HW Answers: Cumulative Review

1) 1/3, –1/2

2) 3.8039

3) m< SRQ = 140°

4) 74 units

5) a) $t = \frac{2400}{x}$ b) $12 c) 96 students

6) a) $y = 1.10x^2 - 30.49x + 890.03$

b) 790.61 points

c) 1984, 2003

7) a) $3ky\sqrt[4]{3y^3}$

b) $3^{\frac{5}{4}}ky^{\frac{7}{4}}$

8) $\frac{-3 \pm \sqrt{3}}{2}$

10) a) 270° rotation

b) (x, y) –> (y, –x)

HW Answers: Cumulative Review

11) a) reflection over x-axis

b) $(x, y) \rightarrow (x, -y)$ c) $(x, y) \rightarrow (x+3, y+4)$

12) a) next = now $\cdot 0.88$; start = 28,500

b) $y = 28500(0.88)^x$

c) $15040.36

13) $y = 8(1.5)^x$

14) $Y = 0.06(x)^{2.0131}$; 69.37 minutes

15) a) Area = $x(120 - 2x)$

b) Area = $120x - 2x^2$

c) 1800 ft^2

Unit 6 Probability

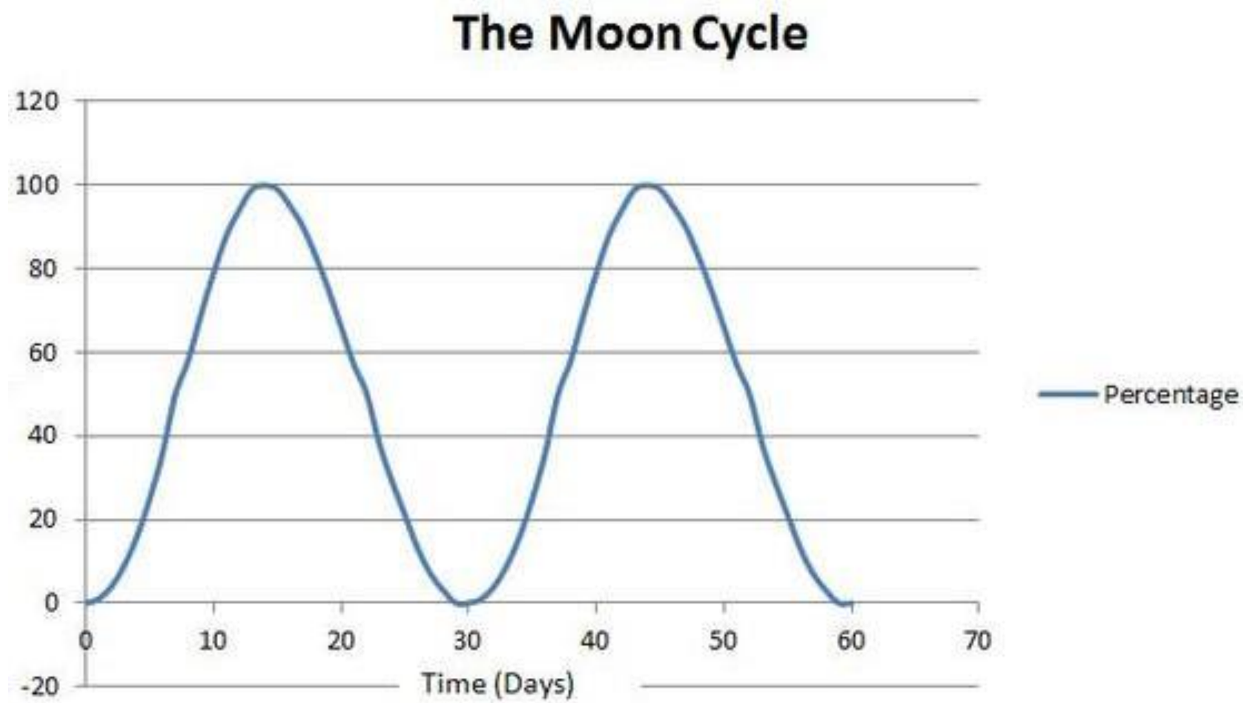
Day 1 Counting Techniques

Warm Up

1. The graph of the visible percent of the moon during a moon cycle roughly models a trig graph, as shown.

Find its
Amp: ____
Period: ____
Midline: ____

Equation: _______



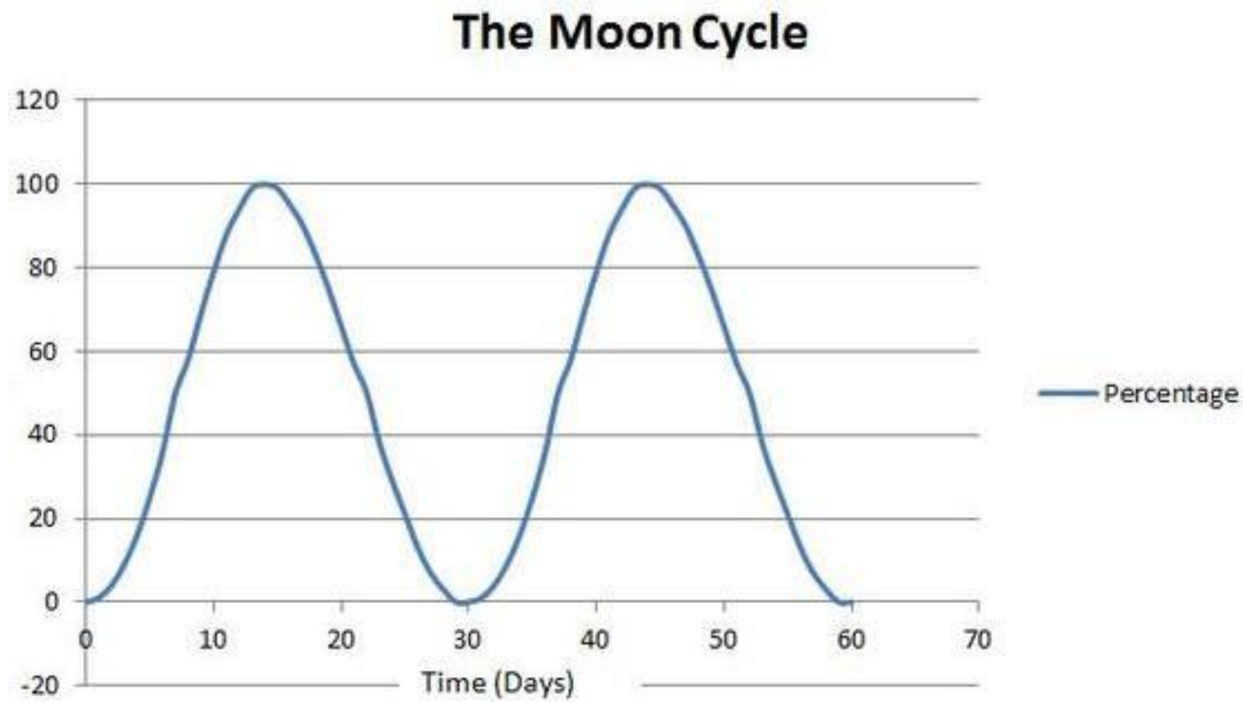
2. Solve $2\sin(x)\cos(x) = \sqrt{3}\cos x$ given $0 \le x \le 180$.

3. Find the area of a triangle given sides 8 cm, 10 cm, and included angle 150 degrees.

4. Find the last side in #3.

Warm Up Answers

1. The graph of the visible percent of the moon during a moon cycle roughly models a trig graph, as shown.



Find its

Amp: 50

Period: 30

Midline: $y = 50$

Equation: $y = -50\cos(12x) + 50$

Warm Up

2. Solve $2\sin(x)\cos(x) = \sqrt{3}\cos x$ given $0 \le x \le 180$.

$$2\sin(x)\cos(x) - \sqrt{3}\cos x = 0$$

$$\cos(x)(2\sin(x) - \sqrt{3}) = 0$$

$$\cos(x) = 0 \qquad 2\sin(x) - \sqrt{3} = 0$$

$$x = \cos^{-1}(0) \qquad x = \sin^{-1}(\frac{\sqrt{3}}{2})$$

$$x = 90°,\ 60°$$

Warm Up

3. Find the area of a triangle given sides 8 cm, 10 cm, and included angle 150 degrees.

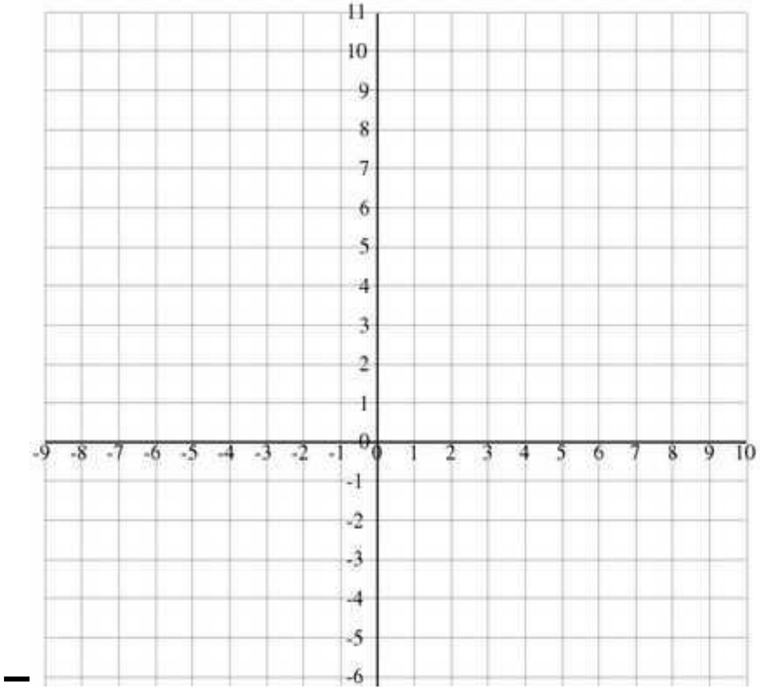
Area = ½ (8)(10)sin(150) = **20 cm^2**

4. Find the last side of #3.

17.4 cm

Warm Up

1. Given the equation $y = 4 + \sqrt{x+2}$ draw the graph, being sure to indicate at least 3 points clearly. Then determine the following:



a. Identify its vertex ____________
b. Identify its domain ___________
c. Identify its range _____________
d. How is this function translated from its parent graph? ________
e. If this graph was translated to the right 5 units, what would the new equation be? ___

Solve

2. $2\sqrt[3]{(x-1)^4} + 4 = 36$

3. $\sqrt{x+7} - x = 1$

Warm Up Answers

1. Given the equation $y = 4 + \sqrt{x+2}$ draw the graph, being sure to indicate at least 3 points clearly. Then determine the following:

a. Identify its vertex __(–2, 4)__

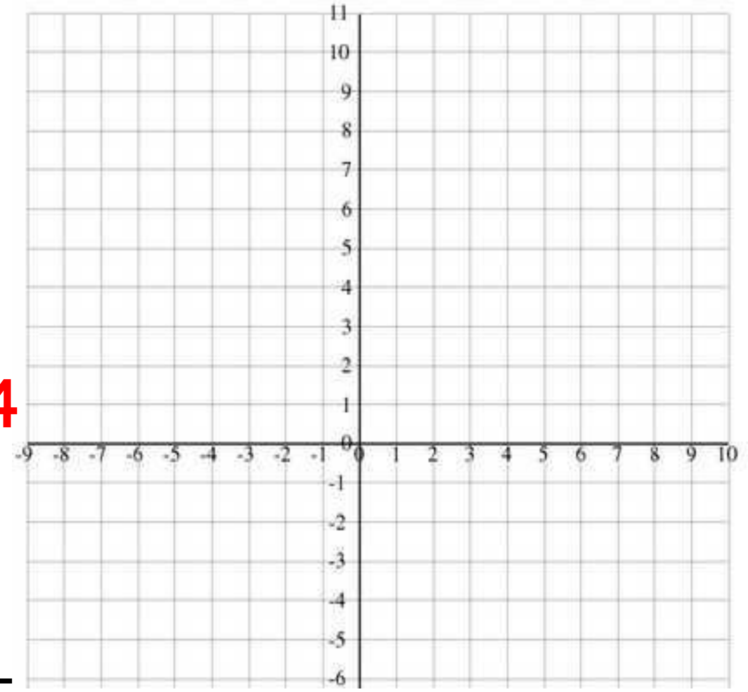
b. Identify its domain __$[-2, \infty)$__

c. Identify its range __$[4, \infty)$__

d. How is this function translated from its parent graph? left 2, up 4

e. If this graph was translated to the right 5 units, what would the new equation be? ____

$y = 4 + \sqrt{x-3}$



Solve

2. $2\sqrt[3]{(x-1)^4} + 4 = 36$

x = 9, –7

3. $\sqrt{x+7} - x = 1$

x = 2

Homework Discussion

Unit 5 Packet p. 27-30

Homework Tonight

- Packet p. 1-2
- Cumulative Review #16-21

Reminder:

- Unit 5 Trig Test Tomorrow!
- Tutorials are Monday and Thursday – second half of lunch.

Unit 6 Probability

Day 1
Fundamental Counting Principle
Other Counting Techniques

Probability

Notes p. 1

I. **Introduction**

Probability Defined:

What do you know about probability?

Probability

Notes p. 1

I. **<u>Introduction</u>**

Probability Defined:

- General: Probability is the likelihood of something happening
- Mathematical expression:

$$\text{Probability} = \frac{\text{Number of desired outcomes}}{\text{Number of total outcomes}}$$

Today, we'll focus on counting techniques to help determine this total #!

II. **<u>Basic Counting Methods for Determining the Number of Possible Outcomes</u>**

a. **Tree Diagrams:**

Example #1: LG will manufacture 5 different cellular phones: Ally, Extravert, Intuition, Cosmos and Optimus. Each phone comes in two different colors: Black or Red. Make a tree diagram representing the different products.

How many different products can the company display?

b. In general:

- If there are *m* ways to make a first selection and *n* ways to make a second selection, then there are *m times n* ways to make the two selections simultaneously. This is called the **Fundamental Counting Principle.**

- Ex #1 above: 5 different cell phones in 2 different colors. How many different products?

$$5 \cdot 2 = 10$$

Practice

Ex #2: Elizabeth is going to completely refurbish her car. She can choose from 4 exterior colors: white, red, blue and black. She can choose from two interior colors: black and tan. She can choose from two sets of rims: chrome and alloy. How many different ways can Elizabeth remake her car? Make a tree diagram and use the Counting Principle.

$$4 \cdot 2 \cdot 2 = 16$$

Ex #3: Passwords for employees at a company in Raleigh NC are 8 digits long and must be numerical (numbers only). How many passwords are possible? (Passwords cannot begin with 0)

$$9 \cdot 10 \cdot 10 \cdot 10 \cdot 10 \cdot 10 \cdot 10 \cdot 10 = 90{,}000{,}000$$

B. Permutations—Another way to "count" possibilities

a. Two characteristics:

1. Order IS important
2. No item is used more than once

Example #1

There are six "permutations", or arrangements, of the numbers 1, 2 and 3.

What are they?

123	132
213	231
312	321

Example #2

How many ways can 10 cars park in 6 spaces? The other four will have to wait for a parking spot. ☺

(Use the Fundamental Counting Principle)

$$10 \cdot 9 \cdot 8 \cdot 7 \cdot 6 \cdot 5 = 151200$$

b. Formula:

If we have a large number of items to choose from, the fundamental counting principle would be inefficient. Therefore, a formula would be useful.

First we need to look at **"factorials".**

Notation: <u>n!</u> stands for n factorial

Definition of n factorial:

For any integer n>0,

$$n! = \underline{n(n-1)(n-2)(n-3)\ldots(3)(2)(1)}$$

<u>Supplemental Example:</u>

4! = 4•3•2•1

If n=0, 0! =<u>1</u>

Example #2 (revisited):

We could rewrite the computation in our example as follows:

$$10 \cdot 9 \cdot 8 \cdot 7 \cdot 6 \cdot 5 = \frac{10 \cdot 9 \cdot 8 \cdot 7 \cdot 6 \cdot 5 \cdot \cancel{4 \cdot 3 \cdot 2 \cdot 1}}{\cancel{4 \cdot 3 \cdot 2 \cdot 1}}$$

$$= \frac{10!}{4!}$$

Furthermore, notice that $= \dfrac{10!}{4!} = \dfrac{10!}{(10-6)!}$

So, the number of permutations (or <u>arrangements</u>)

of 10 cars taken 6 at a time is <u>151200</u>.

Generally, the ***Number of Permutations*** of *n* items taken *r* at a time,

$$_nP_r = \frac{n!}{(n-r)!}$$

How to do on the calculator:

n MATH PRB nPr r

Note: You'll have to know how to calculate these by hand, BUT remember you can check your work with the calculator!

c. EXAMPLE #3

In a scrabble game, Jane picked the letters A,D,F,V, E and I. How many permutations (or arrangements) of 4 letters are possible?

- $$\frac{6!}{(6-4)!} = 360$$

Let's do both ways – by hand with the formula and in the calculator!

Practice Problems

$$_{n}P_{r} = \frac{n!}{(n-r)!}$$

1. Evaluate: (*By hand then using* $_{n}P_{r}$ *function on the calculator to check your answer*.)

a. $_{10}P_{3}$

720

b. $_{9}P_{5}$

15120

2. How many ways can runners in the 100 meter dash finish 1st (Gold Medal), 2nd (Silver) and 3rd (Bronze Medal) from 8 runners in the final? NOTE: This is a permutation because the people are finishing in a position. ORDER matters!

336

C. Combinations

a. Two characteristics:

1. Order DOES NOT matter
2. No item is used more than once

Supplemental Example: How many "combinations" of the numbers 1, 2 and 3 are possible?

There is just 1 combination of 1, 2, 3 because order doesn't matter so 123 is considered the same as 321, 213, etc.

EXAMPLE:

While creating a playlist on your ipod you can choose 4 songs from an album of 6 songs. If you can choose a given song only once, how many different combinations are possible? (List all the possibilities)

We'll let A, B, C, D, E, and F represent the songs.

ABCD ABCE ABCF ACDE ACDF ADEF
ABDE ABDF ACEF
ABEF

BCDE BCDF BDEF CDEF
BCEF

There are 15 combinations!

b. Formula:

Making a list to determine the number of combinations can be time consuming. Like permutations, there is a general formula for finding the number of possible combinations.

<u>Number of Combinations</u> of *n* items taken *r* items at a time is

$$ {}_nC_r = \frac{n!}{(n-r)! \cdot r!} $$

How to do on the calculator:

n MATH PRB nCr r

Let's look at the Playlist EXAMPLE again

While creating a playlist on your I pod you can choose 4 songs from an album of 6 songs. If you can choose a given song only once, how many different combinations are possible? (List all the possibilities)

Let's do both ways – by hand with the formula and in the calculator!

Practice Problems $_nC_r = \frac{n!}{(n-r)! \cdot r!}$

1. Evaluate:

   a. $_4C_2$ b. $_7C_3$ c. $_8C_8$

2. A local restaurant is offering a 3 item lunch special. If you can **choose 3 or fewer items** from a total of 7 choices, how many possible combinations can you select?

3. A hockey team consists of ten offensive players, seven defensive players, and three goaltenders. In how many ways can the coach select a starting line up of three offensive players, two defensive players, and one goaltender?

Practice Problems $_nC_r = \frac{n!}{(n-r)! \cdot r!}$

1. Evaluate:

   a. $_4C_2$ b. $_7C_3$ c. $_8C_8$

   6 35 1

Practice Problems

$$ {}_{n}C_{r} = \frac{n!}{(n-r)! \cdot r!} $$

2. A local restaurant is offering a 3 item lunch special. If you can **choose 3 or fewer items** from a total of 7 choices, how many possible combinations can you select?

$$ {}_{7}C_{3} + {}_{7}C_{2} + {}_{7}C_{1} + {}_{7}C_{0} = 64 $$

3. A hockey team consists of ten offensive players, seven defensive players, and three goaltenders. In how many ways can the coach select a starting line up of three offensive players, two defensive players, and one goaltender?

$$ {}_{10}C_{3} \cdot {}_{7}C_{2} \cdot {}_{3}C_{1} = 7560 $$

$${}_{n}C_{r} = \frac{n!}{(n-r)! \cdot r!}$$

$${}_{n}P_{r} = \frac{n!}{(n-r)!}$$

<u>Mixed Practice:</u> Indicate if the situation following is a Permutation or Combination. Then, solve.

a. In a bingo game 30 people are playing for charity. There are prizes for 1st through 4th. How many ways can we award the prizes?

Permutation or Combination

$${}_{30}P_{4} = 657720$$

b. From a 30-person club, in how many ways can a President, Treasurer and Secretary be chosen?

Permutation or Combination

$${}_{30}P_{3} = 24360$$

$$_nC_r = \frac{n!}{(n-r)! \cdot r!} \qquad _nP_r = \frac{n!}{(n-r)!}$$

Mixed Practice: Indicate if the situation following is a Permutation or Combination. Then, solve.

c. In a bingo game 30 people are playing for charity. There are two $50 prizes. In how many ways can prizes be awarded?

Permutation or Combination

$$_{30}C_2 = 435$$

d. How many 3-digit passwords can be formed with the numbers 1, 2,3,4,5 and 6 if no repetition is allowed?

Permutation or Combination

$$_6P_3 = 120$$

$$_nC_r = \frac{n!}{(n-r)!\cdot r!} \qquad _nP_r = \frac{n!}{(n-r)!}$$

Mixed Practice: Indicate if the situation following is a Permutation or Combination. Then, solve.

e. Converse is offering a limited edition of shoes. They are individually made for you and you choose 4 different colors from a total of 25 colors. How many shoes are possible?

Permutation or Combination

$$_{25}C_4 = 12650$$

f. A fast food chain is offering a $5 box special. You can choose no more than 5 items from a list of 8 items on a special menu. In how many ways could you fill the box?

Permutation or Combination

$$_8C_5 + {}_8C_4 + {}_8C_3 + {}_8C_2 + {}_8C_1 + {}_8C_0 = 219$$

Closing

- Ticket out the door
  - Write down the two new formulas you learned.
  - Write down what n! means.

Homework

- Packet p. 1-2
- Cumulative Review #16-21

- Reminder: Tutorials are Monday and Thursday- first half of lunch.

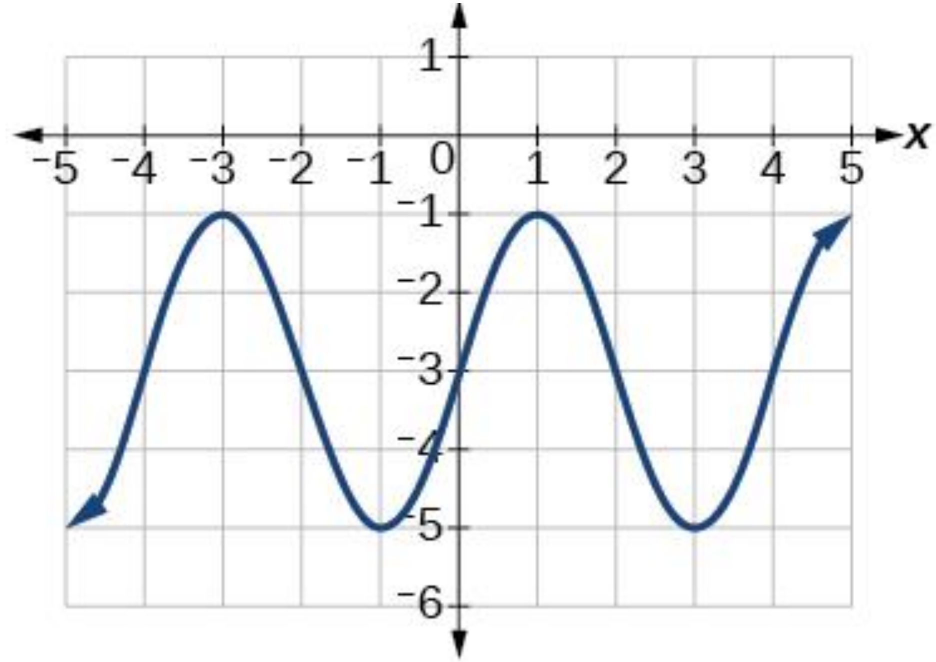
Practice

1. Find its

Amp: 2____

Period: 4____

Midline: y = −3____



Equation: y = −2sin(90x) – 3________