-intercepts all refer to the same thing: Where is the value of my function equal to zero?

If zeros are a,b,c   Then factors are $(x - a)(x - b)(x - c)$ **** Factors will contain opposite sign of roots

Practice Problems:

___1. Which is a zero of $f(x) = x^2 + x - 6$?

A -3

B -2

C 0

D 3

___2. A polynomial function has a zero at

$x = -4$. Which expression *must* be a

factor of the polynomial?

F $x - 4$

G $x - 2$

H $x + 2$

J $x + 4$

___3. Which of the following functions has

x-intercepts at -2 and 1?

A $y = x^2 - x - 2$

B $y = x^2 + x - 2$

C $y = x^2 - 2x + 1$

D $y = 2x - 1$

___4. Which of the following sets contains

all the apparent zeros for the function

shown?

F {1}

G {-2, 0, 2}

H {-2, -1, 1}

J {-2, -1, 0, 1}
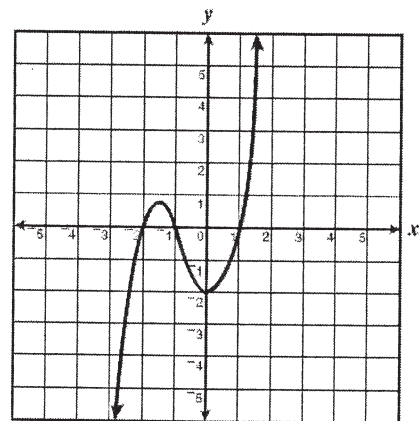
_____5. A section of the graph of a polynomial

function with integral coefficients is

shown. Which of the following sets

most likely contains only elements that

are factors of the polynomial?
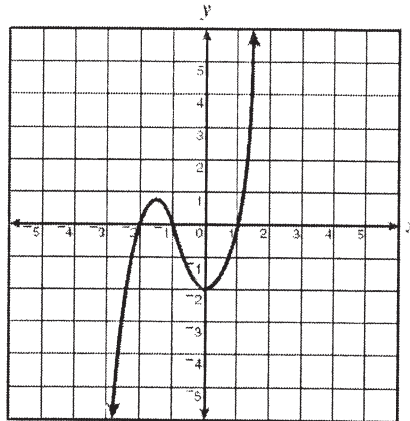
A $\{(x - 2), (x - 1.5)\}$

B $\{(x - 2), (x - 1), (x + 1)\}$

C $\{(x + 2), (x + 1), (x - 1)\}$

D $\{x, (x - 2), (x - 1), (x + 1)\}$

_____6. Which of the following sets contains all the

apparent zeros for the function shown?
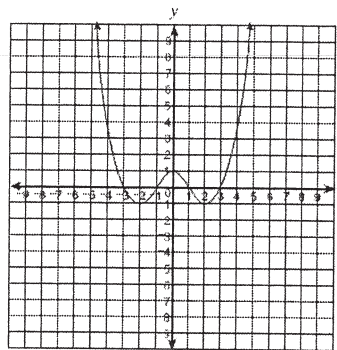
F $\{1\}$

G $\{-2, 0, 2\}$

H $\{-2, 1, 2\}$

J $\{-3, -1, 1, 3\}$

Statistics

Statistics

Notes and Formulas:
Formulas will be on your Formula Sheet

Pay attention to whether you have an arithmetic (Adding) or a geometric (Multiplying)sequence

If you get stuck with the formulas – you can always just write all of your numbers out and find a term or add the numbers up to get the sum

Arithmetic Term	Arithmetic Sum	Geometric Term	Geometric Sum	Infinite Geom. Sum
$A_n = a_1 + (n-1)d$	$S_n = \dfrac{n(a_1 + a_n)}{2}$	$A_n = a_1 \bullet r^{n-1}$	$S_n = \dfrac{a_1(1-r^n)}{1-r}$	$S_\infty = \dfrac{a_1}{1-r}$

Practice Problems:

___1.   What is the sum of the series

defined by $\sum_{n=0}^{4} (3 - 2n)$?

A -5

B -3

C -1

D 0

___2. Two geometric means between 2 and 54 are -

F   4 and 12

G   6 and 12

H   6 and 18

J

___3. If $a_n = 2^{n-1}$, Which number

represents $a_4 = ?$

A 15
B 8

C 7

D 6

_____4.   What are two arithmetic means

between 3 and 24 ?

F 8 and 12

G 8 and 16

H 9 and 16

J 10 and 17

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TEQ 5. Driving a piling into a harbor bottom, a pile driver sinks the piling 24 inches on the first stroke, 18 inches on the second stroke, and $13\frac{1}{2}$ inches on the third stroke. If the sequence is continued, how far will the piling be driven down on the 5th stroke?

Put your answer in the box.

_____6. What is the value of $\sum_{n=1}^{6} 2^n$?

F 62   G 126

H 128   J 252

_____7. If $a_n = 1 + \frac{1}{n}$, then what is a_9 ?

A $\frac{11}{10}$

B $\frac{10}{9}$

C $\frac{9}{8}$

D $\frac{3}{2}$

AII.9   The student will collect and analyze data, determine the equation of the curve of best fit, make predictions, and solve real-world problems, using mathematical models. Mathematical models will include polynomial, exponential, and logarithmic functions.

Notes and Formulas:

If given a graph, LOOK at the shape of your graph to determine if the Best Model would be Linear, Quadratic, Cubic, Exponential, or Logarithmic
        Linear – A line
        Quadratic – Parabola "U" shape
        Cubic – "Egyptian"
        Exponential – One side is increasing rapidly
        Logarithmic – Inverse of Exponential

If given a set of data, read carefully. If it states the type of model, then you are lucky and you use it.
    If it states to determine the best model for the data, then do a rough sketch on your paper and you look to see which model is best

Calculator: Remember to put x's in List 1 and y's in List 2. Clear anything in your lists.

STAT – CALC - #4   Linear   - Enter
                    #5   Quadratic
                    #6   Cubic
                    #9 Ln (Logarithmic)
                    #0 (10) Exponential

Practice Problems:

____1.   In 1940 the life expectancy

at birth in the general public was

62.9 years. By 1980 it had risen to

73.7 years. Assuming a linear relation,

which is the *best* prediction of life
expectancy

in the year 2000?

A 76.4   B 79.1

C 79.9   D 84.5

____2. Which is the best quadratic model for

the data below?

$\{(-1,2), (0,1), (2,5)\}$

F $y = x^2$

G $y = x^2 + 1$

H $y = 2x^2 + x + 1$

J $y = x^2 + 2x + 1$

___3. Which type of function would best model the data below?

x	y
0	2
4	6
8	14
12	26
16	54
20	110

A   Quadratic

B   Cubic

C   Exponential

D   Logarithmic

___4. Using #3 above, what is your Best Model equation for the data?

F $y = 2.21x+1.20$

G $y = 2.21(1.20)^x$

H $y = 1.20(2.21)^x$

J $y = 2.21x^2 + 1.20$

___5. Using #3 and #4 above, what is your best prediction for when x = 30 ?

A   454

B   500

C   525

D   550

___6. The table below shows the number of students enrolled in the Algebra Trig program at York High School the first 5 years the course was begun.

Year (x)	No. of students (y)
1	55
2	71
3	84
4	97
5	108

Which of the following equations most closely describes the relationship between y, the number of students enrolled, and x, the number of years the class has existed?

F $y = x + 13$

G $y = 13x + 43$

H $y = 10x + 23$

J $y = 13x - 43$

___7. Using the data for #6 above, what is the best prediction for the year 10 ?

A   100

B   150

C   175

D   225

AII.10   The student will identify, create, and solve real-world problems involving inverse variation, joint variation, and a combination of direct and inverse variations.

Notes and Formulas:

Direct Variation: $\dfrac{y}{x} = k$ k is your constant of proportionality   Direct=Divide

Inverse Variation: $yx = k$ Inverse=Multiply

Joint Variation: Divide by both

Practice Problems:

___1. The time it takes to travel a given

distance varies inversely as the

average rate of travel. Averaging

42 miles per hour, it takes John

5 hours to drive to Pittsburgh. If it took

him 4 hours and 20 minutes to reach

Pittsburgh on his last trip, what was his

average rate of travel?

A 36.4 mi./hr

B 46.7 mi./hr

C 48.5 mi./hr

D 49.4 mi./hr

___2. The volume (V) of a sphere varies

directly with the cube of its radius (r).

If k is the constant of proportionality,

which is the formula for this

relationship?

F $V = kr$

G $V = kr^3$

H $V = \dfrac{k}{r^3}$

J $r = kV^3$

___3. Hooke's law states that the force required to stretch a spring varies directly with the distance the spring is stretched. If a 10-pound force stretches a spring 2 inches, what force is required to stretch the spring 5 inches?

A   15 pounds

B   20 pounds

C   25 pounds

D   30 pounds

___4. The amount of interest (I) owed on a loan varies directly with the length of time (t) of the loan. If k is the constant of proportionality, which formula represents this relationship?

F $I = kt$

G $I = \dfrac{k}{t}$

H $t = kI$

J $t = \dfrac{k^2}{I}$

___5. Boyle's Law states that, for a fixed amount of gas, the volume of the gas at a constant temperature is inversely proportional to the pressure. If a certain gas occupies 9.84 liters at a pressure of 50 centimeters of mercury (cm Hg), what is the approximate pressure when the volume is increased to 12 liters?

A   39.8 cm Hg

B   41.0 cm Hg

C   43.2 cm Hg

D   45.1 cm Hg

___6. In which of the following is z directly proportional to x and inversely proportional to the square of y?

F $z = k\dfrac{x^2}{y}$

G $z = kxy^2$

H $z = \dfrac{x}{y^2}k$

J $z = k\dfrac{y}{x}$

All.11	The student will identify properties of a normal distribution and apply those properties to determine probabilities associated with areas under the standard normal curve.

Notes and Formulas:

Formulas will be on your formula page.

You must be able to draw your standard normal curve and know your percentages.

If you land on a marker, you can use your percentage from your curve.

If you are between markers you must use your z-score and your table or calculator.

$$z - score = \frac{x - \mu}{\sigma}$$ x=value, μ = mean of your data, σ = standard deviation

Look at your formula page !!!

Practice Problems:

____1. TEQ: Roanoke had the following amounts

of Snowfall last January:

4.2", 2.3", 6",7.8",10", 5.5", 12.5", .8"

Find the mean and the standard deviation. Place

your answers in the box.

Mean   Standard Deviation

____2. At Thomas Nelson, the Pre-Test for Mathematics has 200 points on the test. The mean is 120 and the standard deviation is 20. What percent of students score below 100 points?

F   50%

G   34%

H   16%

J   7%

____3. In order to pass the Mathematics Pre-test a student must score 140 points. If 360 freshmen took the pre-test last fall, how many passed? (Use #2 above)

A   200

B   240

C   302

D   324

____4. On his midterm exam, Jimmy scored 75 points, which was exactly 2 standard deviations above the mean. If the standard deviation for the test is 4, what is the mean for the test?

F   79

G   75

H   71

J   67

____5. Susie's test grades in Algebra 2 for the third quarter are 100, 80, 60, 88, 92, and 90. How many scores are within one standard deviation of the mean?

A   all 6

B   5

C   4

D   3

____6. TEQ: A survey of 20 colleges found that seniors graduated with an average $12,000 in debt from student loans. The debt was normally distributed with a standard deviation of $3200. Find the probability that a senior graduated owing more than $16,000.

Place your answer in the box.

Notes and Formulas:

Use your calculator! **Math → PRB**

Permutation: Order Matters   Formula on formula sheet.

Combination: Order does not matter   Formula on formula sheet.

Practice Problems:

____1. In an Algebra II class there are

8 A's, 6 B's, 5 C's, and 2 D's, and 4 F's.

Susie is in the class. What is the

probability Susie got an A ?

A 8/25

B 8/16

C 8/21

D 50%

____2. If digits can be repeated, how many

3-digit numbers can be formed using the

digits 1, 2, 3, and 4 ?

F 24

G 48

H 64

J 256

____3. TEQ: How many permutations can be

formed using the letters in the word

MATHEMATICS ?

Put your answer in the box.

____4. If numbers and letters can be

repeated, how many different 6-digit

license plates can be made if the first two

positions are letters and the last four are
digits?

F 492.804

G 676,000

H 6,760,000

J 455,625

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_____5. TEQ: A committee of 3 teachers and 3 students is to be formed to judge a contest. If there are 7 students and 5 teachers to choose from, how many different committees could be formed?

Put answer in the box.

_____6. Meredith has 14 girls on her softball team. She wants to have 2 co-captains. How many different choices does she have?

F $_{14}P_2$

G 14!

H $_{14}C_2$

J 14

_____7. A normally distributed set of 968 values has a standard deviation of 11 and a mean of 108. Which is closest to the number of values expected to be above 125?

A 910

B 989

C 210

D 59